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FOREWORD

Fifth International Mediterranean Congress on Natural Sciences, Health Sciences and Engineering (MENSEC V) with the main theme of "Contemporary Issues in Science and Engineering" is jointly organized by the Bandirma Onyedi Eylul University and Komsija-Association of Balkan Intellectuals from Sarajevo, and also supported by the following universities: Istanbul Sabahattin Zaim University, International University of Sarajevo, University of Donja Gorica and Sivas Cumhuriyet University. The congress was held in September 10-12, 2019 in Budapest, Hungary. In the congress, over 70 oral/poster presentations were made by scholars from over 50 universities/institutions from 12 countries (Albania, Azerbaijan, Bosnia and Herzegovina, Bulgaria, Croatia, Ghana, Indonesia, Israil, Kosovo, North Macedonia, Turkey and the United States of America).

The congress aimd to bring together international scholars and researchers in the areas of natural sciences, health sciences, sport sciences and engineering in order to provide a forum for dialogue and exchange of recent research findings and ideas related to the challenges that Balkan and Mediterranean countries. The Scientific and Organizing Committees are founded by different universities in the region. We have received a large number of applications that has given us the opportunity to choose the most excellent of them in order to reach higher scientific level.

I would like to thank all the participants for their enthusiasm to contribute to this project and their willingness both to keep to tight deadlines and to accept editorial recommendations; to all the Scientific and Organizing Committee members, for their patience, support and tolerance. Special thanks for the rectors of our partner universities for their valuable support. We hope to see you all in our next congress.

Sincerely Yours,

Prof. Dr. Suleyman Ozdemir, Rector

Bandirma Onyedi Eylul University

Fifth International Mediterranean Natural Sciences, Health Sciences and Engineering Congress

MENSEC V

Contemporary Issues in Science and Engineering

CONGRESS PROCEEDINGS

Bandirma Onyedi Eylul University & Komsija
Budapest, Hungary
September 10-12, 2019

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Examining the Leadership Tendencies and Self-Confidence Characteristics of Athletes Concerning Certain Variables

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ABSTRACT

This study is a descriptive research aiming at examining leadership tendencies and self-confidence characteristics of athletes. The study was conducted on 524 voluntary athletes (304 males, 220 females) who were actively doing sports in Konya in 2019. In data collection, the "Leadership Tendency Scale" was used, which was developed by Bolman and Deal (1991) and adapted to Turkish by Develi (2003), and the "Self-Confidence Scale" was used which was developed by Akın (2007). The SPSS 22.0 package program was employed in the analysis of the data. As the statistical method, it was determined that the data demonstrated a normal distribution, thus, the Independent Samples t test and the One Way Anova test were conducted. As the conclusion, it was observed that the individuals dealing with team sports had higher structural leadership and political leadership tendencies compared to the athletes dealing with individual sports. Concerning the age variable, the individuals in the 27-and-over age group had more positive structural leadership tendencies compared to the younger age groups, but there was statistically no significant difference concerning the self-confidence. As per the gender variable, it was determined that female athletes had higher tendencies in human-driven leadership and symbolic leadership, while there was statistically no significant difference concerning their self-confidence levels. In terms of the sports experience of the athletes, it was observed that the ones with longer sports experience had higher scores in the structural leadership and political leadership sub-dimensions, while the ones with shorter sports experience had higher scores in the symbolic leadership and human-driven leadership sub-dimensions.

Keywords: Athlete, Leadership, Self-confidence.

INTRODUCTION

Sports is a tool that keeps people healthy, happy, calm, and stress-free. Therefore, in addition to numerous life skills emerging from sports, sedentary individuals can develop socialization and self-confidence, while amateur/professional athletes can develop leadership behaviors (Karataş 2017).

Dating back to the war books written during the Chinese Dynasty, Uighur and Orkhon inscriptions, the leadership phenomena is arootedand ancient subject of the civilization and it is a broad subject reaching to the present day from Roman and ancient Greek times. As the phenomena, it generally covers the traits that a leader, king, sultan, hakan, or commander should have and is responsible for (Hogg and Vaughan 2006). Although there are approximately 350 definitions and a lot of reviews attributed to the leadership literature, it is not clear where the definition of leadership comes from. Even today, the phenomenon of leadership, which has a lot of meanings and is the content of numerous and works, keeps its secret (Kaya 2006). Therefore, why the fact that "guidance" is preferred much more is because the mystery of leadership has not yet been clarified.

Examining the definitions of leadership in terms of "process"; leadership, according to Koçel, is "the process of one's determining and guiding the effectiveness of others in order to create individual or group objectives in some defined circumstances" (Koçel 1998), while it is "influencing other for achieving objectives" according to Can (Can 1994). Considering the definitions of leadership in terms of "behavioral science", Erdoğan defined leadership as the group of behaviors displayed to measure and coordinate the efforts of group members gathered in a specific circle of objectives (Erdoğan 1991).

Self-confidence is defined as an individual's love for oneself, thinking oneself as sufficient, and accepting oneself as is. Although self-confidence in sports is characterized by a high level of success expectation, research studies have revealed that athletes with high self-confidence believe in themselves in having physical and mental skills that will create the potential to be successful, more importantly, they believe in being successful (Yıldırım 20139). In this way, the athletes can be calm and relaxed, focusing on more positive thoughts, even when they are under stress. Jones and Swainv also found that self-confident athletes were more likely to control their anxiety and focus on positive thoughts than other athletes (Jones and Swain 1995). Athletes with high self-confidence are usually the ones, who are aware of their abilities, who work hard in training to improve their physical and mental deficiencies and make themselves ready for competitions, and who have a certain sports culture and morality (Karatas 2017).

This is a study aiming to examine the leadership tendencies and self-confidence characteristics of athletes.

Method

This study is a descriptive research aiming to examine the leadership tendencies and self-confidence characteristics of athletes. The study was conducted on 524 voluntary athletes (304 males, 220 females) who were actively doing sports in Konya in 2019. The personal characteristics of the research group discussed in the study are given in Table 1. In data collection, the "Leadership Tendency Scale" was used, which was developed by Bolman and Deal (1991) and adapted to Turkish by Develi (2003), and the "Self-Confidence Scale" was used which was developed by Akın (2007). The SPSS 22.0 package program was employed in the analysis of the data. As the statistical method, it was determined that the data demonstrated a normal distribution, thus, the Independent Samples t test and the One Way Anova test were conducted.

Table 1: Personal characteristics of the research group

Variables	Groups	Frequency	Percent
Gender	Male	304	58,0
	Female	220	42,0
Age	18-20 years of age	260	49,6
	21-23 years of age	204	38,9
	24-26 years of age	52	9,9
	27 years and over	8	1,5
Branch Status	Individual	272	51,9
	Team	252	48,1
Sports Experience	1-3 years	160	30,5
	4-6 years	244	46,6
	7-9 years	88	16,8
	10-12 years	32	6,1

Findings

Table 2: Comparison of the scores of the research group obtained from the scales concerning the branch status

	Status	N	Mean	Std. Deviation	t	p
Structural Leadership	Individual	272	31.59	3.86	-3.045	.002
	Team	252	32.59	3.65		
Human Driven Leadership	Individual	272	32.88	3.76	-0.963	.336
	Team	252	33.17	3.18		
Political Leadership	Individual	272	29.75	4.03	-3.333	.001
	Team	252	30.95	4.22		
Symbolic Leadership	Individual	272	31.28	4.81	0.515	.607
	Team	252	31.06	4.79		
Inner Confidence	Individual	272	70.56	7.92	-1.327	.185
	Team	252	71.44	7.35		
Outer Confidence	Individual	272	66.28	6.77	-0.846	.398
	Team	252	66.86	8.66		

The comparison of the scores of the research group obtained from the leadership tendencies and self-confidence scales concerning the branch status is given in the Table 2.

Accordingly, it was determined that there was statistically significant difference in the structural and political leadership sub-dimensions in favor of the athletes dealing with team sports ($p<0.05$).

Table 3: Comparison of the scores of the research group obtained from the scales concerning the gender

	Gender	N	Mean	Std. Deviation	t	p
Structural Leadership	Male	304	31.92	3.56	-1.025	.306
	Female	220	32.27	4.09		
Human Driven Leadership	Male	304	32.51	3.45	-3.987	.000
	Female	220	33.73	3.43		
Political Leadership	Male	304	30.17	4.10	-1.012	.312
	Female	220	30.55	4.24		
Symbolic Leadership	Male	304	30.64	4.92	-3.041	.002
	Female	220	31.91	4.53		
Inner Confidence	Male	304	70.54	7.26	-1.538	.125
	Female	220	71.60	8.15		
Outer Confidence	Male	304	66.45	7.42	-0.376	.707
	Female	220	66.71	8.16		

The comparison of the scores of the research group obtained from the leadership tendencies and self-confidence scales concerning the gender is given in the Table 3. According to this, it was determined that there was statistically significant difference in the human driven and symbolic leadership sub-dimensions in favor of the female athletes ($p<0.05$).

Table 4: Comparison of the scores of the research group obtained from the scales concerning the age

		Sum of Squares	df	Mean Square	F	p	Difference
Structural Leadership	Between Groups	144.395	3	48.132	3.396	.018	4-1 4-2 4-3
	Within Groups	7369.131	520	14.171			
	Total	7513.527	523				
Human-Driven Leadership	Between Groups	82.465	3	27.488	2.270	.080	-
	Within Groups	6297.260	520	12.110			
	Total	6379.725	523				
Political Leadership	Between Groups	107.224	3	35.741	2.080	.102	-
	Within Groups	8936.318	520	17.185			
	Total	9043.542	523				
Symbolic Leadership	Between Groups	65.236	3	21.745	.945	.419	-
	Within Groups	11970.611	520	23.020			
	Total	12035.847	523				
Inner Confidence	Between Groups	103.221	3	34.407	.585	.625	-
	Within Groups	30568.656	520	58.786			
	Total	30671.878	523				
Outer Confidence	Between Groups	129.587	3	43.196	.721	.540	-
	Within Groups	31143.695	520	59.892			
	Total	31273.282	523				

Groups; 1st group:18-20 years of age, 2nd group:21-23 years of age, 3rd group:24-26 years of age, 4th group:27 and older

The comparison of the scores of the research group obtained from the leadership tendencies and self-confidence scales concerning the age is given in the Table 4. It was

determined that there was statistically significant difference in the structural leadership sub-dimension ($p<0.05$). The LSD test was employed in order to determine among which groups there are differences. Accordingly, it was determined that the 27-and-older age group had higher scores in the structural leadership sub-dimension compared to the other groups.

Table 5: Comparison of the scores of the research group obtained from the scales concerning the sports experience

		Sum of Squares	df	Mean Square	F	Sig.	Difference
Structural Leadership	Between Groups	216.244	3	72.081	5.136	.002	3-1 4-1 4-2
	Within Groups	7297.283	520	14.033			
	Total	7513.527	523				
Human-Driven Leadership	Between Groups	158.269	3	52.756	4.409	.004	1-3 1-4 2-4
	Within Groups	6221.456	520	11.964			
	Total	6379.725	523				
Political Leadership	Between Groups	417.540	3	139.180	8.390	.000	3-1 4-1 4-2
	Within Groups	8626.002	520	16.588			
	Total	9043.542	523				
Symbolic Leadership	Between Groups	681.441	3	227.147	10.403	.000	1-3 1-4 2-4
	Within Groups	11354.407	520	21.835			
	Total	12035.847	523				
Inner Confidence	Between Groups	386.254	3	128.751	2.211	.086	
	Within Groups	30285.624	520	58.242			
	Total	30671.878	523				
Outer Confidence	Between Groups	373.782	3	124.594	2.097	.100	
	Within Groups	30899.501	520	59.422			
	Total	31273.282	523				

Groups; 1stgroup: 1-3 years, 2ndgroup: 4-6 years, 3rdgroup: 7-9 years, 4thgroup: 10-12 years

The comparison of the scores of the research group obtained from the leadership tendencies and self-confidence scales concerning the sports experience is given in the Table 5. It was determined that there were statistically significant differences in all of the leadership sub-dimensions ($p<0.05$). The LSD test was employed in order to determine among which groups there were differences. Accordingly, it was concluded that the athletes with higher sports experience years had higher scores in the structural leadership and political leadership sub-dimensions, while the ones with lower sports experience years had higher scores in symbolic and human driven leadership sub-dimensions.

Discussion and Conclusion

When the comparison of the scores of the research group obtained from the leadership tendencies and self-confidence scales concerning the sports experience was examined, it was determined that the athletes dealing with team sports had higher scores in structural leadership and political leadership. Karataş (2017) and Semiz (2011) determined that leadership tendencies of the team athletes were higher compared to the individual athletes.

When the comparison of the scores of the research group obtained from the leadership tendencies and self-confidence scales concerning the gender was examined, it was determined that the female athletes had higher scores in human-driven leadership and symbolic leadership behaviors compared to the males. There are previous studies reporting that leadership tendencies vary depending on gender (Atar and Özberk, 2009; Arslan and Uslu, 2015; Can and Pepe, 2003; Turan and Ebiçoğlu, 2002).

When the comparison of the scores of the research group obtained from the leadership tendencies and self-confidence scales concerning the age was examined, it was determined that the 27-and-older age group had higher scores compared to the other age groups.

When the comparison of the scores of the research group obtained from the leadership tendencies and self-confidence scales concerning the sports experience was examined, it was determined that there were statistically significant differences in all of the leadership sub-dimensions ($p<0.05$). Accordingly, it was concluded that the athletes with higher sports experience years had higher scores in the structural leadership and political leadership sub-dimensions, while the ones with lower sports experience years had higher scores in symbolic and human-driven leadership sub-dimensions. The results of previous studies conducted in the literature are in parallel with those of our study (Karataş 2017, Çar 2013, Semiz 2011, Yücel 2011, Gökçe et al., 2008).

As the conclusion, it was observed that the individuals dealing with team sports had higher structural leadership and political leadership tendency levels compared to the individual athletes, and there was no difference concerning their self-confidence levels. In terms of the age variable, it was determined that individuals in the 27-and-older age group had higher structural leadership tendency levels compared to the younger age groups, and there was no difference concerning their self-confidence levels. In terms of the gender variable, it was determined that female athletes had higher human-driven and symbolic leadership tendency levels, and there was no difference concerning their self-confidence levels. In terms of the sports experience variable, it was determined that the athletes with higher sports experience years had higher structural and political leadership tendency levels, while the ones with lower sports experience years had higher symbolic and human-driven leadership tendency levels.

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Relationship between Thiol/Disulphide Homeostasis and Endometrial Inflammation in Postpartum Dairy Cows

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ABSTRACT

Thiol groups are important anti-oxidants and essential molecules protecting organism against the harmful effects of reactive oxygen species. The current study was designed to investigate Thiol/Disulphide Homeostasis (TDH) in infertile cows with subclinical endometritis (SCE). The study was performed on three groups. Endometrial cytological samples (n=40) were collected using cytobrush to diagnose SCE in infertile cows. These cows were divided into acute SCE (group I; n=20) and chronic SCE (group II; n=16) subgroups according to the cytological examination. As the control, group III (n=20) was comprised from healthy heifers without any gynecological abnormality. Blood samples were taken from each group on the day of diagnosis (day 0) to determine TDH. TDH was determined using a recently developed novel automated and spectrophotometric method. In cytological evaluation, in addition to Giemsa method, immunocytochemical staining was performed to detect chronic inflammation and to investigate the presence of an active infection. It was determined that 55.55% (20/36) of cows with cytological endometritis had an active inflammation and % 44.44 (16/36) of them were chronic. In our study, native thiol and total thiol levels were lower in acute (206.54±8.30; 227.11±9.30) and chronic SCE cases (225.15±11.89; 247.96±10.80) than in control group (308.47±13.59; 336.83±15.50) ($p<0.001$) respectively, however, disulphid level, disulphide/native thiol, disulphide/total thiol and native thiol/total thiol ratios were found to be similar between the groups ($p>0.05$). To the best of our knowledge, this is the first study to investigate TDH as a novel marker of oxidative stress in cows with SCE and animals. These results indicate that abnormal thiol/disulphide homeostasis may play a role in the pathogenetic mechanism of the SCE and also TDH may be a reliable indicator of oxidative stress in SCE.

Keywords: Cow, Infertility, Subclinical Endometritis, Thiol/Disulphide.

INTRODUCTION

Infertility is one of the major problems that affect reproductive performance in dairy farms (Senüver and Nak 2015). The presence of subclinical endometritis (SCE) is one of the etiological factors of infertility (Kasimanickam et al 2004; Gilbert et al 2005). Subclinical endometritis is an inflammation of the endometrium without clinical signs of endometritis (Sheldon et al., 2006). Studies within the literature reveal that SCE in dairy cows have negative impacts on subsequent reproductive performance (Gilbert et al 2005; Kasimanickam et al 2004).

Thiols, known as functional sulfhydryl (-SH) groups, have a vital importance in preventing any oxidative stress (OS) formulations in cells (Kemp et al. 2008). While thiol components are mainly formed by albumin and other proteins, a small part of it constitutes low molecular wight thiols such as cysteine, glutathione, homocysteine and γ- glutamyl cysteine (Turell et al 2013). In proteins, thiol groups of amino acids (methionine, cysteine) that include sulphur are primary targets of reactive oxygen species (ROS). Thiol groups that are present with ROS in the setting are oxidised and converted into disulphide bonds, also known as sulphur bridges. This is an indicator of protein oxidation and, under this OS, thiol / disulphide homeostasis (TDH) is disrupted (Jones and Liang 2009). The parameters of TDH include native thiol and total thiol; disulphide and disulphide/total thiol, native thiol/total thiol and disulphide/native thiol ratios.

There are no studies available in the literature concerning TDH in infertile cows so far. Therefore, this study provides the first report in this area. The proposed study aims to determine thiol/disulphide homeostasis in infertile dairy cows with SCE and compare them to healthy heifers. According to our results, this homeostasis might have a role in aetiopathogenesis mechanisms of infertility problem in cows with SCE.

LITERATURE REVIEW

Infertility is resulting in extending the period between calving and re-conception, failing in reproduction, feeding infertile animals in vain, and causing extra labour, infertility in cows leads to economical losses (Senüver and Nak, 2015).

Jones and Liang (2009) stated the thiol groups that are present with ROS in the setting are oxidised and converted into disulphide bonds, also known as sulphur bridges. This is an indicator of protein oxidation and, under this OS, thiol/disulphide homeostasis (TDH) is disrupted.

Biswas et al (2006) and Circu, Aw (2010) point out the thiols and disulphides have significant roles in detoxification, apoptosis, antioxidant defense, enzyme activity regulations, receptors, transporters, Na-K channel and transcription.

In humans, abnormal TDH, which is a part of antioxidant defense, is examined in pathogenesis of some diseases such as preeclampsia (Özler et al 2015), diabetes mellitus (Ateş

et al 2016), some anomalities that occur during pregnancy like recurrent preagnancy loss (Erkenekli et al 2016).

METHODOLOGICAL ASPECTS AND RESULTS

Animals, Housing and Feeding

This study included 40 Holstein-Friesian dairy cows, aged 3-8, which could not become pregnant although inseminated three times and had no anomalities (abnormal uterine discharge, pyometra, urovagina, pneumovagina, perineal defects) in their gynaecological examination. The study also included 20 heifers aged 11-16 months.

Study Design and Grouping

The infertile cows that were found to have no pathological problems in their clinical examinations were evaluated according to cytologic examination results. Those with acute endometritis were included in Group I (n=20) and those with chronic endometritis were included in Group II (n=16). On the other hand, Group III was named as the control group which consisted of healthy heifers that had no previous gynaecological anomalities (n=20). The control group was conducted heifers, because it is difficult to select cows that are not bred at approximately 200 days postpartum as SCE.

Cytologic Sampling and Evaluation

Cytologic samples of cows with infertility problem were taken by using an endocervical brush via the method suggested by Kasimanickam et al (2004). Collected samples were spread onto the LAM and moved to the laboratory after fixation. The smear samples were stained through Giemsa method and a proportion of 5% neutrophile or greater was defined as threshold for SCE (Melcher et al 2014). Inflammatory cell presence and inflammation characteristics were evaluated according to the design by Polat et al (2015). In this respect, to determine the inflammatory status, the percentage of polymorphonuclear (PMN) cells and lymphocytes (LYM) were calculated. According to the results, cytopathological classifications were determined (If PMN+LYM $\geq$ 5%, acute; if LYM $\geq$ % 5, chronic). In cytologic examination, to determine chronic inflammation and understand whether it is active or not, immunocytochemical staining was done, as well. Collected samples were incubated 20 mins with BSA-Bovine Serum Albumin solution (after adding 1 gr BSA to 100 cc PBS, the solution was dissolved). To determine T lymphocytes and active inflammation in smear samples, they were incubated 20 mins with CD3 (Sigma, Catalog no: C7930, Dilution rate: 1/200) and IFNɣ (AbdSerotec, Catalog no: MCA1964, Dilution rate: 1/300) primary antibodies, respectively. Secondly, Mouse and Rabbit Specific HRP/DAB Detection IHC Kit (Abcam, Catalog no: Ab80436) was used. Then, the preparates undertook a reverse staining process via Mayer's Hematoksilen and they were exposed to alchole-xylol series. Finally, these preparates were put into Entellan and analysed in light microscope. The ratio of immunopositive lymphocytes seen in the samples to all lymphocytes was evaluated.

Collection of Blood Samples

Blood samples were collected from coccygeal vein for all groups on the day of examination (0 day). The samples were put into vacuumed glass tubes of 10 ml that did not include any anticoagulants. The collected samples were centrifuged for 15 mins at 3000 revolutions/min so that their serum was extracted. The serum was taken into Eppendorf tubes and kept in a freezer at - 20 °C until they were analysed.

Determining Thiol/Disulphide Homeostasis

Thiol/disulfide parameters were determined in collected blood samples according to Erel and Neselioglu (2004). TDH was analysed with a fully automated method. This technique uses the sodium borohydrate (NaBH4) for reduction of dynamic disulfide bonds to functional thiol groups. After the native thiol, total thiol and disulfide levels were measured; disulphide/total thiol, native thiol/total thiol and disulphide/native thiol ratios were calculated (Erel and Neselioglu 2014). Results were obtained as lmol/L.

Statistical Analysis

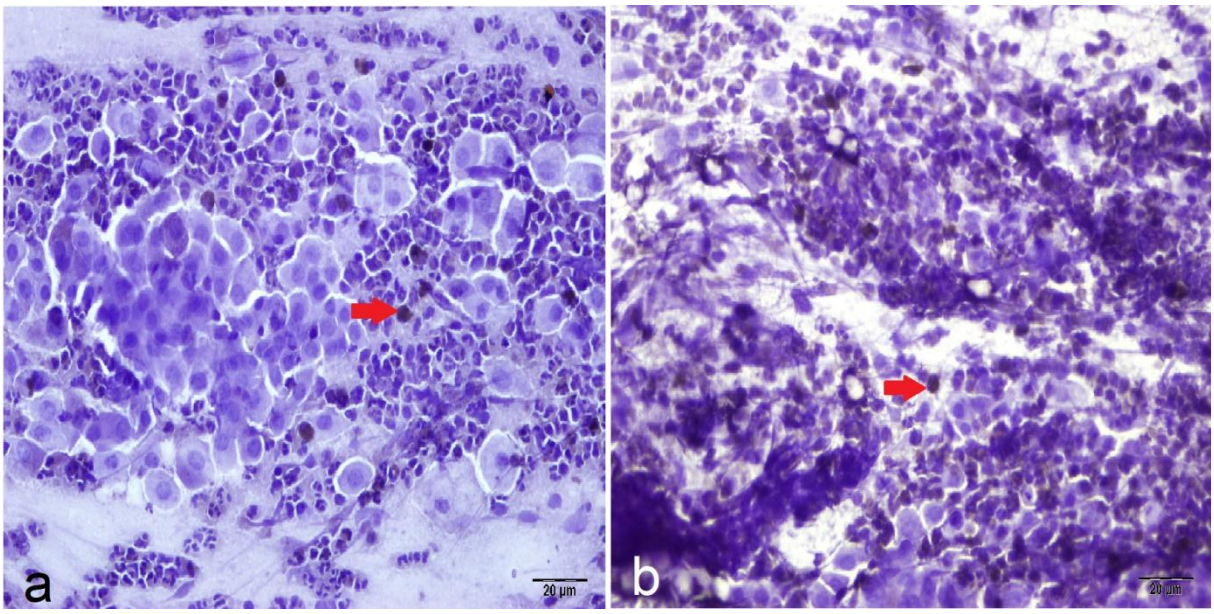
Whether the findings of the study were compatible with normal distribution was determined via Shapiro-Wilk test. Significance control of difference among study groups relating to their serum TDH profiles was conducted through one-way ANOVA, post hoc Tukey tests.

RESULTS

Cytologic Findings

During the study period, a total of 40 cows without vaginal discharge were included in the study. Cytological samples were obtained from 36 cows. After cytologic examination, SCE was cytopathologically classified as acute and chronic according to collected cell evaluation results. In cows determined to have acute endometritis, an intensity of neutrophils along with prismatic epitheliums were observed. On the other hand, in cows that had chronic endometritis, lymphocytes were more in count. In these cases, the number of neutrophils was also high (Figure. 1). It was found out that, in 55.55% (20/36) of infertile cows with subclinical endometritis, the inflammation is still active whereas in 44.44% (16/36) of them, it becomes chronic.

Figure 1:The image of epithelial cells recovered from the endometrium via cytobrush.



a) CD3 immunopositive cells, **b) IFNɣ immunopositive cells. ICCX20**

Calculating Thiol/Disulphide Homeostasis

In our study, a statistically meaningful difference was determined among control, acute and chronic groups regarding native thiol and total thiol variables ($p<0.001$). In other words, native thiol and total thiol averages in acute and chronic groups were detected lower than those of control group. However, disulphide level, disulphide/total thiol, native thiol/total thiol and disulphide/native thiol ratios found at similar levels among the groups ($p>0.05$). Likewise, when acute and chronic SCE groups were compared, the levels were determined to be statistically similar ($p>0.05$). In Grup I and II, TDH was found to have declined when compared to control group. The serum TDH profiles of the cows were summarized in Table 1.

Table 1: The serum thiol/disulfide profiles of the groups.

Parameters	Groups			*P*
	Acute n (20)	Chronic n (16)	Normal n (20)	
Native thiol (lmol/L)	206.54±8.30[b]	225.15±11.89[b]	308.47±13.59[a]	<0.001
Total thiol (lmol/L)	227.11±9.30[b]	247.96±10.80[b]	336.83±15.50[a]	<0.001
Disulphide (lmol/L)	9.44±1.16	11.40±1.22	14.20±1.48	0.244
Disulfide/native thiol (%)	4.66±0.60	5.55±0.78	4.53±0.39	0.470
Disulfide/total thiol (%)	4.14±0.50	4.87±0.62	4.10±0.32	0.503
Native thiol/total thiol (%)	91.16±1.12	90.26±1.23	91.80±0.64	0.619

[a,b]: Letters in the same row demonstrate differences among groups.

DISCUSSION

Subclinical endometritis is an inflammotary disease which is one ofe major problems that affect reproductive performance (Kasimanickam et al 2004; Gilbert et al 2005). In many inflammatory diseases, an increase in the production of proinflammatory cytokines has been associated with an increase in oxidative stress mediators. TDH is a one of important marker for oxidative stress (Sen 1998; Biswas et al 2006). Since TDH is included in aetiopathogenesis of many diseases, determining this parameter might reveal valuable data about various normal or abnormal biochemical processes (Erel and Neselioglu 2014).

All inflammatory reactions which occur in organism cause oxidative stress at cellular, tissue and organ levels. Obviously, OS plays a important role in the cause and progression of many reproductive events such as fertilization and early embryo development (Anne et al 2002; Celi 2011), embryonic losses (Celi et al 2011). The formation and severity of OS might be calcucated through different techniques including lipidhydroperoxide (LPO), malondialdehyde (MDA), glutathione S-transferase (GST), Haptoglobin (Hp), serum amyloid A (SAA) and nitricoxide (NO), total antioxidant status (TAS) and some other markers (Celi 2011; Krishnan et al 2014; Menon 2014; Emre et al 2017). In many studies, it has been suggested that, in cases of uterus infections, Hp, SAA and ceruloplasmin levels were significantly higher when compared to heathy animals (Biswal et al 2014; Chan et al 2004; Kaya et al 2016).

Although only one side (reductive thiol) of this bilateral balance could have been measured in the past (Ellman et al 1979); due to a new method that has been recently developed (Erel and Neselioglu 2014), the level of these two variables can be calculated separately and in total. Moreover, with this method, ratios of the sides to each other and the system can also be analysed. In this context, it becomes more important to determine both reductive (native thiol) and oxidative (disulphide) sides of this homeostasis. According to literature review, there is no study researching the TDH as a marker for OS in animals except for rats. However, these parameters were analysed in human medicine as pathogenesis of many problems such as Alzheimer's disease (Gümüşyayla et al 2016), peripheral facial paralysis (Demir et al 2018), diabetes mellitus (Ateş et al 2016), idiopathic recurrent pregnancy loss (Erkenekli et al 2016) and pre-eclampsia (Özler et al 2015).

In the proposed study, thiol levels were determined to be lower in acute and chronic SCE groups when compared to healty control group. In addition, while in acute and chronic SCE cases, native thiol and total thiol levels were lower that heathy group ($p<0.001$), disulphide levels, disulphide/total thiol, native thiol/total thiol and disulphide/native thiol rates were at similar levels among groups ($p>0.05$). Between acute and chronic SCE groups, thiol levels were also similar. In SCE groups, it was found that oxidised thiol form increased when compared to control group, and so decreased the native thiol and total thiol levels. This shows that OS level is higher in SCE groups than heathy control group. However, contrary to some studies (Ergin et al 2015; Gümüşyayla et al 2016; Aktaş et al 2017; Bababemez et al 2017) when disulphide level was analysed, it was found to be at a similar level to that of control group. This situation makes us think that the OS in SCE might seem as a mechanism independent of disulphide levels. Regarding the findings, it can be said that this test might have a role in aetiopathogenesis

mechanisms of infertility problem. These findings are compatible with the data published previously in medical studies regarding human. Therefore, it can be possible to decrease or prevent the impact of oxidative stress on SCE through treatment.

CONCLUSION

This is the first research to show thiol/disulphide homeostasis in Holstein dairy cows with SCE. Our findings show that infertility cases in cows can be associated with thiol balance. TDH was defined as useful indicator of oxidant/antioxidant imbalance and may be used as a practical marker in diagnosis of SCE. In addition to therapeutic approaches for normalization of redox state can be beneficial in infertile cows with SCE.

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Neutron Attenuation Properties of Hexagonal Boron Nitride-Titanium Diboride Composites for Pu-Be Neutron Howitzer

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ABSTRACT

In this study, neutron attenuation properties of hexagonal boron nitride-titanium diboride (hBN-TiB_2) composite material were investigated against Pu-Be neutron howitzer source. hBN-TiB_2 composites contains 55% hBN by weight with density of 2.214 g/cm^3. Neutron transmission technique was used in the experiments. Neutron attenuation ratios were carried out for both thermal and epi-thermal neutrons by using the thermal channel of the Pu-Be neutron howitzer. The total macroscopic cross-section of hBN-TiB_2 composite was determined as 0.257 cm^{-1}. hBN-TiB_2 composite is a candidate material for neutron attenuation and thermal neutron shielding applications.

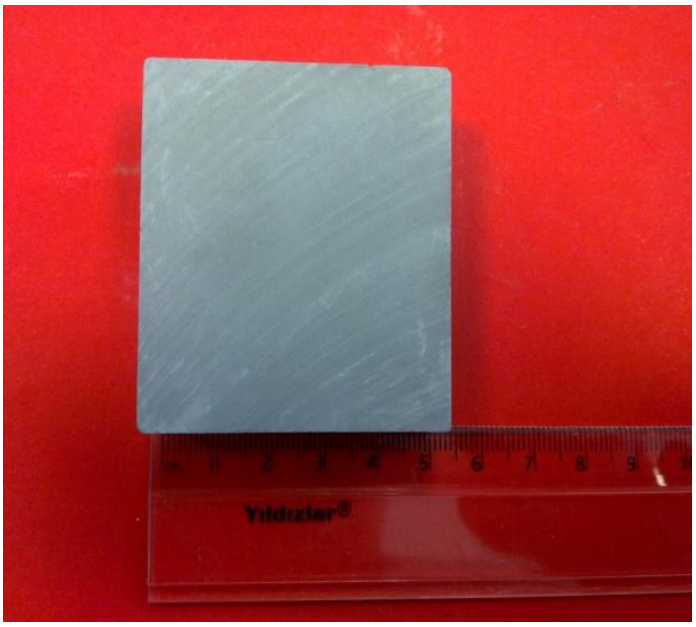
INTRODUCTION

Hexagonal Boron Nitride (hBN) and related materials have good properties such as high thermal shock resistance, high temperature resistance and high thermal conductivity (Steinborn et al. 2013, Wang et al. 2017, Zhang et al. 2015). hBN and related materials have been used in various applications from high temperature applications to steel industry (Eichler and Lesniak, 2008, Chen et al. 2018). In addition, Titanium Diboride (TiB_2) is a refractory material which has excellent hardness, corrosion resistance and electrical conductivity (Schmidt et al. 2007, Munro 2000, Subramanian et al. 2007, Koyanagi et al.2019) . Therefore, hBN-TiB2 composites are attractive materials for many application fields including nuclear technology (Koyanagi et al.2019). It is known that natural boron has high thermal neutron absorption cross-section (767 barn) and boron containing materials are tempting materials for nuclear applications especially neutron shielding applications and neutron detectors Maity et al. 2016, Buyuk et al. 2014, Knoll 2002). In this study, neutron attenuation properties of hBN-TiB2 composites were investigated for Pu-Be Neutron howitzer source.

MATERIALS AND METHODS

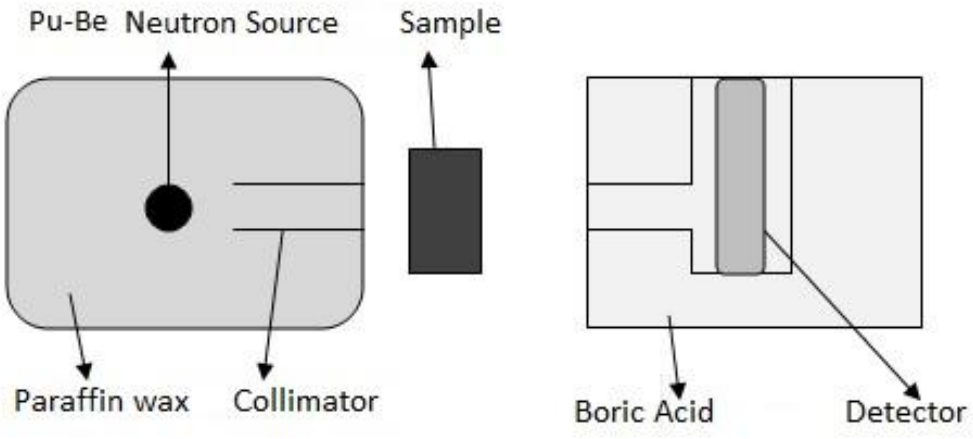
hBN-TiB2 composites were provided by BORTEK Inc. hBN-TiB_2 composites contains 55% hBN by weight. Hexgonal boron nitride- titanium diboride composites were produced in nitrogen atmosphere at 1800 °C, during 2 hours in pressureless sintering. The samples have 5x5x1cm^3 dimensions and density of 2.214 g/cm^3. The produced hexgonal boron nitride- titanium diboride composites were shown in Figure 1.

Figure 1: Hexgonal boron nitride- titanium diboride (hBN-TiB_2) composites



Neutron transmission technique was used to get neutron attenuation behaviours of the (hBN-TiB_2) composites for Pu-Be neutron source. Neutron transmission technique is based on the principle which attenuation of incoming neutrons through the materials by interacting with materials atoms. Schematic view of the neutron transmission technique was given in Figure 2.

Figure 2: Schematic view of the neutron transmission technique



In the experiments, Pu-Be Neutron Howitzer-3 (NH-3) was used as neutron source. Pu-Be Neutron Howitzer has 1,85x10^5 MBq (5 Ci) activity and two irradiation channel (thermal and fast channel). The thermal irradiation channel of the Pu-Be neutron Howitzer was used to get thermal neutron attenuation properties of the hBN-TiB2 composites. A He-3 neutron source which has detection capability of 0.025 eV - 14 MeV energetic neutrons was used as neutron detector. Boric acid based collimator (has 2 cm diameter hole) and shielding system was used to get narrow beam conditions. Neutron source and collimator has been set up on the same axis and initial neutron counts (I_0) were detected without sample. Then hBN-TiB2 samples were put between the detector and the source. The counts (I) were detected at different material thicknesses. The relative intensity (I/I_0) values were determined for each material thickness. The relative intensity values was used to get total macroscopic cross sections (Σ_{tot}) of the samples by using Beer Lambert formula [12];

$$I = I_0 e^{-\Sigma_{tot} x} \qquad (1)$$

where I_0 and I represent incident and transmitted neutron counts, respectively. x is material's thickness.

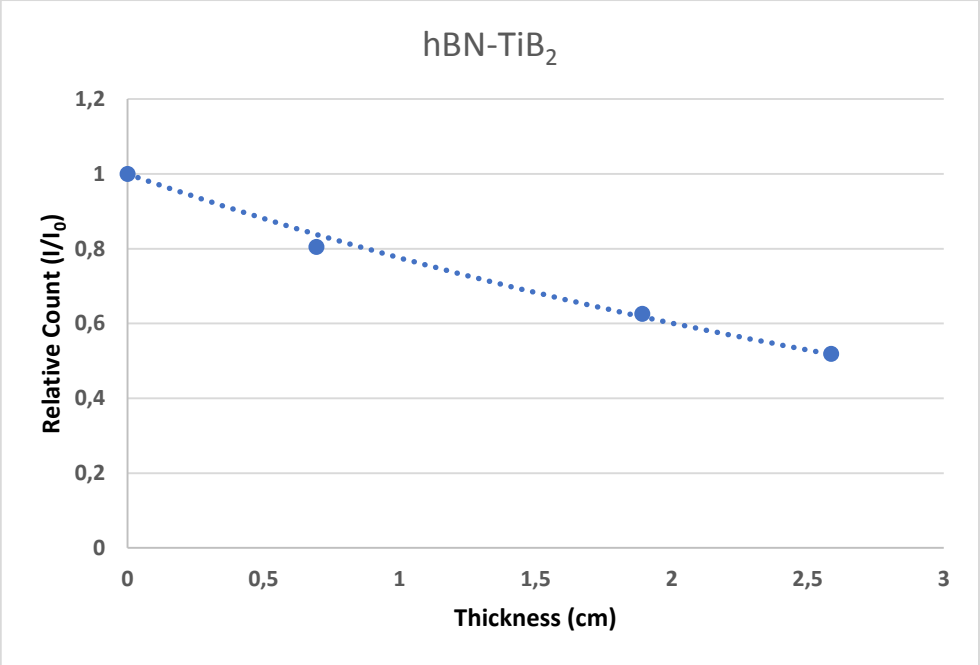
RESULTS

Relative intensity values of hBN-TiB2 composite were given on Table 1. Neutron attenuation curve of the hBN-TiB2 composite was figured out by using relative intesity values. Figure 3 shows the neutron attenuation capability of the hBN-TiB2 composite for Pu-Be neutron source.

Tablo 1: Attenuation properties of hBN-TiB2 composite for Pu-Be neutron source

Thickness (cm)	Relative Count (I/I_0)
0,0000	1,0000
0,6939	0,8050
1,8918	0,6256
2,5857	0,5189

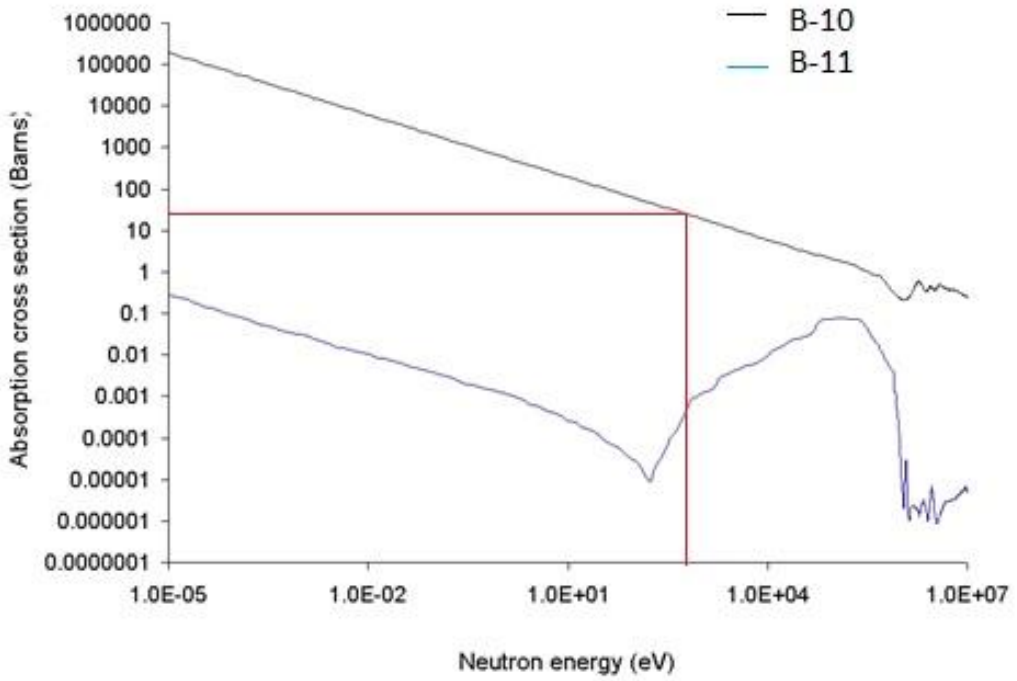
Figure 3: Attenuation properties of hBN-TiB2 composite for Pu-Be neutron source



Increasing hBN-TiB2 thickness caused to decrease on relative counts. It means Neutron attenuation capability increase with increasing material thickness for Pu-Be Neutron Howitzer. The thermal neutrons of Pu-Be Neutron Howitzer interact with atoms (especially ^{10}B isotope) in hBN-TiB2 composite. On the other hand, attenuation curve was fitted by using Origin 8 program according to Beer Lambert's formula. The total macroscopic cross-section (Σ_{tot}) of hBN-TiB2 was figured out as 0.257 cm^{-1}. This total macroscopic cross-section shows that hBN-TiB2 composites could be used for neutron attenuation applications. However, the theoretical total macroscopic cross-section of hBN-TiB2 composite for thermal neutrons was determined as 32.3 cm^{-1}. There was a difference between experimental and theoretical total macroscopic cross-section values. The main reason of the difference is energy distribution of Pu-Be Neutron Howitzer. Pu-Be Neutron Howitzer includes thermal, epithermal and fast neutrons in the thermal channel. Therefore, average neutron energy of the Pu-Be Neutron Howitzer was given as 4.5 MeV in the previous studies. Neutrons were thermalized by using some paraffin wax in the thermal channel, but still there were epithermal neutrons in the channel. If all neutrons were thermalized by paraffin wax the experimental and theoretical results would be closed to each other. According to experimental result, the average neutron

energy of the thermal channel of the Pu-Be Neutron Howitzer could be accepted as about 500 eV. Our estimation was given in Figure 4.

Figure 4: Average energy of studied thermal channel of Pu-Be Neutron Howitzer
(URL-1, the original graph was taken from
https://en.wikipedia.org/wiki/Neutron_capture#/media/File:Neutroncrosssectionboron.png and derivated)



CONCLUSIONS

The neutron attenuation properties of hBN-TiB2 composites were investigated for Pu-Be Neutron Howitzer. Increasing the thickness of the hBN-TiB2 composites were cused to lower relative counts which means higher neutron attenuation capability. The total macroscopic neutron cross-section (Σ_{tot}) was determined as 0.257 cm^{-1} which shows the hBN-TiB2 composites are among the materials which could be used for neutron attenuation applications. In addition, the average neutron energy for the studied thermal neutron channel of the Pu-Be neutron source could be astimated as about 500 eV. This shows that thermal channel of the Pu-Be neutron Howitzer includes both thermal and epithermal neutrons.

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Microhardness and Microstructural Characteristics of Al-3Ni-3Sb Alloy

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ABSTRACT

Rapid solidification process for the manufacture of metallic alloys mechanical properties markedly the same composition is better than conventionally solidified alloy. Increased solid solubility limit and better distribution of secondary phases in alloys due to rapid solidification that improves mechanical properties. Moreover, it is possible to fabricate metastable samples such as, amorphous, nano-crystals and quasi-crystals alloys by cooling metallic melts at cooling rates over the 10^4 Ks^{-1}. On the other hand, Al-Ni based alloys are widely used in automobile, aircraft and weapons industry due to their high mechanical properties, light weight, good portability and excellent corrosion resistance. The physical properties of Al-Ni alloy are being developed with the help of alloying elements such as Si, Cu, Zr, etc. In this study, the effect of rapid solidification production method on the microstructural and mechanical properties of Al–3Ni-3Sb alloys was investigated. The Al–3Ni-3Sb samples were produced by the ingot casting and melt spinning methods at 20 m/s. The morphologies of the alloys were analyzed by optic microscopy (OM) and the phase structures were examined by X-ray diffractometry (XRD). The microstructure has significantly changed with rapid solidification; the microstructures changed from transformed into smaller dendrites and particles than larger rods and dendrites with rapid solidification process. The X- ray diffraction patterns of the melt spun samples at 20 m/s showed Al_3Ni and AlSb and the α–Al phases. The mechanical properties of the ingot and melt-spun alloy was measures Vickers micro-hardness test method. The microhardness values of the rapidly solidified sample were about 2.4 times higher than those of ingot counterpart sample.

Keywords: Al–3Ni-3Sb sample, Melt-spinning, Microstructure, Microhardness.

INTRODUCTION

Researchers have been endeavoring for recent years to develop new alloys which are stronger, stiffer, more ductile and lighter than existing alloys which can be used at high temperatures. One way of achieving this purpose is to use the rapid solidification production technique to synthesize the fine-grained microstructure and obtain a large fraction of phases in solidified condition (Liebermann (1984), Ünlü et al. (2002), Katgerman and Dom (2004)). The transformation from the liquid phase to solid phase in the rapid ejection of thermal energy in rapid solidification processing (RSP) produced alloys of excellent characteristics, which include decreased levels of segregation, a reduction in the grain sizes of the alloying elements, increased solid solubility as well as microhardness values, and in some situations, the formation of amorphous, quasi-crystals and nano-sized materials by cooling metallic melts at cooling rates exceeding 10^4 K s^{-1} (Lavernia and Srivatsan (2010), Karaköse and Keskin (2012a)). The Al–Ni alloys have been using for high temperature applications because of their properties like as the high creep strength, high melting temperature, high corrosion, oxidant resistance and low density. Especially, they have been employed in the aerospace, mechanical, electro-chemical and environmental industries (Ha et al. (2006), Karaköse et al. (2008), Karaköse and Keskin (2012b)). The mechanical and structural features of Al-Ni alloy are being improved with the help of adding elements such as Si, Cu, Zr etc. (Zhong et al. (1997), Kim et al. (2001)). It has been found that Sb can effectively refine the structure of Al based alloys (Nagel et al. (1980), Karaköse and Keskin (2009)). Best our knowledge, microstructure and mechanical properties of Al-Ni alloys with Sb addition have not been investigated so far. Therefore, the aim of this work is to investigate the microstructural and mechanical properties of Al–Ni-Sb alloy within the rapid solidification production method, namely the melt spinning. Al-Ni-Sb alloy with the nominal composition of Al–3Ni-3Sb sample was produced by the ingot casting and the melt spinning method at 20 m/s. The microstructural of Al–3Ni-3Sb alloy is carried out by using the optical microscopy (OM), the enerji diffraction X-Işını (EDX) and X-ray diffraction (XRD) analyzes. The mechanical properties of the ingot alloy and rapidly solidified samples were also measured Vickers micro-hardness test method.

EXPERİMENTAL

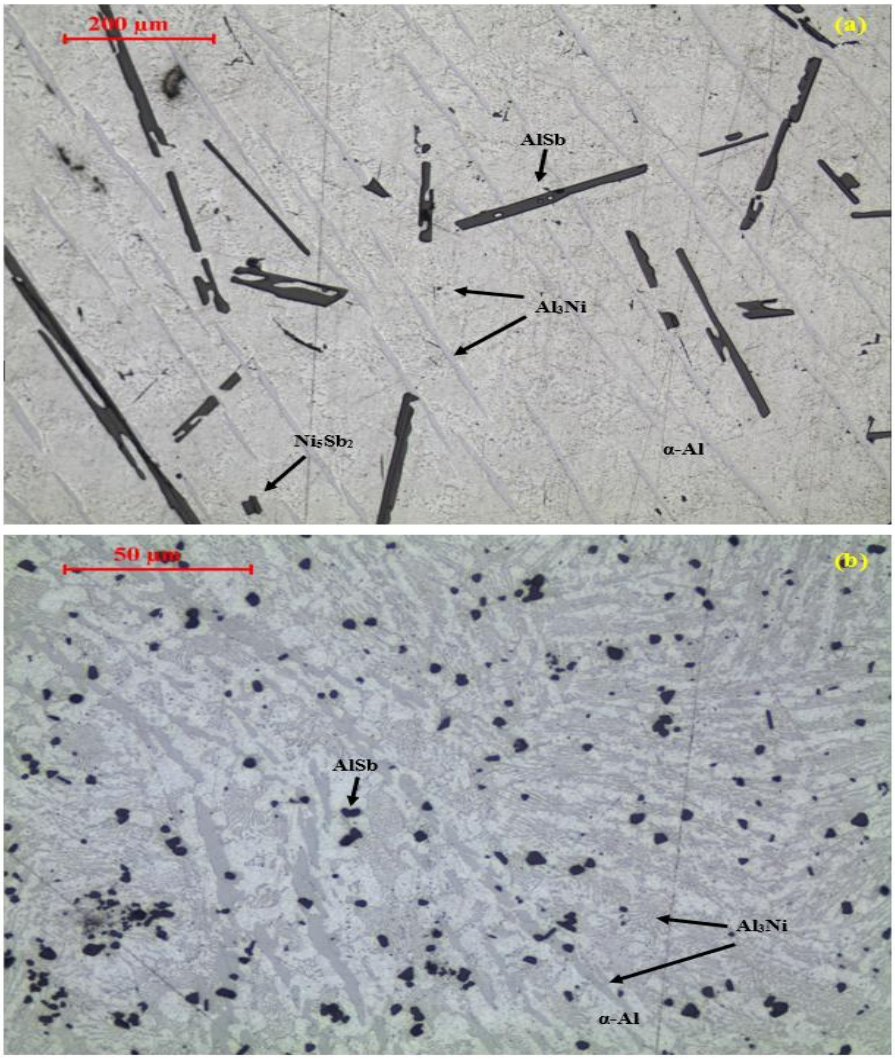
As cast alloy with nominal compositions of Al–wt% 3Ni-wt% 3Sb was prepared in a vacuum induction furnace by using 99.99% Al, 99.9% Ni and 99.9% Sb. As-cast sample with a mass of about 50 g were put into a graphite crucible. The master alloys were produced in vacuum induction furnace. On the other hand, the rapidly solidified alloys were prepared using the single-roller melt-spinning method an Ar atmosphere with the wheel speed at 20 m/s. The resulting melt-spun samples were 25-100 μm thick and 2-10 mm wide. The morphology and phase identification of all samples were analyzed by the OM (Olympus BH2 model), the EDX (EDAX TEAM EDS Analysis System) and the XRD (Bruker AXS D8 X-ray diffractometer) with device parameters of 160 mA, 40 kV and 10°/min using CuKα radiation. The hardness tests of the alloys were made a Durascan 70 model digital Vickers microhardness tester at 25 °C.

RESULTS AND DISCUSSION

OM and XRD results

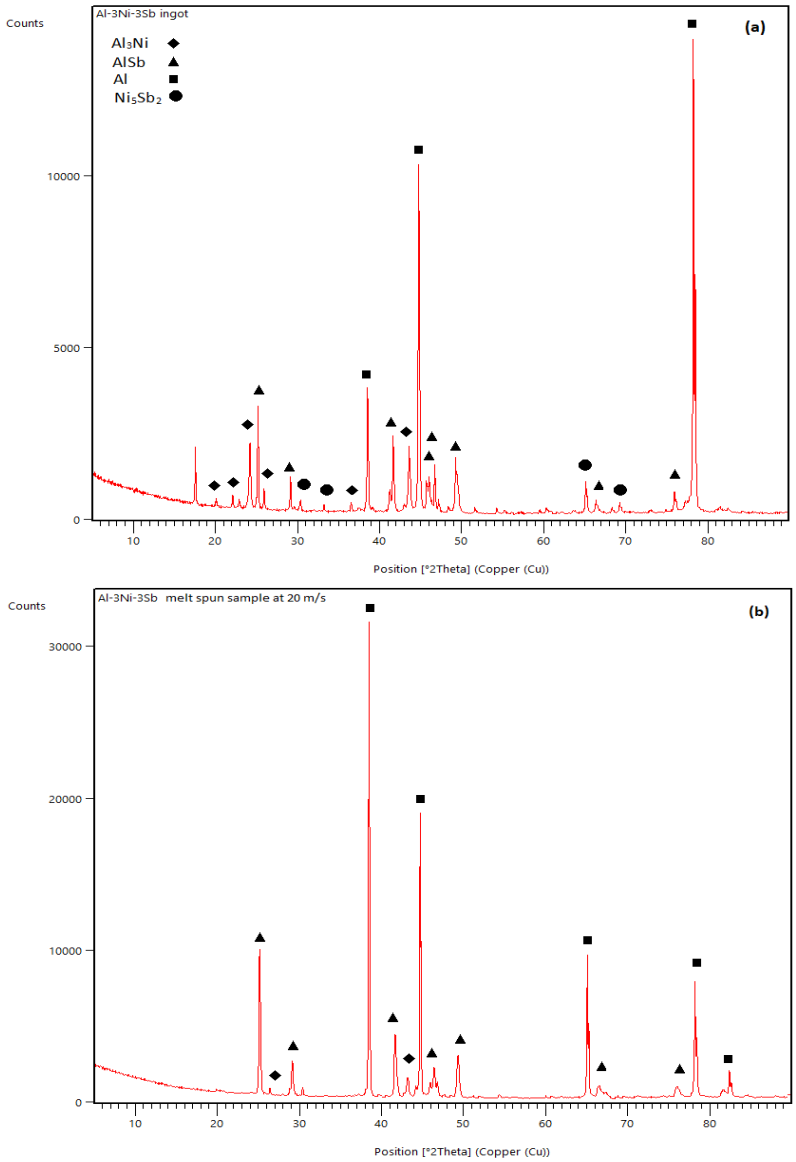
Figures 1 (a) and (b) show the OM images of the conventionally solidified (ingot) and the the rapidly solidified ribbon with the wheel speed at 20 m/s, respectively. Figure 1(a) illustrates the microstructure of the Al–3Ni-3Sb ingot sample, containing dentritic and gray rod shaped Al_3Ni intermetallic phase, black rod shaped Sb phase and quadrangular Ni_5Sb_2 intermetallic phases embedded in α-Al matrix, in the compositions of these phases are 89.88% (wt.) Al, 4.9% (wt.) Sb and 5.2% (wt.) Ni within EDX analysis. Ni belongs to the alloy matrix. Figure 1(b) shows the OM image of the Al–3Ni-3Sb melt-spun sample at 20 m/s, a large amount of dentritics and minor rod shape particles exist in the rapidly solidified ribbon surface. As seen in Figures 1 (a) and (b) the sizes of all particles are considerably reduced. Evidently, a high solidification rate leads to smaller grain size and increases particle number.

Figure 1: The OM micrographs of Al–3Ni-3Sb alloys, (a) Ingot and (b) of melt-spun ribbons at 20 m/s



Figures 2 (a) and (b) display the XRD patterns of the as-cast and rapidly solidified Al–3Ni-3Sb samples, respectively. Figure 2 (a) shows the XRD pattern of an Al–3Ni-3Sb as-cast alloy that have four phases; α-Al, Al3Ni, AlSb and Nb5Sb2. For the rapidly solidified Al–3Ni-3Sb ribbons has three different diffraction patterns namely Al3Ni, AlSb and α-Al, as seen in Figure 2 (b). XRD analysis results illustrates the rapid solidification has effect on the phase constitution of the alloy because Nb5Sb2 phases are not detected in the melt-spun samples. Furthermore, the numbers of Al3Ni and AlSb peaks are significantly decreased compare Figure 2(a) with Figure 2(b), as expected.

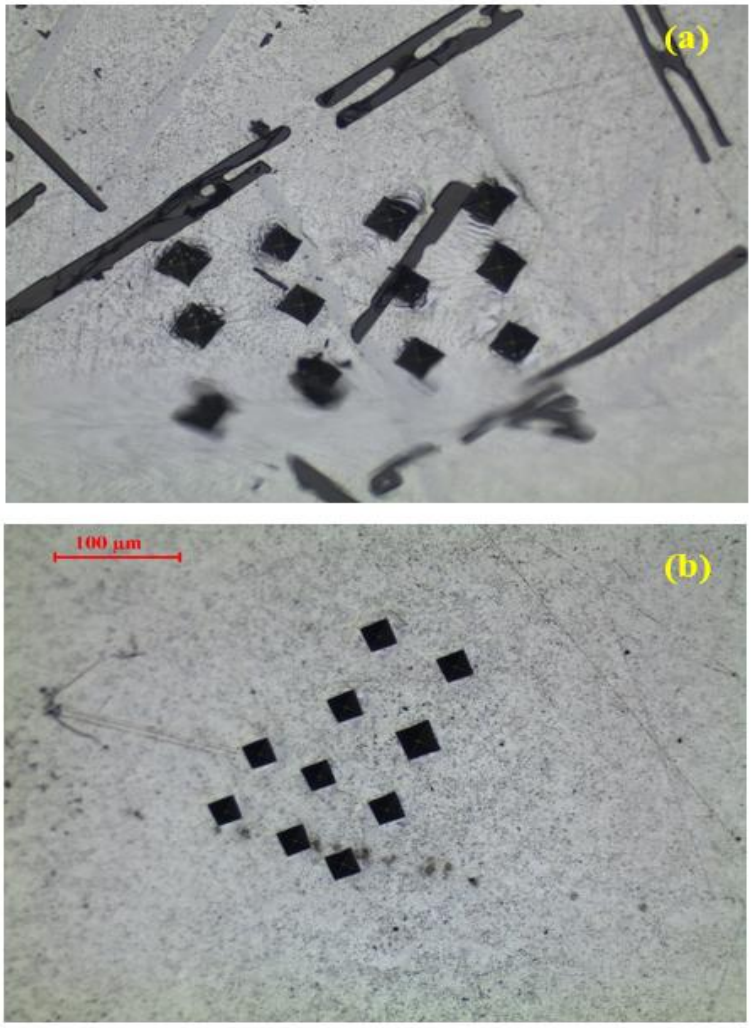
Figure 2: The XRD peaks of Al-3ni-3Sb alloy, (a) ingot and (b) the melt-spun ribbon at 20m/s.



Mechanical Properties

We also investigate and compare the mechanical properties as-cast and rapidly solidified Al–3Ni-3Sb samples via Vickers microhardness (Hv) test. Figures 3 (a) and (b) illustrate the microhardness test photograph of the as-cast and rapidly solidified Al–3Ni-3Sb samples, respectively. Indents were observed on a fully automatic image evaluation in camera system (Figure 3).

Figure 3: The microhardness test photograph of Al–3Ni-3Sb alloy, (a) ingot and (b) melt-spun ribbons at 20 m/s



In Vickers microhardness (Hv) test, an average of 10 readings at different locations on the specimen surfaces was taken for each specimen. We found that the Hv values of the as-cast and melt-spun samples at 20 m/s were 52.7 and 128.5 kg/mm^2, respectively; hence the Hv values of the melt-spun sample is approximately 2.4 times higher than those of the as-cast counterparts. We should also mention that the as-cast alloy had a relatively coarser and inhomogeneous microstructure when compared to their melt-spun counterparts, as seen in Fig.

3. Therefore, the microhardness value of the melt-spun sample at 20 m/s were more developed than those of the ingot counterpart due to the good uniformly distributed microstructure.

CONCLUSIONS

The structural and mechanical features of as-cast and rapidly solidified Al–3Ni-3Sb alloys were investigated. The photograph saved using the OM that give knowledge about the size and morphology of the alloy structures. The dendritic particles had a smaller and more homogeneous distribution in the rapidly solidified alloys. The XRD analysis result on rapidly solidified Al–3Ni-3Sb sample is revealed onlyAl_3Ni, AlSb and α-Al phase, but the ingot alloy has α-Al, Al3Ni, AlSb and Nb5Sb2. The numbers of Al3Ni and AlSb peaks are significantly decreased compare in ribbon samples. Futhermore, the rapidly solidified samples indicate better microhardness property than as-cast samples, namely the Hv value of the melt-spun sample with wheel speed at 20 m/s is approximately 2.4 times higher than the as-cast counterpart.

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Complete Rewriting System and some Results on Crossed Product of Groups

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ABSTRACT

In this review paper, firstly, we give some basic information about complete rewriting system and word problem, which is one of the three decision problems and introduced by Max Dehn in 1911's. Then by considering presentations of crossed, two-sided crossed and iterated crossed product of groups, we present their complete rewriting systems with respect to corresponding deg-lex order on words (Karpuz & Çetinalp, 2018), (Çetinalp, et al., 2016), (Çetinalp & Karpuz, 2018). Complete rewriting system yields solvability of the word problem of a given algebraic structure by finding normal form of elements. Finally, we give a complete rewriting system of monoid presentation of crossed product of two cyclic groups as an aplication of a result given in (Karpuz & Çetinalp, 2018).

Keywords: Presentation, Rewriting System, Word Problem, Crossed Product.

INTRODUCTION AND PRELIMINARIES

Complete Rewriting System

In Combinatorial Group and Semigroup theory one of the fundamental questions is the solvability of the word problem which is one of the decision problems introduced by Max Dehn in 1911 (Dehn, 1911). In general, this problem for finitely groups (or monoids) is not solvable; that is, given two words in the generators of the group (or monoid), there may be no algorithm to decide whether the words in fact represent the same element of the group (or monoid). So it is important to know which groups/group constructions (or monoids/monoid constructions) have solvable word problem. There are several approaches to solve the word problem for a given algebraic structure. One and the most effective of them is to obtain normal form of elements of this structure. In this sense complete rewriting system method is the most popular method to obtain these normal forms. Now let us give some information about complete rewriting system as in the following paragraphs.

Let X be a set and let X^* be the free monoid consisting of all words obtained by the elements of X. A (string) *rewriting system* on X^* is a subset R of $X^* \times X^*$ and an element $(u,v) \in R$, also can be written as $u \to v$, is called a rule of R. The idea for a rewriting system is an algorithm for substituting the right-hand side of a rule whenever the left-hand side appears in a word. In general, for a given rewriting system R, we write $x \to y$ for $x, y \in X^*$ if $x = uv_1w,\ y = uv_2w$ and $(v_1, v_2) \in R$. Also we write $x \to^* y$ if $x = y$ or $x \to x_1 \to x_2 \to \ldots \to y$ for some finite chain of reductions and $\to^*$ is the reflexive, symmetric, and transitive closure of $\to$. Furthermore an element $x \in X^*$ is called irreducible with respect to R if there is no possible rewriting (or reduction) $x \to y$; otherwise x is called *reducible*. The rewriting system R is called

- *Noetherian* if there is no infinite chain of rewritings $x \to x_1 \to x_2 \to \ldots$ for any word $x \in X^*$,
- *Confluent* if whenever $x \to^* y_1$ and $x \to^* y_2$, there is a $z \in X^*$ such that $y_1 \to^* z$ and $y_2 \to^* z$,
- *Complete* if R is both Noetherian and confluent.

A critical pair of a rewriting system R is a pair of overlapping rules such that one of the forms is satisfied. **(i)** $(r_1r_2, s), (r_2r_3, t) \in R$ with $r_2 \neq 1$ or **(ii)** $(r_1r_2r_3, s), (r_2, t) \in R$. Also a critical pair is resolved in R if there is a word z such that $sr_3 \to^* z$ and $r_1t \to^* z$ in the first case or $s \to^* z$ and $r_1tr_3 \to^* z$ in the second. A Noetherian rewriting system is complete if and only if every critical pair is resolved (Sims,1994). Knuth and Bendix have developed an *algorithm* for creating a complete rewriting system R' which is equivalent to R, so that any word over X has an (unique) irreducible form with respect to R'. By considering overlaps of left-hand sides of rules, this algorithm basically proceeds forming new rules when two reductions of an overlap word result in two distinct reduced forms. We finally note that the reader is referred to (Book,

1987), (Book & Otto, 1993), (Miller, 1992) and (Sims,1994) for a detailed survey on complete rewriting systems and word problem.

Crossed product construction appears in different areas of algebra such as Lie algebras, C^*-algebras and group theory. This product has also many applications in other fields of mathematics like group representation theory and topology. In this paper, crossed product construction and its derivations, namely two-sided crossed product and iterated crossed product, have been investigated from view of Combinatorial Group Theory. These group constructions are more important than the other known group products since they contains direct, semidirect, twisted and knit products (Ateş & Çevik, 2009) of groups.

Crossed Product of Groups

Let H and G be two groups. A crossed system of these groups is a quadruple (H,G,α,f), where $\alpha: G \to Aut(H),\ g \mapsto g \triangleright_\alpha h$ and $f: G\times G \to H$ are two maps such that the following compatibility conditions hold:

$$g_1 \triangleright_\alpha (g_2 \triangleright_\alpha h) = f(g_1,g_2)(g_1g_2 \triangleright_\alpha h) f(g_1,g_2)^{-1} \quad (1)$$

$$f(g_1,g_2) f(g_1g_2,g_3) = (g_1 \triangleright_\alpha f(g_2,g_3)) f(g_1,g_2g_3) \quad (2)$$

for all $g_1,g_2,g_3 \in G$ $h \in H$. The crossed system (H,G,α,f) is called normalized if $f(1,1)=1$ (H,G,α,f) is normalized crossed system then $f(1,1)=f(1,g)=f(g,1)=1$ for any $g \in G$. The crossed product of H and G associated to the crossed system, denoted by $H\#_\alpha^f G$, is the set $H\times G$ with the multiplication

$$(h_1,g_1)(h_2,g_2) = (h_1.(g_1 \triangleright_\alpha h_2) f(g_1,g_2), g_1g_2),$$

for all $h_1,h_2 \in H$ and $g_1,g_2 \in G$. Then $\left(H\#_\alpha^f G,.\right)$ is a group with the unit $1_{H\#_\alpha^f G} = (1,1)$ if and only if (H,G,α,f) is a normalized crossed system. Then $H\#_\alpha^f G$ is called the crossed product of groups H and G associated to the crossed system (H,G,α,f) (Agore & Militaru, 2008).

In (Agore & Fratila, 2010), the authors defined the presentations of crossed products of finite\infinite cyclic groups. Let C_n and C_m be finite cyclic groups presented by $C_n = \langle a; a^n = 1\rangle$ and $C_m = \langle b; b^m = 1\rangle$, respectively.

Theorem 1 (Agore & Fratila, 2010): A finite group E is isomorphic to a crossed product $C_n\#_\alpha^f C_m$, if and only if E is the group generated by two generators a and b subject to relations

$$a^n = 1,\ b^m = a^i \quad \text{and} \quad b^{-1}ab = a^j,$$

where $i,j \in \{0,1,2,...,n-1\},\ i.(j-1) \equiv 0 \pmod n$ and $j^m \equiv 1 \pmod n$.

In this paper, we order words in given alphabet in the deg-lex way by comparing two words first with their degrees (lengths), and then lexicographically when the lengths are equal. Additionally, the notation $(i)\cap(j)$ and $(i)\cup(j)$ will denote the intersection and inclusion overlapping words of left hand side of relations (i) and (j), respectively.

COMPLETE REWRITING SYSTEM FOR CROSSED PRODUCT OF CYCLIC GROUPS

We consider presentation of $C_n \#_\alpha^f C_m$ given in Theorem 1. In this section, we give a complete rewriting system of $C_n \#_\alpha^f C_m$ by using corresponding deg-lex order on words. The detailed proof of results given in this section can be found in (Karpuz & Çetinalp, 2018). Let us use the ordering $a > a^{-1} > b > b^{-1}$ among generators. Then the first result is as follows.

Theorem 2 (Karpuz & Çetinalp, 2018): A complete rewriting system for the crossed product $C_n \#_\alpha^f C_m$ consists of the following relations:

Case 1: Let $n \le m$.

- For $j = 1$ and $0 \le i \le n-1$, we have

$1)\ a^n \to 1,\ \ 2)\ b^m \to a^i,\ \ 3)\ ab \to ba,\ 4)\ aa^{-1} \to 1,\ 5)\ a^{-1}a \to 1,\ 6)\ bb^{-1} \to 1,\ 7)\ b^{-1}b \to 1.$

- For $2 \le j \le n-1$ and $0 \le i \le n-1$, we have

$1)\ a^n \to 1,\ 2)\ b^m \to a^i,\ 3)\ ba^j \to ab,\ \ 4)\ aa^{-1} \to 1,\ 5)\ a^{-1}a \to 1,$
$6)\ bb^{-1} \to 1,\ 7)\ b^{-1}b \to 1,\ \ 8)\ a^i b \to ba^i.$

Case 2: Let m < n.

- For $j = 1$ and $0 \le i \le m-1$, we have

$1)\ a^n \to 1,\ 2)\ b^m \to a^i,\ 3)\ ab \to ba,\ 4)\ aa^{-1} \to 1,\ 5)\ a^{-1}a \to 1,\ 6)\ bb^{-1} \to 1,\ 7)\ b^{-1}b \to 1.$

- For $j = 1$ and $m \le i \le n-1$, we have

$1)\ a^n \to 1,\ 2)\ a^i \to b^m,\ 3)\ ab \to ba,\ 4)\ aa^{-1} \to 1,\ 5)\ a^{-1}a \to 1,\ 6)\ bb^{-1} \to 1,\ 7)\ b^{-1}b \to 1.$

- For $2 \le j \le n-1$ and $0 \le i \le m-1$, we have

$1)\ a^n \to 1,\ 2)\ b^m \to a^i,\ 3)\ ba^j \to ab,\ 4)\ aa^{-1} \to 1,\ 5)\ a^{-1}a \to 1,\ 6)\ bb^{-1} \to 1,\ 7)\ b^{-1}b \to 1.$

- For $2 \le j \le n-1$ and $m \le i \le n-1$, we have

$1)\ a^n \to 1,\ \ 2)\ a^i \to b^m,\ \ 3)\ ba^j \to ab,\ \ \ 4)\ aa^{-1} \to 1,\ \ 5)\ a^{-1}a \to 1,$
$6)\ bb^{-1} \to 1,\ \ 7)\ b^{-1}b \to 1,\ \ 8)\ ab^m \to b^m a.$

Since we have the ordering $a > a^{-1} > b > b^{-1}$ among generators there are no infinite reduction steps for all overlapping words. This shows that the rewriting system is Noetherian for both cases given in theorem. It remains to check that the confluent property holds for each cases separately. It is shown that this condition holds as well. For example, for the Case 1; $j = 1$

and $0 \le i \le n-1$ and for the Case 2; $j=1$ and $0 \le i \le m-1$, we have following overlapping words and critical pairs, respectively.

$(1)\cap(1)$: $a^{n+1}, (a,a)$ $(1)\cap(3)$: $a^n b, (a^{n-1}ba, b)$

$(1)\cap(4)$: $a^n a^{-1}, (a^{n-1}, a^{-1})$ $(2)\cap(2)$: $b^{m+1}, (a^i b, ba^i)$

$(2)\cap(6)$: $b^m b^{-1}, (a^i b^{-1}, b^{m-1})$ $(3)\cap(2)$: $ab^m, (bab^{m-1}, aa^i)$

$(3)\cap(6)$: $abb^{-1}, (bab^{-1}, a)$ $(4)\cap(5)$: $aa^{-1}a, (a,a)$

$(5)\cap(1)$: $a^{-1}a^n, (a^{n-1}, a^{-1})$ $(5)\cap(3)$: $a^{-1}ab, (a^{-1}ba, b)$

$(5)\cap(4)$: $a^{-1}aa^{-1}, (a^{-1}, a^{-1})$ $(6)\cap(7)$: $bb^{-1}b, (b,b)$

$(7)\cap(2)$: $b^{-1}b^m, (b^{m-1}, b^{-1}a^i)$ $(7)\cap(6)$: $b^{-1}bb^{-1}, (b^{-1}, b^{-1})$.

All critical pairs are resolved. We can give one of them as follows.

$(3)\cap(2)$: ab^m, (bab^{m-1}, aa^i)

$$ab^m \to \begin{cases} bab^{m-1} \to b^2ab^{m-2} \to b^m a \to a^i a \to a^{i+1} \\ aa^i \to a^{i+1} \end{cases}$$

For other cases all other overlapping words and critical pairs have been proved in (Karpuz, Çetinalp, 2018).

Corollary 2 (Karpuz & Çetinalp, 2018): Let us consider the word $u \in C_n \#_\alpha^f C_m$. Then the normal form C(u) of this word is given as follows:

Case 1: Let $n \le m$.

- For $j=1$ and $0 \le i \le n-1$, $C(u) = b^k a^l$ $(0 \le k \le m-1,\ 0 \le l \le n-1)$.
- For $2 \le j \le n-1$ and $0 \le i \le n-1$,

$C(u) = a^{k_1} b^{l_1} a^{k_2} b^{l_2} \dots a^{k_s} b^{l_s}$ $(0 \le k_\varepsilon \le n-1\ (1 \le \varepsilon \le s), 0 \le l_\delta \le m-1\ (1 \le \delta \le s), k_1 \in \mathbb{Z}$ and $s \in \mathbb{N})$

Case 2: Let m < n.

- For $j=1$ and $0 \le i \le m-1$, $C(u) = b^k a^l$ $(0 \le k \le m-1,\ 0 \le l \le n-1)$.

For $j=1$ and $m \le i \le n-1$, $C(u) = b^k a^l$ $(k \in \mathbb{Z}, 0 \le l \le i-1)$.

- For $2 \le j \le n-1$ and $0 \le i \le m-1$,

$C(u) = a^{k_1} b^{l_1} a^{k_2} b^{l_2} \dots a^{k_s} b^{l_s}$ $(0 \le k_\varepsilon \le n-1\ (1 \le \varepsilon \le s), 0 \le l_\delta \le m-1\ (1 \le \delta \le s), s \in \mathbb{N})$.

- For $2 \le j \le n-1$ and $m \le i \le n-1$,

$C(u) = a^{k_1} b^{l_1} a^{k_2} b^{l_2} \dots a^{k_s} b^{l_s}$ $(k_1 \in \mathbb{Z}, 0 \le k_\varepsilon \le m-1\ (2 \le \varepsilon \le s), 0 \le l_\delta \le j-1\ (1 \le \delta \le s), s \in \mathbb{N})$

Corollary 3 (Karpuz & Çetinalp, 2018): The word problem for the crossed product of finite cyclic groups, $C_n \#_{\alpha}^{f} C_m$, is solvable.

COMPLETE REWRITING SYSTEM FOR TWO-SIDED CROSSED PRODUCT OF CYCLIC GROUPS

In (Çetinalp, et al. 2016), the authors defined a new version of the crossed product of groups under the name of two-sided crossed product. Then they presented a generating and relator sets for this new product over cyclic groups.

Let H and G be two groups. Assume that

$$\left.\begin{array}{ll} \alpha : G \to Aut(H), & \alpha' : H \to Aut(G) \\ f : G \times G \to H, & f' : H \times H \to G \end{array}\right\} \quad (3)$$

be maps such that (1), (2) and the following compatability conditions hold:

$$h_1 \triangleright_{\alpha'} (h_2 \triangleright_{\alpha'} g) = f'(h_1, h_2)(h_1 h_2 \triangleright_{\alpha'} g) f'(h_1, h_2)^{-1}$$
$$f'(h_1, h_2) f'(h_1 h_2, h_3) = (h_1 \triangleright_{\alpha'} f'(h_2, h_3)) f'(h_1, h_2 h_3)$$

for all $h_1, h_2, h_3 \in H$ and $g \in G$. Then *two-sided crossed product* of H and G, denoted by $H \#_{\alpha,\alpha'}^{f,f'} G$, with respect to the actions given above is the set $H \times G$ endowed with the operation $(h_1, g_1)(h_2, g_2) = (h_1.(g_1 \triangleright_{\alpha} h_2) f(g_1, g_2), g_1.(h_1 \triangleright_{\alpha'} g_2) f'(h_1, h_2))$ for all $h_1, h_2 \in H$ and $g_1, g_2 \in G$. Unlikely crossed products of groups, two-sided crossed product need not always be a group. The following result gives some conditions of $H \#_{\alpha,\alpha'}^{f,f'} G$ to be a group.

Theorem 4 (Çetinalp, et al. 2016): Let H and G be any groups. For all $h_1, h_2, h \in H$ and $g_1, g_2, g \in G$, let us consider again the actions given in (3) with the properties

$$g^{-1}.(h_1 \triangleright_{\alpha'} g) f'(h_1, h_2) \in Ker\alpha$$
$$h^{-1}(g_1 \triangleright_{\alpha} h) f(g_1, g_2) \in Ker\alpha'.$$

Then two-sided normalized crossed product $H \#_{\alpha,\alpha'}^{f,f'} G$ defines a group.

As consequences of Theorem 4, two-sided crossed product $H \#_{\alpha,\alpha'}^{f,f'} G$ becomes direct, knit, semi-direct, crossed and twisted products of H and G according to the cases of maps α, α', f and f'.

Let C_n ve C_m be cyclic groups of order n and m generated by a and b, respectively. Then a presentation of two-sided crossed of cyclic groups, $C_n \#_{\alpha,\alpha'}^{f,f'} C_m$, is as follows.

Theorem 5 (Çetinalp, et al. 2016): A finite group E is isomorphic to a two-sided crossed product $C_n \#_{\alpha,\alpha'}^{f,f'} C_m$ if and only if E is a group generated by two generators a and b subject to the relations

$$a^n = b^{i_2},\ b^m = a^{i_1},\ ba = a^{j_1}b^{j_2},$$

where

$$1 \le |j_1| < n,\quad i_1(j_1 - 1) \equiv 0 (\mathrm{mod}\, n),\quad j_1^m \equiv 1 (\mathrm{mod}\, n)$$
$$1 \le |j_2| < m,\ i_2(j_2 - 1) \equiv 0 (\mathrm{mod}\, m),\ j_2^n \equiv 1 (\mathrm{mod}\, m).$$

The monoid presentation for $C_n \#_{\alpha,\alpha'}^{f,f'} C_m$ is given as follows

$$\left\langle a, b, a^{-1}, b^{-1};\ a^n = b^{i_2},\ b^m = a^{i_1},\ ba = a^{j_1}b^{j_2},\ aa^{-1} = a^{-1}a = 1,\ bb^{-1} = b^{-1}b = 1 \right\rangle, \tag{4}$$

where $1 \le |j_1| < n$, $1 \le |j_2| < m$, such that $i_1(j_1 - 1) \equiv 0 (\mathrm{mod}\, n)$, $j_1^m \equiv 1 (\mathrm{mod}\, n)$, $i_2(j_2 - 1) \equiv 0 (\mathrm{mod}\, m)$ and $j_2^n \equiv 1 (\mathrm{mod}\, m)$.

Let us order the generators as $a > a^{-1} > b > b^{-1}$. Then the main result for $C_n \#_{\alpha,\alpha'}^{f,f'} C_m$ is as follows.

Theorem 6 (Çetinalp, et al. 2016): A complete rewriting system for the monoid presentation of $C_n \#_{\alpha,\alpha'}^{f,f'} C_m$ given by (4) consists of the following relations:

Case 1: Let $n \ge m$. For

- $0 \le i_1 < m < n$, we obtain

$$1)\ a^n \to b^{i_2},\ \ 2)\ b^m \to a^{i_1},\ \ 3)\ a^{j_1}b^{j_2} \to ba,\ 4)\ ab^{i_2} \to b^{i_2}a,\ 5)\ a^{i_1}b \to ba^{i_1},$$
$$6)\ aa^{-1} \to 1,\ \ 7)\ a^{-1}a \to 1,\ \ 8)\ bb^{-1} \to 1,\ \ 9)\ b^{-1}b \to 1.$$

- $m \le i_1 < n$, we obtain

$$1)\ a^n \to b^{i_2},\ \ 2)\ a^{i_1} \to b^m,\ \ 3)\ a^{j_1}b^{j_2} \to ba,\ 4)\ ab^{i_2} \to b^{i_2}a,\ 5)\ ab^m \to b^m a,$$
$$6)\ aa^{-1} \to 1,\ \ 7)\ a^{-1}a \to 1,\ \ 8)\ bb^{-1} \to 1,\ \ 9)\ b^{-1}b \to 1.$$

Case 2: Let $m > n$. For

- $0 \le i_2 \le n < m$, we obtain

$$1)\ a^n \to b^{i_2},\ \ 2)\ b^m \to a^{i_1},\ \ 3)\ a^{j_1}b^{j_2} \to ba,\ 4)\ ab^{i_2} \to b^{i_2}a,\ 5)\ a^{i_1}b \to ba^{i_1},$$
$$6)\ aa^{-1} \to 1,\ \ 7)\ a^{-1}a \to 1,\ \ 8)\ bb^{-1} \to 1,\ \ 9)\ b^{-1}b \to 1.$$

- $n < i_2 < m$, we obtain

$1)\ b^{i_2} \to a^n$, $2)\ b^m \to a^{i_1}$, $3)\ a^{j_1}b^{j_2} \to ba$, $4)\ a^n b \to ba^n$, $5)\ a^{i_1}b \to ba^{i_1}$,
$6)\ aa^{-1} \to 1$, $7)\ a^{-1}a \to 1$, $8)\ bb^{-1} \to 1$, $9)\ b^{-1}b \to 1$.

Corollary 7 (Çetinalp, et al. 2016): Let us consider the words $u_1, u_2, u_3, u_4 \in C_n \#_{\alpha,\alpha'}^{f,f'} C_m$. Thus, for the orderings $0 \le i_1 < m < n$, $m \le i_1 < n$, $0 \le i_2 \le n < m$ and $n < i_2 < m$, respectively, the normal forms of these words are given as

- $C(u_1) = b^{k_1}a^{l_1}b^{k_2}a^{l_2}...b^{k_s}a^{l_s}$ $\left(0 \le k_1 \le m-1, 0 \le l_\delta \le i_1 - 1 (1 \le \delta \le s), 0 \le k_\varepsilon \le i_2 - 1 (2 \le \varepsilon \le s)\right)$.
- $C(u_2) = b^{k_1}a^{l_1}b^{k_2}a^{l_2}...b^{k_s}a^{l_s}$ $(0 \le l_\delta \le j_1 - 1 (1 \le \delta \le s), 0 \le k_\varepsilon \le i_2 - 1 (1 \le \varepsilon \le s))$.
- $C(u_3) = b^{k_1}a^{l_1}b^{k_2}a^{l_2}...b^{k_s}a^{l_s}$ $(0 \le k_1 \le m-1, 0 \le l_\delta \le i_1 - 1 (1 \le \delta \le s), 0 \le k_\varepsilon \le i_2 - 1 (2 \le \varepsilon \le s))$.
- $C(u_4) = b^{k_1}a^{l_1}b^{k_2}a^{l_2}...b^{k_s}a^{l_s}$ $(0 \le l_\delta \le i_1 - 1 (1 \le \delta \le s-1), 0 \le k_\varepsilon \le i_2 - 1 (1 \le \varepsilon \le s), l_s \in \square)$.

By Theorem 6 and Corollary 7, we have the following result.

Corollary 8 (Çetinalp, et al. 2016): Let us consider the two-sided crosse product $C_n \#_{\alpha,\alpha'}^{f,f'} C_m$ with a monoid presentation as in (4). Then the word problem for it is solvable.

COMPLETE REWRITING SYSTEM FOR ITERATED CROSSED PRODUCT OF CYCLIC GROUPS

Let $C_1, C_2, ..., C_n$ be finite cyclic groups of order $x_1, x_2, ..., x_n$, respectively. A crossed system of these groups is a quadruple

$$\left(C_i,\ C_{i+1} \#_{\alpha_{i+1}}^{f_{i+1}} C_{i+2} \#_{\alpha_{i+2}}^{f_{i+2}} ... \#_{\alpha_{n-1}}^{f_{n-1}} C_n,\ \alpha_i,\ f_i\right)\ (\ 1 \le i \le n-1),$$

where

$$\alpha_i : C_{i+1} \#_{\alpha_{i+1}}^{f_{i+1}} C_{i+2} \#_{\alpha_{i+2}}^{f_{i+2}} ... \#_{\alpha_{n-1}}^{f_{n-1}} C_n \to Aut(C_i)$$
$$f_i : \left(C_{i+1} \#_{\alpha_{i+1}}^{f_{i+1}} C_{i+2} \#_{\alpha_{i+2}}^{f_{i+2}} ... \#_{\alpha_{n-1}}^{f_{n-1}} C_n\right) \times \left(C_{i+1} \#_{\alpha_{i+1}}^{f_{i+1}} C_{i+2} \#_{\alpha_{i+2}}^{f_{i+2}} ... \#_{\alpha_{n-1}}^{f_{n-1}} C_n\right) \to C_i$$

and

are maps such that (1), (2) and the following compatability conditions hold:

$$\left.\begin{array}{l} x_{1,2} \triangleright_{\alpha_1} \left[x_{2,2} \triangleright_{\alpha_1} \left(x_{1,3}x_{2,3} \triangleright_{\alpha_2} \left(... \triangleright_{\alpha_{n-2}} \left(x_{1,n}x_{2,n} \triangleright_{\alpha_{n-1}} x_{3,1} \right) ... \right) \right) f_1\left(x_{2,2}, x_{3,2}\right) \right] = \\ x_{1,2} \triangleright_{\alpha_1} \left(x_{1,3} \triangleright_{\alpha_2} \left(... \triangleright_{\alpha_{n-2}} \left(x_{1,n} \triangleright_{\alpha_{n-1}} \left[x_{2,2} \triangleright_{\alpha_1} \left(... \triangleright_{\alpha_{n-2}} \left(x_{2,n} \triangleright_{\alpha_{n-1}} x_{3,1} \right) ... \right) f_1\left(x_{2,2}, x_{3,2}\right) \right] \right) ... \right) \right) \end{array}\right\} \quad (5)$$

and

$$f_i\left(x_{m,i+1}, x_{n,i+1}\right) = x_{m,i} \quad \left(2 \le i \le n-1\right), \quad (6)$$

where where $x_{j,i}$ is the j th element of i th group. The iterated crossed product of cyclic groups $C_1, C_2, ..., C_n$ associated to the crossed system with respect to the actions given above is the set $C_1 \times C_2 \times ... \times C_n$ with the multiplication

$$\left(x_{1,1}, x_{1,2}, ..., x_{1,n}\right)\left(x_{2,1}, x_{2,2}, ..., x_{2,n}\right) = \begin{pmatrix} x_{1,1}\left(x_{1,2} \triangleright_{\alpha_1} \left(x_{1,3} \triangleright_{\alpha_2} \left(... \triangleright_{\alpha_{n-2}} \left(x_{1,n} \triangleright_{\alpha_{n-1}} x_{2,1}\right)...\right)\right)\right) \\ f_1\left(f_2\left(...\left(f_{n-1}\left(x_{1,n}, x_{2,n}\right), x_{2,n-1}\right),...\right), x_{2,2}\right),\ x_{1,2}x_{2,2}, ..., x_{1,n}x_{2,n} \end{pmatrix}$$

for all $x_{j,i} \in C_i\ (1 \le i \le n)$. We denote this product by $C_1 \#_{\alpha_1}^{f_1} C_2 \#_{\alpha_2}^{f_2} ... \#_{\alpha_{n-1}}^{f_{n-1}} C_n$.

Theorem 9 (Çetinalp & Karpuz, 2018): Let $C_1, C_2, ..., C_n$ be finite cyclic groups. For all $x_{j,i} \in C_i\ (1 \le i \le n)$, let us consider the actions given in (5) and (6). Then the iterated normalized crossed product $C_1 \#_{\alpha_1}^{f_1} C_2 \#_{\alpha_2}^{f_2} ... \#_{\alpha_{n-1}}^{f_{n-1}} C_n$ defines a group.

To obtain a presentation for $C_1 \#_{\alpha_1}^{f_1} C_2 \#_{\alpha_2}^{f_2} ... \#_{\alpha_{n-1}}^{f_{n-1}} C_n$, let $C_i\ (1 \le i \le n)$ be finite cyclic groups presented by $\left\langle a_i;\ a_i^{x_i} = 1 \right\rangle$. Then we have the following result of which proof have benn obtained by induction process. .

Theorem 10 (Çetinalp & Karpuz, 2018): A group E is isomorphic to iterated crossed product $C_1 \#_{\alpha_1}^{f_1} C_2 \#_{\alpha_2}^{f_2} ... \#_{\alpha_{n-1}}^{f_{n-1}} C_n$ if and only if E is a group generated by generators $a_i (1 \le i \le n)$ and relations

$$\left.\begin{array}{l} a_1^{x_1} = 1, \\ a_p^{x_p} = W_{a_1} W_{a_2} ... W_{a_{p-1}} \quad (2 \le p \le n), \\ a_j^{-1} a_i a_j = W_{a_1} W_{a_2} ... W_{a_i} \quad (1 \le i \le n-1,\ 2 \le j \le n,\ j - i \ge 1) \end{array}\right\} \qquad (7)$$

where $W_{a_k}\ (1 \le k \le n)$ are positive words obtained by the powers of generators $a_k (1 \le k \le n)$.

The following theorem gives a complete rewriting system for $C_1 \#_{\alpha_1}^{f_1} C_2 \#_{\alpha_2}^{f_2} ... \#_{\alpha_{n-1}}^{f_{n-1}} C_n$ For simplicity, we can write $a_k^s\ (0 \le s \le x_k - 1)$ instead of the word $W_{a_k} (1 \le k \le n)$ given by (7) in Theorem 10. In this way, we have the following presentation for $C_1 \#_{\alpha_1}^{f_1} C_2 \#_{\alpha_2}^{f_2} ... \#_{\alpha_{n-1}}^{f_{n-1}} C_n$. In this presentation $0 \le k_i, l_i \le x_i - 1\ (1 \le i \le n)$.

$$\left\langle a_i\ (1 \le i \le n);\ a_1^{x_1} = 1,\ a_1^{k_1} a_2^{k_2} ... a_{p-1}^{k_{p-1}} = a_p^{x_p}\ (2 \le p \le n),\ \ a_j a_1^{l_1} a_2^{l_2} ... a_i^{l_i} = a_i a_j\ (1 \le i \le n-1, 2 \le j \le n) \right\rangle \qquad (8)$$

To obtain a complete rewriting system for $C_1 \#_{\alpha_1}^{f_1} C_2 \#_{\alpha_2}^{f_2} ... \#_{\alpha_{n-1}}^{f_{n-1}} C_n$, firstly, we order the generators as $a_n > a_{n-1} > ... > a_2 > a_1$.

Theorem 11 (Çetinalp & Karpuz, 2018): A complete rewriting system for the presentation given in (8) consists of the following relations:

Case 1: Let $x_p \geq \sum_{j=1}^{p-1} k_j$. Then we have

(1) $a_1^{x_1} \to 1$, (2) $a_p^{x_p} \to a_1^{k_1} a_2^{k_2} ... a_{p-1}^{k_{p-1}}$ $(2 \leq p \leq n)$,

(3) $a_j a_1^{l_1} a_2^{l_2} ... a_i^{l_i} \to a_i a_j$ $(1 \leq i \leq n-1, 2 \leq j \leq n, j-i \geq 1)$,

(4) $a_p a_1^{k_1} a_2^{k_2} ... a_{p-1}^{k_{p-1}} \to a_1^{k_1} a_2^{k_2} ... a_{p-1}^{k_{p-1}} a_p$ $(2 \leq p \leq n)$.

Case 2: Let $x_p < \sum_{j=1}^{p-1} k_j$. Then we have

(1) $a_1^{x_1} \to 1$, (2) $a_1^{k_1} a_2^{k_2} ... a_{p-1}^{k_{p-1}} \to a_p^{x_p}$ $(2 \leq p \leq n)$,

(3) $a_j a_1^{l_1} a_2^{l_2} ... a_i^{l_i} \to a_i a_j$ $(1 \leq i \leq n-1, 2 \leq j \leq n, j-i \geq 1)$.

For

- $l_i + k_i + k_{i+1} + ... + k_{p-1} + 1 > l_1 + k_1 + x_p$, we have

(4) $a_i a_j a_i^{k_i - l_i} a_{i+1}^{k_{i+1}} ... a_{p-1}^{k_{p-1}} \to a_j a_1^{l_1 - k_1} a_p^{x_p}$ $(2 \leq i \leq n-1, 3 \leq j \leq n, 3 \leq p \leq n, i \leq p-1, j-i \geq 1)$,

(5) $a_j a_1^{l_1 - k_1} a_p^{x_p} a_{p-1}^{l_{p-1} - k_{p-1}} a_p^{l_p} ... a_i^{l_i} \to a_i a_j$ $(2 \leq p \leq n, 3 \leq i \leq n, 4 \leq j \leq n, p < i < j)$.

For

- $l_i + k_i + k_{i+1} + ... + k_{p-1} + 1 \leq l_1 + k_1 + x_p$, we have

(4) $a_j a_1^{l_1 - k_1} a_p^{x_p} \to a_i a_j a_i^{k_i - l_i} a_{i+1}^{k_{i+1}} ... a_{p-1}^{k_{p-1}}$ $(2 \leq i \leq n-1, 3 \leq j \leq n, 3 \leq p \leq n, i \leq p-1, j-i \geq 1)$,

(5) $a_j a_1^{l_1 - k_1} a_p^{x_p} a_{p-1}^{l_{p-1} - k_{p-1}} a_p^{l_p} ... a_i^{l_i} \to a_i a_j$ $(2 \leq p \leq n, 3 \leq i \leq n, 4 \leq j \leq n, p < i < j)$,

(6) $a_i a_j a_i^{k_i - l_i} a_{i+1}^{k_{i+1}} ... a_{p-1}^{l_{p-1}} a_p^{l_p} ... a_m^{l_m} \to a_m a_j$ $(2 \leq i \leq n-1, \ i < p < m < j)$.

In the proof of Theorem 11, all overlapping words and critical pairs are checked for all cases. By Theorem 11, we have the following result.

Corollary 12 (Çetinalp & Karpuz, 2018): Let us consider the word $u \in C_1 \#_{\alpha_1}^{f_1} C_2 \#_{\alpha_2}^{f_2} ... \#_{\alpha_{n-1}}^{f_{n-1}} C_n$. Thus, the normal form C(u) of the word u is as follows: $C(u) = W_{a_1} W_{a_2} ... W_{a_n} W_{a_1}^{'} W_{a_2}^{'} ... W_{a_n}^{'} W_{a_1}^{''} W_{a_2}^{''} ... W_{a_n}^{''}$, where W_{a_k}, $W_{a_k}^{'}$ and $W_{a_k}^{''}$ $(1 \leq k \leq n)$ are reduced words generated by $a_k (1 \leq k \leq n)$.

By Theorem 11 and Corollary 12, we have the following result.

Corollary 13 (Çetinalp & Karpuz, 2018): The word problem for the iterated crossed product of cyclic groups, $C_1 \#_{\alpha_1}^{f_1} C_2 \#_{\alpha_2}^{f_2} ... \#_{\alpha_{n-1}}^{f_{n-1}} C_n$, is solvable.

EXAMPLE PART FOR COMPLETE REWRITING SYSTEM FOR CROSSED PRODUCT OF CYCLIC GROUPS

In this part, we consider two cyclic groups and give an application of Theorem 2. Let $C_4 = \langle a; a^4 = 1 \rangle$ and $C_4 = \langle b; b^4 = 1 \rangle$. By Theorem 1, a presentation for crossed product $C_4 \#_\alpha^f C_4$ can be given as $\langle a, b; a^4 = 1, b^4 = a^2, ab = ba \rangle$. Now we order the generators as $b^{-1} > a^{-1} > b > a$ (different ordering given for Theorem 2). By considering deg-lex ordering, we have the following complete rewriting system for the group $C_4 \#_\alpha^f C_4$.
(1) $a^4 \to 1$, (2) $b^4 \to a^2$, (3) $ba \to ab$.

Since we have the ordering $b^{-1} > a^{-1} > b > a$, there are no infinite reduction steps for all overlapping words. Hence the rewriting system is Noetherian. To show that the confluent property holds, we give the following overlapping words and corresponding critical pairs, respectively. $(1) \cap (1) : a^5$, (a, a), $(2) \cap (2) : b^5$, $(a^2 b, ba^2)$, $(2) \cap (3) : b^4 a$, $(a^3, b^3 ab)$, $(3) \cap (1) : ba^4$, (aba^3, b). All these above critical pairs are reduced by reduction steps. Now we take a word $u \in C_4 \#_\alpha^f C_4$. Then $C(u) = a^k b^l$ $(0 \le k, l \le 3)$.

Now we consider monoid presentation of crossed product $C_4 \#_\alpha^f C_4$ and obtain a complete rewriting system for this monoid presentation of $C_4 \#_\alpha^f C_4$ by using the same ordering $b^{-1} > a^{-1} > b > a$ among generators. Monoid presentation of $C_4 \#_\alpha^f C_4$ is as follows:

$$\langle a, b, a^{-1}, b^{-1}; a^4 = 1, b^4 = a^2, ab = ba, aa^{-1} = a^{-1}a = bb^{-1} = b^{-1}b = 1 \rangle . \quad (9)$$

By considering deg-lex ordering, we have the following complete rewriting system for (9).

(1) $ba \to ab$, (2) $a^{-1}b \to ba^{-1}$, (3) $b^{-1}a \to ab^{-1}$,
(4) $b^{-1}a^{-1} \to a^{-1}b^{-1}$, (5) $aba^{-1} \to b$, (6) $b^2 a^{-1} \to ab^{-2}$,
(7) $a^{-1}b^{-2} \to ab^2$, (8) $a^2 b^2 \to b^{-2}$, (9) $a^2 b^{-2} \to b^2$,
(10) $a^3 \to a^{-1}$, (11) $a^{-2} \to a^2$, (12) $b^3 \to a^2 b^{-1}$,
(13) $b^{-3} \to a^2 b$, (14) $ba^{-1}b^{-1} \to a^{-1}$, (15) $aa^{-1} \to 1$,
(16) $a^{-1}a \to 1$, (17) $bb^{-1} \to 1$, (18) $b^{-1}b \to 1$.

By taking into consideration above complete rewriting system, elements for monoid presentation of $C_4 \#_\alpha^f C_4$ are

$$\{1, a, b, a^{-1}, b^{-1}, a^2, b^2, b^{-2}, ab, ab^{-1}, ba^{-1}, a^{-1}b^{-1}, a^2 b, a^2 b^{-1}, ab^2, ab^{-2}\}.$$

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Welding Technology and Effects on Human, Environment and Food Chain

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ABSTRACT

The aim of this study is to indicate the types of welding technology and effect of welding types on the environment and feed to food chain. Welding is used extensively in various manufacturing industries including feed and food, medical products, machines and other constructions. Therefore, many things that people use in daily lives are welded or made by welded parts. Welding is a very common operation in many industries and workplaces. Welding, is a manufacturing method used to join metal or thermoplastic materials with each other. It is widely used in the joining of metal materials. Welding is a joining process, wherein joining is produced by heating to suitable temperature with or without the use of filler metal. Many different sources of energy can be used for welding, such as gas flame, electric arc, laser, electron beam, friction, ultra sound waves. In industrial processes, welding can be carried out in many different environments such as open air, underwater, closed area. Some types of welding processes are Shielded Metal Arc Welding, Gas Metal Arc Welding, Gas Tungsten Arc Welding, Submerged Arc Welding, Plasma Arc Welding and Electric Arc Welding. The welding process involves a variety of hazards for human health and the environment, wherever it is made. It is necessary to take precautions against arc flames, electric shock, ultraviolet rays, toxic fumes and gases. Welding operators face various hazards resulting in adverse health effects specially on welders and even death. Air pollution due to welding leads to certain consequents on humans, environment and food. Welding and corrosion of these materials used in food and feed technology after welding may also cause heavy metal pollution in the environment and in the food chain. This may affect the ecosystem, animals, feed and the food chain of living organisms, causing toxicity and bioaccumulation.

Keywords: Welding Techniques, Environment, Food Chain.

ÖZET

Bu çalışmanın amacı, kaynak teknolojisi türlerini ve kaynak türlerinin çevre ve gıda zincirine etkisini incelemektir. Kaynak teknolojisi yem ve gıda, tıbbi ürünler, makineler ve diğer yapılar dahil olmak üzere çeşitli imalat endüstrilerinde yaygın olarak kullanılmaktadır. Bu nedenle, insanların günlük yaşamlarında kullandıkları pek çok malzeme kaynak yapılmış malzemelerden oluşur. Kaynak birçok endüstride ve işyerinde çok yaygın bir işlemdir. Kaynak, metal veya termoplastik malzemelerin birbirleriyle birleştirilmesi için kullanılan bir üretim yöntemidir. Metal malzemelerin birleştirilmesinde yaygın olarak kullanılır. Kaynak, birleştirme işlemidir, burada birleştirme, dolgu metali kullanılarak veya bu olmadan metalin uygun sıcaklığa ısıtılmasıyla yapılır. Kaynak için gaz alevi, elektrik arkı, lazer, elektron ışını, sürtünme, ultra ses dalgaları gibi birçok farklı enerji kaynağı kullanılabilir. Endüstriyel işlemlerde, kaynak açık hava ve su altı alan gibi birçok farklı ortamda gerçekleştirilebilir. Bazı kaynak işlemleri; Korumalı Metal Ark Kaynağı, Gaz Metal Ark Kaynağı, Gaz Tungsten Ark Kaynağı, Tozaltı Ark Kaynağı, Plazma Ark Kaynağı ve Elektrik Ark Kaynağıdır. Kaynak işlemi, nerede yapılırsa yapılsın, insan sağlığı ve çevre için çeşitli tehlikeler içerir. Ark alevlerine, elektrik çarpmasına, ultraviyole ışınlarına, toksik dumanlara ve gazlara karşı önlem almak gerekir. Kaynak operatörleri, özellikle kaynakçılar ve hatta ölüm üzerinde olumsuz sağlık etkileri ile sonuçlanan çeşitli tehlikelerle karşı karşıyadır. Kaynaktan kaynaklanan hava kirliliği insanlar, çevre ve yiyecek üzerinde belirli sonuçlara yol açar. Kaynak önemli ölçüde hava kirliliğine neden olabilir. Her türlü kaynak işleminde duman ve gaz hava kirletici olarak oluşur. Kaynak işlemi ve sonrasında gıda ve yem teknolojisinde kullanılan bu malzemelerin korozyonu aynı zamanda çevrede ve gıda zincirinde ağır metal kirliliğine neden olabilir. Bu da ekosistemi, hayvanları, yemleri ve canlı organizmaların besin zincirini etkileyerek toksisite ve biyolojik birikmeye neden olabilir.

Anahtar Kelimeler: Kaynak Teknikleri, Çevre, Besin Zinciri.

INTROCUCTION

In recent years, our world has been facing difficulties due to global warming and other natural climate changes. Pollution of the environment occurs mainly when industrial commercial activities and the concentration of harmful substances in the environment reach levels that may harm human, fauna, flora and ecosystem (Adekeye et al., 2011).

According to the findings obtained from historical ruins, the first known welding process dates back to 1400 BC. Under the conditions of that day, people were able to join hot or cold metal pieces by beating them together. With the advances in welding technology after the first world war, the welding process has increased the use of technology not only as a repair method but also as a production method. With the developments in welding technology during the last eighty years; welding in the maritime industry, the automotive industry, the construction industry, the aerospace industry, the machinery industry and much more; is widely used today as an indispensable manufacturing method (Anık, 1991; Azeez and Akinlabi, 2018).

Welding process in industrial production is the joining process of metals and is an important technology in this sector (Escala et al., 2006). The three main components required to form the welded joint are a heat source, such as an electric arc, flame, pressure or friction. Welding is a basic process in the manufacturing of food and feed processing machines in the engine and aircraft industries. Today, the most widely used welding processes are gas and electricity (Adekeye et al., 2011). On an annual basis, a total of one million tons of industrial resources are made worldwide. An average of 5000 tons of fume is produced annually from this process. This represents 0.5% of the world's annual fume production. Statistics show that more than 3 million welding personnel are directly exposed to welding smoke and gas radiation (Amza et al., 2013). These fumes and gases also cause health problems in living organisms, environmental pollution, and ultimately, the transmission of organisms' food chains with harmful substances.

Fume released at the welding is a combination of various fine particles. Welfing fume analysis shows that this fume is rich in toxic and hazardous compounds. Health research shows that welders are suffering from serious and chronic respiratory diseases. The problems are not limited to respiratory diseases (Fard and Fard, 2016). Metals released into the environment through industrial and human activities are transported to the food chain of animals and humans by contaminating the soil from which they will be taken as nutrients by plants. In this way, they can contaminate surface and groundwater by contamination (Adekeye et al., 2011).

Toxic fumes that enter the body through respiration during welding processes cause health problems in humans and at the same time become unstable due to permanent contamination of both the local and global ecosystem. A good welding building process is therefore directly related to a sustainable environment and human health. During, and after welding, lead, vanadium, chromium, cobalt, manganese, arsenic, nickel, cobalt, cadmium, arsenic, etc. released into the environment. In addition to the alloy, gaseous carbon dioxide, nitrogen, helium, argon, hydrogen fluoride, nitrogen dioxide, ozone, nitrogen dioxide, carbon monoxide, phosgene and the like. substances are also released into the environment. Gases

produced by welding processes are different according to the type of welding and may cause various health effects in case of excessive exposure to them (Azeez and Akinlabi., 2018). Depending on certain factors, such as concentrations, properties and exposure times, welding emissions can have health effects in different parts of the human body (Golbabaei and Khadem, 2015). Therefore, more attention should be given to health and the environment during and after the welding process (Azeez and Akinlabi, 2018).

This article is basically structured into three sections: The beginning section contains an entry. The first part covers welding process and welding types. The second part contains toxic gases and fumes generated during the welding process. The third section deals with the effects of welding and heavy metals on the human, environment and food chain.

WELDING AND WELDING TYPES

Welding is the process of combining of two metals with or without melting. Welding is widely used in joining metal materials. There are over 50 different types of welding (Yılmaz, 2015).

Gas Melting Welding

The welding made with the help of medium heat by burning flammable and combustible gases is called gas melting welding. Gases such as acetylene, hydrogen, gas, methane, propane, butane are used to heat the materials to melting temperatures. In these gases; acetylene gas is the most preferred gas because it is easy to supply and gives high heat. Oxygen is also used with acetylene for quick combustion and high heat. The gas melting source in which oxygen and acetylene are used together is called the oxy-acetylene welding.

Electric Arc Welding

Electric arc welding is the process of melting and joining metals and alloys at temperatures above their melting temperature using an electric arc. This welding process requires an energy source that generates high heat. Because, for welding, the metal must be heated to above the melting temperature and solidify again. When a short gap occurs in a strong electric current circuit, an electric arc with a temperature of 3500 ° to 4000 ° C is formed. The arc occurs when electrons emitted from an angry cathode bombard the anode at a high speed. This bombardment provides a strong rise in temperature since it causes the neutral molecules to ionize at the end of the impact. Thus, it turns into electrical energy. According to recent research, 85% of total energy is converted to heat and 15% to light energy. In electric arc welding, the arc is formed between two carbon rods or between the metal to be welded and a carbon or metal rod (Anik and Tülbentçi 1991).

Submerged Arc Welding

Submerged arc welding is a highly efficient arc welding that can be applied automatically or semi-automatically. This welding process occurs between the base metal and a consumable wire electrode. However, welding arc; it cannot be seen because it occurs under

a welding powder pouring into the welding zone. Submerged arc welding method used in shipbuilding industry, automotive and locomotive industry, manufacturing of pressure tanks and steel constructions. It is widely used in industrialized countries due to its suitability for automation, being suitable for indoor and outdoor environments and high welding quality and efficiency (Külahlı, 1988; Golbabaei and Khadem, 2015).

Gas Welding

The type of arc welding in which it is protected from the atmosphere with the help of a suitable gas supplied from the outside of the welding zone is called gas welding. In this method, inert gases such as helium and argon or active gases such as carbon dioxide are used as shielding gas. Gas welding used for welding mild steels, low alloy and stainless steels, copper nickel and aluminum alloys. According to the arc, electrode material and shielding gas, it can be classified as follows.

Table 1: Types of gas welding

Elektrode type Tipi	**Type of gas welding**
Gas Welding with Melting Electrode	Submerged arc welding with inert electrode (MIG)
	Melting metal electrode with carbon dioxide atmosphere under gas welding (MAG)
Gas Welding with Non-Melting Electrode	Submerged arc welding with two non-melting electrodes (arc atom welding)
	TIG welding with an non-melting electrode

MIG-MAG Welding

It is defined as a gas welding under continuous atmosphere with continuous wire. Heat energy required for gas welding by continuous wire is formed by the electric arc formed between the material and the continuous wire. The welding torch feeds the additional wire to the welding zone and also sends the shielding gas to the welding zone to protect the welding zone and the welding bath from the adverse effects of the air. Welding under an inert gas atmosphere such as helium or argon is called MIG. As a result of the researches, it is applied for the first time in the USA in the welding of aluminum and its alloys, followed by high alloy steels, copper and its alloys and carbon steels. Welding method under active gas protection such as carbon dioxide is called MAG. When using some flux cored wires there is no need to use gas in the welding circuit, this method is defined as welding with flux cored wire. Here, the welding zone and the bath are protected by the gas formed by the wire core. Generally used in welding of steel, low carbon steel and alloy steels (Tülbentçi, 1990).

TIG Welding

In TIG (Tungsten Inert Gas) welding; the heat required for the welding process is provided by the arc formed between an insoluble (Tungsten) electrode and the workpiece. The

welding zone is protected by an inert gas such as helium or argon gas. TIG welding, which has a wide range of applications, can be used successfully in the welding of ferrous alloys and in joining most non-ferrous metals and alloys. This welding method, which is suitable for processing in all welding positions, provides very successful results in welding of thin plates and can be easily applied to thick parts. The use of insoluble tungsten electrodes also eliminates the need for additional weld metal by melting the base metal when necessary. Since the bath can be observed during welding in this method; welding process can control (Tülbentçi, 1990; Hasdemir, 2001).

HAZARDOUS FUME AND GAS IN THE WELDING PROCESS

Welding process which is widely used in many sectors; can cause significant air pollution. Harmful substances that emerge after welding and affect the environment and human health in general; vapors, fumes and gases.

If the metal to be welded is painted, coated or if there is a toxic solvent on it; they cause toxic vapor formation during the process. Some chemicals used as binders or solvents on metal may cause the welder to be exposed to more than the permissible formaldehyde (Anonymous, 2019).

Arc formed during welding process causes the welding material to heat up and even burn. Almost all metals in the molten state absorb oxygen and nitrogen from the air and form new compounds, causing the formation of fumes and gases. Due to the high temperature of 3500-4000 ^{o}C during the welding process, different materials in the welding arc evaporate. This vapor condenses, oxidizes upon contact with air and causes the formation of fume particles. The particles may consist of Aluminum, Antimony, Arsenic, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Silver, Tin, Titanium, Vanadium and Zinc metals or compounds of these metals and is usually smaller than one micrometer. Since the fume particles are very small, they can reach all airways in the respiratory system. The welding method used and all materials used during the process determine the type and amount of fume particles and gases. Also welding process cause oxygen-free environment formation, radiation, electric shock, noise, fire and explosion (AFSCME, 2011: Tan, 2008; WORK SAFE ALBERTA, 2009).

Health Hazardous Gases During Welding Process

Nitrogen Oxides (NO2)

Soluble in water and alcohol, tasteless, colorless, odorless, liquid in the form of gases. After high exposure; it will cause lung problems (Department of Labor, 2006).

Ozone (O3)

When exposed to ozone, a colorless, toxic gas; itching or burning in the throat, coughing, chest pain and wheezing, such as symptoms, will cause the respiratory tract to be affected (Department of Labor, 2006).

Carbon dioxide (CO2)

Exposure to carbon dioxide, which is a colorless, odorless choking gas, is more than permissible. It prevents the transport of oxygen to the blood, and can cause respiratory distress, fainting, and death at higher rates (IHSA, 2009).

Carbon Monoxide (CO)

It is a colorless, odorless choking gas, binds to cells in the blood, preventing the blood from carrying oxygen. In carbon monoxide poisoning; fatigue, headache, palpitations and fainting. Exposure to high levels can cause death (Kandiş et al., 2009).

Ethyl Bromide (C2 H5 Br)

Ethyl bromide, which is a colorless and suffocating gas formed by oxygen supply and cutting works, can be an explosive gas when combined with air in certain proportions. It affects human health through respiration (WORK SAFE ALBERTA, 2009).

Phosgene (COCl2)

Phosgene, a colorless, easily toxic gas. Electrical arc welding is caused by exposure of chlorinated solvents in the environment to the welding arc. Irritation of the mouth and throat brings burns to the media and causes pulmonary edema. Long-term exposure may cause poisoning and death by affecting the circulatory, respiratory and nervous systems (Anonymous, 2009).

Phosphine (PH3)

Occurs during welding of weld metal coated with rust inhibitors. It is a colorless, odorless, flammable and toxic gas. Symptoms such as phosphine, respiratory distress, fainting, diarrhea, and headache are observed. Exposure at high rates; paralysis, coma and death in a short time (Anonymous, 2019).

THE EFFECT OF WELDING PROCESS ON PEOPLE, ENVIRONMENT AND FOOD CHAIN

Effects of Welding Process on Welder and Human

The fumes generated during the welding process present a serious danger to the workers. One of the hazards is fine dust particles formed by exposure to gases and arc welding. 0.2 to 2.0% of the working population in industrialized countries is engaged in welding activities (Elderly et al., 2012). Welding risks can be classified as risks arising from physical agents and risks related to chemical components. The main components of welding emissions are oxides of metals due to contact between oxygen and vaporized metals in the air. Recently, nanoparticles emitted from welding processes have been recognized as an important group of air pollutants (Golbabaei and Khadem, 2015).

Epidemiology studies have shown that many welders experience some form of respiratory disease. Pulmonary infections increase in severity, duration and frequency among welders. Understanding the possible adverse health effects of exposure to welding fumes is important for risk assessment and development of prevention strategies (Antonini, 2003). The type and quantity of hazardous substances in the welding fume depends on the welding process and the materials used. Their effects can be divided into three categories:

- Respiratory and lung damaging substances
- Toxic hazardous substances
- Carcinogenic dangerous substances

Iron oxides, which are formed by welding process and affect the lungs, cause lung siderosis and siderosis, while aluminum oxide causes aluminosis. Exposure to lead and mercury can lead to joint diseases such as rheumatoid arthritis, kidney diseases, circulatory and nervous system disorders, and the development of autoimmunity that can cause fetal brain damage in humans. Cadmium is known to be carcinogenic and mutagenic and affects the endocrine system. Chromium causes hair loss, headache, diarrhea, nausea and vomiting in humans (Ayanbengro and Babalola, 2017).

Corrosion of metal materials and welding zones used in the feed and food industry in general cause the following health problems (Golbabaei and Khadem, 2015):

Effects on respiratory system: Inhalation may cause acute or chronic respiratory diseases in all welding processes.

Effects on kidney: Exposure to metals and solvents can be nephrocarcinogenic.

Effects on skin: Skin damage and non-melanocytic skin cancer, malignant melanoma may occur.

Effects on eye: Most welding processes emit intense ultraviolet as well as visible and infrared rays. Negative effects on the eyes can be caused by these optical radiation.

Effects on reproductive system: In the past, some studies have shown an increase in infertility and reduced fertility in mild steel weldingss.

Effect on nervous system: Memory loss, concussion, ataxia and neurofibril degeneration are related to exposure to aluminum.

Carcinogenic effect: Welding fumes and gases and heavy metals released by corrosion can be carcinogenic. Nickel, cadmium and chromium are classified as “Class 1 by the International Cancer Research Agency.

Effects of Welding and Heavy Metals on Environment and Food Chain

The most important environmental damage of the welding process starts with direct air pollution. Fume and gas are produced as air pollutants in all welding processes. During the welding process, different materials in the arc evaporate due to the high temperature. Then, the vapor condenses and oxidizes in contact with air, which leads to the formation of fume (Golbabaei and Khadem, 2015). In addition to damaging human health, air pollution can cause various environmental effects. In order to protect the welded environment and prevent oxidation, inert gases such as carbon dioxide and argon are used because of their availability and low cost. However, these gases need to be taken into account in reducing environmental and greenhouse gas emissions (Nakhla et al., 2012).

Industrial and mining activities are considered to be the major sources of heavy metals (Guan et al., 2014). Heavy metals form a very heterogeneous element group that varies widely in chemical properties and biological functions (Raikwar et al., 2008). They are not degraded and destroyed and not separated into less harmful components and accumulate. Some heavy metals such as mercury, cadmium and lead are highly toxic in nature (Ahmed et al., 2012). Environmental toxicity and biosynthesis of heavy metals is a serious threat to the health of living organisms. Therefore, it is imperative to remove or reduce heavy metal contamination to prevent or reduce the environment and the likelihood of intake in the food chain (Ayanbengro and Babalola, 2017). The bonding energy between naturally occurring heavy metals and soil is much higher than that of anthropogenic sources. Heavy metals from anthropogenic sources typically have a high bioavailability due to their soluble and mobile reactive forms. These anthropogenic sources include alloy production and welding (Dixit et al., 2015).

Heavy metals are well-known environmental pollutants for their toxicity, environmental exposure and biological accumulation. Heavy metals are classified as environmental pollutants due to their toxic effects on plants, animals and humans (Vaishaly et al., 2015). Heavy metals may contaminate food chains in the environment and cause different health problems due to their toxicity. Terrestrial ecosystems with toxic heavy metals are an environmental problem for public health. Heavy metals accumulate as persistent pollutants and consequently contaminate food chains (Hazrat Ali et al., 2019).

The main heavy metal contamination pathways in the animal and human food chain are soil, water and air. However, due to the metal equipment used in the food industry and the feed processing equipment used in feed manufacturing, there is a heavy metal and food transition. Heavy metals, which arise from corrosion during welding and directly from welded areas of metal materials, are concentrated in the environment by reaching potentially harmful levels in some areas. Since heavy metals have toxic and carcinogenic effects, they can cause serious harm to both the animal and the human body. In addition to inhalation and absorption through the skin, people absorb heavy metals with contaminated foods and drinking water. Both plants and animals can bioaccumulate heavy metals in their tissues. Therefore, when used as a food source, these plants and animals can contribute to the uptake of heavy metals by humans (McGrath, 2014). Consumption of food contaminated with these heavy metals above the safe limit leads to various organ dysfunction, including cancer (Hezbullah et al., 2016). Heavy

metals cause problems in fish, especially when they reach water (Ahmed et al., 2012). Plants grown in polluted environments also accumulate high concentrations of heavy metals and, when consumed, pose a serious risk to human health. Such factors affect food safety and threaten the safety of the food chain of living things, especially animals and humans. These toxic metals accumulate in the body and their levels in food need to be controlled to protect human health (Food Safety Authority of Ireland, 2009).

Cadmium is one of the environmental and occupationally important heavy metals. It has a long biological half-life due to its low excretion rate. Another risk is the heavy metal lead, which is ubiquitous. This heavy metal is the most common industrial metal that is common in air, water, soil and food (Raikwar et al., 2008). The non-biodegradable nature of lead is the main reason for its long-lasting environment (Hezbullah et al., 2016). There is also the transition of lead from the metal equipment and welding zones used in the feed and food industry to the food chain by corrosion.

METHODS OF REDUCING THE EFFECTS OF WELDING AND HEAVY METALS

Countries, professional bodies and international health-related organizations set exposure standards for welding emissions. The American State Industrial Hygienists Conference (ACGIH) proposes a Threshold Limit Value-Time Weighted Average of 5 mg/m^3 for total welding fume, assuming it does not contain highly toxic components. Each metal or gas in the weld has its own exposure standard (Golbabaei and Khadem, 2015). Assessing the risks of source emissions and fumes passes through a settlement procedure that includes hazard identification, risk assessment, risk elimination and control measure assessment. For effective risk monitoring, assessors and welders need to be properly trained (Azeez and Akinlabi, 2018).

The main steps to prevent welding damage to the welder, human and environment are as follows (Golbabaei and Khadem, 2015; Fard and Fard 2016; Azeez and Akinlabi, 2018):

- Monitoring of source emissions and risk assessment,
- Biological and Health monitoring,
- Selecting or changing the welding process,
- Ventilation and respiratory system protection equipment,
- A strategic plan to effectively improve occupational safety, health and conditions,
- Comprehensive and continuous staff training,
- Adoption of innovative technologies in the welding industry:
- Environmental and climate friendly welding process,
- Welding process which eliminates the separation of alloy components,
- Welding process requiring low energy input and output,
- Welding process which eliminates the use of filler metals or arc.

CONCLUSION

Air and environmental pollutants are produced in all welding processes and in case of corrosion and use of materials produced by welding. These pollutants can directly harm human beings during the welding process, as well as affecting the environment and ecosystem, creating risks for the animal and human food chain. Good risk assessment programs and monitoring are important to protect employees and the environment through appropriate procedures. In order to protect the air, the environment and water and thus the safety of the food chain, it is imperative to comply with the legislation.

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Use of Aluminum Alloys in Automotive Industry

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ABSTRACT

Increasing competition in the automotive sector and the development of environmental awareness have led the manufacturers to new approaches. Companies increase the production efficiency of vehicles and work to reduce operating costs. New vehicles manufactured with lighter materials than those in the past, with reduced safety and comfort, reduced fuel consumption and reduced exhaust emissions; they are less harmful to the environment. For compelling reasons for reducing fuel economy and exhaust gas output on vehicles; aluminum alloys are traditional steel and cast iron substitutes. Especially in recent years with the understanding of the importance of energy saving; In the automotive industry, tendencies towards lighter and less energy-consuming designs have increased. Aluminum alloys have low density, high strength, easy shaping, good resistance to corrosion, high resistance to external conditions and easy to recycle; are the main reasons they are preferred in vehicle designs. The use of aluminum alloys in vehicle constructions plays an important role in reducing vehicle weight. With a 10% reduction in the total weight of the car; A fuel saving of 5-10% is achieved in the total spent fuel per kilometer. This also means a reduction in the emission gases emitted from the vehicle. The aim of this review is to explain the advantages of aluminum alloys which are widely used in automotive industry.

Keywords: Automotive Industry, Aluminum Alloys, Vehicle Constructions.

ÖZET

Günümüzde otomotiv sektöründe artan rekabet ve çevrecilik bilincinin gelişmesi, üretici firmaları yeni yaklaşımlara itmiştir. Firmalar, taşıtların üretim verimliliğini artırırken, işletme maliyetlerini düşürmek için çalışmaktadırlar. Emniyet ve konforun arttırıldığı, eskiye nazaran daha hafif malzemelerle imal edilen yeni taşıtlar, daha az yakıt tüketimleri ve egzoz salınım değerlerinin azalmasıyla; çevreye daha az zarar vermektedirler. Taşıtlarda yakıt tasarrufunu ve egzoz gazı çıkışını azaltmanın gerektirdiği zorlayıcı sebeplerle; alüminyum alaşımları geleneksel çelik ve dökme demir yerine geçmişlerdir. Özellikle son yıllarda enerji tasarrufunun öneminin anlaşılması ile; otomotiv sanayinde daha hafif ve daha az enerji harcayan tasarımlara yönelimler artmıştır. Alüminyum alaşımlarının yoğunluğunun düşük olması, mukavemetinin yüksek olması, kolay şekillendirilebilmesi, korozyona karşı direncinin iyi olması, dış şartlara karşı gösterdiği direncinin yüksek olması ve geri dönüşümünün kolay olması; taşıt tasarımlarında tercih edilmelerinin temel sebepleridir. Alüminyum alaşımlarının taşıt konstrüksiyonlarında kullanılması, taşıt ağırlığının azaltılmasında önemli rol oynamaktadır. Yaklaşık olarak otomobilin toplam ağırlığındaki %10'luk bir azalma ile; kilometre başına toplam harcanan yakıtta %5-10 oranında bir yakıt tasarrufu sağlanmaktadır. Bu aynı zamanda araçtan açığa çıkan emisyon gazlarının da azalması anlamına gelmektedir. Bu derlemenin amacı, otomotiv endüstrisinde yaygın olarak kullanılan alüminyum alaşımlarının avantajlarını açıklamaktır.

Anahtar Kelimeler: Otomotiv Sanayi, Alüminyum Alaşımları, Taşıt Tasarımları.

INTRODUCTION

Aluminum is one of the three most found elements in the world with a ratio of 8.23% after oxygen with a rate of 46.10% and silicon with a rate of 28.20%. Minerals containing aluminum are very stable and require intensive energy and high temperatures to produce metal from them. Therefore, its widespread use as metal has recently begun.

In 1827, Friedrich Wöhler reduced the anhydrous aluminum chloride with potassium to produce the first metal aluminum. Industrial production of aluminum was realized in 1886 with the introduction of electrolysis method, which is still used today. Thanks to the discovery of the Bayer Process in 1886, which produced alumina from bauxite, aluminum became the most used metal after iron in today's industry. Today, Bayer + Hall-Heroult processes are used for industrial primary aluminum production.

Since the turn of the century, the production of primary aluminum obtained by the same method throughout the world takes place in two stages. In the first stage, alumina is obtained from bauxite ore by Bayer method. In the second stage, aluminum is obtained from alumina by electrolysis.

Aluminum is a metal that can be recycled repeatedly without losing its material properties. Aluminum obtained from the new scrap consisting of aluminum residues from the production and metal processing stages and / or from the old scrap consisting of expired aluminum parts in various fields of use is called secondary aluminum. Compared to the recovery of aluminum from ore, which a much more economical recycling processis, based on re-shaping the metal by melting. The energy consumed in the recovery process is 5% of the energy consumed during the refining of aluminum. Metal beverage cans, auto parts, windows and doors, devices and containers made of aluminum can be counted as recycling sources (Türker, 2005; Johansen, 1994).

The automotive industry has to turn to vehicles that use less fuel to reduce energy consumption and air pollution. Aluminum alloys are the ideal materials that meet the demand for weight reduction for the automotive industry with their characteristic properties such as high strength, good formability, good corrosion resistance and recycling potential. Reducing the weight of the vehicle, as additional regulations on safety, emissions and fuel economy are made in vehicles; is the most important solution to comply with these regulations. (Miller et al. 2000; Moons et al. 1996).

It would be best for consumers to ensure that vehicle weight is reduced without reducing the vehicle's volume and carrying capacity. This is most easily achieved by reducing the weight of the automotive body panels. In the search for lighter cars, the automotive industry has shown great interest in the application of aluminum sheets for car body panels. Replacing the steel material with aluminum alloy materials in the vehicle constructions will reduce the weight of the vehicle without loss of brake and engine performance (Moons et al. 1996; Burger et al. 1995).

Increasing public awareness of fuel consumption in Europe and strict legal regulations on CO_2 emissions also enable consumers to turn to light vehicles. That means a car consumes less fuel this means that the combustion gases generated in the internal combustion engine also decrease the emission gases released from the vehicle. In order to reduce CO_2 emissions caused by road transport many other alternative measures are taken such as the development of engines that produce less emission output after high efficiency combustion, increase the occupancy rates of vehicles, and launch of electric vehicles. However, reducing vehicle weight is seen as the most effective measure since it will also reduce direct fuel consumption and CO2 gas output. Therefore, the use of aluminum alloys in vehicles is extremely important for the environment (González Palencia et al. 2012).

The purpose of this study is to explain the advantages of aluminum alloys which are widely used in automotive industry and vehicle manufacturing in terms of environment, fuel saving and safety etc. and the usage areas of alloys in vehicles.

ALUMINUM AND ALLOYS

Aluminum, which is soft, light, air-oxidized, non-toxic, non-magnetic, easily cast, forged and machined, is known for its three major plus properties compared to other metals. It is preferred in aerospace or automotive constructions where high strength / density ratio and low weight are important. Aluminum alloys have high mechanical properties despite their low weight.

In terms of electrical conductivity / density ratio, aluminum alloys which are at the forefront of other metals and it is preferred in high voltage lines because of this feature.

Due to its corrosion resistance in weather and other corrosive environments, it is preferred in architectural applications and in the construction of household vehicles. Aluminum has a higher corrosion resistance than most other metals thanks to its naturally thin oxide film. In the atmosphere of oxygen this oxide film is always formed. The resulting oxide layer cannot be removed by washing with water. This feature of aluminum has expanded the field of use. Cold deformation reduces corrosion resistance. Corrosion resistance decreases if the purity of aluminum decreases (Bargel and Schltze, 1995; Yıldırım, 2006).

Aluminum alloys are extremely diverse and are divided into two groups as casting and wroght. The composition of both groups is represented by a four-digit number indicating the major foreign elements and, in some cases, the level of purity. For cast alloys, there is a decimal number between the last two digits. These steps are followed by a dash and one to three digits followed by a letter and number indicating the mechanical and / or heat treatment to which the alloy is subjected. For example F, H and O represent the manufactured, strain-hardened and annealed states, respectively. T3 means that the alloy is heat-treated, cold-treated, and then naturally aged. A subsequent solution heat treatment with artificial aging is indicated by T6 (Callister, 2007). Most of the aluminum alloys in both groups can be heat treated.

Wrought Aluminum Alloys : They can be hardened by applying heat treatment to 2XXX series which is Al-Cu alloy, 6XXX series which is Al-Mg-Si alloy, 7XXX series which is Al-Zn alloy and 8XXX series which is Al-Li alloy. Heat treatment cannot be applied to 1XXX series which is pure aluminum, 3XXX series which is Al-Mn alloy, 4XXX series which is Al-Si alloy and 5XXX series which is Al-Mg alloy.

Casting Aluminum Alloys: They can be hardened by applying heat treatment to 2XXX series which is Al-Cu alloy, 3XXX series which is Al-Si-Cu-Mg alloy, 4XXX series which is Al-Si alloy and 7XXX series which is Al-Zn alloy. Heat treatment cannot be applied to the 1XXX series of pure aluminum, the 5XXX series of the Al-Mg alloy and the 8XXX series of the Al-Sn alloy. 6XXX series is not available in casting aluminum alloys (Johansen,1994).

USE OF ALUMINUM IN VEHICLES

In the Automotive Industry, aluminum alloys were first introduced by Clark in 1897 and De Dion Bouton in 1898 with the use of aluminum crankcases. Due to the need of warplanes during the Second World War, the growing aluminum industry turned to other market areas, especially the automotive sector after the war. Especially with the increase in fuel prices after the 1973 oil crisis, the use of aluminum alloys in the automotive sector has increased. It has long been used in aluminum engine blocks, intake manifolds and transmission housings to reduce engine weight. The basic requirement of these applications is that aluminum has the ability to pour into good sealing components for water and air flow, has good thermal conductivity and can withstand mechanical forces (Cole and Sherman, 1995).

Advantages of Using Aluminum Alloy in Vehicles

For compelling reasons required to reduce fuel economy and exhaust gas output in vehicles magnesium and aluminum alloys have replaced traditional steel and cast iron. Especially with the understanding of the importance of energy saving in recent years tendencies towards lighter and less energy consuming designs in land, air, sea and rail vehicles have increased. Today, the increasing competition in the automotive sector and the development of environmental awareness has pushed manufacturers to new approaches. Companies are working to reduce the operating costs while increasing the production efficiency of the vehicles. New vehicles, which are manufactured with lighter materials compared to the previous years, increase safety and comfort and cause less damage to the environment with less fuel consumption and exhaust gas emissions. For this reason, aluminum alloys used in the construction of aircraft, watercraft, automobiles, buses and trains have become the preferred materials today (Musfirah and Jaharah, 2012).

Recycling of aluminum is achieved successfully without deteriorating the quality of the material. Aluminum is unique in this respect. The scrap value of aluminum is quite high in this sense. 80-95% of the aluminum used in automobiles can be manufactured by recycling it from scrap aluminum. Aluminum is the most economical material for many auto parts. In order to develop an environmentally conscious automobile, automobile manufacturers use aluminum

in consideration of the advantages to provide in production costs and the fuel savings of their customers (Özcömert, 2012; Anyasodor and Koroschetz, 2017).

Aluminum reflects 80% of visible light and 90% of thermal radiation striking its surface. It provides a decorative appearance with this feature and as well it is also used as a heat shield in the automotive industry.

The density of aluminum is about one third of steel and copper. High resistance to corrosion, easy forming, good corrosion resistance, high resistance to external conditions and easy to recycle are the main reasons for its widespread use in vehicles. In this sense, aluminum plays an important role in vehicle weight reduction.

All production, assembly and recovery techniques used for steel sheets in automobile construction can also be used for aluminum sheets. There is no need for a different technology and an additional budget for the use of aluminum material.

An advantage of using aluminum in vehicles is fuel saving. With each 100 kg weight reduced from the total weight of the vehicle and it cause 0.6 liters of fuel is saved per 100 kilometers. Weight saving of a 1400 kilogram vehicle with aluminum alloy approximately 300 kilograms. This corresponds to 20% of the vehicle weight. The fuel saving of such a vehicle 1.8 liters per 100 kilometers.

Rolling resistance, slope resistance and acceleration resistance of the resistance forces acting on the vehicle are directly related to the weight of the vehicle. By reducing the weight of the vehicle, these resistance forces and the resistance power required to overcome them will also be reduced. Reducing air resistance and strength from resistance forces is possible with aerodynamic vehicle designs. Today's vehicles are designed with this feature in mind. Designing comfortable, safe, lightweight and aerodynamic vehicles will reduce the amount of fuel consumed and the exhaust gas output after combustion.

Increasing public awareness of fuel consumption and strict legal regulations on CO_2 emissions in Europe also enable consumers to turn to light vehicles. A car's mass-saved 100 kilograms can save about 9 grams of CO_2 per kilometer. It is therefore essential to reduce vehicle mass to reduce CO_2 emissions and to maintain performance, ride quality and driving safety. Less fuel consumption of an automobile means a reduction in the emissions of the combustion gases from the internal combustion engine. By using five hundred grams of aluminum alloy instead of one thousand grams of steel used in its constructio. The automobile will emit less than 10 kilograms of emission gas over its entire working life. Thus, 44 million tons of CO_2 emissions will be saved annually worldwide (González Palencia, 2012; Anyasodor and Koroschetz, 2017; Hirsch, 2011).

Aluminum alloys also have superior properties in achieving rigidity and absorbing impact energy in vehicles. While providing these properties, they provide up to 50% weight gain compared to other materials.

The capacity of the automobile structure to absorb the kinetic energy is determined by the mechanical characteristics of the material used the design and the assembly. The results obtained from numerous crash tests show that this capacity is increased by using aluminum alloy. For this reason, the use of aluminum alloys is ideal in front impact systems (Baumeister et al. 1997).

Another advantage of the use of aluminum in vehicles is the corrosion resistance of aluminum alloys. Corrosion occurs when the paint on the parts made of steel is removed for any reason. In the same environment, the natural oxide layer on the aluminum parts prevents oxidation. Aluminum materials are resistant to corrosion caused by water and road salts, even if they are unpainted or uncoated. Aluminum is stainless and corrosion resistant, such as steel, if the paint is scratched or removed (Stojanovic et al. 2018; Gándara, 2013).

Usage Areas of Aluminum Alloys in Automotive

The aluminum and automotive industries have a common history of using the most common light metal in vehicles. As a result of this common history, an average automobile today contains a wide variety of aluminum parts. In the press, engine block and cylinder covers made of aluminum by casting method, pistons, transmission box, differential box, wheels, vehicle bodies made of aluminum by extrusion method, radiators, seat rails, impact bars, suspension parts, condensers, plate-shaped, body panel and inner surface plates and fuel tanksa re made from aluminum. The average weight of these components in a vehicle is around 100 kg (10% of the total weight). All of these features are used in vehicles without compromising safety and comfort because they carry aluminum.

In the last fifty years, an increasing amount of aluminum material has been used in vehicles. Designing automobiles made of all-aluminum parts for high fuel economy seems to be the solution. However, the price of aluminum for vehicle components produced from plates is still high compared to steel, which is a conventional and inexpensive material. Casting, extruded and sheet aluminum alloys which mainly cast parts are expected to reach 250 kg by 2050 in cars. Until 2050, the proportion of castings decreased, while the total amount of aluminum was envisaged to increase. This means an increase in the amount of plates and extrusion pieces (Tisza and Lukács, 2018; Dündar and Güngör, 2006).

The extrusion process makes it possible to produce parts with complex structures. Aluminum extrusion profiles are used in chassis parts, space frame, bumper and energy absorber crash boxes. Two types of alloys are recommended for aluminum extrusion profiles. These 6xxx (Al-MgSi) and 7xxx (Al-Zn-Mg) series.

Casting products account for 80% of the aluminum used in vehicles and are mainly used in suspension, transmission, differential, engine block and cylinder head. Aluminum alloys are commonly used in wheels as well as in reducing the weight of vehicles. Low-pressure die-casting processes produce high-quality, high-performance aluminum alloys with a smooth, shiny surface appearance, while at the same time offering design freedom. Cast aluminum wheels are used in most luxury cars. Wrought aluminum wheels are used in vehicles where

loading conditions are higher and better mechanical properties are required (Cole and Sherman, 1995; Gören et al. 2013).

Sheet aluminum alloys are preferred in body panel applications. The most common aluminum alloys used in body panel applications are 2XXX series, 5XXX series and 6XXX series aluminum alloys.

2XXX Series (Al-Cu) Aluminum Alloys: They are used in body panel applications. 2008, 2010 and 2036 are the most commonly used 2000 series alloys. 2008 and 2010 alloys are alloys with high corrosion resistance. 2036 alloy has high strength. Heat treatment of these alloys reduces the strength of 2008 and 2010 alloys. For this reason, they are used to design more on the 2036 alloy to increase the shaping.

5XXX Series (Al-Mg-Mn) Aluminum Alloys: 5182, 5454 and 5754 alloys are used in body panel applications. Their strength does not increase with heat treatment. Shaping strength increases. They have high corrosion resistance (Hirsch, 2014; Hirsch and Al-Samman, 2013).

6XXX Series (Al-Mg-Si) Aluminum Alloys: 6009, 6022 and 6111 alloys are used in body panel applications. Alloys that can be heat treated. 6111 is the 6000 series aluminum alloy with the highest strength. 6009 alloy has good shaping feature (Zhong et al, 2017).

Aluminum foam metals also find application in the automotive industry with their high energy damping capabilities and relatively favorable costs. Aluminum foam metals have high mechanical, acoustic, thermal, electrical and chemical properties. They are preferred in the engine part of the vehicles due to their heat and sound insulation properties. They are also used as filling material in the collision box, bumper and doors placed between the chassis and bumper in order to increase the safety of vehicles (Dahil, 2017; Doruk et al. 2016)

CONCLUSION

The density of aluminum is about one third of steel and copper. High mechanical strenght, easy forming, good corrosion resistance, high resistance to external conditions and easy to recycle are the main reasons for its widespread use in vehicles. In this sense, aluminum plays an important role in vehicle weight reduction.

With every 100 kilogram reduction in vehicle weight, a fuel saving of 0.6 liters per 100 kilometers is achieved. This also reduces the emission gas output. A 100 kilogram reduction in vehicle weight results in a CO_2 output reduction of 9 grams per kilometer.

The vehicle weight is directly related to the rolling resistance force, the slope resistance force and the acceleration resistance force acting on the vehicle. By reducing the weight of the vehicle using aluminum alloys, it will be possible to reduce these resistance forces and the resistance power required to overcome these forces. Comfortable, safe and lightweight vehicles will also reduce fuel consumption and emissions after combustion.

The use of aluminum alloys in the automotive industry is ideal, as it is important in maintaining rigidity, absorbing impact energy in vehicles, and increasing the capacity to absorb kinetic energy.

Recycling of aluminum is achieved successfully without deteriorating the quality of the material. 80- 95% of the aluminum used in automobiles can be manufactured by recycling aluminum from the so-called secondary aluminum. Aluminum is the most economical material for many auto parts.

Today, automobile manufacturers prefer to use aluminum alloys in vehicle constructions for these reasons. As it is lighter than aluminum steel constructions, thus, it consumes less fuel and emits less emission gases and vehicles that are environmentally friendly and have lower production costs are manufactured.

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Experimental and Theoretical Evaluation of the Flow-Net in Non-Homogenous Soil

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ABSTRACT

Flow-nets are the conceptual representations of the flow-lines through the porous media. In this respect, the behavior of the flow-lines is on the interest of the engineers. Theoretical approaches like those suggested by Darcy or Richards equation are usually mathematical realization of the possible solutions for those flow-lines in the homogenous medium. However, in real experiments with non-homogenous soil samples, a lot of deviation from theoretical solutions occurs. An experimental approach is used in this study to evaluate the flow-net in a non-homogenous soil sample. The experimental set up is built using a 5 mm plexi-glass with 30×30×15 cm in dimensions and constant heads are used at upstream and downstream of an impermeable wall to produce hydraulic gradient. A sand with diameter ranging between 0.5 - 1 mm is used to simulate the heterogeneity of the porous medium while food color is used to visualize the flow lines in the experiment. The flow-lines were tracked down by changes in their Cartesian coordinates through time. Later, theoretical projection of the flow-lines is done using try and error method considering the boundary conditions for Laplace equation. Then, polynomial equations are fitted to theoretical and experimental data to make a comparison. Results indicate to similarities between theoretical and experimental flow line trajectories. However, some deviations are also observed which are linked to the heterogeneity of the porous medium.

Keywords: Experimental Study, Flow-Net, Polynomial Fit, Laplace Equation, Theoretical Study.

INTRODUCTION

Groundwater flow and its behavior is an important topic in the study of the hydraulics of porous medium. Particularly, the velocity and the direction of the groundwater flow can be catastrophic for hydraulic structures. For instance, piping under dams' foundation is a progressive erosion of concentrated leakage caused by groundwater flow. Piping, weaken the shear force between soil particles and causes serious damage in the body and foundation of the dams.

In this respect, many studies have been conducted to evaluate the behavior of the water in this environment. For instance, Darcy (1856) used to study the groundwater hydraulics in porous medium. In this study, the velocity of the groundwater flow in porous media was introduced using,

$$V = -K\frac{\Delta h}{\Delta l} \quad (1)$$

while the groundwater flow velocity, V is calculated by the hydraulic conductivity K, and the hydraulic gradient, which is expressed by the ratio of head difference Δh, over the length of the flow Δl. The assumption of this study however was the homogeneity of the soil sample as the porous medium.

Also, Richard (1931) studied the movement of groundwater in unsaturated media. He also, expressed this movement using,

$$\frac{\partial \theta}{\partial t} = \frac{\partial}{\partial z}\left[K(\theta)\left(\frac{\partial h}{\partial z} + 1\right)\right] \quad (2)$$

while, the ratio of the changes in θ, the volumetric water content, over time, t, is expressed using hydraulic conductivity, K, head induced by the capillary action, h, and elevation above a vertical datum, z.

Pinder and Bredehoeft (1968) used to model groundwater flow in non-steady flow conditions at a confined aquifer by an implicit finite difference method. In this study the vertical conductivity, nonstable boundary conditions, and non-homogeneity was considered in the study. The obtained results then were compared with the field tests to evaluate the laboratory experiments. Similarly, Freeze and Witherspoon (1966; 1967), Bredehoeft (1969), Taylor and Luthin (1969), Bredehoeft and Pinder (1970), Larson and Trescott (1977), Kinzelbach (1986), Anderson and Woessner (1992), Irfanoglu (1994), Yilmaz (1999), Ayvaz (2004), and Karahan and Ayvaz (2005) can be mentioned as some of the post studies that addressed groundwater flow in porous medium.

The aim of this study, is to (*i*) conduct an experimental study to evaluate the groundwater flow direction (flow net) in non-homogenous soil sample, (*ii*) evaluate the mathematical equation for flow-line obtained by a polynomial curve fit, and finally (*iii*) investigate the relationship between length of the flow line and the water velocity in the heterogeneous soil sample.

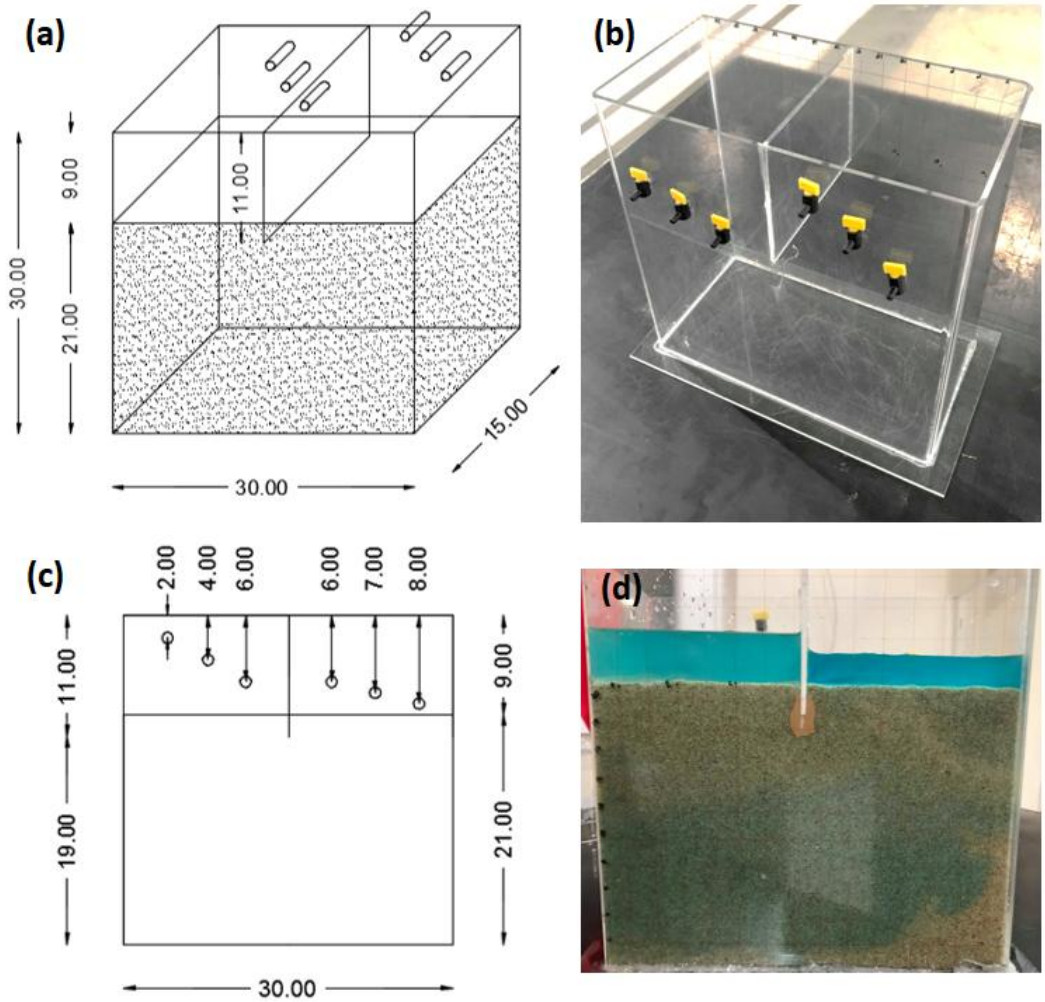
MATERIAL AND METODS

For this aim, an experimental apparatus is designed, fabricated, and used to measure the data that were later used in mathematical analysis. The following part explains the materials, methods, and approaches used in evaluation of this study.

Experimental Apparatus and Set Up

To conduct the experiments, an experimental set up of 300×300×150 mm box with 5mm thickness made up with plexi-glass is used (Figure 1). To produce hydraulic gradient and groundwater flow, a cut-off wall at the center of the box is used. This caused a natural hydraulic gradient in the experiment. For the detailed analysis, several wholes are delved to produce some different water gradient ratios and a water pump is used to provide the closed water cycle within the experimental apparatus.

Figure 1: Experimental apparatus and set up



Material Used

To conduct the analysis, the experimental set up is constructed by a box with 30×30×15 cm dimension and 5 mm thickness using plexi-glass to prevent potential harms while

conducting the experiments. A non-homogenous soil sample ranging between 0.5-1 mm is used to produce the porous medium (Figure 2a). The whole experimental set up, cutoff wall, and related joints are then calibrated and adjusted for the perfect experiment results (Figure 2b). Plexi-glass is also used to construct a wall in the middle of the experimental set up and produce hydraulic gradient. The effect of the wall with different lengths is also investigated by additional plexi-glass pieces which were used in increasing the length of the wall (Figure 2d). In order to waterproof the joints between the initial and additional wall lengths, a typical clay sample is used (Figure 2d) and blue food color is used as a tracer in the experiment (Figure 2c). The food color was injected to the soil sample using a regular 5 ml syringe (Figure 2e).

Figure 2: Material used in the experiment including (a) sand sample, (b) additional plexi-glasses, (c) food color, (d) clay, and (e) syringe.

Methodology

First, the sand sample is poured in the box and hydraulic gradient is produced by means of the difference in the water level at both sides of the wall (Figure 1d). Then, 3 different points based on their distance from the cutoff wall is defined as points A, B, and C to be used in ejection of the tracer in order to track down the flow-net experimentally. Therefore, the food color is injected from each of these predefined points separately. Then, the trajectory of the food color in the soil is tracked down using marked points at particular time steps separately defined for each experiment. Later, a 4th degree polynomial curve is then fitted to the data defined for the experimental flow-line using,

$$f(x) = a_4x^4 + a_3x^3 + a_2x^2 + a_1x + a_0 \quad (3)$$

to project the trajectory, $f(x)$ by means of obtained coefficients a_4, a_3, a_2, a_1, and a_0.

The obtained equation is then compared with the theoretical solution of the flow line obtained by Laplace equation (Figure 3a) using,

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0 \qquad (4)$$

considering the following boundary conditions,

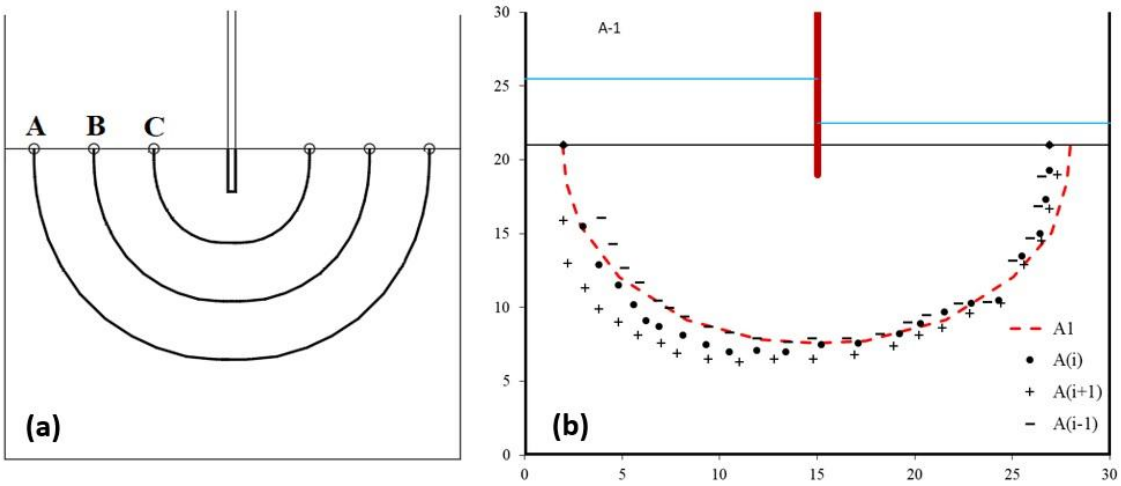
$$\frac{\partial u}{\partial x}(0, y) = 0 \quad \text{and} \quad \frac{\partial u}{\partial x}(L, y) = 0 \qquad \text{for} \qquad 0 \le y \le H \qquad (5)$$

$$u(x, 0) = 0 \quad \text{and} \quad u(x, H) = f(x) \qquad \text{for} \qquad 0 \le x \le L \qquad (6)$$

where H and L are the dimensions of the soil sample. The initial condition at each iteration was set up to the predefined points; whilst trial and error is used to obtain the theoretical flow-line trajectory through the soil sample.

The obtained results for the polynomial curve and the Laplace equation is compared with each other graphically to see if the experimental and theoretical flow lines resemble to each other (Figure 3b).

Figure 3: Theoretical aspect of the flow-line in the experimental set up by means of (a) selected point for color injection, and (b) comparison between theoretical and experimental lines of the flow-net



RESULTS AND DISCUSION

Obtained results are compared while evaluating the polynomial curve and the theoretical flow-lines obtained by Laplace equation. Figure 4a, shows the experiment conducted at point B with a 3cm wall. As seen in this figure, several deviations occurred which are thought to be linked to the heterogeneity of the soil sample. Based on the flow-line that water choose to went through, and the time needed for this aim, the mean velocity at each experiment is obtained. These results are given in Figure 5. It is obvious that, when the flow-line is getting

longer, the mean velocity reduces. This can either be observed by means of increasing the length of the wall or getting far from the wall itself from point C toward point A at the far side of the box.

Figure 5, shows the effect of the distance on the changes in velocity of the flow. The least reduction can be observed at point A in which the increases in the length of the wall could not make a great difference. However, in point C, which is the closest point to the wall, the highest decrease occurred when the length of the wall increased.

Figure 4: Obtained results for point B by means of (a) comparing theoretical and polynomial curve by means of data obtained by (b) conducted experiment for point B

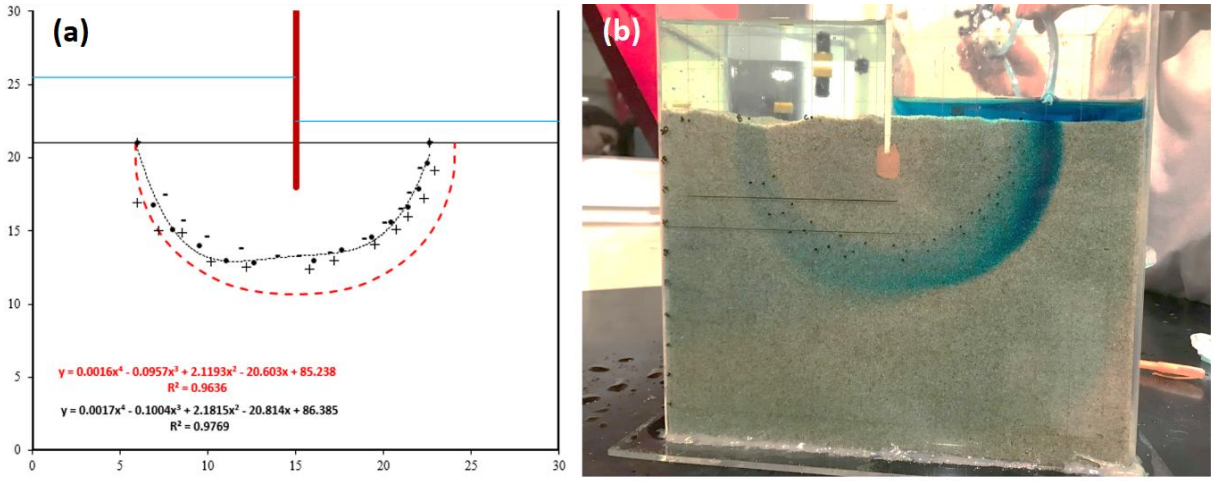
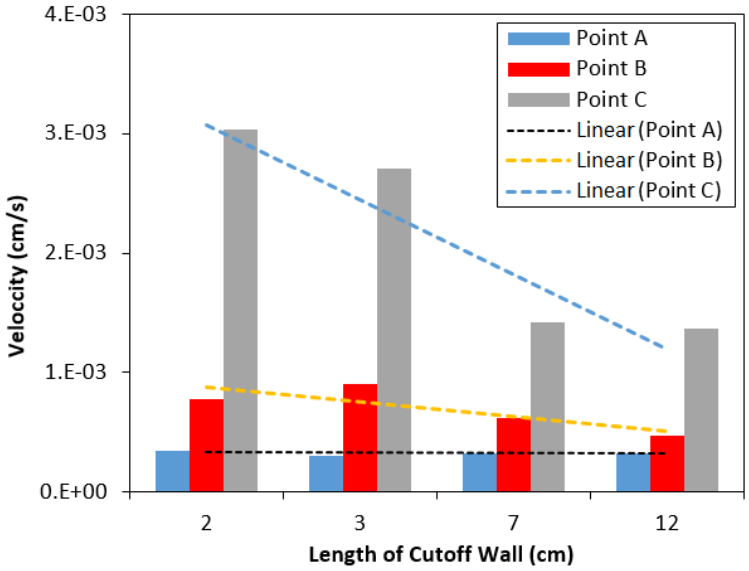


Figure 5: Studying the effect, of the length and distance from wall on the reduction of mean velocity of flow across the porous medium



CONCLUSION

A non-homogenous soil sample was selected and used in an experimental set up to study the effect of the heterogeneity in the porous medium and the length of the flow-line on the mean velocity of the flow through the soil sample. For this aim, three predefined points are used to conduct the experiments. The Laplace equation and polynomial curve fitting are used to investigate the flow line trajectory both theoretically and experimentally. Results indicated that the heterogeneity causes a lot of deviation in the prediction given by the Laplace equation. It is also concluded that the mean velocity of the flow reduces when the flow line is getting longer.

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The Analysis of the Relationship between the Organizational Justice Perception and the Glass Ceiling Syndrome in Female Health Care Professionals

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ABSTRACT

Objective: In this study, it is aimed to evaluate the effect of the glass ceiling syndrome in female health care professionals on their organizational justice perception and to examine the factors affecting organizational justice perception and glass ceiling syndrome.

Method: The population of this cross-sectional study consists of 105 female health care professionals working at Aksaray Training and Research Hospital in November-December 2018. Personal information form including the demographical-sociocultural characteristics of the female health care professionals, Organizational Justice Perception Scale and Glass Ceiling Syndrome Scale were used as the data collection tool in the research. Student t test and analysis of variance was performed in the statistical analysis, and Spearman correlation coefficient was calculated in evaluating the relationship between the variables.

Results: It was found that the highest mean of the Organizational Justice Perception Scale of female health care professionals was at the interactional justice dimension with the score of 22.64±7.36, and the highest mean in the Glass Ceiling Syndrome Scale was at the stereotypes dimension with the score of 4.09±0.66. Glass Ceiling Syndrome Scale Multiple Role Taking subscale scores and Personal Preference Perceptions subscale scores of the female health care professionals were found significantly high ($p<0.05$). A negative and low level of significant relation was determined between the Organization Culture and Policies subscale scores and Organizational Justice Perception subscale scores, between Inability to Attend Informal Communication Networks and Interactional Justice subscale scores, between Occupational Segregation and Procedural Justice subscale scores, and between Glass Ceiling Syndrome Scale total scores and Interactional Justice subscale scores ($p<0.05$).

Conclusion: It was determined that glass ceiling syndrome affected organizational justice perception in a negative way in female health care professionals.

Keywords: Female Health Care Professional, Organizational Justice Perception, Glass Ceiling Syndrome.

INTRODUCTION

Globalization, improvements in technology and ever-increasing competition have forced organizations to change. In many aspects of organizations such as their climates, structures, working conditions and management resources have changed and transformed. Related to human resource, which is one of the most important management resources, many factors such as employee rights, working hours, union rights and flexible organization types have gain importance, and women have begun to play active roles in working life (Tunç and Özmen, 2016).

Historically, women's role as wage workers in working life emerged in periods when the economy needed women's labor. In addition to their traditional roles, women began to work as wage workers with the industrial revolution. Therefore, studies on women's employment focus on the role of women in economic development, family, social status of women and fertility (Özer and Biçerli, 2003).

The concept of glass ceiling was first introduced in July 1979 at the National Press Club. It is accepted that this concept was used by the two women directors of Hewlett-Packard, Katherine Lawrence and Marianne Schreiber. Lawrence and Schreiber used this metaphor to describe the career process of women at the Conference of Women's Institute for Press Freedom, directed by Katherine Lawrence (Ünal, 2015).

Due to the higher proportion of female employees in health care institutions, glass ceiling syndrome has become more important in these institutions (Urhan, 2011). Öztürk and Bilkay (2016) have determined that women working for Turkey Public Hospitals Institution have glass ceiling syndrome. Glass ceiling syndrome is an expression of injustice, and it reveals the concept of "organizational justice." The fact that organizations' failure to care enough the concept of organizational justice negatively affects many other parameters such as women workers' motivation, work performance, work satisfaction and organizational trust (Özden, 2018; Tunç and Özmen 2016; Doğan, 2018).

Organizations that do not give due importance to the concept of organizational justice may not be able to provide the ground for protect and maintain the physical, mental and emotional wellness states of their employees. However, organizations should be aware that productivity will increase in case of providing organizational justice for employees (Toğa, 2016).

In this study, it is aimed to evaluate the effect of the glass ceiling syndrome in female health care professionals to their organizational justice perception, and to examine the factors affecting organizational justice perception and glass ceiling syndrome.

Methods

The population of this cross-sectional study consists of 105 female health care professionals including 1 biologist, 1 child development specialist, 4 dieticians, 4 chemists, 4 physiotherapists, 5 psychologists, 9 first aid and emergency medical technicians, 10 anesthesia

technicians, 24 laboratory technicians, 15 x-ray technicians, 17 medical secretaries, 3 physical therapy technicians, 1 pathologic technician, 1 surgical technician, 2 audiometric technicians, 2 dialysis technicians and 2 social workers working at Aksaray Training and Research Hospital in November-December 2018. The entire research population was reached and 105 female health care professionals were included in the study.

Data Collection Tools

Personal information form including the demographical-sociocultural characteristics of the female health care professionals, Organizational Justice Perception Scale and Glass Ceiling Syndrome Scale were used as data collection tools in the research. Data collection tools were carried out on the participants on a voluntary basis with face to face interview technique.

Organizational Justice Perception Scale

"Organizational Justice Perception Scale" was developed by Moorman (1991), and it was adapted into Turkish and its validity and reliability study was conducted by Yıldırım (2003). It consists 20 questions in 5 point likert scale type and 3 subscales as distributive justice (2nd,4th,6th,12th and 14th questions), procedural justice (1st,7th,8th,9th,10th and 11th questions) and interactional justice (3rd,5th,13th,15th,16th,17th,18th,19th and 20th questions). Three separate total scores are obtained for each dimension. The lowest and highest scores that can be obtained are 5 and 25 for distributive justice dimension, 6 and 30 for procedural justice dimension, and 9 and 45 for interactional justice dimension. As the score increases, organizational justice perception also increases. Cronbach's Alpha (α) value of the scale was calculated as 0.94 in this study.

Glass Ceiling Syndrome Scale

The validity and reliability study of the scale was conducted by Karaca (2007). The scale consists of 7 subscales and total 38 questions. 26 items, which include the 1st, 3rd, 4th, 5th, 9th, 10th, 12th, 13th, 14th, 15th, 18th, 20th, 22nd, 23rd, 24th, 26th, 27th, 28th, 30th, 31st, 32nd, 33rd, 35th, 36th, 37th and 38th question items, need reverse scoring. The subscales of the scale are undertaking multiple roles (1st, 2nd, 3rd, 4th and 5th questions), women's personal perceptions (6th, 7th, 8th, 9th, 10th, 11th and 12th questions), organization culture and policies (13rd, 14th, 15th, 16th, 17th, 18th, 19th and 20th questions), inability to attend informal communication networks (21st, 22nd and 23rd questions), mentor deficiency (24th and 25th questions), occupational segregation (26th, 27th, 28th, 29th, 30th and 31st questions) and stereotypes (32nd, 33rd, 34th, 35th, 36th, 37th and 38th questions). As a result of the calculated mean of each item, the judgement was passed as "0.00-0.79=Strongly disagree, 0.80-1.59= Disagree, 1.60-2.39= Neutral, 2.40-3.19= Agree, 3.20-4.00= Strongly agree" (Karaca, 2007). In this study, Cronbach's Alpha (α) value of the scale was calculated as 0.71.

Statistical Analysis

SPSS 25.0 software was used for the analysis of the collected data. The suitability of the data for normal distribution was evaluated by Shapiro-Wilk test. Independent two samples

t test and one-way analysis of variance were used for the quantitative variables in between-groups comparisons. Tukey (post-hoc test) method was used as multiple comparison analysis. Spearman correlation coefficient was calculated to evaluate the relationship between variables. Significance level was accepted as $p< 0.05$ in evaluations.

RESULTS

This study was conducted on 105 female health care professionals working at Aksaray Training and Research Hospital.

The average age of the individuals in the research group was 34.46±7.69, 67.6% of them were married, 63.8% had bachelor's degree, and their working period in the profession was 12.11±7.45 years. The average working period of the female health care professionals at this institution was 7.61±6.29 years, and it was determined that 3.8% of them work at nights, 49.5% in the daytime, and 46.7% worked both in the daytime and at nights. Monthly average of the shift number of those having shifts was 4.34. All of the participants answered yes to the question whether there is a woman manager in your institution, and 68.6% of them cited the manager of care services, 26.7% the deputy chief physician and 4.8% deputy manager.

Table 1: The Distribution of the Scores Female Health Care Professionals Obtained from the Organizational Justice Scale and Glass Ceiling Syndrome Scale

Scales and Subscales	Min.	Max.	Mean	Std. Deviation
Organizational Justice Perception Scale				
Distributive Justice	5.00	25.00	12.21	4.08
Procedural Justice	6.00	30.00	14.20	4.82
Interactional Justice	9.00	45.00	22.64	7.36
Total Score	20.00	100.00	49.07	15.31
Glass Ceiling Syndrome Scale				
Undertaking Multiple Roles	1.80	5.00	3.90	0.74
Personal Perceptions	2.29	5.00	4.00	0.51
Organization Culture and Policies	1.75	5.00	2.96	0.63
Inability to Attend Informal Communication Networks	1.00	5.00	2.99	0.81
Mentor Deficiency	1.00	4.50	2.80	0.73
Occupational Segregation	1.25	5.00	3.42	0.61
Stereotypes	2.43	5.00	4.09	0.66
Total Score	2.61	4.13	3.51	0.31

Total score average of the Organizational Justice Perception Scale was 49.07±15.31, and the highest average among the subscales was determined in the *interactional justice* subscale with the score of 22.64±7.36.

Total score average of the Glass Ceiling Syndrome Scale was 3.51±0.31, and the highest average among the subscales was determined in the *stereotypes* subscale with the score of 4.09±0.66 (Table 1).

Table 2: The Distribution of the Organizational Justice Perception Scale and Glass Ceiling Syndrome Scale Scores Depending on Various Variables

Variables	n(%)	Organizational Justice Perception Scale Subscales				Glass Ceiling Syndrome Scale Subscales							
		Distributive Justice	Procedural Justice	Interactional Justice	Total Score	Undertaking Multiple Roles	Personal Perceptions	Organization Culture and Policies	Inability to Attend Informal Communication Networks	Mentor Deficiency	Occupational Segregation	Stereotypes	Total Score
Marital Status													
Married	71(67.6)	50.11	48.97	49.72	49.27	48.32	54.06	53.36	52.34	50.27	53.48	52.33	50.75
Single	34(37.4)	59.03	61.41	59.85	60.79	62.76	50.79	52.25	54.38	58.71	52.00	54.40	57.69
p value		0.159	**0.050**	0.110	0.069	**0.022***	0.606	0.861	0.745	0.174	0.813	0.744	0.274
Educational Background													
Vocational School of Health	4(3.8)	31.25	59.00	39.63	42.88	30.00	20.00	70.25	48.63	62.63	37.88	34.13	43.75
Associate Degree	29(27.6)	55.21	54.22	55.45	55.45	62.59	50.12	56.79	58.26	58.07	49.72	51.36	58.03
Bachelor	67(63.8)	53.93	52.53	53.70	53.34	50.57	56.78	51.69	51.89	52.14	54.61	55.34	52.76
Graduate Degree	5(4.8)	45.20	47.40	40.10	42.30	48.40	45.40	34.70	40.90	27.40	62.50	46.20	34.40
p value		0.457	0.942	0.594	0.739	0.124	0.095	0.297	0.602	0.171	0.561	0.516	0.386
Working type													
Continuously at night	4(3.8)	47.25	59.00	38.25	43.75	81.75	13.00	71.00	53.25	49.50	61.75	34.00	56.25
Continuously in the daytime	52(49.5)	50.36	50.40	51.53	51.20	53.72	56.00	49.38	50.01	49.42	46.01	56.27	51.67
Daytime and night	49(46.7)	56.28	55.27	55.77	55.66	49.89	53.08	55.38	56.15	57.08	59.70	51.08	54.14
p value		0.574	0.667	0.480	0.629	0.126	**0.024***	0.294	0,593	0.422	0.061	0.306	0.899
Whether or not there is a female manager													
Head nurse	72(68.6)	49.37	51.19	48.25	49.13	53.14	51.74	52.16	52.01	53.15	57.17	51.83	52.24
Deputy Chief Physician	28(26.7)	57.89	56.32	61.45	59.32	51.80	52.86	52.48	54.50	54.43	42.48	54.02	53.82
Deputy Manager	5(4.8)	77.90	60.50	74.10	73.40	57.70	72.00	68.00	58.80	42.80	51.90	64.20	59.30
p value		0.077	0.639	**0.042***	0.99	0.921	0.351	0.526	0.848	0.722	0.089	0.663	0.870

* $p<0.05$

In the study, Glass Ceiling Syndrome Scale Undertaking Multiple Roles subscale scores of the single health care professionals were found significantly higher when compared to the married ones (Table 2).

The scores of the Personal Perceptions subscale of Glass Ceiling Syndrome Scale of the female health care professionals working in the daytime were found significantly higher than the other groups (Table 2).

When the scores of the Interactional Justice subscale of Organizational Justice Perception Scale were evaluated, it was seen that the scores of the female health care professionals those answering as deputy manager to the question if there was female manager in their institution were found significantly higher (Table 2).

Between the variable of age and Organizational Justice Perception Scale scores; a negative low level of relation was determined between Age and Procedural Justice subscale ($r= -0.254$, $p<0.05$), a negative low level of relation between Age and Interactional Justice subscale ($r= -0.202$, $p<0.05$), and a negative low level of relation between Age and Scale total score ($r= -0.247$, $p<0.05$).

Between the variable of age and Glass Ceiling Syndrome Scale scores; a negative low level of relation was determined between Age and Personal Perceptions subscale ($r= -0.213$, $p<0.05$) and a negative low level of relation between Age and Scale total score ($r= -0.243$, $p<0.05$).

When working period in the profession and Glass Ceiling Syndrome Scale scores were examined, a negative low level of relation was determined between the Working Period in the Profession and Organization Culture and Policies subscale scores ($r= -0.196$, $p<0.05$), and a negative low level of significant relation between the Working Period in the Profession and Scale total score ($r= -0.245$, $p<0.05$).

When Monthly Shift Number and Glass Ceiling Syndrome Scale scores were examined, a positive low level of significant relation was determined between Monthly Shift Number and Occupational Segregation subscale ($r= 0.193$, $p<0.05$).

Table 3: The Correlation Matrix between the Organizational Justice Scale and Glass Ceiling Syndrome Scale scores of Female Health Care Professionals

Subscales		Organizational Justice Perception Scale			
		Distributive Justice	**Procedural Justice**	**Interactional Justice**	**Total Score**
Glass Ceiling Syndrome Scale	**Undertaking Multiple Roles**	r= -0.051 p= 0.605	r= -0.085 p= 0.391	r= -0.056 p= 0.569	r= -0.057 p= 0.567
	Personal Perceptions	r= 0.076 p= 0.442	r= -0.004 p= 0.968	r= 0.111 p= 0.258	r= 0.093 p= 0.347
	Organization Culture and Policies	**r= -0.353 p<0.01***	**r= -0.307 p= 0.001***	**r= -0.367 p<0.01***	**r= -0.349 p<0.01***
	Inability to Attend Informal Communication Networks	r= 0.166 p= 0.091	r= 0.174 p= 0.77	**r= -0.205 p<0.05***	r= 0.183 p= 0.061
	Mentor Deficiency	r= 0.073 p= 0.460	r= 0.190 p= 0.052	r= 0.167 p= 0.088	r= 0.165 p= 0.093
	Occupational Segregation	r= 0.156 p= 0.111	**r= -0.207 p<0.05***	r= 0.156 p= 0.111	r= 0.168 p= 0.086
	Stereotypes	r= -0.101 p= 0.305	r= 0.067 p= 0.500	r= -0.102 p= 0.299	r= -0.086 p= 0.384
	Total Score	r= 0.109 p= 0.268	r= 0.141 p= 0.152	**r= -0.194 p<0.05***	r= 0.163 p= 0.97

* p<0.05

In the study, a negative low level of significant relation was determined between Organization Culture and Policies subscale scores and Organizational Justice Perception subscale scores, between Inability to Attend Informal Communication Networks and Interactional Justice subscale scores, between Occupational Segregation and Procedural Justice subscale scores, and between Glass Ceiling Syndrome Scale total scores and Interactional Justice subscale scores (p<0.05) (Table 3).

DISCUSSION

In our study, Glass Ceiling Scale total score of female health care professionals are above average. The highest score is in the subscale of stereotypes, and the lowest in mentor deficiency. Organizational Justice Perception Scale total score was found below average. The highest score is in the interactional justice subscale, and the lowest in the distributive justice. The results of the study reveal that female health care professionals have glass ceiling syndrome, and accordingly, their organizational justice perception decreases. This is an expected result. In the literature, many studies reveal similar results (Özyer 2014, Tunç and Özmen 2016, Kılıç and Çakıcı 2016).

In the study, the score of Overtaking Multiple Roles subscale of Glass Ceiling Syndrome Scale belonging to single health care professionals was found significantly higher than the score of married ones. In the literature, there are studies revealing similar results about that single employees meet more glass ceiling obstacle (Çetin and Atan, 2014, Karcıoğlu and Leblebici, 2014, Kılıç and Çakıcı 2016, Öztürk and Bilkay 2016, Tunç and Özmen, 2016). A reason of that single health care professionals are affected by Glass Ceiling Syndrome more can be related to that they are relatively younger, more idealist and ambitious. In other words,

different aspects of life (growing children, maintaining family order, etc.) come into prominence for married and relatively older workers, and they have the process of accepting the present conditions in time.

In our study, it was determined that there was a significant difference between working type and glass ceiling syndrome personal perceptions subscale, and this difference was due to those working in the daytime continuously. Yıldırım (2010) stated that since female health care professionals working shifts were both wives and mothers, they couldn't have job satisfaction, and therefore they preferred to work in the daytime continuously. Hoşgör et al. (2016) reported that women's of personal perceptions were high. It is seen that because of marriage, having children and suspend working, which are the personal preferences of female health care professionals, they have the idea of that they face the glass ceiling obstacle. Kara (2015) stated that female workers felt under pressure about time management since they had to get round to housework, due to this time pressure, they were unwilling to work overtime, and as a result of this and they avoided from some responsibilities related to work, and these caused negative results in their career development. Our findings coincide with the findings of these studies.

In our study, it was found that as female health care professionals' age increased, their perception of Glass Ceiling Syndrome decreased. Individuals' thresholds of frustration tolerance increases with age. Kılıç and Çakıcı (2016) stated in their study that there was a negative relationship between the ages of the health care professionals and personal perceptions. Hoşgör et al. (2016) stated that there was a negative relationship between the age and inability to attend informal communication networks and Organization Culture and Policies. These findings coincide with our findings.

In our study, a negative low level of significant relationship was determined between the variable of age and procedural justice and interactional justice subscales of organizational justice perception scale and scale total score. As the age increases, the average score of organizational justice perception of female health care professionals decreases. In Özyer and Azizoğlu's (2015) study, no statistically significant relationship was found between age and glass ceiling syndrome, perceived organizational justice and its subscales. Arı, Gülova and Köse (2017) found that procedural justice perception increased as the ages of the health care professionals increased. It can be thought that employees' expectations of taking roles in eminences or administrative positions should increase as their knowledge and work experience increase. However, in case of the same people's inability to gain some achievements, their capacity to be able to tolerate this situation also increase, and it can be thought that their expectations-ideals about life are not only related to work but also related to other aspects of life. For instance, there may be goals such as growing their children, struggle for them to reach certain positions (e.g. provide a good education) and conveniences about life (to have a house, a car, etc.). All of these can lead their ambitions about work to become of secondary importance.

The scores of interactional justice subscale of organizational justice perception scale of the female health care professionals who answered as deputy manager to the question if there was a female manager in their institution were found significantly high. It can be said that such a result came out because female health care professionals encountered an unfair practice in the

fields of kindness, honesty and respect in the communication process with their fellow managers. In a study conducted by Bingöl et al. (2011) it was concluded that female managers behave female employees more negatively. This situation is called as Queen Bee syndrome in the literature. Staines et al. (1973) defines Queen Bee syndrome as that a female manager who obtains a position and high status in a male-dominant organization / environment with her own individual efforts see her fellows as rivals and exhibits a negative attitude and discrimination to them. According to the research result that was conducted by Columbia Board, Newyork, USA on female managers in 1500 organizations for 20 years, female managers were reluctant to support the women working other lower echelons (Knapton 2015). These findings are consistent with our results.

In our study, a negative low level of significant relationship was determined between working period in the profession and Glass Ceiling Syndrome Scale total score and the subscale of Organization Culture and Policies. It can be said that female health care professionals whose professional experiences increase may face less obstacles to be top managers especially in the organization cultures having a male-dominant management structure since they comprehend organization policies and social relationships in the organization. Other studies in the literature support our findings (Hoşgör et al. 2016, Kılıç and Çakıcı, 2016).

A positive low level of significant relationship was determined between the number of shifts and occupational segregation subscale in our study. One of the leading problems that female employees have in the hospitals is shifts. This is also one of the most important reasons that cause women to fall behind in being managers (Çaha et al. 2016). Especially due to the characteristics of the professions, physicians, nurses, midwives and other health care professionals have to continue to serve with different shift types at nights and on holidays.

In our study, it was found that there was a negative low level of significant relationship between organizational justice perception and glass ceiling syndrome. The results of many studies in the literature are similar to the results of our study (Tunç and Özmen 2016; Özyer and Azizoğlu, 2014; Özden 2018). It can be stated that female health care professionals think that sexist approaches they face in their organizations prevent them to achieve their career goals, and therefore there is a decrease in their thoughts about that their organizations are fair. In our study, it was found that female healthcare workers with reduced of Organizational Justice perception were confronted with a higher level of glass ceiling barriers especially because of Organizational Culture and Policies. In their study, Soysal and Baynal (2016) stated that female health care professionals expressed that they were more unlucky than their male colleagues in the issues such as reaching top level positions and participating in job trainings, they had less opportunities than males about promotion in their organizations, and they lose their jobs in time of crisis. It is an expected situation that the perception of organizational justice of the employees who face such procedures and policies will decrease .

In our study, it was determined that the Interactional Justice perceptions of the employees who face obstacles due to the Inability to Attend Informal Communication Networks decreased. Female health care professionals' inability to establish social relationships with their male colleagues causes them to think managers are not fair in their behaviors they display when

practicing procedures. In our study, it was concluded that as occupational segregation increased, procedural justice perception decreased. Female employees feel that the procedures and the reward-punishment system are not fair because of the barriers they face due to the society's differentiation of professions by gender. Kara (2015) stated that the leading social obstacles of glass ceiling syndrome is occupational segregation. A negative low level of significant relationship was determined between Glass Ceiling Syndrome and Interactional Justice subscale scores. Doğan (2002) argued that organization management and policies could develop positive or negative emotions in employees as related to organizational justice, and suggested that communication and flow of information were effective for a fair management. This suggestion supports our findings. It is concluded that the fact that managers do not explain their decision-making processes in their organization kindly and respectfully enough increases female employees' glass ceiling perceptions.

Conclusion and Recommendations

In our study, it was found that female health care professionals encountered glass ceiling syndrome and their perception of organizational justice decreased due to this situation. Single female health care professionals were found to face more glass ceiling barriers than married ones. It was determined that both the glass ceiling perceptions and organizational justice perceptions of older female health care professionals decreased. Organizational justice perceptions of female health care professionals who answered as deputy manager to the question if there was a female manager in their institution were found to be low. It was determined that female health care professionals whose Organizational Justice perception decreased had a higher level of facing with the glass ceiling barrier especially due to Organizational Culture and Policies. It was found that female health care professionals were not able to attend the informal communication in the workplace due to the organization culture and policies, and this situation decreased their interactional justice perceptions. It was concluded that as occupational segregation increased, interactional justice perception decreased. Based on the findings of our study, the following recommendations can be made:

In health institutions, male and female employees should be treated equally in terms of both working conditions and opportunities for promotion. Female and male employees' social rights should be ensured to be equal as well as their personal rights. Female employees should be ensured to participate in personal and occupational development programs. Either groups should not be allowed to dominate one another. In line with the opportunities to be provided for female health care professionals, the ground of conflict between the job of the woman and the motherhood duty and the choice to make in this framework should not be created.

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Comparison of Yield, Quality and Nutrient Contents of Hybrid and Standard Tobacco Varieties

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ABSTRACT

This study was carried out to compare the yield, yield parameters, mineral element concentrations, nicotine and sugar content between hybrid tobacco (Xanthi/2AxKaterini, NailxKaterini, KaterinixErbaa, CanikxErbaa) and standard tobacco (Xanthi-2A, Nail, Katerini, Canik, Erbaa) varieties. Tobacco plants were grown under controlled conditions, required macro (N, P and K) and micro (Fe and Zn) nutrients were applied. The experiment was laid out in split plot design with four replications. All matured tobacco leaves were harvested in three priming's and cured at sun. The leaf yield, leaf width, leaf length, number of leaves, N, P, K, Zn concentration, nicotine and sugar content of leaf samples were determined. According to the results obtained, leaf width, leaf length, number of leaves and leaf yield were higher in hybrid tobacco than standard tobacco varieties. While the average leaf yield of standard tobacco was 5.17 g plant^{-1}, hybrid tobacco yield were 5.78 g plant^{-1}. In terms of N, P and K concentrations of leaves, standard tobacco had higher values than hybrid tobacco. The reason for this difference can be explained by the decrease in mineral element concentrations that fall on the unit area due to the increase in width and height in hybrid tobacco leaves. While the average nicotine concentration of standard tobacco was 0.49%, hybrid tobacco appeared to have lower nicotine (0.39 %). Unlike nicotine, the average sugar concentration of standard tobacco (7.10%) was lower than that of hybrids (8.37%). As a result, it was found that hybrid tobacco was better than standard varieties in terms of quality parameters and yield.

Keywords: Tobacco, Hybrid, Quality, Nicotine, Yield.

INTRODUCTION

Tobacco is an annual crop originating in South America. The global market value of tobacco which differs from other agricultural products in production, use, domestic and foreign trade, is approximately 600-650 billion dollars (Anonymous, 2013a; Anonymous, 2013b; Anonymous, 2013c; Anonymous, 2013d). Tobacco has a total of 67 known varieties (Bürün and Emiroğlu, 1988), among them *Nicotiana (N.) tabacum, N. rustica* and *N. alata* are the widely cultivated species. The leaves of *N. tabacum* and *N. rustica* are used in the production of tobacco products such as cigarettes, cigars, pipes and so on, and leaves of *N. alata* is used in the production of hubble-bubble. Today, about 90% of the cultivated varieties belong to *N. tabacum* variety.

Yields of hybrid varieties are generally higher than non-hybrid varieties due to the heterosis phenomenon (hybrid crossbreeding or hybrid power). Heterosis usually causes growth in vegetative organs and an increase in the number of generative organs. In addition to the yield, heterosis may also be related to the earliness, adaptation to environmental conditions, resistance to diseases and pests and quality characteristics. Hybrid varieties can yield relatively better results under highly unfavorable conditions as in favorable conditions (Philouze, 1976).

In this study, the nutrient contents and the amount of synthesized matters in hybrid and standard tobacco varieties were compared, and the differences between the two groups were revealed. The results of the study showed that the leaf width and length of the hybrids and therefore the leaf yield were higher than the standard varieties. The nutrient contents of the hybrids were lower than that of the parents, and the results were attributed to the larger leaf area of hybrid plants compared to the standard varieties. The amount of nutrients taken per unit area decreased as the leaf area increased. The results of lower nicotine and higher sugar contents of hybrid lines compared to that of the parents are favorable for tobacco leaf quality.

LITERATURE REVIEW

In Croatia, performances of 6 F1 hybrids from four parents of Burley tobacco (TN 86, Saturn, Bs 32 and Bols 100) were investigated. Butorac et al. (2000) found significant differences between parents and hybrids and the best combination was obtained from TN 86 and Bs 32. In another study, Butorac et al. (2004) conducted a half-diallel hybridization in 4 Burley tobacco varieties (Saturn, TN 86, Bs 92 and Bols 100). The results indicated that Saturn had dominant alleles in leaf width, TN 86 in flowering days, Bs 92 in leaf length and yield, and Bols 100 in leaf number. In the same study, the highest yield (338 kg da^{-1}) was obtained from Saturn x TN 86, plant height (189 cm) from Bs 92 x Blos 100, leaf length (69.5 cm) from TN 86 x Bs 92 and leaf width (41 cm) from Bs 92 x Blos 100 hybrids. The authors also reported no significant changes in the leaf numbers of the parents and hybrids.

Gixhari and Sulovari (2010b) investigated some characteristics of the lines obtained by half diallel hybridization of eight different types of oriental tobacco (R2, Roskovec, Samsun-Bafra and Canik, Basma-Xanthi and Katerini, Nevrokop, Perustitza). The increase in leaf yield was reported between 2.8 and 4.7%. Aleksoski and Aleksoska (2011) determined the heredity

level and mode of total green and dry matter yield per plant of four tobacco varieties (Burley - B2/93, Suchum - S1, Suchum - S2 and Prilep - P-84) and six F1 tobacco hybrids. The results showed that S1 x S2 hybrids had positive heterosis in both green and dry matter yields, S1 x P-82 hybrid had positive heterosis in dry matter yield, S1 x P84 and S2 x P-84 hybrids had negative heterosis in green matter yield.

Dyulgerski and Dimanow (2012) examined the width and height of 7-8th and 13-14th leaves of Burley tobacco plant at the F1 level. The researchers conducted ten cross-fertilizations and the heterosis effect was found to be more important for the width of leaves compared to the length of leaves. In addition, heterosis was reported to be more pronounced in the lower hands than in the upper hands.

Korubin-Aleksoska et al. (2010) examined the changes in leaf length, leaf width and leaf area in the middle hands of F1 and F2 progeny of four oriental and semi-oriental tobacco varieties (Oriental Prilep P12-2/1, Pobeda P-2 and Collar YV 125/3 and semi-oriental Forchheimer Ogrodowny - FO). The results showed that, in both generations, P12-2/1 was dominant in leaf size and recessive genes were effective in P-2.

Yil et al. (2005) developed a male infertile Burley tobacco variety (Eyan 4) and the new variety was tested in many locations. The new variety was superior to control variety (Eyan 1) in the mean yield of 2.9%, the value of 5.8% and the price of 2.54%. In another study, an infertile male Burley tobacco variety (Eyan 6) was developed. The results revealed that Eyan 6 had higher quality than Eyan 1 and was more resistant to diseases (Guo-ping et al., 2008).

METHODOLOGICAL ASPECTS AND RESULTS

Methodological Aspects

Five tobacco genotype (Parent-1 (Xanthi/2A), parent-2 (Nail line), parent-3 (Katerini), parent-4 (Canik-Malmawater) and parent-5 (Erbaa)) as the parents and 4 hybrid lines (hybrid-1 (Xanthi/2A x Katerini), hybrid-2 (NailxKaterini), hybrid-3 (KaterinixErbaa), hybrid-4 (CanikxErbaa)) which stand out from F1 hybrids obtained by half diallel hybridization (non-reciprocal hybridization) of 5 lines were used in the study. The experiment was laid out according to a randomized plot design with 4 replications. Experimental soil was in sandy-loam texture, low in organic matter (0.89%) content, alkaline character (pH 8.01) and very calcareous (11.8%). In the establishment of the experiment, basic fertilizer containing 250 mg kg^{-1} N (as $Ca(NO_3)2.4H_2O$), 100 mg kg^{-1} P (as KH_2PO4), 50 mg kg^{-1} S (as $CaSO_4.2H_2O$), 2.0 mg kg^{-1} Fe (as Fe-EDTA) and 2.0 mg kg^{-1} Zn (as $ZnSO_4.7H_2O$) was applied to all pots as a solution and mixed with the soils.

The greenhouse experiment continued for 95 days. Harvesting of matured tobacco leaves was completed in three hands. Leaves were air dried at sun and ground with an agate mill for subsequent analysis. A microwave was used to digest the leaf samples of tobacco varieties by using a mixture of 7 ml 35% H_2O_2 - 65% HNO_3 (2:5, v/v). After the completion of digestion, nitrogen (N), potassium (K), phosphorus (P), magnesium (Mg) and sulfur (S)

concentrations were determined by using an inductively coupled plasma optical emission spectrophotometry (ICP-OES; Varian Vista) (Jones et al., 1991).

Nicotine content of tobacco leaves was quantified by HPLC analysis using an Agilent technology 1260 series HPLC system (Agilent Technologies, Boeblingen, Germany) with a diode array detector. A reversed-phase ACE C18 column (Agilent Technologies) of 250 x 4.6 mm dimensions and 5 µm particle size was used in separation of the contents. Mobile phase of the system contained acetic acid in water (solvent A, 1%) and acetonitrile (solvent B). Alkaloid contents were detected using a UV at 324 nm and nicotine content of samples was determined using an authentic standard (Moghbel et al., 2015; Kinay, 2018). The contents of reducing sugars were analyzed considering Agilent Hi-Plex Columns for Carbohydrate, Alcohols and Acids application note using the Zorbax Carbohydrate column (4.6 x 250 mm and 5 µm particle size) (Kinay, 2018).

The data on leaf characteristics, plant nutrients, nicotine and reducing sugar contents were evaluated using analysis of variances (ANOVA) according to the experimental lay out of the experiment. The results were grouped according to the Duncan multiple comparison test (Wang et al., 2013). SPSS 21 statistical software was used in statistical computations.

Results

Leaf width, leaf length, number of leaves and leaf yield, nicotine and reducing sugar contents of tobacco parents and hybrids were presented in Table 1. The differences in leaf width between parent and hybrid tobacco were statistically insignificant. However, the mean leaf width of the hybrid tobacco (8.95 cm) was wider than that of the parents (8.4 cm). The leaf length of hybrid tobacco (15.8 cm) was higher than that of the parents (15.0 cm), though the difference was statistically insignificant. However, the leaf length difference was statistically significant in parent and hybrid tobacco varieties. For example, Hybrid-3 had a leaf length of 16.5 cm, while Hybrid-1 had a leaf length of 15.0 cm. The highest numbers of leaves were found in Canik cultivars, while the mean number of leaves in the hybrids was higher than that of the parents and the difference was statistically significant.

Leaf yield values of tobacco are important since the part of the tobacco plant used is the leaves. The most important characteristic affecting the yield is the genotype. The characteristics of leaf number, leaf width and leaf length cause yield differences between genotypes (Kinay, 2014). Leaf yields of hybrid tobacco varieties were significantly higher than that of the parents. The mean leaf yield of the parents was 30.3 g plant^{-1} while the mean leaf yield of the hybrids was 32.2 g plant^{-1} (Table 1). Leaf yield between the parents and the hybrids was statistically significant. The yield of parent-4 was 41.2 g plant^{-1}, while hybrid-4 yielded 38.0 g plant^{-1}.

Table 1: Leaf width, leaf length, leaf number, leaf yield, nicotine and reducing sugar contents of parent and hybrid tobacco

Genotypes	Leaf width (cm)	Leaf length (cm)*	Number of leaves**	Yield** (g/plant)	Nicotine (%)	Reducing sugar (%)
Parent-1	8.20	15.3^{ab}	24.0^{f}	5.00^{de}	0.68^{a}	7.26^{ab}
Parent-2	8.50	15.1^{ab}	24.5^{f}	3.87^{f}	0.46^{b}	9.04^{a}
Parent-3	8.90	13.8^{b}	28.0^{e}	5.30^{cd}	0.59^{a}	7.49^{ab}
Parent-4	8.40	16.5^{a}	41.2^{a}	6.90^{a}	0.39^{bc}	5.51^{c}
Parent-5	8.00	14.2^{b}	34.0^{c}	4.80^{e}	0.33^{bc}	6.19^{bc}
Hybrid-1	8.70	15.0^{ab}	32.2^{cd}	6.60^{a}	0.46^{b}	8.81^{a}
Hybrid-2	9.30	15.5^{ab}	28.0^{e}	5.77^{b}	0.41^{bc}	8.19^{a}
Hybrid-3	9.50	16.5^{a}	30.5^{d}	5.67^{bc}	0.39^{bc}	9.16^{a}
Hybrid-4	8.30	16.1^{ab}	38.0^{b}	5.07^{de}	0.30^{c}	7.32^{ab}
Parents average	**8.40**	**15.0^{ns}**	**30.3^{B}**	**5.17^{B}**	**0.49^{A}**	**7.10^{B}**
Hybrids average	**8.95**	**15.8^{ns}**	**32.2^{A}**	**5.78^{A}**	**0.39^{B}**	**8.37^{A}**

*p<0.05, **p<0.01, ns: non significant

Nicotine is an alkaloid that creates addiction in humans. The main source of nicotine is the tobacco, though can be found in small quantities in some other plants (Dominiak et al., 1984). Quality classification of tobacco can be made according to nicotine and sugar ratios. Tobacco with low nicotine and high reducing sugar contents is considered to be of higher quality (Kinay, 2018). The nicotine concentration of hybrids was lower than the parents. Mean nicotine concentration in hybrid tobacco was 0.39%, while the mean nicotine was 0.49% in parents.

The lowest nicotine concentration among the hybrids was obtained in hybrid-4 (0.30%) and the highest nicotine was in hybrid-1 (0.46%) while the lowest nicotine in parents was found in parent-5 (0.33%) and the highest nicotine concentration was in parent-1 (0.68%). Although the mean nicotine concentrations of hybrid tobacco were lower, their reducing sugar concentrations were higher compared to the parents. The mean reducing sugar concentration of hybrid tobacco was 8.37%, while it was 7.10% in parents. The highest reducing sugar ratio among the hybrids was obtained in hybrid-3 (9.16%), while the lowest ratio was observed in hybrid-4 (7.32%) (Table 1).

Leaf N, P, K, Mg and S concentrations of parent and hybrid tobacco lines were given in Table 2. The concentrations of N, P, K, Mg and S in hybrid tobacco lines were generally lower than the parents. The mean N concentration of the parent tobacco was 1.71%, which was 1.69% in the hybrids Similarly the mean P concentration in the parents was 0.26%, while it was 0.25% in the hybrids.

Table 2: Nitrogen (N), phosphorus (P), potassium (K), magnesium (Mg) and sulfur (S) concentrations of parent and hybrid tobacco leaves

Genotypes	N* (%)	P* (%)	K* (%)	Mg* (%)	S** (%)
Parent-1	1.47^{c}	0.26^{a}	2.42^{bc}	0.71^{a}	0.11^{c}
Parent-2	1.58^{bc}	0.27^{a}	2.65^{a}	0.65^{ab}	0.11^{c}
Parent-3	1.94^{ab}	0.26^{a}	2.33^{bc}	0.61^{bc}	0.12^{c}
Parent-4	1.49^{c}	0.27^{a}	2.54^{ab}	0.66^{ab}	0.18^{a}
Parent-5	2.08^{a}	0.26^{a}	2.69^{a}	0.71^{a}	0.12^{c}
Hybrid-1	1.54^{c}	0.24^{b}	2.53^{ab}	0.58^{bc}	0.14^{b}
Hybrid-2	1.70^{abc}	0.27^{a}	2.64^{a}	0.64^{ab}	0.12^{c}
Hybrid-3	1.97^{a}	0.25^{ab}	2.37^{bc}	0.61^{bc}	0.11^{c}
Hybrid-4	1.55^{c}	0.24^{b}	2.31^{c}	0.54^{c}	0.12^{c}
Parents average	**1.71^{ns}**	**0.26^{A}**	**2.53^{ns}**	**0.67^{A}**	**0.13^{A}**
Hybrids average	**1.69^{ns}**	**0.25^{B}**	**2.46^{ns}**	**0.59^{B}**	**0.12^{B}**

*p<0.05, **p<0.01, ns: non significant

The N, P, K, Mg and S contents of hybrid tobacco cultivars were lower than those of the parents. Low amount of nutrient content per unit area can be attributed to the high leaf area of the hybrids.

CONCLUDING REMARKS

Tobacco is an important model plant in the application of plant breeding methods. The leaves of tobacco plant are used in the industry; therefore, the yield and quality values of leaves are important in the assessment of a tobacco variety. The results indicated that hybrid tobacco is better than the parents in terms of yield-yield parameters and quality characteristics (nicotine, reducing sugar). In addition, significant variation was observed in yield and yield parameters within the parents and the hybrids, used in the study. The results revealed the importance of research need on the efficacy of hybrid and standard varieties in nutrient uptake from soil.

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Interactions between Drugs in Patients with Chronic Polytherapy

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ABSTRACT

Studies carried out in different countries have shown an increase in the occurrence of drug interactions, especially in elderly patients. As age advances, more diseases develop resulting in use of more medications at the same time. Physiological changes, alterations in homeostatic regulation and diseases modify pharmacokinetics and drug response in older patients. The risk for drug interactions and drug related problems increases along with multiple medications. Periodic evaluation of the patients, drugs regimen is essential to minimize polytherapy. This presentation gives a reflection on polytherapy and interactions between drugs based on scientific literature. Main objective of topics focuses on analysis and evaluation of interactions between drugs in patients with chronic polytherapy and how much attention is paid by healthcare professionals, especially by doctors and pharmacists. There are gathered statistics by private ordinance "Ibrahim Ramadani" and pharmacy "Arteina" localized in village Zajas of Kichevo (North Macedonia). Based on this statistical analysis, the results showed that there was a considerable number of interactions between drugs, so in 100 analysed patients were reported 24 major interactions, 292 moderate interactions, 54 minor interactions, and in 9 patients there was no interactions between drugs that they use. Major interactions are highly clinically significant, should be avoided combination of those drugs and repleaced with other drug.

Keywords: Polytherapy, Drug Interactions, Major, Moderate, Minor.

INTRODUCTION

Based on different studies that have been done in other places have shown an increase of incidence of drug interactions, and the majority of patients taken for analysis and study are over 65 years old. Studies carried out in different countries around the world have shown that incidence of interactions in patients over 65 years old in Sweden was 17.4 %, in Australia was 12.1 %, in China was 6.8 % and in India was 7% in year 2000, and it is projected that in 2030 there will be a significant increase in values, 25 % for Sweden, 20% for Australia, 15.7% for China and 9.6% for India.[3]

As people age, they develop multiple symptoms and illnesses. Therefore, polytherapy is often mandatory in the management of the common ailments.

The term polytherapy refers to the use of multiple medications, ranging from 5 to 10 drugs at the same time. [4]

Consequences of polypharmacy include adverse drug reactions and interactions, increased risk of cognitive impairment, impaired balance, increased risk of morbidity, hospitalization and mortality. [5,6,7]

This study shows results of interactions between drugs in 100 patients from Kichevo, concretely from village Zajas and how much importance is paid to these interactions from medical professionals.

Polytherapy and Drug Interactions

An interaction is said to occur when the effects of one drug are changed by the presence of another drug, herbal medicine, food, drink or by some environmental chemical agent. [1] The outcome can be harmful if the interaction causes an increase in the toxicity of drug. For example, there is a considerable increase in risk of severe muscle damage if patients on statins start taking azole antifungals. Patients taking monoamine oxidase inhibitor antidepressants (MAOIs) may experience an acute and potentially life-threating hypertensive crisis if they eat tyramine-rich foods such as ‘cheese’.[1] A reduction in efficacy due to an interaction can sometimes be just as harmful as an increase: patients taking warfarin who are given rifampicin need more warfarin to maintain adequate and protective anticoagulation, while patients taking ‘tetracylines’ or ’quinolones’, need to avoid antacids and milky foods because the effects of these antibacterials can be reduced or even abolished if admixture occurs in the gut.[1] Specific combination of various drugs in a given patient has the potential to result in an interaction. [8] As the number of medications increase, the potential for drug interactions increases. The risk of an adverse drug event has been estimated at 13% for two drugs, 58% for three drugs, 58% for five drugs, and 82% for seven or more drugs. [9] The overall incidence of drug reactions in geriatric patients is estimated to be at least twice that in younger population because of errors both in prescription pattern of practitioners and drug usage by the patients. [10] Practitioner errors occurs because of lack of knowledge of geriatric clinical pharmacology and not conducting medication review with the patient. Patient errors may result from noncompliance

and use of multiple pharmacies. Poor compliance in geriatric patients is due to poor communication with health professionals and decline in cognitive abilities. Other predictors for the drug interactions include severity of the diseases being treated, age of the patient, and renal and hepatic dysfunction.

Mechanisms of Drug Interaction

Some drugs interact together in totally unique ways. The action and interaction of drugs are dependent on their "pharmacokinetics" and "pharmacodynamics".[11] Pharmacokinetic interactions are those that can affect the processes by which drugs are absorbed, distributed, metabolized and excreted.

Drug absorption interactions

Most drugs are given orally for absorption through the mucous membranes of the gastrointenstinal tract, and the majority of interactions that go on within the gut result in reduced rather than increased absorption. For drugs given long-term, in multiple doses (e.g. the oral anticoagulants) the rate of absorption is usually unimportant, provided the total amount of drug absorbed is not markedly altered. On the other hand for drugs that are given as single doses, intended to be absorbed rapidly (e.g. hypnotics or analgesics), where a rapidly achieved high concentration is needed, a reduction in the rate of absorption may result in failure to achieve an adequate effect. It is delayed due to reduced blood flow to gut, alteration in gastric pH, reduced motility and formation of complexes.

Gastric pH – an alteration in gastric pH due to antacids, H2 antagonists, and proton pump inhibitors affects the absorption of other drugs. Drugs such as ketoconazole, itraconazole and salycilates require gastric acidity for their optimum absorption. If both these are given concurrently, the bioavailability of the latter is reduced. This potential interaction can be reduced by giving a gap of 2-3 h between antacid and potentially interacting drug.

Gastric motility – prolonged gastric emptying may delay absorption of some drugs in elderly. Anticholinergic drugs used in the control of movement disorders delay gastric emptying. They reduce bioavailability of levodopa by 50%.

Complex formation- drugs interfering with metals such as Al, Mg, Ca, and Fe form complexes resulting in the reduced absorption. Biophosphonates are often co-prescribed with calcium supplements in the treatment of osteoporosis. Calcium binds to the biophosphonates and reduces with a possibility of therapeutic failure. This may be avoided by allowing sufficiently long dosage interval; possible approach is to give biophosphonates for 2 weeks and calcium supplements for 10 weeks.

Drug Distribution Interactions

The distribution of drugs in elderly is altered due to reduction in lean body mass, total body water content, increase in the percentage of body fat, and decrease in serum albumin. Body composition- as age increases, muscle mass and body water may decrease with an

increase in body fat. Protein bindig-plasma albumin may be reduced with age resulting in increase in the free form of acidic drugs and consequent risk. Drugs competing for binding site on albumin may exaggerate the displacement of one drug by another, with potential toxic effects of the unbound form of the displaced drug.

Drug Metabolism Interactions

Some drugs metabolism goes on in the serum, the kidneys, the skin and the intenstines, but the greatest proportion is carried out by enzymes that are found in the membranes of the endoplasmic reticulum of the liver cells. Metabolism of drugs is carried by two major types of reaction. The first so-called phase I reactions (involving oxidation, reduction or hydrolysis), turn drugs into more polar compounds, while phase II recations involving coupling drugs with some other substance (e.g. glucuronic acid, known as glucuronidation) to make usually inactive compounds.

The majoriy of phase I oxidation reactions are carried out by the haemcontaining enzyme cythochrome P450. Enzyme induction; induction of the enzymes results in reduced plasma concentration of the substrate agent due to its increased metabolism. The extent of the enzyme induction depends on the drug and its dosage, but it may take days or even 2 to 3 weeks to develop fully, and may persist for a similar length of time when the enzyme inducer is stopped. This means that enzyme induction interactions are delayed in onset and slow to resolve. Enzyme inhibition; more common than enzyme induction is the inhibition of enzymes. This results in the reduced metabolism of an affected drug, so that it may begin to accumulate within the body, the effect usually being essentially the same as when the dosage is increased. Unlike enzyme induction, which may take several days or even weeks to develop fully, enzyme inhibition can occur within 2 to 3 days, resulting in the rapid development of toxicity. For example, a marked increase occurred in the plasma levels of a single dose of sildenafil after ritonavir had also been taken for 7 days, probably because ritonavir inhibits the metabolism of sildenafil by CYP3A4.

Drug Excretion Interactions

Most drugs are excreted either in the bile or in the urine. Renal blood flow, golmerular filtration rate, and tubular secretion decrease in elderly. As renal function declines the clearance of many drugs is reduced in elderly. Toxicity may occur with drugs which are mainly eliminated through kidneys and have narrow therapeutic index such as lithium or digoxin.

Pharmacodinamyc Interactions

Are those where the effects of one drug are change by the presence of another drug at its site of action. Sometimes the drugs directly comepete particular receptors but often the reaction is more indirect and involves interference with physiological mechanisms. These interactions can be:

Additive or synergistic interactions- if two drugs that have the same pharmacological effect are given together the effects can be additive.

Antagonistic or opposing interactions- in contrast to additive interactions, there are some pairs of drugs with activities that are opposed to one another. For example, the coumarins can prolong the blood clotting time by competitively inhibiting the effects of dietary vitamin K.

METHODOLOGICAL ASPECTS AND RESULTS

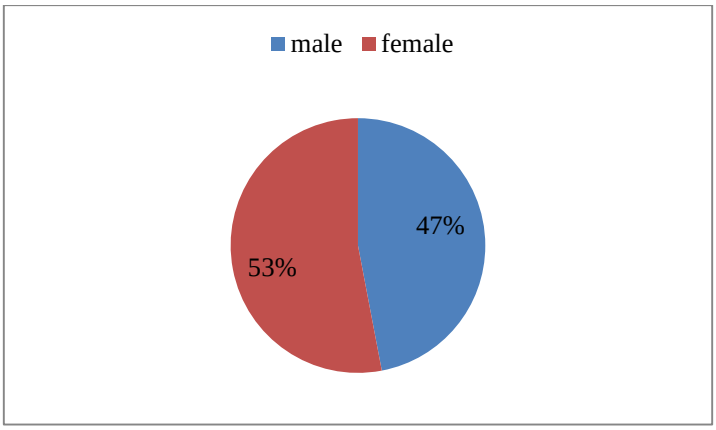
Methodological Aspects

The study was carried out by analyzing the prescriptions, respectively the chronic therapy of patients. Prescriptions were taken from private ordinance "Ibrahim Ramadani" localized in village Zajas of Kichevo (North Macedonia) and pharmacy "Arteina" localized in the same place.

Conditions for participation in the study was age (above 40) and using more than 3 drugs.Prescribed drugs being taken concurrently and checked for drug-drug interaction using www.drugs.com online drug reference. Drugs.com is medical software which gives information about drugs, drug combinations and drug interactions categorized in major, moderate and minor. Numerical data were presented with graphical methods using Microsoft Exel 2010 and theoretical concepts are derived from scientific literature.

Results

Figure 1: The total number of patients

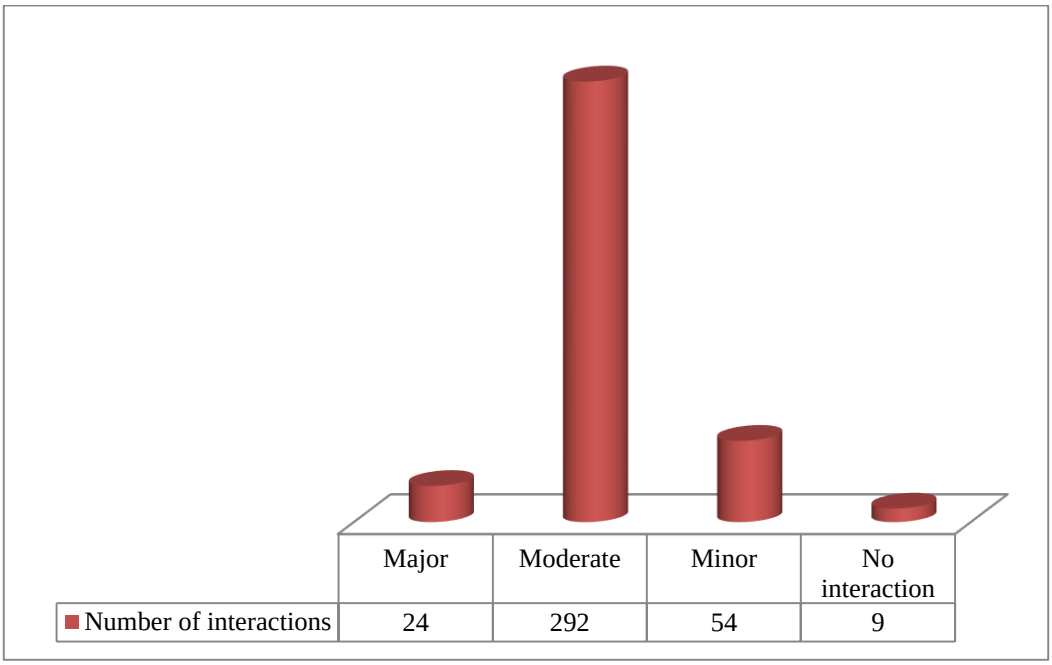


A total of 100 patients with chronic therapy of which 53 females and 47 males were participated in the study. The age of patients was between 40 – 90 years old.

Table 1: Classification of interactions by severity

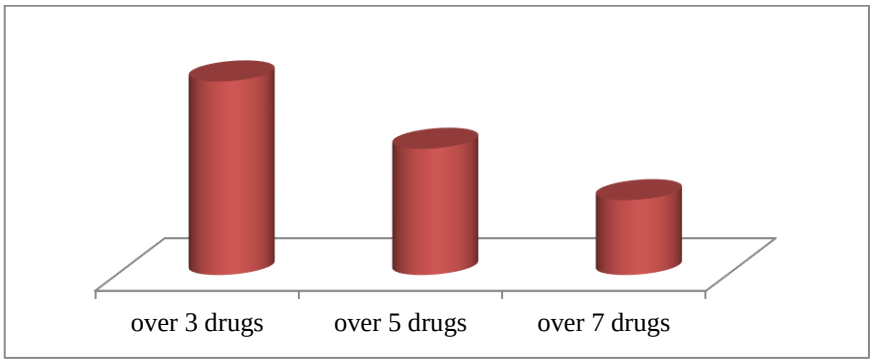
Severity	Explanation
Major	These interactions are highly clinically significant. These kind of combinations should be avoided; the risk of the combination outweighs the benefit.
Moderate	These interactions are moderately clinically significant and they can aggravate patients condition. Usually these kind of combinations should be avoided and used only under special circumstances
Minor	These interactions are minimally clinically significant, and the risk is minimal.

Figure 2: Interactions between drugs in patients taken for the study



This graph shows the potential number of interactions in patients (370 the total number of interactions between drugs), so 24 of them were major interactions, 292 were moderate interactions, 54 were minor interactions and in 9 patients there was no interactions between drugs that they used.In percentage the major interactions are represented with 6.48% from the total number of interactions, moderate with 78.91% and minor with 14.59 % from the total number of interactions.

Figure 3: Number of drugs that use patients taken for the study



Patients taken for the study were with chronic therapy, they used more than 3 drugs. Therefore 49 of them were patients that use more than 3 drugs, 32 of them used more than 5 drugs, and 19 of them used more than 7 drugs.

Major interactions and drugs with higher potential for interactions

Table 2: Interactions between bronchodilators and beta blockers

Drug combinations	Number of patients	Interaction effects
Aminophyline <> Bisoprolol	3	Insomnia, nausea, vomiting, tremors, uneven heartbeats, difficulty breathing.
Aminophyline <> Metoprolol	1	
Aminiphyline <> Nebivolol	1	

From 100 patients analyzed, in 5 patients were displayed interaction between bronchodilators and beta blockers. Drugs that interact were aminophyline with bisoprolol, metoprolol and nebivolol.

Table 3: Interactions between statines and fibrates

Drug combinations	Number of patients	Interaction effects
Atorvastatine <> Fenofibrate	2	Nausea, vomiting, muscle pain, tenderness, weakness, fever, chill, skin rash, itching.
Rosuvastatine <> Fenofibrate	1	

From 100 patients analyzed, in 3 patients were displayed interaction between statines and fibrates. Drugs that interact were atorvastatine and rosuvastatine with fenofibrate.

Table 4: Interactions between antipsychotics and benzodiazepines

Drug combinations	Number of patients	Interaction effects
Olanzapine <> Diazepam	2	Low blood pressure, weakness, drowsiness, dizziness, weak pulse.
Olanzapine <> Clonazepam	1	

From 100 patients analyzed, in 3 patients were displayed interactions between antipsychotics and benzodiazepines. Drugs that interact were olanzapine with diazepam and clonazepam.

Table 5: Interactions between ACE inhibitors and angiotensin II receptor antagonists.

Drug combinations	Number of patients	Interaction effects
Enalapril <> Valsartan	1	Low blood pressure, hyperkalemia, muscle paralysis, irregular heart rhythm,nausea, vomiting, weakness.
Enalapril <> Losartan	1	
Perindopril <> Losartan	1	

From 100 patients analyzed, in 3 patients were displayed interactions between ACE inhibitors and angiotensin II receptor antagonists. Drugs that interact were enalapril with valsartan and losartan.

Table 6: Interactions between calcium channel blockers and beta blockers

Drug combinations	Number of patients	Interaction effects
Verapamil <> Bisoprolol	2	Fatigue, headache, swelling of the extremities, weight gain, chest pain, irregular heartbeat.

From 100 patients analyzed, in 2 patients were displayed interactions between calcium chanell blockers and beta blockers. Drugs that interact were verapamil with bisoprolol.

Table 7: Interactions between potassium-sparing diuretics and ACE inhibitors

Drug combinations	Number of patients	Interaction effecets
Spironolactone <> Lisinopril	2	Hyperkalemia, confusion, irregular heartbeat.
Spironolactone <> Perindopril	1	

From 100 patients analyzed, in 3 patients were displayed interactions between potassium sparing diuretics and ACE inhibitors. Drugs that interact were spironolactone with lisinopril and perindopril.

Table 8: Interactions between selective reuptake inhibitors and tricyclic antidepressant

Drug combinations	Number of patients	Interaction effecets
Paroxetine <> Amitriptyline	2	Sedation, dry mouth, blurred vision, constipation, urinary retention, confusion, abdominal cramping, sweating, high blood pressure, high heart rate.

From 100 analyzed, in 2 patients were displayed interactions between selective reuptake inhibitors and tricyclic antidepressant. Drugs that interact were paroxetine with amitriptyline.

Table 9: Interactions between antipsychotics and antipsychotics

Drug combinations	Number of patients	Interaction effects
Haloperidol <> Risperidone	2	Diarrhea, vomiting, dizziness, heart palpitations, long QT syndrome,shortness of breath.

From 100 patients analyzed, in 2 patients were displayed interactions between the same group of drugs. Drugs that interact were haloperidol with risperidone.

Table 10: Interactions between anticonvulsants and antipsychotics

Drug combinations	Number of patients	Interaction effects
Topiramate <> Olanzapine	1	Fever, dizziness, sweating, drowsiness

From 100 patients analyzed, in 1 patient were displayed interaction between anticonvulsants and antipsychotics. Drugs that interact were topiramate with olanzapine.

Table 11: Interactions percentage

Drugs with higher potential for interactions	% (from total number of interactions)	% (from total number of major interactions)
Bronchodilators <> Beta bllockers	1.35 %	20.83%
Statines <> Fibrates	0.81 %	12.5 %
Antipsychotic <> Benzodiazepines	0.81%	12.5 %
Calcium channel blockers <> Beta bllockers	0.54 %	8.33%
ACE inhibitors <> Angiotensin II receptor antagonists	0.81 %	12.5%
Potassium-sparing diuretics <> ACE inhibitors	0.81 %	12.5%
Selective reuptake inhibitors <> Tricyclic antidepressant	0.54%	8.33 %
Antipsychotic <> Antipsychotic	0.54%	8.33 %
Anticonvulsant <> Antipsychotic	0.27 %	4.16 %

CONCLUDING REMARKS

Drug prescription in elderly is a serious challenge as there is an increased possibility of drug interaction resulting in toxicity, loss of drug effect or treatment failure. Based on results of the study the most of interactions were moderate with 78.91% from the total number of interactions, but we were focused on major interactions represented with 6.48% from the total number of interactions, these highly clinically significant interactions. On a general overview, we can conclude that health professionals should pay attention on the possibility of drug-drug interactions, and should be avoided combination of drugs who interact between.

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Body Composition Reference Percentiles of Healthy Turkish Children and Adolescents in Turkey

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ABSTRACT

Background: In addition to body mass index (BMI), fat mass (FM), fat-free mass (FFM), and their index may be used to predict metabolic health risks. The aim of this study is to define age- and gender-specific FM, fat mass index (FMI), FFM and fat-free mass index (FFMI) percentiles for heatly Turkish children and adolescents.

Methods: A total of 4028 (2252 girls, 1776 boys) participant aged 6–17 years were recruited. The body composition was evaluated by bioelectrical impedans. FM, FMI, FFM and FFMI percentiles were produced.

Results: FM, FFM, FMI and FFMI percentiles were calculated. FMI and FM were female predominance through 6 to 17 years. The differences in 3rd-97th percentiles of FFMI were 4.06–7.20kg/m^2 respectively for males, where this difference was 4.06-6.95kg/m^2 for females. We checked the age-specific contribution of FMI, FFMI to BMI and fat% with Hattori chart and found that children with similar BMI may lie in different fat%.

Conclusions: Since FM and FFM are important for the evaluation of body composition, in addition to BMI and body fat%, FM and FFM percentiles are required as local reference. Therefore, this study provides normative data for body FM, FMI, FFM and FFI percentiles.

Keywords: Fat Mass, Fat Mass Index, Fat-Free Mass, Fat-Free Mass Index, Children, Adolescents.

INTRODUCTION

In addition to secular change in growth, change in body composition should also be considered as an indicator of endocrine and cardiometabolic parameter which needs serious concern (Lobstein et. al., 2004). The overweight and obesity burden in adults can be observed in childhood (Lobstein et. al., 2004, Han et. al., 2010, Ernst et. al., 2012, Johnson et. al., 2013, Sabin et. al., 2015). Early onset overweight and obesity in childhood is not only an endocrine and cardiometabolic disorder which are precursors of cardiovascular disease, hypertension, insulin resistance, diabetes mellitus, dyslipidemia, polycystic ovaries syndrome, hyperandrogenism, neoplasm but also a serious cause of adult overweight and obesity burden. Other than endocrine and cardiometabolic problems social and emotional impairment extending to adulthood may even be a cause of non physical disorders (Dietz, 1998, Melanson et. al., 2001, Whang et. al., 2014).

The primary aim of this study is to produce the FM and FFM percentiles and fat mass and fat- free mass indexes (FMI, FFMI) in a quite competent sample in Turkish children and adolescents for the first time. This would provide the opportunity of both to detect fat and fat-free mass and also its variation for height. Calculated percentiles then may be used in evaluation of body composition for thinness, overweight and obesity resulted by body fat or muscle mass content and distribution.

Material and Method

This is the most recent (2007-2008) and the comprehensive cross-sectional study which uses the data of Determination of Anthropometric Measures of Turkish Children and Adolescents (DAMTCA II) (Kurtoglu et. al., 2010). The study sample consists of 1776 male and 2252 female 6-17 years old children and adolescents.

In 6-17 years old children and adolescents age and gender specific FM, FMI, FFM and FFMI percentiles are produced by LMSP method (13). The device Tanita BC-418MA (Tanita Corporation, Tokyo, Japan) was used to calculate fat mass (FM), fat-free mass (FFM) fat. The mass index (FMI; FM/height^2), fat-free mass index (FFMI: FFM/Height^2) were then calculated (Talma et. al., 2013).

Age-related FFM, FFMI, FM and FMI z-score plots were examined and the discontinuities were checked. Further, liberal cut-off values, where the z-scores of data values outside [Thibault and Pichard, 2012, Dietz, 1998), were used to detect outliers (Van Buuren e. Al., 2009 15). After outlier detection, remaining 4.028 observations (1.776 boys, 2.252 girls) were randomly split into training (70%) and validation (30%) sets. Training set was used for model building and validation set was used for model validation and model selection. GAMLSS models were used to fit the models (Rigby and Stasinopoulos, 2005). For each anthropometric measure and each gender, three methods including LMS, LMST and LMSP methods were applied to data. Box-Cox normal (BCN), Box-Cox *t* (BCT) and Box-Cox power exponential (BCPE) distributions were used in GAMLSS models, respectively. Maximum penalized likelihood method was used, RS algorithm and Fisher scoring procedure was applied to estimate

distribution parameters. As smoothing functions, cubic splines were used. Each gender was modeled separately. Analyses were conducted using GAMLSS package (version 4.3-1) of R 3.1.1 software (www.r-project.org).

Parameter Optimization

In order to apply LMSP method, we followed the three step optimization procedure (Rigby and Stasinopoulos, 2004) and generalized Akaike's information criteria with parameter #3 for model selection. Firstly, identity link functions were defined for μ and ν, log-link functions were defined for σ and τ. An initial age transformation was optimized as $x=age^{\lambda}$ after a grid search of λ between -2 to 2 in steps of 0.25. Next, initial degrees of freedom of all four parameters was set to 1 and df(μ), λ and df(σ) values were optimized respectively. For df(μ) and df(σ) we made a search between 1 to 20 in steps of 1 and for λ between -2 to 2 in steps of 0.05. After optimizing these three parameters, optimal df(ν) and df(τ) were searched ranging between 0 to 9 in steps of 1, respectively. In last step of procedure, fine tuning was used for the model with optimum parameters with changing values of df(σ), df(μ), df(ν), df(τ) and λ. Same procedure was followed for LMST and LMS methods, considering the absence of τ parameter in BCCG distribution of LMS method. Final models for each gender, each measure and each method are given in Table 1. Results from the Table 1 demonstrates the best fit models for age-related FFM, FFMI, FM and FMI data for both boys and girls. The contribution of fat and fat free mass (FMI, FFMI) to BMI and fat% is shown in Hattori chart (Figure 1) (Hattori et. al., 1997).

Results

The LMSP method parameters used to produce FM, FFM, FMI and FFMI were shown in Table 2. Our initial observation for FMI and FM was female predominance through 6 to 17 years in which the predominance significantly increases after 9 years (Table 2). The gender differences in 6 years were 0.16 kg but in 17 years gender difference became 2.05 kg. Although FM increased gradually from 6 to 17 years in male gender, there was a peak of FM in 14 years of female, which then gradually decreases (Table 2).

The differences in 3rd-97th percentiles of FM were 4.38 kg-19.65 kg respectively, for 6 and 17 years old males where this difference was 5.57-19.65 kg at 6-17 years old females (Table 3). The increase in FM through 6-17 years old was 2.54 kg and 2.94 kg for 3rd percentile and 17.81 and 17.02 for 97th percentiles respectively for males and females. The 50th percentile increases for 50th percentile through 6-17 years were 5.85 and 8.57 respectively for males and females (Table 3).

The differences in 3rd-97th percentiles of FMI were 3.15-6.44 kg/m^2 respectively for 6 and 17 years old male where this difference was 3.38-7.59 kg/m^2 at 6-17 years old females (Table 4). The increase in FMI through 6-17 years old was -0.49 kg/m^2 and 0.8 kg/m^2 for 3rd percentile and 2.8 kg/m^2 and 4.29 kg/m^2 for 97th percentile respectively for males and females. The 50th percentile increases for 50th percentile through 6-17 years were 0.17 and 2.84 kg/m^2

respectively, for males and females (Table 4). In Table 5, we found that the mean FM was slightly higher than females, but significantly higher after 13 years (Table 5).

The differences in 3rd-97th percentiles of FFM were 8.16kg–27.06 kg respectively, for 6 and 17 years old males where this difference was 7.95-13.31 kg at 6-17 years old females (Table 6). The increase in FM through 6-17 years old was 30.05 kg and 23.63 kg for 3rd percentile and 48.95 and 28.99 for 97th percentile respectively, for males and females. The 50th percentile increases for 50th percentile through 6-17 years were 34.77 and 25.83 respectively for males and females (Table 6).

The difference in 3rd-97th percentiles of FFMI was 4.06 kg/m^2 – 7.20 kg/m^2 respectively for 6 and 17 years old males, where this difference was 4.06-6.95 kg/m^2 at 6-17 years old females (Table 7). The increase in FFMI through 6-17 years old was 4.06 kg/m^2 and 4.06 kg/m^2 for 3rd percentile and 7.20 kg/m^2 and 6.95 kg/m^2 for 97th percentiles respectively, for males and females. The 50th percentile increases for 50th percentile through 6-17 years were 5.25 kg/m^2 and 4.67 kg/m^2 respectively, for males and females (Table 7).

In interpretation of Hattori chart, we found that children with similar BMI may lie in different fat %. Another finding was discrimination between males and females for fat % which was prominent in BMI higher than 26 kg/m^2. The 50^{th} percentiles of FM, FMI, FFM and FFMI were compared in Figure 1. The prominent findings in Figure 2 were the increase in FM from 9 years on and increase in FFM from 13 years on respectively, for females and males (Table 5).

Discussion

The well-known determinant of body composition; the BMI is composed of both the body fat (FM) and fat-free mass (FFM). In this study, we produced FM, FFM references and two components of BMI; FMI and FFMI references of 6–17 years old Turkish children for the purpose of screen and compare these references with other references. We constructed Hattori chart in which FMI versus FFMI was classified according to both BMI and fat % (Figure 1). The use of FMI, FFMI other than BMI is the fact that similar BMI may have significantly different FMI (fat mass) and FFMI (lean) component (Wells, 2010). In other words BMI may fail to discriminate children with overfat (fat mass) and overweight (fat mass and lean mass) both of which has discrete cardiometabolic end points.

Our findings also support the above statement by indicating that children with similar BMI may have significantly different fat content (Figure 1). Even in normal BMI range gender related splitting in favour of females for fat mass index can be observed. In the overweight children the discrimination between each gender becomes much more apparent. In overweight and obese children distraction between FMI and FFMI becomes much more clear where females are concentrated in 30-40% and males 20-30% range. Then, we may conlude that not solely BMI but its components FMI and FFMI should be considered together in clinical assesment. Although BIA is not the gold standard it is stil may be considered as both the most practical and reliable method of screening and detection of overweight and obesity.

In comparison of our results with previous studies we detected that almost all previous studies were performed in relatively narrow age groups. Other than age group, it is not easy to find studies performed in similar periods which may bias comparison. FM of Turkish children was higher than Japan (2003) and Bengal (2013) children which may be related with several factors such as geographic location, nutrition, ethnic origin, and e.t.c. (Sen and Mondal 2013, Nakao and Komiya, 2003 20,21). Considering the findings of Eissa MA et. al. in white USA children (n=678) FFM ve FFMI are similar with our findings (Eissa et. al., 2009 22). Inconsiderable differences between our data and Eissa MA data were detected in 8, 11 and 14th years of age in favor of USA male children and female Turkish children. This comprehensive similarity between USA and Turkish children may be an indicator of body composition change towards USA children. Comparison of our data with Bangladesh study supported our above statement indicating body composition of Turkish children is similar with Bangladesh data (n=200) in relatively young children (6 years) but extending towards USA children, as they get older. This finding may show that increased fat mass may be caused by nutritional shift to western type (Khan et. al., 2012 23). Prins M et al. determined FFM values in 133 Gambian children aged between 5-16 years (Prins et. al., 2008 24). We detected higher FFM values for Turkish children in all ages. This finding pointed out both ethnic and socio-economic differences. Similarly, in Nightingale CM et al. study conducted in London with Southeast Asian, African and English children aged between 8-10 years, found different FFM values and emphasized ethnicity as a determinant factor (Nightingale et. al., 2013 25). McCarthy HD et al. measured FFM and skeletal muscle mass with BIA in 1985 English children aged between 5-18 years (McCarthy et. al., 2014 26). FFM values were similar to Turkish children both in males and females, whereas higher values were found in 17 years. These reflect the nutrition and physical activity difference in late adolescent period.

The primary assesment tools for nutritional status can be listed as height, weight, mid uppper arm circumference, and skinfold thickness. It is now known that BMI calculated from height and weight is not reflecting total and compartmental fat accumulation (Maynard et. al., 2001, Hosking et. al. 2006 27, 28). Failure of discriminating fat and lean mass for BMI lead to research of other methods like BIA and DEXA (Talma et. al., 2013, Maynard et. al., 2001 14, 27). Although relatively small differences may exist between BIA and DEXA, these differences may be neglected since BIA is a practical and cheap method versus DEXA. The detected fat mass underestimation of BIA versus DEXA is 65% and 103% respectively in female and male (Hosking et. al., 2006 28). On the other hand, estimation of FFM may be as high as % 2,4 in boys, 5,7 in girls (Hosking et. al., 2006 28). Lyra A et al. reported lower fat % and higher FFM values according to BIA versus DEXA (Lyra et. al., 2015 29). In another study performed with Tanita BC-418, no difference was detected between BIA-DEXA values in normal-weight children (Meredith-Jones e. al., 2015 12).

In conclusion both in screening and clinical practice use of FMI and FFMI together with BMI would significantly contribute to detect and follow-up of adiposity rebound, puberty precous, delayed puberty, overweight and obesity. This study would contribute to literature as one of the most comprehensive one. Additionally, future studies on the same subject in Turkish population can use our data as acomparison base.

Conflicts of Interest: None

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Table 1: Comparison of LMS, LMST and LMSP methods in modeling age-related FFM, FFMI, FM and FMI for each gender

Method	Distribution Parameters					GAIC(3)*
	df_μ	df_σ	df_ν	df_τ	λ	
FFM index						
Boys						
LMS	3	1	1	-	1.30	**6371.60**
LMST	4	1	1	1	-0.35	6382.108
LMSP	3	1	1	1	1.30	6374.43
Girls						
LMS	5	3	1	-	1.65	**7571.26**
LMST	5	2	2	2	1.55	7584.01
LMSP	5	3	2	2	1.55	7579.88
FFM						
Boys						
LMS	5	2	1	-	2.00	10662.38
LMST	5	2	1	1	2.00	10669.27
LMSP	5	2	1	1	2.00	**10661.87**
Girls						
LMS	4	6	2	-	1.80	**12294.12**
LMST	5	6	1	1	2.00	12302.31
LMSP	4	6	1	1	1.70	12294.89
FM						
Boys						
LMS	0.20	1	2	1	-	8835.30
LMST	0.20	1	2	3	3	8855.37
LMSP	0.05	1	2	1	1	**8831.52**
Girls						
LMS	0.55	8	1	1	-	12320.83
LMST	0.20	7	1	3	3	12338.19
LMSP	0.55	9	2	1	1	**12311.04**
FMI						
Boys						
LMS	-1.00	1	1	1	-	**5671.92**
LMST	-1.00	1	1	1	1	5680.16
LMSP	-0.65	2	1	1	1	5674.97
Girls						
LMS	0.25	5	1	1	-	8381.95
LMST	0.90	10	1	2	2	8397.38
LMSP	0.25	4	1	1	1	**8369.30**

*** Optimal model criteria with minimum GAIC are indicated as bold.**

Table 2: Descriptives of Fat mass Fat mass index and (kg) of Turkish children and adolescents 6-17 years old

Age (years)	Boys			Girls		
		Fat mass index	Fat Mass		Fat mass index	Fat Mass
	n	Mean (SD)	Mean (SD)	n	Mean (SD)	Mean (SD)
6	119	3.26(1.10)*	4.63(1.68)	129	3.52(0.97)	4.79(1.44)
7	148	3.53(1.30)	5.42(2.12)	161	3.82(1.36)	5.84(2.15)
8	160	3.71(1.56)	6.32(2.83)	165	3.89(1.48)	6.52(2.85)
9	141	4.06(2.13)	7.49(4.11)	144	4.20(1.61)	7.56(3.15)
10	163	3.87(1.83)*	7.71(3.97)*	177	4.70(1.92)	9.57(4.27)
11	141	3.83(1.92)*	8.08(4.40)*	115	4.78(1.90)	10.48(4.57)
12	116	3.98(2.18)*	9.09(5.23)*	156	4.87(1.69)	11.53(4.32)
13	133	3.72(1.90)*	9.31(4.72)*	159	5.55(2.39)	13.46(5.66)
14	147	3.56(2.04)*	9.92(5.91)*	147	6.05(2.17)	15.58(6.03)
15	217	3.53(1.73)*	10.48(5.20)*	378	5.35(2.04)	13.85(5.42)
16	212	3.79(2.05)*	11.47(6.11)*	413	5.56(2.27)	14.41(5.98)
17	84	3.74(1.72)*	11.44(5.29)*	133	5.26(1.96)	13.49(4.96)

Age indicates whole age group (e.g. 7.00-7.99 years, etc.),*; $p<0.05$, SD; Standard Deviation

Table 3: Fat mass percentiles of Turkish children and adolescents

Age (years)	Percentiles										
	3rd	5th	10th	15th	25th	50th	75th	85th	90th	95th	97th
Boys											
6	2.64	2.75	2.93	3.07	3.30	3.82	4.54	5.07	5.51	6.33	7.02
7	2.95	3.09	3.33	3.51	3.82	4.59	5.71	6.53	7.20	8.46	9.51
8	3.16	3.32	3.60	3.83	4.22	5.27	6.86	8.01	8.97	10.72	12.17
9	3.30	3.48	3.81	4.08	4.56	5.87	7.93	9.43	10.65	12.88	14.70
10	3.44	3.65	4.02	4.32	4.88	6.42	8.88	10.64	12.08	14.66	16.72
11	3.62	3.84	4.26	4.60	5.21	6.94	9.68	11.64	13.22	16.03	18.25
12	3.83	4.08	4.53	4.90	5.57	7.43	10.38	12.48	14.16	17.16	19.52
13	4.09	4.36	4.84	5.24	5.95	7.92	11.00	13.20	14.96	18.10	20.58
14	4.37	4.66	5.18	5.59	6.34	8.38	11.56	13.83	15.66	18.93	21.52
15	4.66	4.96	5.51	5.95	6.73	8.83	12.09	14.43	16.34	19.78	22.53
16	4.93	5.25	5.82	6.28	7.10	9.26	12.61	15.04	17.04	20.70	23.67
17	5.18	5.52	6.12	6.60	7.45	9.67	13.10	15.63	17.74	21.63	24.83
Girls											
6	3.05	3.17	3.39	3.56	3.84	4.53	5.51	6.21	6.77	7.79	8.62
7	3.08	3.21	3.45	3.63	3.94	4.75	5.93	6.74	7.40	8.58	9.51
8	3.57	3.73	4.02	4.25	4.65	5.72	7.32	8.42	9.29	10.81	12.01
9	3.72	3.90	4.22	4.48	4.95	6.22	8.14	9.45	10.46	12.22	13.56
10	4.25	4.48	4.88	5.21	5.80	7.44	9.91	11.55	12.81	14.94	16.53
11	4.93	5.21	5.73	6.15	6.90	8.97	12.04	14.04	15.54	18.03	19.84
12	5.34	5.69	6.30	6.80	7.69	10.06	13.45	15.62	17.22	19.84	21.70
13	5.88	6.30	7.05	7.65	8.70	11.41	15.15	17.49	19.21	21.98	23.94
14	6.54	7.06	7.98	8.70	9.95	13.06	17.21	19.78	21.66	24.67	26.79
15	6.53	7.11	8.13	8.91	10.25	13.46	17.62	20.18	22.05	25.03	27.12
16	6.26	6.88	7.95	8.77	10.13	13.31	17.31	19.77	21.57	24.43	26.42
17	5.99	6.64	7.76	8.60	9.98	13.10	16.93	19.29	21.00	23.74	25.64

Table 4: Fat mass index percentiles of Turkish children and adolescents.

Age (years)	Percentiles										
	3rd	5th	10th	15th	25th	50th	75th	85th	90th	95th	97th
Boys											
6	2.12	2.20	2.33	2.43	2.60	2.98	3.52	3.90	4.21	4.79	5.27
7	2.09	2.18	2.34	2.46	2.65	3.12	3.80	4.30	4.72	5.52	6.21
8	2.04	2.14	2.31	2.45	2.67	3.21	4.00	4.61	5.12	6.11	6.98
9	1.97	2.08	2.26	2.41	2.65	3.25	4.13	4.80	5.37	6.49	7.45
10	1.90	2.01	2.21	2.36	2.62	3.25	4.19	4.91	5.51	6.68	7.69
11	1.84	1.95	2.16	2.31	2.58	3.24	4.22	4.96	5.59	6.79	7.81
12	1.78	1.90	2.11	2.27	2.55	3.22	4.23	4.99	5.63	6.85	7.88
13	1.74	1.86	2.07	2.24	2.52	3.20	4.23	5.00	5.65	6.88	7.92
14	1.70	1.83	2.04	2.20	2.49	3.19	4.23	5.01	5.67	6.91	7.95
15	1.67	1.80	2.01	2.18	2.47	3.17	4.23	5.02	5.69	6.94	7.99
16	1.65	1.77	1.99	2.16	2.45	3.16	4.23	5.03	5.70	6.97	8.03
17	1.63	1.75	1.97	2.14	2.43	3.15	4.23	5.04	5.72	7.01	8.07
Girls											
6	2.35	2.42	2.55	2.66	2.83	3.28	3.92	4.34	4.68	5.27	5.73
7	2.33	2.41	2.56	2.68	2.88	3.39	4.13	4.63	5.02	5.70	6.23
8	2.32	2.42	2.58	2.71	2.93	3.53	4.38	4.95	5.40	6.17	6.76
9	2.32	2.42	2.60	2.74	2.99	3.66	4.63	5.28	5.77	6.61	7.24
10	2.39	2.50	2.71	2.87	3.16	3.93	5.04	5.76	6.31	7.22	7.89
11	2.48	2.61	2.85	3.03	3.36	4.24	5.49	6.29	6.88	7.86	8.56
12	2.56	2.71	2.97	3.18	3.55	4.53	5.90	6.75	7.38	8.40	9.12
13	2.63	2.80	3.09	3.33	3.74	4.81	6.27	7.18	7.84	8.90	9.64
14	2.66	2.85	3.18	3.44	3.90	5.05	6.58	7.52	8.20	9.29	10.05
15	2.62	2.82	3.19	3.47	3.95	5.14	6.70	7.65	8.34	9.42	10.18
16	2.53	2.75	3.13	3.43	3.93	5.15	6.70	7.64	8.32	9.39	10.13
17	2.43	2.66	3.06	3.37	3.89	5.12	6.66	7.58	8.25	9.30	10.02

Table 5: FFM index and FFM (kg) of Turkish boys and girls

Age (years)	Boys			Girls		
		FFM index	FFM		FFM index	FFM
	n	Mean (SD)	Mean (SD)	n	Mean (SD)	Mean (SD)
6	119	12.84(1.09)*	18.20(2.35)*	130	12.16(1.01)	16.49(2.24)
7	148	13.17(1.13)*	20.18(2.89)*	160	12.59(1.23)	19.23(2.65)
8	160	13.59(1.29)*	22.99(3.27)*	166	12.86(1.2)	21.41(3.29)
9	141	14.02(1.32)*	25.72(3.66)*	145	13.26(1.23)	25.72(3.66)
10	163	14.09(1.42)	27.78(4.40)	177	13.95(1.55)	28.20(4.99)
11	141	14.64(1.56)*	30.62(5.07)	115	14.22(1.62)	30.95(5.09)
12	118	15.22(1.44)*	34.75(5.52)	156	14.65(1.65)	34.52(5.32)
13	133	15.89(1.66)*	39.89(6.79)*	157	15.03(1.78)	36.60(4.89)
14	147	16.64(1.86)*	46.46(7.78)*	147	15.49(1.68)	39.74(5.49)
15	216	17.30(1.83)*	51.56(7.21)*	378	15.85(1.34)	40.86(3.79)
16	213	17.79(1.99)*	54.06(7.56)*	412	16.11(1.26)	41.71(3.56)
17	84	18.14(1.72)*	55.59(6.92)*	133	15.96(1.26)	41.08(3.82)

Age indicates whole age group (e.g. 7.00-7.99 years, etc.),*; $p<0.05$, SD; Standard Deviation

Table 6: Fat-free mass percentiles of Turkish children and adolescents

Age	Percentiles										
(years)	3rd	5th	10th	15th	25th	50th	75th	85th	90th	95th	97th
Boys											
6	13.43	13.82	14.44	14.87	15.53	16.79	18.21	19.10	19.76	20.83	21.59
7	15.06	15.49	16.19	16.68	17.43	18.94	20.65	21.69	22.45	23.68	24.55
8	16.90	17.38	18.17	18.73	19.60	21.41	23.48	24.71	25.61	27.03	28.01
9	18.72	19.25	20.13	20.76	21.77	23.91	26.40	27.85	28.89	30.51	31.63
10	20.47	21.05	22.02	22.73	23.87	26.39	29.32	31.01	32.21	34.05	35.31
11	22.19	22.82	23.89	24.68	25.98	28.88	32.29	34.23	35.60	37.69	39.10
12	24.45	25.17	26.37	27.27	28.75	32.10	36.04	38.27	39.83	42.21	43.81
13	27.60	28.44	29.84	30.89	32.60	36.45	40.96	43.51	45.28	47.99	49.81
14	31.94	32.94	34.59	35.81	37.78	42.11	47.13	49.98	51.97	55.02	57.08
15	36.86	38.00	39.88	41.24	43.40	48.01	53.29	56.33	58.47	61.78	64.03
16	40.72	41.93	43.91	45.33	47.54	52.13	57.33	60.39	62.56	65.97	68.31
17	43.48	44.71	46.71	48.12	50.30	54.71	59.68	62.65	64.80	68.19	70.54
Girls											
6	12.23	12.57	13.14	13.54	14.17	15.46	16.94	17.82	18.46	19.48	20.18
7	13.84	14.23	14.87	15.33	16.05	17.52	19.21	20.22	20.95	22.10	22.90
8	15.62	16.07	16.81	17.33	18.15	19.84	21.78	22.93	23.76	25.08	26.00
9	17.40	17.93	18.81	19.43	20.41	22.43	24.74	26.13	27.13	28.71	29.81
10	19.15	19.82	20.92	21.70	22.93	25.46	28.38	30.12	31.38	33.38	34.77
11	21.44	22.23	23.53	24.46	25.91	28.88	32.27	34.29	35.73	38.01	39.59
12	24.59	25.44	26.80	27.76	29.26	32.28	35.65	37.62	39.02	41.21	42.70
13	27.70	28.55	29.92	30.88	32.37	35.34	38.62	40.50	41.84	43.91	45.31
14	30.05	30.93	32.34	33.33	34.86	37.94	41.32	43.28	44.66	46.81	48.27
15	32.88	33.67	34.94	35.83	37.20	39.95	42.97	44.71	45.94	47.85	49.14
16	35.33	35.98	37.03	37.76	38.89	41.15	43.64	45.08	46.10	47.69	48.77
17	35.86	36.44	37.40	38.08	39.13	41.29	43.76	45.23	46.30	47.99	49.17

Table 7: Fat-free mass index percentiles of Turkish children and adolescents

Age	Percentiles										
(years)	3rd	5th	10th	15th	25th	50th	75th	85th	90th	95th	97th
Boys											
6	11.02	11.18	11.44	11.63	11.92	12.55	13.29	13.75	14.10	14.67	15.08
7	11.27	11.44	11.72	11.91	12.23	12.89	13.68	14.17	14.53	15.13	15.56
8	11.52	11.70	12.00	12.21	12.54	13.24	14.08	14.59	14.98	15.60	16.05
9	11.75	11.94	12.26	12.48	12.84	13.58	14.46	15.00	15.41	16.06	16.53
10	11.97	12.18	12.51	12.75	13.13	13.92	14.85	15.42	15.84	16.52	17.00
11	12.24	12.46	12.81	13.07	13.47	14.31	15.28	15.88	16.32	17.02	17.52
12	12.60	12.83	13.21	13.49	13.91	14.80	15.83	16.46	16.92	17.65	18.17
13	13.07	13.32	13.72	14.02	14.47	15.41	16.50	17.16	17.65	18.42	18.96
14	13.60	13.87	14.30	14.60	15.08	16.08	17.24	17.93	18.44	19.26	19.84
15	14.13	14.40	14.85	15.17	15.68	16.73	17.94	18.68	19.22	20.09	20.70
16	14.60	14.89	15.35	15.68	16.21	17.30	18.57	19.35	19.92	20.84	21.50
17	15.05	15.35	15.83	16.17	16.71	17.84	19.17	19.98	20.59	21.56	22.25
Girls											
6	11.14	11.30	11.56	11.75	12.05	12.68	13.42	13.88	14.23	14.79	15.20
7	11.34	11.51	11.79	11.99	12.30	12.96	13.74	14.23	14.59	15.18	15.60
8	11.56	11.74	12.03	12.24	12.58	13.28	14.11	14.62	15.00	15.62	16.07
9	11.74	11.93	12.24	12.47	12.82	13.57	14.45	14.99	15.39	16.05	16.51
10	11.91	12.11	12.45	12.69	13.06	13.85	14.78	15.35	15.77	16.46	16.95
11	12.10	12.32	12.68	12.93	13.33	14.17	15.16	15.76	16.20	16.92	17.42
12	12.46	12.69	13.07	13.34	13.77	14.65	15.69	16.32	16.78	17.52	18.04
13	12.99	13.24	13.64	13.93	14.38	15.32	16.40	17.06	17.54	18.31	18.85
14	13.61	13.87	14.30	14.61	15.09	16.08	17.23	17.92	18.43	19.24	19.81
15	14.19	14.47	14.92	15.24	15.74	16.79	18.01	18.75	19.29	20.16	20.77
16	14.64	14.92	15.39	15.73	16.25	17.35	18.64	19.42	20.00	20.93	21.59
17	15.14	15.44	15.91	16.26	16.80	17.93	19.26	20.07	20.67	21.64	22.33

Figure Legends:

Figure 1: Gender comparison for FM, FFM, FMI and FFMI 50th percentiles.

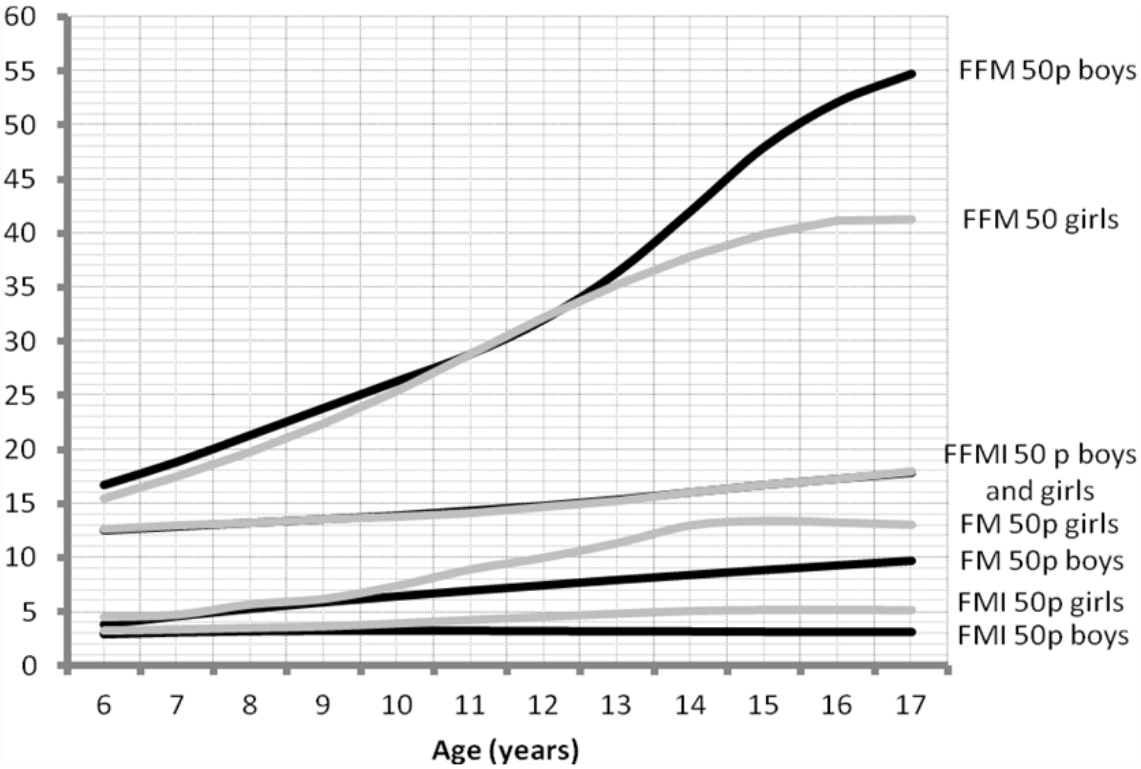
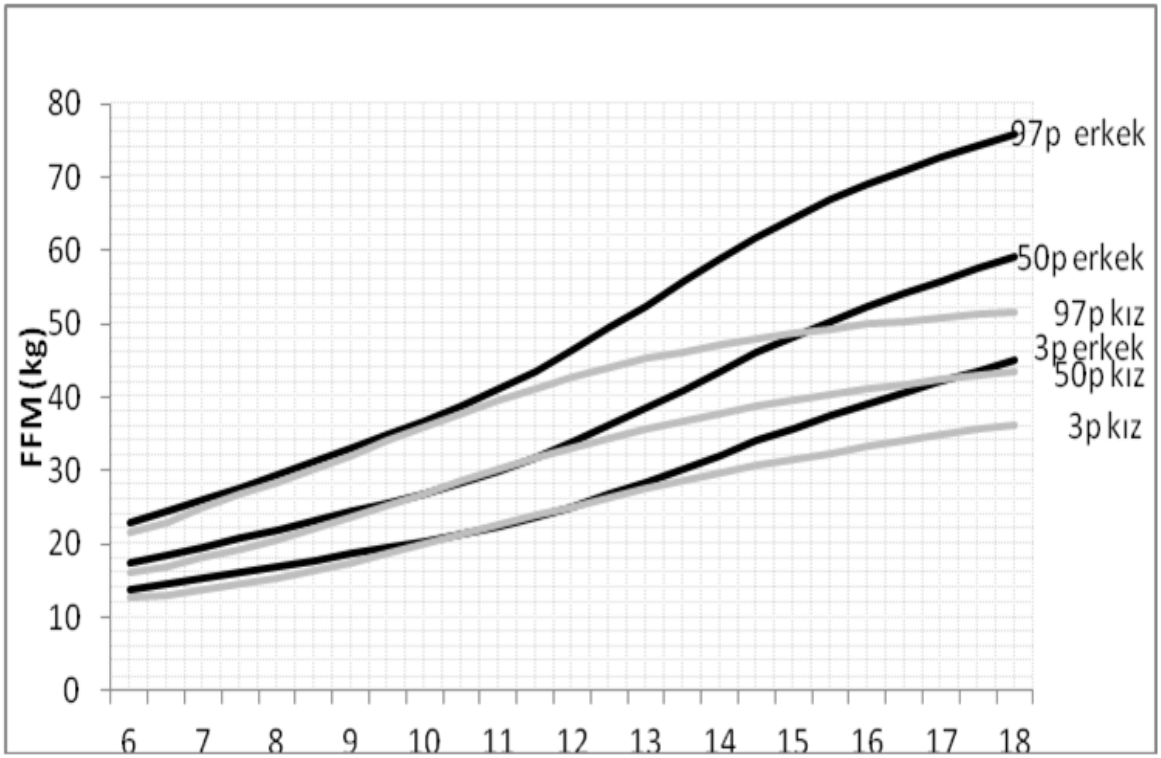


Figure 2: The comparison of 3rd, 50th anfd 97th percentiles of FFM.



Preterm Newborn Care with Mechanical Ventilation: Example of Concept Map

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Introduction: Concept map, which is a visual presentation of the relationship between key terms derived from the subjects learned is a method used to determine how students perceive, synthesize, and evaluate their conceptual understanding. Concept maps that improve nursing students' problem-solving, critical thinking skills also help students to understand the relationship between medical condition of the patient, response to disease, and nursing interventions.

Method: The care of a preterm newborn, who hospitalized in a neonatal intensive care unit of a university hospital, was born at 28th gestational age from the third pregnancy of a 38-year-old mother and weighed 1120 gr, was followed with the diagnosis of prematurity + hyperbilirubinemia + RDS and mechanically ventilated was schematized with the concept map. The data of the newborn collected using functional health patterns; are discussed features of preterm newborn period, disease symptoms, diagnostic methods, possible complications, patient care with mechanical ventilation, treatment and parents.

Results: The newborn was given the following diagnoses: inability to sustain spontaneous respiration, change in respiration pattern, deterioration in gas exchange, deterioration of peripheral tissue perfusion, retardation in growth and development, skin integrity deterioration, change in oral mucous membranes, insufficiency of sensory stimulation, lack of self-care, failure to maintain body temperature, risk of complications related to mechanical ventilation, risk of complications related to phototherapy treatment, risk of aspiration, risk of liquid electrolyte imbalance, failure of mother-infant interaction. The planned and applied nursing interventions related to these diagnoses are discussed and evaluated.

Conclusions: As a result; the concept map can be suggested as an application tool that makes it easier for nursing students to give holistic care by using problem solving and systematic thinking skills, provides meaningful learning and can be used to evaluate students.

Keywords: Nursing Care, Concept Map, Mechanical Ventilation, Preterm Newborn.

INTRODUCTION

In recent years, with the advancement of perinatal care and technology, the principles of mechanical ventilation (MV) have been better understood, and with the widespread use of MV, high-risk neonates have a higher chance of survival in neonatal intensive care units (Atıcı and Özkan, 2011). Increasing the level of education and participation in working life in women and development of assisted reproductive techniques; advanced age causes undesirable neonatal outcomes such as increased pregnancy and preterm delivery rate (Olusanya, 2011; Blencowe et al., 2013). Although advances in science and technology have helped to reduce mortality rates, it is observed that morbidity rates (motor, sensory and developmental problems) of preterm newborns increase (Mwaniki et al., 2012).

Preterm newborns tend to have some health problems more than term newborns because they are born without completing the intrauterine life process (Can et al., 2010; Çavuşoğlu, 2013; Karabudak and Ergün, 2013; Beken, 2007; Potts and Mandleco, 2007; Carlo, 2011). The need for resuscitation at birth, respiratory distress, apnea, sepsis, hypothermia, hypoglycemia, hyperbilirubinemia and feeding intolerance were increased in preterm newborns compared to term newborns. (Arıcı et al., 2015; Boyle and Boyle, 2013). Because preterm newborns have poorly developed respiratory muscles, they have periods of apnea and cyanosis. Respiratory is fast and irregular. The development of alveoli and alveolar capillaries is limited before 26-28 gestational weeks. Surfactant production is insufficient in preterm newborns born before the 34th gestational week and therefore may develop Respiratory Distress Syndrome (RDS) (Can et al., 2010; Çavuşoğlu, 2013; Karabudak and Ergün, 2013; Potts and Mandleco, 2007; Carlo, 2011). Cough and gag reflexes are minimal or absent. Because of these physiological and developmental characteristics, hypoxia, cyanosis and respiratory failure are seen in most of the preterm newborns, and in the presence of these findings, MV support is needed to support respiration in some of the newborns (Atıcı and Özkan, 2011).

MV support, which is one of the most common treatment methods, is used in Neonatal Intensive Care Units (NICUs) to support respiration in newborns with or without respiratory function and to provide alveolar oxygenation and accumulation of carbon dioxide excretion through MV (Atıcı and Özkan, 2011). The breathing pattern of the newborn with MV should have similar characteristics to the normal spontaneous breathing pattern of a healthy newborn at the same gestational week (Atıcı and Özkan, 2011). When the heart rate, respiration rate, chest movements, body temperature and metabolic status and ventilator treatment care (aspiration, position, pain control, airway humidification and heating) of the newborn in MV is better, MV treatment will be so successful. For this, care of preterm newborns hospitalized in the NICU, especially those requiring respiratory support with MV, needs knowledge and intensive labor. The neonatal nurse plays an important role in guiding the care and treatment of the newborns because they are in constant contact with the newborn and observes newborns more frequently (Dursun and Bülbül, 2014). The neonatal nurse routinely evaluates the daily body weight, follow-up, body and incubator temperature, heart rate, respiration rate, color, circulation, muscle tone, skin integrity of newborns at regular intervals. Apart from routine follow-up, nurses are usually the first to notice signs of deterioration in general status of the

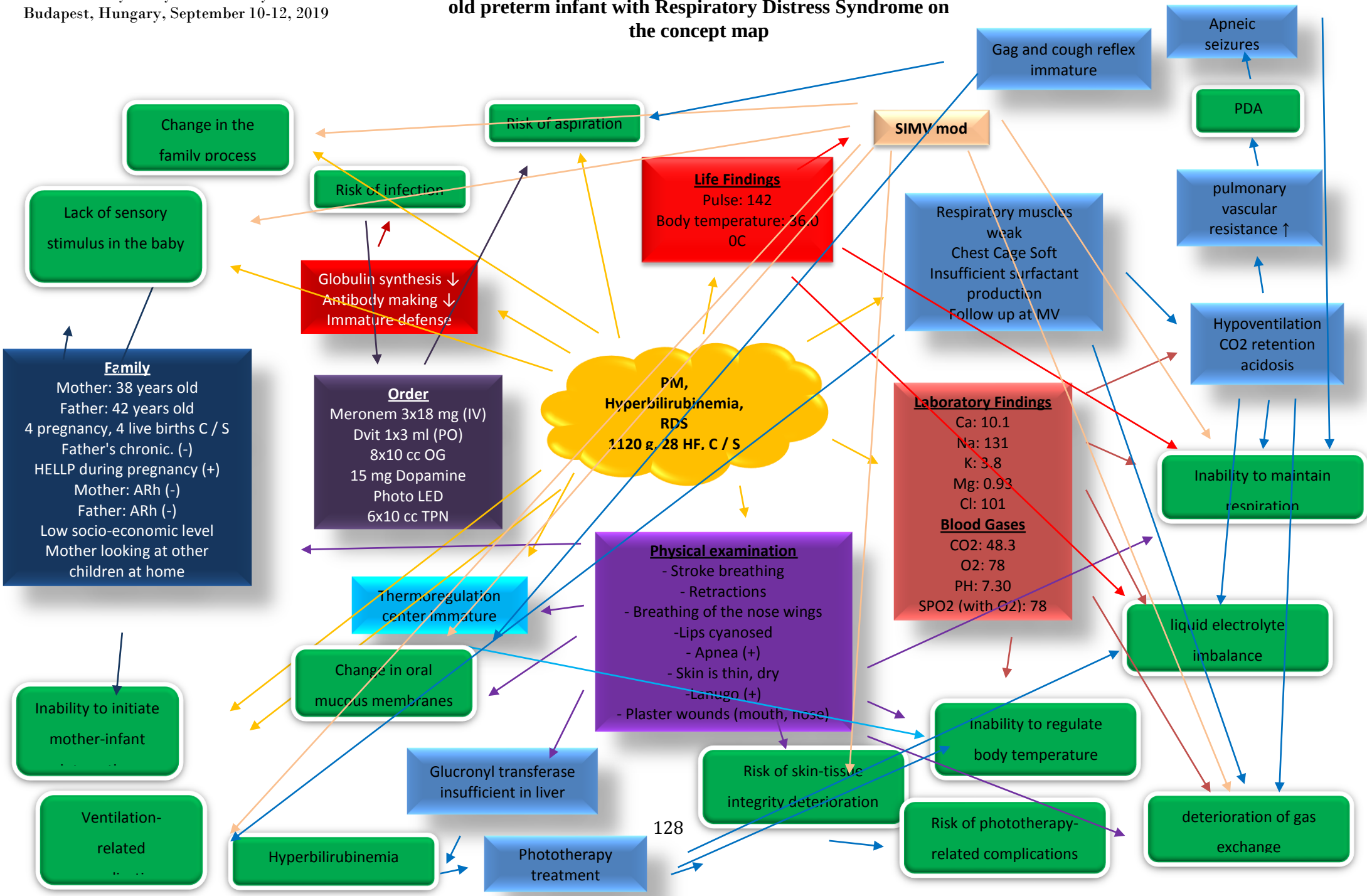
newborns such as abdominal distension, gastric residues, malnutrition, and apnea. The neoanatal nurses play a role in guiding the care and treatment of the newborn by informing the other members of the team about changing clinical status of the newborns (Dursun and Bülbül, 2014; Sivasli and Tekinalp, 2005). NICU nurses should be able to provide care and treatment for newborns, prevent risky conditions in newborns, predict possible complications, and provide holistic care to the newborn by supporting parents participation in the care of the newborn. While providing nursing care to newborns; neonatal nurses can use the concept map method when making a care plan in order to establish a cause- effect relationship, to facilitate the transfer of information within the nurse team, and to provide a easier and more holistic understanding of the phenomenon.

To facilitate meaningful learning, the concept map was first developed by Novak in the early 1970s. It is a learning-teaching strategy that bridges between how people learn and meaningful learning topics (Korkmaz et al., 2011; Novak and Canas, 2008). In nursing education, concept maps are frequently used in group studies, case management, skill laboratories, clinical learning activities and academic article preparation (All et al., 2003; Senita, 2008). In this case, the nursing diagnoses of a preterm newborn receiving MV support and their relationship with each other were examined using the concept map method. Thus, it is aimed to help the organization of complex patient data, to define the relationships and to provide holistic care, to transfer more detailed information to each other using with the concept map in nursing care and to understand the case easier visually.

CASE REPORT

It was schematized with the concept map of the care of a preterm newborn, who was born 28 weeks from the third pregnancy of a 38-year-old mother who was hospitalized in the NICU of a university hospital, weighing 1120 g, followed by prematurity + hyperbilirubinemia + RDS and receiving MV support. The data of the newborn collected using functional health patterns. Preterm neonatal features, disease symptoms, diagnostic methods, possible complications, newborn care with MV, treatment and family are discussed. In the care plan, it was included nursing diagnosis following: Inability to sustain spontaneous respiration, change in respiration pattern, deterioration in gas exchange, deterioration in skin integrity, change in oral mucous membranes, sensory stimulus deficiency in infants, risk of complications related to mechanical ventilation, complication related to mechanical ventilation risk, aspiration risk, liquid electrolyte ımbalance risk, failure of mother-baby ınteraction. The planned and applied nursing interventions related to nursing diagnosis are discussed and evaluated.

Figure 1: Presentation of the case discussion of a 28-week-old preterm infant with Respiratory Distress Syndrome on the concept map



CONCLUSION

In nursing education, concept maps are used to develop critical thinking skills, holistic approach, patient-centered care, preparation for clinical learning activities, linking between clinical practice and theory in students (Clayton, 2006). The concept map method can enable students to realize their own cognitive levels, identify relationships, identify issues that they do not know/understand, and provide holistic care by organizing data (Korkmaz et al., 2011; Daley et al., 2016; Latif et al., 2016; Henderson; et al., 2006; Hinck et al., 2006).

This study was examined the care of preterm newborn with MV support using a concept map and can be used by neonatal nurses working at clinics and in nursing education. Therefore, concept maps that provide holistic care by establishing a cause- effect relationship, can be increase the retention of concepts with meaningful learning, make the care plan funny, and used in student evaluation. The concept maps may be proposed as an application and evaluation tool in nursing education and practice.

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Recent Situation of School Milk Program in Turkey

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ABSTRACT

Adequate and balanced nutrition is important for the protection and development of human health. In all societies, children are the most sensitive group in terms of health and nutrition. Because children express both the most powerful potential that constitutes the future of a society as well as individuals in need of protection. For this reason, in order to give children the habit of consuming milk as in many countries of the world was also in Turkey "School Milk Program" is being implemented. In this study, it was aimed to determine whether school milk consumption is dependent on gender and whether there is a difference between school milk consumption between grades and School Milk Program of the latest situation in Turkey were examined. The data obtained by using a self-administered questionnaire survey were used from 217 primary school students who were in 2nd, 3th and 4th grades. The collected data was analyzed by SPSS package and interpreted according to chi-squared test. The results showed that 82.9% of the students (42.8% of female and 40.1% of male) consumed school milk. 83% of female students participating in the research and 82.8 % of male students participating in the research consumed school milk. While the percentage of famale students drinking school milk among total school milk drinker students was 51.7%, it was 48.3% for male students.It was determined that primary school students who participated in the study; 81.4% of the second grade students, 86.25% of the third grade students and 80.6% of the forth grade students consumed school milk.It was found that there was no relationship between gender and grades and school milk consumption. Similar studies on school milk which were obtained in Adana, Mersin and Osmaniye,different countries of Turkey, conducted similar results.In these studies, in order to gain individuals the habit of drinking milk at a young age; first of all, it was emphasized that the parents should be educated, the advertisements about the importance of dairy products in terms of health should take place more on social media, experts should provide nutrition education in schools, and dairy products should be included more in school canteens.According to the estimated realization figures of the school milk program of 2017-2018 academic year published by National Milk Councilin Turkey, three days a week in 32 128 schools to 6.0564 million students 254 368 800 pieces 200 ml of UHT milk is distributed in totaly.In many countries, the School Milk Program is still successfully implemented. But; continuing uninterruptedly School Milk Program in seven years, seven different geographical regions of Turkey, during the 2018-2019 academic year spring semester has been removed quietly. In other regions of our country and in the provinces to be determined, it will be appropriate to investigate the current status of the School Milk Project and support more effective projects.

Keywords: School Milk, Turkey, Questionnaire Study, Primary School Student.

INTRODUCTION

According to Turkish Standards, milk is a white or cream colored liquid which is secreted from the mammary glands of cows, sheep, goats and buffalos and has a unique taste and consistency, no other substances are mixed, and no substance is taken from it (Anon., 2011).

Milk is a food that contains all the elements necessary for the growth, development and continuity of the organism (Yücecan, 2016).So milk is a good source of macro and micro nutrients such as calcium, vitamin C, iron, riboflavin (vitamin B2), B12, B6, B1, vitamin A, niacin and folic acid (Besler&Ünal, 2008).The contribution of milk proteins to known growth and development in the body, as well as the effectiveness of tissue differentiation; it is known that it has positive effects on calcium absorption and immune functions, decreases blood pressure and cancer risk, effective in controlling body weight and protective against dental caries.The highest share of milk production and consumption both in the world and in our country belongs to cow's milk (Terin, 2014). Therefore, when milk is mentioned in our country, cow milk comes to mind first. But; consumed milk is four types: cow, sheep, goat and buffalo milk (Besler&Ünal, 2006).The composition of cow's milk varies under the influence of various factors, primarily race.The average composition of cow's milk can be sorted as 87.10% water, 8.9% fat-free dry matter, 31% dry matter fat, 4.6% lactose, 4% fat, 3.3% protein, 2.6% casein, 0.70% mineral substances, 0.17% organic acids and 0.15% other components (Gürsoy, 2017).

Increasing the consumption of milk and milk products, it is recommended by health professionals in terms of providing adequate and balanced nutrients and energy.The recommended amount of milk to be consumed for individuals varies according to age, gender and physiological status. Experts recommend consuming 2-3 servings (200-400 ml) of milk and dairy products per day for an adult healthy individual. According to Council Nutrition Guide published by the National Dairy 2-4 (400-800 mL) servings and two servings of Dietary Guidelines for adults in Turkey; for children, adolescent adolescents, pregnant and lactating women and postmenopausal women are recommended to consume 3-4 (600-800 ml) portions of milk products.When looking at the world, we can say that each country consumes different amounts of milk and dairy products.It is remarkable that the habit of drinking milk is very low in Turkey.

LITERATURE REVIEW

Regular milk consumption during adulthood is related to the habit of milk consumption in childhood. The most prominent among the strategies used to gain milk drinking habits at early ages, to determine the factors that affect milk drinking and to produce solutions and to reach desired rates of milk consumption is the "School Milk" program which has been tried in our country, Turkey (Nahcivan, 2006). This program was officially launched worldwide in 1999 and on 29 September is celebrated as "World School Milk Day (FAO, 2010). In Turkey, the official school milk program began to be applied in countrywide with the academic year 2011-2012 (Anon., 2016).It is carried out jointly by the Ministry of Food, Agriculture and Livestock, the Ministry of National Education and the Ministry of Health.With the School Milk Program, it is aimed to raise the awareness of preschool and elementary school students on the

effects of milk and health, to support their healthy nutrition by providing milk drinking, and to ensure the spread of healthy and hygienic milk consumption; it is aimed to encourage the increase of milk production and to ensure the stability of production by providing the evaluation of excess milk supply For this purpose, school milk in Turkey; obtained from domestic raw milk in accordance with the Regulation on Special Hygiene for Animal Foods published in the Official Gazette dated 27/12/2011 and numbered 28155.The shape of the packaging is determined by the Ministry of Food, Agriculture and Livestock, the Ministry of Health and the Ministry of National Education.200 ml packaged, fat, plain UHT drinking milk (defined in the Turkish Food Codex Communiqué on Raw Milk and Heat Treated Drinking Milk published in the Official Gazette No. 23964 dated 14/2/2000) is distributed to kindergarten and primary school students three days a week (Anon., 2015). Students who are determined to be sensitive to milk by parents, teachers, family physicians and health institutions are excluded from the program by the school administrations.The procurement of distributed school milk is obtained from food establishments that produce UHT drinking milk in the country from local raw milk, which has the approval certificate in accordance with the Regulation on Registration and Approval of Food Establishments or the equivalent certificate valid in accordance with the provisions of the same Regulation (Anon., 2018). The production of drinking milk, which was 1 661 785 tons in 2018 by commercial milk enterprises, was 131 961 tons in March 2019 (TÜİK, 2019).

The National Dairy Council publishes figures for the realization of the school milk program each year (USK,2016a;2016b;2018a;2018b). According to the estimated realization figures of the school milk program of 2017-2018 academic year published by National Milk Council in Turkey, three days a week in 32 128 schools to 6.0564 million students 254 368 800 pieces 200 ml of UHT milk is distributed in totaly. (USK, 2018a).

Table 1: Estimated Realization Figures of School Milk Program for the Last Four Years

Acedemic Year	Number of Schools	Number of Students	Amount of Milk Delivered (tonne)	**Delivered Amount (200 ml UHT Milk)**
2017-2018	32.128	6.056.400	50.873	254.368.800
2016-2017	32.125	5.781.827	52.689	263.445.430
2015-2016	33.736	6.012.130	57.716	288.582.216
2014-2015	33.736	5.848.375	55.195	275.978.842

Source: USK, 2016a; 2016b; 2018a; 2018b.

In many countries, the School Milk Program is still successfully implemented. But; continuing uninterruptedly School Milk Program for seven years, seven different geographical regions of Turkey, during spring semester ofthe 2018-2019 academic yearhas been removed quietly (Anon., 2019a; Anon., 2019b). In other regions of our country and in the provinces to be determined, it will be appropriate to investigate the current status of the School Milk Program and support more effective projects.

METHODOLOGICAL ASPECTS AND RESULTS

Methodological Aspects

The data of the research were obtained through face-to-face surveys conducted in 2018-2019 academic year for the students in Vatan Primary School in Silopi district of Şırnak.Probability sampling method was used to determine the number of students.The sample formula used to determine the number of students is as follows:

$$n = \frac{N \times P \times Q \times z^2}{(N-1) \times d^2 + P \times Q \times z^2}$$

Here, *n* sample volume (number of students to whom the study was applied), *N* population volume (total number of students in the school: 500), *z* test value at *z*% (1-a), a significance level, *d* error margin, *p*ratio of what was investigated, *q* is the absence of what is being investigated ($p + q = 1$) (Newbold, 1995). In addition, as a convenience to the researchers, there is a chart which shows the sample sizes that have to be drawn from different universe sizes for the sampling errors of + - 0.03, + - 0.05 and + - 0.10 for a=0.05 (Yazıcıoğlu &Erdoğan, 2004). The researcher should use the necessary formulas to calculate the sample size according to his / her special case.

This program is implemented in all cities of Turkey. And we want to investigate recent sutiation of school milk in underdeveloped cities. So, as a sample we choose Şırnak, Silopi. For our research, only one school is selected in fifty schools. The 2nd, 3rd and 4th grades, which are the most crowded groups of students of Vatan Primary School in Silopi district of Şırnak, were included in the study.As a result of the calculation, the number of people was calculated as 217 (n) for the school with a size of N of 500 (95% confidence interval and 5% error margin).

Table 2: Participant Students' Number

Grade	Students'Number	%Percentage
2. Grade	70	32.2
3. Grade	80	36.9
4. Grade	67	30.9
Total	217	100

Source: Authors' estimations

According to participant students' number (Table 2); distribution of students participating in the research was % 32.2, % 36.9, %30.9 respectively.In this study, the students were asked questions such as whether they liked school milk, how they evaluated the increasing school milk, whether they preferred school milk to be flavored, how they wanted the school milk packaging, whether they want ayran or yogurt instead of school milk. The results obtained were interpreted according to the Chi-Square test (Güngör&Bulut, 2008) based on whether the difference between observed frequencies (G) and expected frequencies (B) was statistically significant. In this study, it was aimed to determine whether school milk consumption is

dependent on gender and whether there is a difference between school milk consumption between grades and School Milk Program of the latest situation in Turkey were examined.

Results

As a result of face-to-face survey and statistical analyzes, school milk consumption status was determined according to gender and class of the students and is shown in Table 3.82.9% of 217 students who participated in this study consume school milk. The results showed that 82.9% of the students (42.8% of female and 40.1% of male) consumed school milk. 83% of female students participating in the research and 82.8 % of male students participating in the research consumed school milk.While the percentage of famale students drinking school milk among total school milk drinker students was 51.7%, it was 48.3% for male students. It was determined that primary school students who participated in the study; 81.4% of the second grade students, 86.25% of the third grade students and 80.6% of the forth grade students consumed school milk. It was found that there was no relationship between gender and grades and school milk consumption (Pearson Chi-Square $p>0.05$).

There are very few studies on school milk in the literature. In astudy conducted by Nahcivan (2006) on milk consumption status of students in an elementary school, it was stated that age was the most important determinant of milk consumption.It was reported that Güler (2016) conducted a study on the determination of milk drinking habits of primary school children in Edirne center and showed that there was no significant difference between the subjects' love of drinking milk according to age, gender, height, weight and familial characteristics.Güzeler &Esmek (2017), Güzeler & Özbek (2018), Say & Güzeler (2018) have conducted research on school milk in different cities of Turkey.They are reported that school milk consumption was not significantly affected by gender and grade variables.

Table 3: School Milk Consumption Status According to Gender and Class

Gender	Grade	Students that drink school milk (%)	Students that do not drink school milk (%)
Female	2.	81.1	18.9
	3.	87.5	12.5
	4.	80.0	20.0
Male	2.	81.8	18.2
	3.	85.0	15.0
	4.	81.3	18.7
Total		82.9	17.1

Source: Authors' estimations

It was concluded that 43.3% milk, 18.4% yoghurt, 25.3% cheese and 13% ayran were the most consumed dairy products at home by the participants. Students; stated that 36.8% of them consume milk every day, 21.2% consume 4-5 days a week, 20.4% consume 3 days a week, 21.6% consume one day a week.The students who participated in the survey; 42.6% had one glass of milk a day, 18.4% had two glasses of milk a day, 11.2% had more than two glasses of milk a day, 27.8% had no milk in one day.Dal et al. (2018), in a study conducted on young consumers' drinking milk consumption habits, reported that the participants generally had milk

consumption habits, although at different frequencies.It is known that children should consume at least two portions of milk or equivalent nutrients per day for healthy growth and development (Sepp et al., 2001;Sümbül & Ünüsan,2009; Ünal & Besler,2012).It should be remembered that the amount of milk consumed daily is as important as the milk drinking rate of individuals(Yabancı Ayhan et al.,2018).Childhood awareness about nutrition provides the foundation of a society where healthier individuals will be in the majority in the future(Konca et al.,2019).

In an investigation of milk and milk products consumption habits of students of University of Erzincan, it was determined that 39.7% of the students who participated in the survey got milk drinking habits, and 55.5% of them stated that they won this habit in preschool period(Özyürek et al.,2019).

In another study, it was stated that one-day menu of school children should have 2-3 servings of milk and its derivatives (Demir et al.,2018).It was stated that a survey showed that milk consumption in European Union countries per capita was 331 kg/year while it was 171 kg/year for Turkey(Şahinöz &Özdemir,2017).Nahcivan (2006) conducted a research on the consumption status of primary school students in the 6-14 age group and pointed out that despite the high perceptions of children about the importance of drinking milk and the percentage of those who like to drink milk, the milk consumption rate was low.It is thought that this deficiency is caused by factors such as low education level, nutritional habits of the society, low purchasing power, and lack of knowledge of the nutritional value of milk and dairy products by consumers (Tenekecioğlu, 2006).Among the reasons for those who do not have regular habit of consuming milk; disliking the smell and taste and the importance of milk in nutrition is not known enough(Durmaz et al.,2002; Tarakçı et al.,2003; Yıldız, 2009; Şimşek & Açıkgöz, 2011). In a study on the effect of social inequalities on nutrition, it was reported that only 13% of the children in the public school had the same opportunity while students attending private schools drank milk every day (Baysal, 2003).In a study on the factors affecting the consumption expenditures of dairy products in Turkey, it was concluded that the socio-demographic and economic factors of the consumers living in different settlements had a significant effect on the probability of consumption of milk and dairy products and their consumption expenditure levels (Akbay & Tiryaki, 2008; Yılmaz, 2008;Tiryaki & Akbay, 2009;Terin et al., 2015; Onurlubaş & Çakırlar, 2016).

When students were asked whether their parents consume milk, 33.2% answered "yes" while 66.8% answered "no".Like many habits, the habit of nutrition and physical activity is acquired in the family.In another study, it was stated that the choice of nutrition of children is determined mainly by the nutrition preferences or feeding patterns of parents and other individuals in the family (Garipoğlu & Özgüneş, 2008).

47.9% of the students who participated in the survey stated that milk was obtained from street milk, 21.2% from the market as UHT milk and 20.8% from the market as daily milk; 10.1% stated that no milk was taken. In a research about street milk, it was established that vitamin values were lower than expected and significant losses occurred with boiling for open milk (Besler &Ünal, 2006).In an another study about point of view of the milk producers on

the street milk in Antalya province, it was concluded that to avoid street milk, more reasonable price policies should be applied for the raw milk suppliers, and the importance and necessity of milk collecting centers in good conditions should be considered more (Sayin et al.,2011).In a study conducted in Istanbul, it was found that 26.5% of the families consumed street milk, 26.2% pasteurized milk and 87.7% sterilized milk (Karakaya &Akbay,2013).

Students learn knowledge about milk from; 30% television, 2.3% newspaper, 10.3% from internet, 37.6% school, 15.6% family, 2.8% friends, 1.4% other sources.

In a study conducted in Elazığ, was stated that the most effective way to encourage the population about drinking milk consumption was Radio and TV with a rate of 70.9% (Şeker et al.,2012).In a study on the place and importance of internet and social media on consumer buying behaviors; was revealed that the first place consumers met with products and their sources of information were internet, social media, visual press and friends (Ayar &Nizamoğlu, 2002; Ersoy Quadır &Akaroğlu, 2009; Bahşi & Bostan Budak, 2014; Kurt & Altun,2014;Torun, 2017; Şahin et al., 2018).Marketing efforts should be carried out taking into account the milk consumption habits of young consumers (Gözener & Sayılı, 2013).It is clear that informative advertisements should be made for children to gain proper nutrition behavior and habits (Can, 2016).

64.5% of students stated that they drank school milk immediately, while 35.5% said they consumed it later.In case of unopened milk package left from distributed school milk, 16.1% of students stated that they used milk at home, 5.1% shared it with friends, 20.3% later drank it, 4.1% shared it with family at home, 0.9% trashed it, 2.3% fed stray animals, and 50.7% said that milk had never left.When students were asked how they evaluated the remaining milk from opened milk packages, 53.9% said they trashed it, 0.9% said they shared it with family at home, 2.8% said they used it at home, 6.9% said they threw it in the recycling bin, 3.2% fed stray animals, 15.2% later consumed it, 2.3% shared it with friends, 12.9% said that milk had never left.

When students were asked how they wanted school milk packaging to be, 30.3% of female students and 32.7% of male students argued that packaging should be more colorful, 1.8% of female students and 1.9% of male students argued that packaging should be more colorless.12.3% of female students and 15.7% of male students stated that packaging should be more funny, 52.6% of female students and 49.3% of male students stated that packaging should be more instructive.In a study conducted in Karaman province on how packaging affects the purchasing behavior of food products and the importance of packaging for the consumer, was stated that the packaging colors affect the purchasing behavior, that in the packaging design of a successful packaging, the demographic characteristics, needs and demands of the customers must be taken into account; that the packaging is not only effective in terms of color and appearance, the packaging must also provide information about the product and be easily portable (Dilber et al., 2012).

When the idea of school milk being flavored was taken, 18.4% of female students and 19% of male students said they wanted strawberry flavored milk, 4.6% of female students and

5.7% of male students said banana flavored milk, 53.6% of female students and 58.2% of male students said chocolate flavored milk, 23.4% of female students and 17.1% of male students said they wanted plain milk to be distributed.Milk is made attractive to the child by changing the taste of the milk with sweeteners such as cocoa and chocolate (Johnson et al.,2002).Yildiz (2009)'sstudy found that 65.3% of the students consumed milk as plain and 34.7% of them consumed milk by adding taste-giving substances.In a study on the consumption habits of milk and dairy products of primary school students aged 10-15 years; it was reported that 38.6% of the students could consume all kinds of milk, 23.8% preferred sugary milk, 16.8% preferred plain milk and 13.9% preferred to drink cocoa flavored milk.

In this study, the ratio of those who prefer cocoa milk was higher in female students than in male students, whereas the rate of preference for sugary milk was higher in male students than in female students (Tutumlu, 2011).According to the survey conducted by Güler (2016), 34% of children between the ages of 7 and 12 preferred to consume cocoa flavored milk, 11% preferred to consume fruity milk and 13% preferred to consume sugary milk.

To the question of whether to distribute ayran or yogurt instead of school milk, 10.1% of the students answered yogurt, 13.8% answered ayran, 16.1% answered yogurt and ayran, and 60% answered milk.According to the information obtained from the study ofSelçuk et al. (2003);50.77% of students consumed cheese, 35.91% yoghurt, 8.11% of butter and 5.21% of ice cream.

As "World School Milk Day" is held on 27 September and as "World Milk Day" (21-26 May World Milk week) on 21 May, events are held in our country, Turkey, as well as in other countries. However, these activities are not enough. In this study, 94.5% of the students wanted more activities related to school milk. When students are asked about the idea of what can be done to benefit more from the program;11.9% stated that advertising should be done, 2.3% said that different types of milk products should be distributed, 5.1% said that flavored milk should be distributed, 3.2% said that packaging should be changed, 7.4% said that fun activities should be organized, 32.2% said that it should be distributed every day, 1.4% said that it should be distributed in both periods, 21.6% said that educational activities should be organized, 2.3% said that they should be distributed to secondary school students, and 9.6% said that they should include educational information. The point that attracts attention is that none of the students found the studies are sufficient.

CONCLUDING REMARKS

Adequate and balanced nutrition is important for the protection and development of human health. And it can be provided by taking the energy and nutrients required by our body every day with the recommended amount of nutrients. For this, every day, five basic nutrients of meat, milk and products, cereals, vegetables and fruits should be consumed in a balanced way. In all societies, children are the most sensitive group in terms of health and nutrition. Because children express both the most powerful potential that constitutes the future of a society as well as individuals in need of protection. Because children express both the most powerful potential that constitutes the future of a society as well as individuals in need of protection. For

this reason, as in many countries of the world, "School Milk Program" is carried out in Turkey in order to give children the habit of consuming milk. The school milk program started in Turkey in 2011-2012 academic year and ended in 2018-2019.

This study was carried out in Vatan Primary School in Silopi district of Şırnak province in March 2019, when school milk distribution ended. A face-to-face questionnaire was applied to 217 students. When the obtained results are evaluated it was found that there was no relationship between gender and grades and school milk consumption. Although most of the students love milk, they do not drink milk regularly, while those who drink milk regularly do not consume enough milk. In order to increase consumption of milk and dairy products which are indispensable foodstuffs in a healthy and balanced nutrition; the reasons why children do not like milk should be investigated and methods to increase milk consumption should be applied.

The importance of drinking milk in terms of nutrition and health should be explained in detail with the most effective advertising and information methods, and also factors affecting milk consumption and preventive measures should be informed. Advertisements explaining the importance of dairy products in terms of health should have more place in social media. In schools, it should be ensured that experts provide nutrition trainings at regular intervals. More dairy products should be included in school canteens. Parents play a major role in vaccination at an early age in the importance of milk, which plays a major role in maintaining our health in every period of our lives, especially in growth and development period. In particular, the family is critical in acquiring the right eating habits. Because; it is known that milk drinking habits are acquired in the family in preschool period.

For this reason, it is essential that parents are educated about healthy eating before the individuals who want to gain milk habits at a young age. In addition, the majority of families obtain milk from milk roundsman system (street milk).Milk roundsman system should be prevented and milk production should be recorded. Considering the reasons why children do not like milk, it should be ensured that they consume milk in alternative ways. For example; for children who do not like the taste and smell of milk, the consumption of flavored milk may be recommended or children may be encouraged to consume milky desserts. Although the students found that the school milk was inadequate and the activities were less and they wanted the distribution more and more frequently, the "School Milk Project" application was stopped. But; continuing uninterruptedly School Milk Program in seven years, seven different geographical regions of Turkey, during the 2018-2019 academic year two has been removed quietly. In other regions of our country and in the provinces to be determined, it will be appropriate to investigate the current status of the School Milk Project and support more effective projects.

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Hormonal Ultrasonograpic and Clinical Evaluation of the Effects of Aglepristone Used in Termination of Unwanted Pregnancies in Cats

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ABSTRACT

In this study, it was aimed to evaluate the success rate of aglepristone in the termination of unwanted pregnancies in 22-30-day pregnant cats and its effects on blood progesterone values with ultrasonographic and clinical findings. Twenty cats, in which pregnancy was determined by ultrasonography, were randomly divided into two groups. An experimental group was formed by administering aglepristone to the 1st group (n:15) twice at a dose of 15mg/kg at a 24-hour interval, and a control group was formed by administering the same dose of physiological saline solution at the same time to the 2nd group (n:5). The cats were checked for 15 days by clinical and ultrasonographic examinations. Progesterone measurements were performed by the RIA technique by taking blood samples from the control group every two days, from the experimental group every two days before the abortion and for three days consecutively after the abortion. 14 pregnancies in the experimental group resulted in abortion (94.4%), and 1 cat had a healthy birth. The plasma progesterone level during the abortion was high (21.46 ± 5.843 ng/ml), and the first statistically significant decrease in the progesterone level ($p<0.01$) occurred on Day 2 (14.45 ± 3.249 ng/ml) following the abortion. The cats showed normal estrus on days 13-18 after the abortion and became pregnant after mating. Consequently, it was concluded that aglepristone can be successfully used in the termination of unwanted pregnancies in 22-30-day pregnant cats, and it does not affect fertility adversely, and it is superior to the current protocols with its success rate when administered alone in the early period.

Keywords: Cat, Aglepristone, Termination, Pregnany.

INTRODUCTION

Unwanted pregnancies of cats are one of the problems that animal owners frequently encounter. Unwanted pregnancies may be terminated by surgery or medical means. Surgical methods are used in animals that are not wanted to breed again, while medical methods are preferred in animals that are wanted to breed again. One of the medical methods is the use of antiprogestin (Eilts, 2002, Musal and Ağaoğlu, 2013).

Aglepristone (RU534) that is a synthetic steroid is the first antiprogestin to receive a license for veterinary use (Hoffmann and Schuler, 2000, Özalp at al., 2008). Aglepristone is a recommended medication for the termination of pregnancy in cats with high effectiveness and low side effects (Goericke-Pesch, 2010). It binds to progesterone receptors with higher affinity than endogenous progesterone, leading to the suppression of the biological effects of progesterone (Baan,2005, Fieni et al., 2001). It is reported that aglepristone is used to terminate pregnancy in many species and is effective and safe in the termination of cat pregnancies in the early, middle and late stages in the form of two subcutaneous administrations at a dose of 10-15 mg/kg at a 24-hour interval (Goericke-Pesch, 2010, Gogny and Fieni, 2016, Musal and Ağaoğlu, 2013). When aglepristone was used to terminate unwanted pregnancies in cats, the termination of pregnancies was reported to be at the ratio of 100% on days 5-6, 87% on days 25-26, 88.5% on days 30-35, and 67% on days 45-46 (Fieni et all., 2006, Georgiev and Wehrend, 2006, Georgiev et all. 2010, Goericke-Pesch et al., 2010). It is reported that there are very few or no side effects of aglepristone used to terminate pregnancy in cats (Fieni et al., 2006, Mitacek et al., 2017).

In this study, it was aimed to evaluate the success rate of aglepristone in the termination of unwanted pregnancies in cats during the 4th gestational week (22-30 days) and its effects on blood progesterone values together with ultrasonographic and clinical findings.

MATERIAL AND METHODS

Animal groups

The material of this study consisted of 20 healthy pregnant cats between the ages of 2 and 6 years, whose mating dates were monitored. Twenty cats, determined to be in the 4th gestational week (22-30 days) by ultrasonography, were randomly divided into two groups, 15 of which formed the experimental group and 5 of which formed the control group. Each of the animals was held in a separate cage, fed with the appropriate commercial feed considering all their body needs, and the water they consumed daily was always kept available. Aglepristone (Alizine, 5 ml vial, 30 mg aglepristone/ml, Virbac) was administered to the experimental group subcutaneously at a dose of 15 mg/kg twice (day 0 and day 1) at a 24-hour interval. Physiological saline solution was administered subcutaneously in the same amount at the same time to the animals in the control group.

Clinical Examinations

In all animals included in the study, body temperature was measured once a day. Eating-drinking, defecation and overall appearance were observed. Vulvar changes, vaginal discharge, and abortion were monitored.

Ultrasonographic Examinations

The gestational age was confirmed by comparing the mating date with the measurements of the uterus diameter during the first ultrasonographic examination performed at the end of 3 weeks following the mating day. After the first aglepristone administration, the ultrasonographic examination was repeated every 2 days for 15 days, and then once a week.

Collection of Blood Samples and Progesterone Analysis

The day of the first injection was considered as day 0, and blood samples were taken from all animals prior to injections. Subsequently, blood samples were taken from the vena jugularis with a 2cc injector from the control group every 2 days for 15 days, from the experimental group every 2 days until the abortion and for three days consecutively after the abortion, and they were transferred to EDTA tubes. They were centrifuged at 3000 rpm for 15 minutes, and the plasma were separated and stored at - 20 ^{0} C until the analysis. The plasma progesterone analysis was performed by the RIA method using the Coat-A Progesterone I-125 commercial test kits by measuring it with a Gamma Counter device.

Statistical Analyses

Statistical analyses were performed by the repeated measures analysis using the SPSS statistical program. The 'Bonferroni adjusted paired t-test' and 'one-way ANOVA' tests were used for further evaluations when there was a significant difference between the control and experimental groups according to this analysis. In order to accurately reflect the relations of body temperature and progesterone values with the abortion, measurements performed on the abortion day and afterwards were evaluated by overlapping the abortion days, not according to the days of blood collection.

RESULTS AND DISCOSSION

On days 22-30 of the pregnancies, the uterus diameters of the cats were measured, and fetal heartbeats were determined. The measurements of the uterus diameter were found to be between 0.16-0.18 cm (22-day pregnancy) and 0.28-0.32 cm (29-30-day pregnancy) (Figure 2 and 3). In the experimental group, the abortion occurred in 14 of 15 cats (94.4%) that were administered with aglepristone. Abortions took place between days 3-13 by accepting the first day of aglepristone administration as day 0 (Figure 1).

The most important clinical symptom in animals that aborted was a thick, mucous and bloody discharge and the ejection of the offspring with the placenta within 12-36 hours following the discharge (Figure 6, 7). Following the drug administration, no change was

observed in the normal clinical appearance. Eating-drinking and defecation were normal, and no vomiting was observed. In all cats, the appropriate amount of daily commercial feed was consumed every day. The pain symptoms before and during the abortion were little if any.

In the ultrasonographic examinations performed following the administration of aglepristone, no clues were found to help predict the abortion in advance. Even during the first hours of bleeding, fetal heartbeats were perceived. One day before the abortion (start of bleeding), a tense uterus was observed to be clear and normal, while the next day, echogenicity increased, clarity decreased, and unidentified images were observed because the abortion occurred (Figure 4, 5).

The body temperature measurements were evaluated by the repeated measures analysis using the SPSS statistical program. There was no significant difference between the control and experimental groups ($P>0.05$) (Table 1).

1 of the 15 cats in the experimental group gave birth to 6 healthy offspring. In 14 cats that aborted, estrus symptoms started from the 11th day following the abortion in the presence of a male cat. 9 of the cats that were allowed to mate mated on days 13-18, and pregnancy occurred in all of them, and they gave healthy births following a smooth pregnancy period.

The plasma progesterone levels in the experimental and control groups were similar in all measurements, starting from the day 0 measurements performed before the aglepristone administration and including those performed on day 1 after the abortion. According to the repeated measures analysis conducted using the SPSS statistical program, there was a significant difference between the control and experimental groups on the days following the abortion. In further evaluations performed with the Bonferroni Adjusted Paired T-Test, the progesterone level measurements on days 2 and 3 after the abortion were found to be different from other days (Figure 8, Table 2).

On the abortion day, the progesterone level of the experimental group was measured as 21.46 ± 5.843 ng/ml, and it was observed that the abortions took place above the minimum progesterone level of 11 ng/ml. Within 72 hours following the abortions, the progesterone level did not decrease to the basal level in any subject, and a minimum level of 7 ng/mL was measured. The cats that aborted in the experimental group showed their first natural estrus after 15 ± 3 days following the abortion.

Aglepristone is a progesterone antagonist with the proven effectiveness in many species to terminate pregnancy (Gogny and Fieni, 2016). It has been reported as an effective and safe abortive agent in dogs, cats, rabbits, and rats (Agaoglu et al., 2011, Fieni et al., 2006, Oguejiofor et al., 2013, Özalp et al., 2013).

In the present study, aglepristone administered subcutaneously at a dose of 15mg/kg for abortive purposes at a 24-hour interval in 22-30-day pregnant cats caused abortions at the ratio of 94.4% alone. Jurka (2010) reported abortion at the rate of 92.8% with the same dose and same administration in 21-24-day pregnant cats, whereas Fieni et al. (2006) reported

abortion at the rate of 88.5% with the same dose and same administration in 33.3 + 4.2-day pregnant cats. Garcia Mitacek et al. (2012) reported a 100% abortion ratio with the aglepristone administration on two consecutive days at a dose of 10 mg/kg in 21-22-day and 35-38-day pregnancies.

In our study that included 15 cats that were 22-30 days pregnant, the abortions took place between days 3-13 after the first aglepristone administration. While the day when 50% of the abortions were completed and exceeded was the 7th day, abortions in 50% of all the cats took place on the 6th, 7th and 8th days. Georgiev et al. (2010) reported that abortions occurred between the 4th and 7th days after the first aglepristone administration, while Fieni et al. (2006) reported that 50% of the abortions took place within the first three days and the abortions continued until the 8th day. It is thought that the early occurrence of abortions in the mentioned studies may be related to the advanced pregnancy, and the early pregnancy factor may have relatively delayed the abortions in our study.

The blood progesterone measurements showed that abortions in pregnant cats in the present study occurred at a high progesterone level and the first significant decrease in the progesterone level was observed on day 2 after the abortion (from 21.63 ±5.179 ng/ml to 14.45 ± 3.249 ng/ml). Fieni et al. (2006) reported in their studies carried out on 33.3 ± 4.2-day pregnant cats that abortions occurred under a high progesterone concentration and that a significant decrease occurred 30 hours after the abortion. Similarly, Georgiev et al. (2010) reported that abortions occurred under high progesterone concentrations in 45-46-day pregnant cats. This shows that aglepristone behaves like real progesterone and induces the abortion without forming luteolysis (Fieni et al., 2001, Fieni et al., 2006, Galac et al., 2000).

The shortening of the interestrous interval between 1-3 months observed in dogs was not observed clearly in the present study (Galac et al., 2000). Since cats exhibit seasonal polyestrus and the study was carried out during the estrus season, it was observed that the cats in the experimental group showed estrus within 13-18 days following the abortions, and they mated and became pregnant. Georgiev et al. (2010) reported that estrus was observed 16-25 days after the abortions induced by aglepristone used in late period pregnancies in cats and that aglepristone did not affect fertility adversely. Mitacek et al. (2017) reported that aglepristone administered in 35-38-day pregnant cats did not affect fertility adversely and that the first estrus after the abortion was observed 34.4 ± 5.84 days later and 100% pregnancy was ensured with mating in this estrus.

In the present study, a thick, mucous and bloody discharge was observed in the vulva as the most significant clinical symptom in the experimental group cats. Abortions occurred within 12-36 hours following this discharge. Following the ejection of the offspring with the placenta, the bloody discharge ceased. Following the drug administration, no change was observed in the normal clinical appearance. Eating-drinking and defecation were normal, and no vomiting was observed. In all cats, the appropriate amount of daily commercial feed was consumed every day. The pain symptoms before and during the abortion were little if any.

The bloody discharge was also reported in rats 24.7±3.8 hours after the first injection of aglepristone (Oguejiofor et al., 2013). It was reported that aglepristone used to induce abortion in the advanced pregnancy in cats formed a bloody discharge immediately before, during and 3-6 days after the abortion (Georgiev et al., 2010). Georgiev et al. and Mitacek et al. (2010,2017) did not report any side effects in cats treated with aglepristone, while Fieni (2006) reported side effects such as a short-term decrease in the general condition, inflammation in the injection area, and anorexia, depression, agitation and diarrhea in 4 cats.

In the rectal temperature measurements, there was no statistical difference between the control and experiment groups. In the individual evaluation, however, 6 of the experimental group cats had lower levels by 0.2-0.3 degrees on the 2nd day after the abortion. Other researchers (Fieni et al., 2001, Verstegen, 2000) also reported an overall decrease of 0.3 degrees in the 48th hour following the abortion in dogs. Although Corrada et al. (2005) reported that aglepristone used for abortive purposes in dogs significantly reduced body temperature in the experimental group compared to the control group, Özalp et al. (2008) reported that it did not cause changes in the body temperatures in rabbits.

As a result, it was concluded that aglepristone used in the termination of unwanted pregnancies in 22-30-day pregnant cats was effective and safe, that the abortions occurred under the high progesterone concentration, and that it did not affect the following fertility adversely.

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Figure 1: Distribution of Aborts in the Days

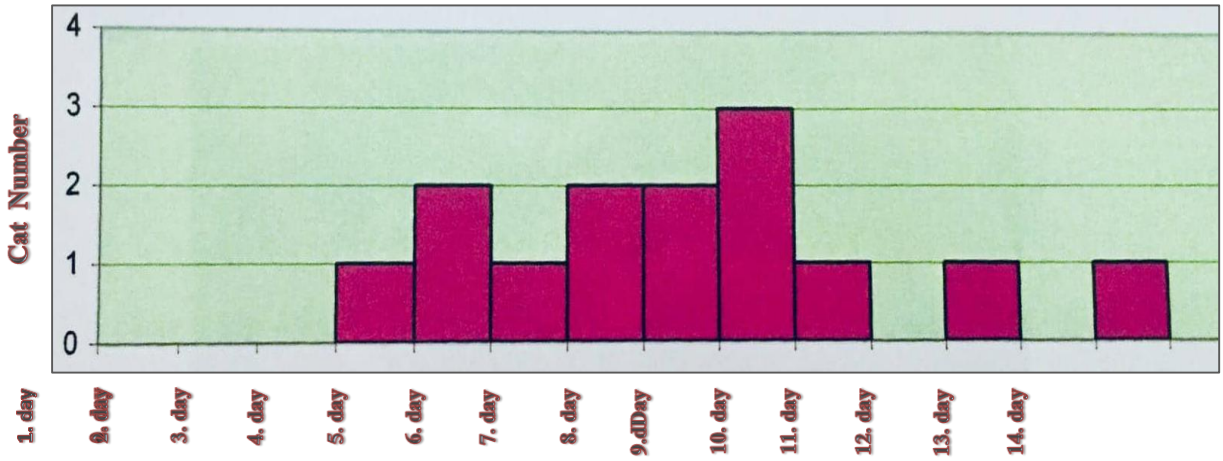

Figure 2: 28 Day Pregnant Cat Ultrasonografic Imaging

Figure 3: 28 Day Pregnant Cat Ultrasonografic Imaging

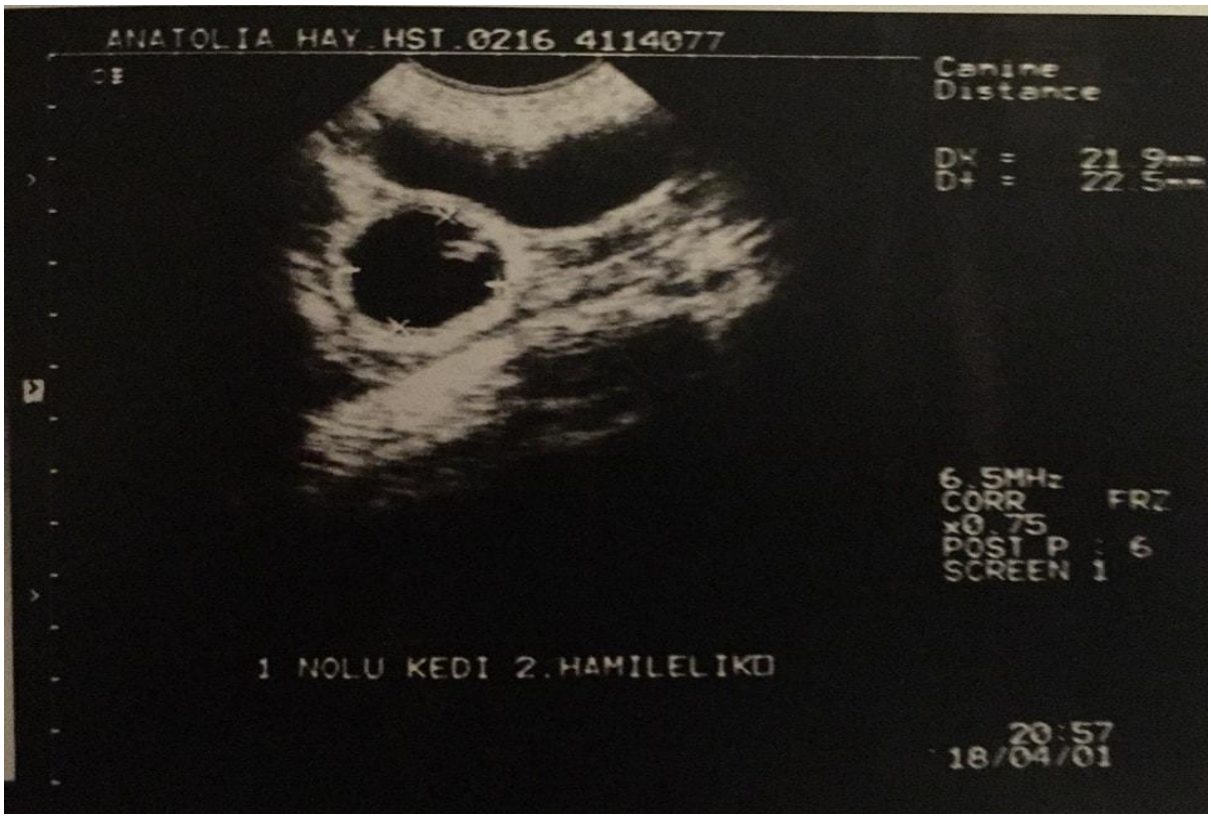

Figure 4: Ultrasound image of the bleeding time of the aglepriston applied cat.

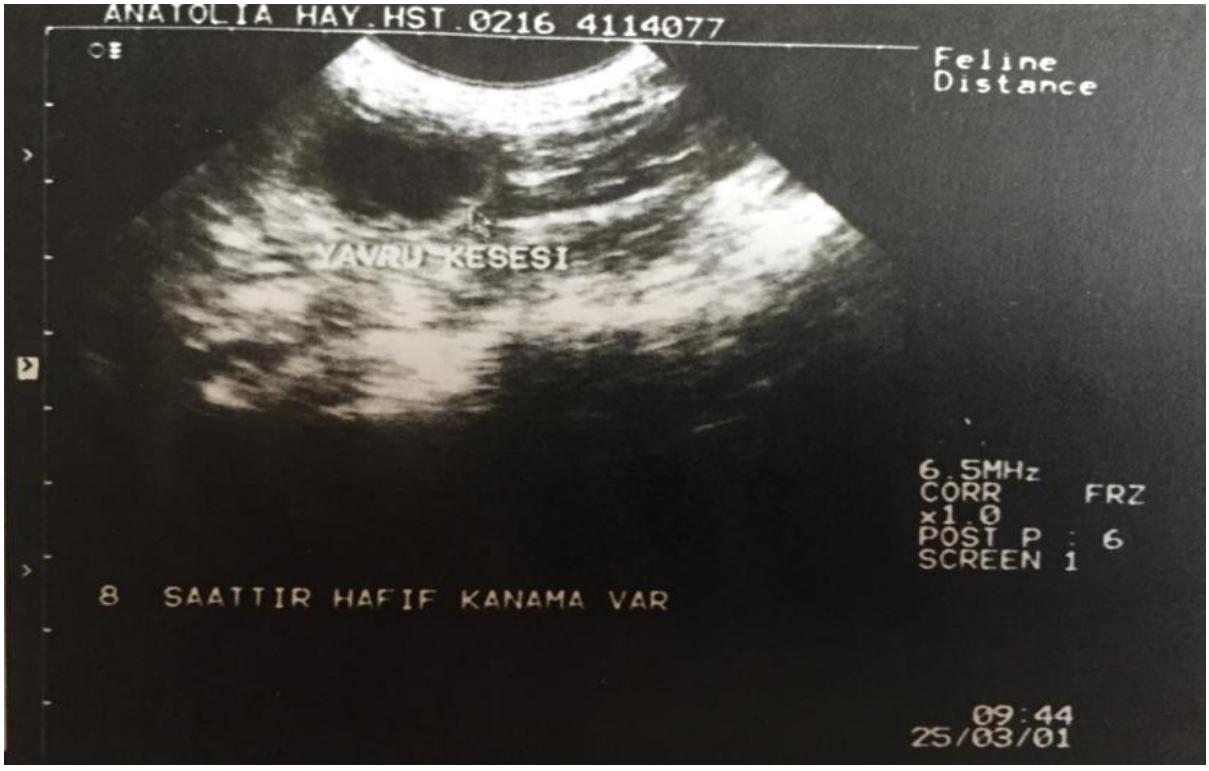

Figure 5: Ultrasound image taken during abortion applied to Aglepriston of cat

Figure 6: Hemorrhagic Flow Observed in 22-30 Days Pregnant Cats Applied to Aglepriston

Figure 7: Feto-Plasental Wastes Observed in Aglepriston-Applied 22-30 Day Pregnant Cats

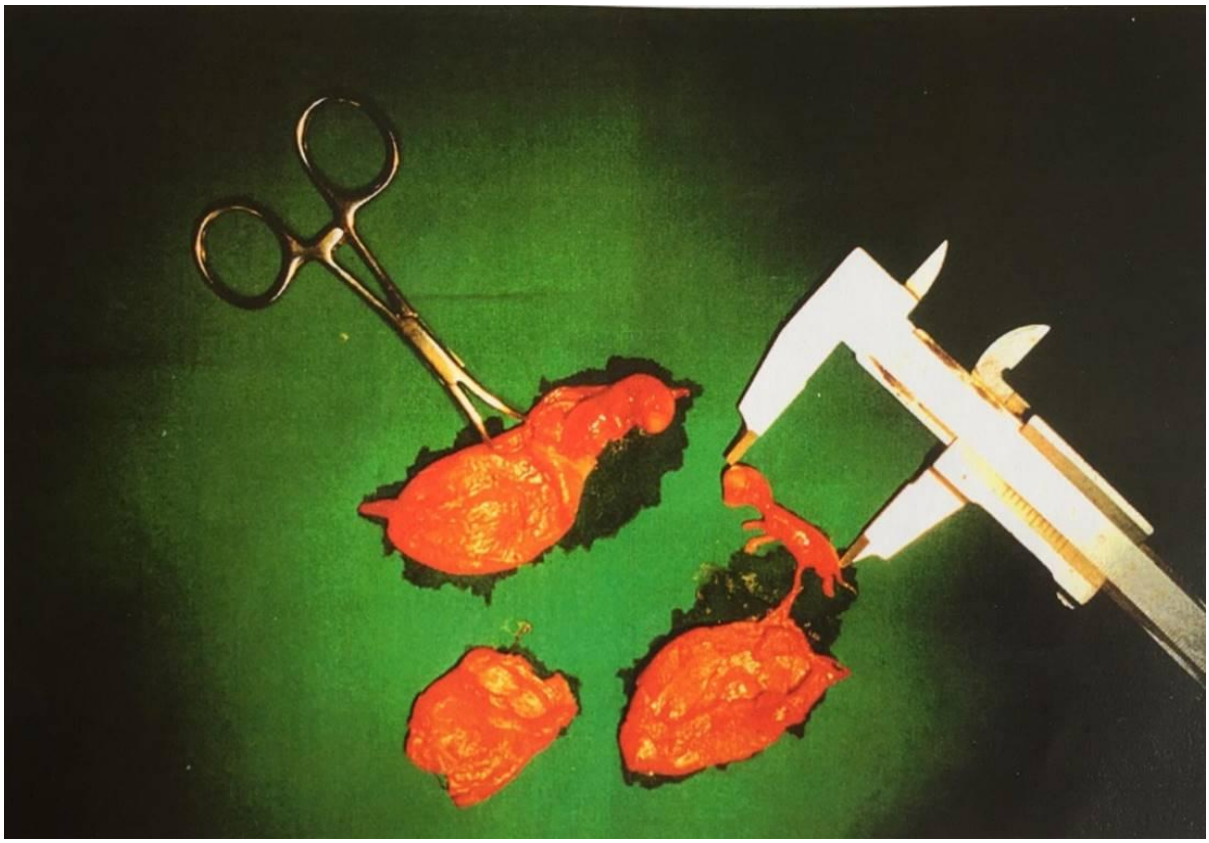

Figure 8: Progesterone values before and after abortion in experimental groups

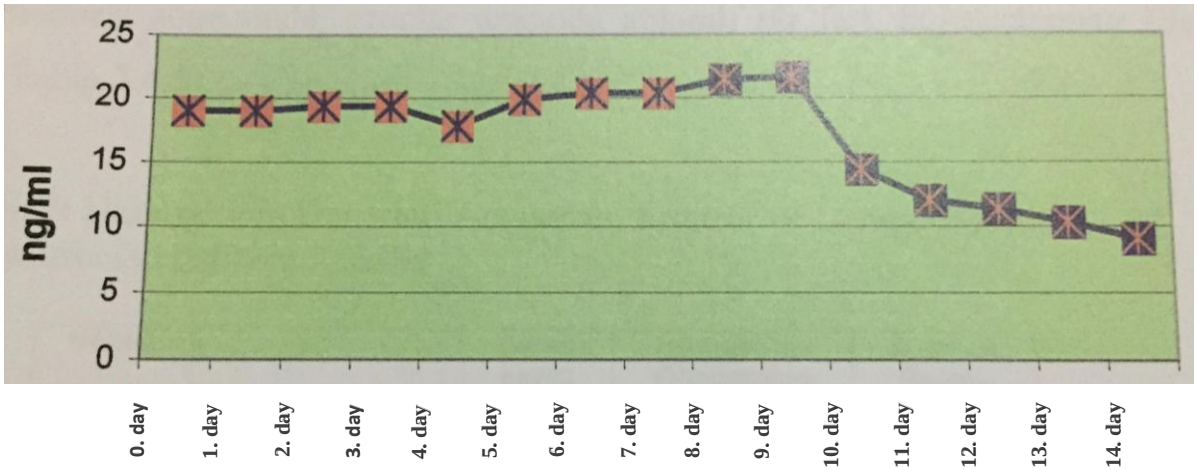

Table 2: Progesterone Values, Control and Experimental Groups Average and Statistical Relationships

Günler	Gruplar	Denek sayısı	Progesteron Ortalamaları	Standart Sapma
0.gün	Kontrol Grubu	5	18.30 ng/ml	5.294
	Deney Grubu	15	19.05 ng/ml	3.941
2.gün	Kontrol Grubu	5	19.08 ng/ml	6.029
	Deney Grubu	15	19.40 ng/ml	5.153
4.gün	Kontrol Grubu	5	18.40 ng/ml	5.449
	Deney Grubu	12	17.85 ng/ml	2.504
6.gün	Kontrol Grubu	5	21.54 ng/ml	6.469
	Deney Grubu	9	20.41 ng/ml	4.911
8.gün	Kontrol Grubu	5	21.66 ng/ml	8.799
Abort	Deney Grubu	14	21.46 ng/ml	5.843
9.gün	Kontrol Grubu			
Ab. 1	Deney Grubu	14	21.63 ng/ml	5.179
10.gün	Kontrol Grubu	5	19.58 ng/ml	7.960
Ab. 2	Deney Grubu	14	14.45 ng/ml	3.249
11.gün	Kontrol Grubu			
Ab. 3	Deney Grubu	14	12.05 ng/ml	2.578
12.gün	Kontrol Grubu	5	18.50 ng/ml	6.516
	Deney Grubu			
14.gün	Kontrol Grubu	5	16.76 ng/ml	4.033

Table 1: Body Temperature Measurement of Control and Experiment Groups According to Day

Günler	Gruplar	Denek Sayısı	Vücut Sıcaklığı (°C)	Standart Sapma
0.gün	Grup I	15	38.46	0.159
	Grup II	5	38.42	0.148
1.gün	Grup I	15	38.41	0.140
	Grup II	5	38.38	0.130
2.gün	Grup I	15	38.38	0.120
	Grup II	5	38.34	0.134
3.gün	Grup I	14	38.37	0.130
	Grup II	5	38.34	0.114
4.gün	Grup I	12	38.40	0.180
	Grup II	5	38.36	0.114
5.gün	Grup I	11	38.40	0.150
	Grup II	5	38.34	0.114
6.gün	Grup I	9	38.40	0.150
	Grup II	5	38.36	0.114
7.gün	Grup I	7	38.36	0.130
	Grup II	5	38.32	0.130
8.gün	Grup I	14	38.36	0.120
	Grup II	5	38.30	0.122
9.gün	Grup I	14	38.34	0.100
	Grup II	5	38.28	0.080
10.gün	Grup I	14	38.21	0.160
	Grup II	5	38.32	0.130
11.gün	Grup I	13	38.35	0.126
	Grup II	5	38.32	0.130
12.gün	Grup I	13	38.37	0.130
	Grup II	5	38.32	0.130
13.gün	Grup I	12	38.35	0.124
	Grup II	5	38.30	0.122
14.gün	Grup I	12	38.35	0.137
	Grup II	5	38.32	0.130

Mechanical Response and Bond Strength of GFRP Rebar in PVA Reinforced Concrete

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ABSTRACT

In this study, effects of PVA fibers on the bond strength between concrete and polymer composite rebar (ribbed, sand coated and helically wrapped with Kevlar strand) are investigated. PVA fibers were added into the concrete mixture at a volume fraction of %0.5. After 28 days, the specimens prepared were tested for compression, impact and bond strength. The results showed that addition of PVA fibers reduced the compressive strength while the fibre inclusion significantly increased the impact strength and bond strength of the mixtures. In addition, the surface was helically wrapped with Kevlar strand, the effect of PVA fibers was more pronounced.

Keywords: Glass Fiber Reinforcement Rebar, Bond Strength, Concrete, PVA Fiber.

INTRODUCTION

In many cases, materials used in the constructions are formed by combining different objects. Such material acts as a single object under mechanical stresses. Such a behavior can only be achieved by the presence of a bond force called adherence between the bodies of this material. Many materials in structural engineering are owed to this adherence. Concrete can have high compressive strength due to the adherence between cement paste and aggregate grains. Reinforced concrete structural elements deform like a single object under load due to the adherence between the steel rod reinforcement and concrete (Araújo et al., 2013).

In order for a structural element consisting of concrete and reinforcement to act as reinforced concrete, the reinforcement must be clamped to the concrete. To ensure full adherence, the clamping length should be sufficient. The adherence that provides this is called coupling adherence. In order for the clamping to be sufficient, the reinforcement must reach the yield strength or should not be stripped from the concrete and splitted the concrete in case of transverse deformation (Erdem et al., 2015).

It is known that the characteristic compressive strength (fck) of the concrete is high, the shear strength (fcv) is equal to about half of the compressive strength (≈0.5 fck), the tensile strength is very low (≈0.1 fck) and it is accepted as zero in the concrete calculations. However, in most of the structural elements, large tensile stresses occur due to bending moments and central tensile forces. For this reason, in order to meet the tensile stresses in order to use concrete in such structures, a sufficient amount of reinforcement has been placed in the regions that will be affected by tensile stress, and joint work has been achieved by using the adherence between reinforcement and concrete and thus the reinforced concrete structure technique has been born (Erdem et al., 2015).

Adherence, which is called bond between concrete and reinforcement, is considered to be based on the following three main reasons depending on whether the reinforcement is flat or threaded (Kankam, 2004).

a) Molecular and capillary bond forces called chemical adhesion between concrete and reinforcement,
b) Friction forces between concrete and reinforcement,
c) Mechanical interaction between concrete and reinforcement,

The adherence which forms the connection of flat surface reinforcements with concrete depends on the first two reasons listed above, namely chemical adhesion and frictional force. In threaded reinforcement, adherence is practically achieved through mechanical interaction, the effect of chemical adhesion is so low that the friction does not contribute to adherence before stripping the reinforcement relative to concrete (Kankam, 2004 and MacGregor, 1997). To date, each parameter affecting the adherence has been addressed for both concrete and reinforcement and various studies have been carried out to improve bond strength.

The composites are any of the combinations obtained by physically mixing two or more different materials having an interface to match with each other and having better properties than the starting materials. Composite materials can be classified into three groups as granular, fibrous and layered (Arenas et al, 2010).

Fibers are very small in diameter compared to their length. These are called fibers when they are fibers or plural. In order to increase the mechanical strength of the material and prevent brittle fracture, the systems formed by reinforcing the original material with fibers and rod-shaped reinforcements are also called fibrous composites (Cohades and Michaud, 2018). The glass fiber reinforced polymer composite materials selected as reinforcement are glass fiber as the reinforcing material, and around this reinforcing material is a matrix of volumetric amounts of polyester, filler, dye and the materials required for chemical reaction. Glass fiber improves mechanical properties as reinforcement, while matrix plays a role in preventing crack formation during deformation (Watson and Raghupath, 1987).

In this study, PVA fiber admixture for concrete; glass fiber reinforced polymer (CTP) composite reinforcement with different surface properties was preferred for reinforcement. The contribution of both high performance composite materials to the mechanical properties and bond strength of concrete and reinforcement were investigated.

MATERIALS AND METHOD

Cement used in the study is defined as CEM I 52.5 R in TS EN 197–1 (2002). The physical and chemical properties of cement are given in Table 1. The aggregate used in concrete production has a maximum grain diameter of 16 mm. Mixing ratios are given in Table 2 by using TS 802 (2009) concrete mixing principles in concrete production.

Table 1: Properties of the cement used

Chemical Properties	CEM I 52.5 R
CaO	64,05
SiO_2	20,95
Al_2O_3	4,98
Fe_2O_3	3,24
MgO	1,29
SO_3	2,59
Insoluble residue	0,44
Specific gravity (g/cm^3)	3,19

Table 2: Mix proportions for 1 m^3

Mix ID	Cement (kg/m^3)	Water (kg/m^3)	Aggregate (Fine/Coarse) (kg/m^3)
C 40	425	195	1820

0.5% PVA fiber (Fig.1) was used in the study. The properties of the fibers used are given in Table 3. In this study, GFRP reinforcement produced by pultrusion method (Fig. 2) was also used. The properties of GFRP materials produced by pultrusion can be listed as follows:

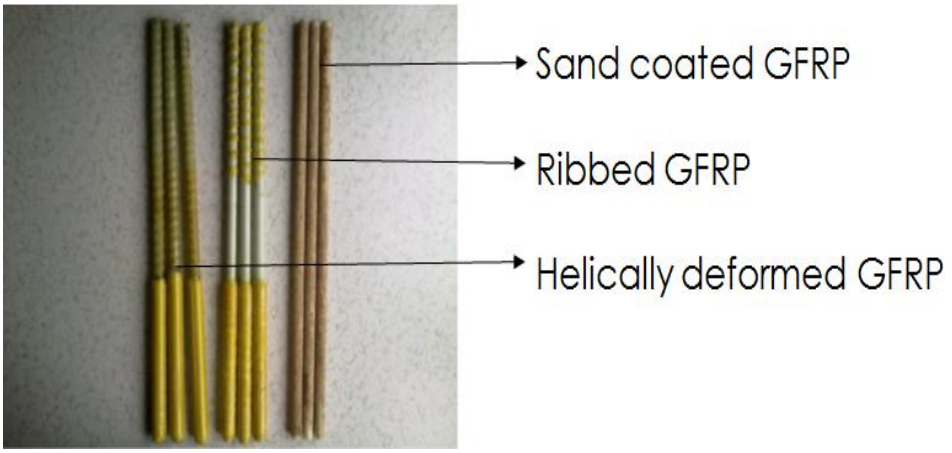
- Due to their low specific gravity, they have a wide usage area,
- Due to their light weight, it can be applied by hand or simple tools,
- Easy to cut and process,
- Resistance / density ratio is higher than metals and ceramics,
- High fatigue and impact resistance,
- High abrasion and corrosion resistance,

Figure 1: PVA fibers used

Table 3: Properties of PVA fibers

Fiber	Length (cm)	Diameter (µm)	Density (gr/cm^3)	Breaking Elongation (%)	Tensile Strength (MPa)
PVA	3~4	14	1,44	3,6	3600

Figure 2: GFRP reinforcements used



In the tensile tests carried out in GFRP reinforcement, crushing of GFRP rods in contact with the jaws occurred. In order to prevent these crushing and cross-section losses, in order to prevent damages of material to the jaw contacting parts of GRP reinforcement and to increase the strength of the reinforcement, Kevlar fiber fabric was used as a matrix material taking into account the diameter of the reinforcement and maximum opening of the device. After the winding process, 3 days (72 hours) was waited and completely strengthened.

Concrete samples (150x150x150 mm) were produced by reinforcing 0.5% of PVA fiber concrete volume into concrete. In order to compare the results, the same amount of pure mix was produced. Concrete samples were stored in standard cure at 20 ± 2 ˚C, taking into account their age to reach compressive strength. Three replicates have been produced for all the tests. Compressive and impact resistance tests were performed on these samples. Reinforcement rods produced by pultrusion method having different surface properties with a diameter of 12 mm were placed in unadulterated and PVA fiber doped concrete and the adherence between concrete and reinforcement was measured.

RESULTS AND DISCUSSION

Compressive Strength Results

The cube pressure test was performed by applying pressure to the cube samples measuring 150x150x150 mm on the 7th and 28th day. 2000 KN hydraulic press was used as the test instrument. In the compressive test, the loading speed was selected as 0.50 kN / sec.

The compressive strength test results of the reference (Ref), PVA fiber doped (PVAF) concrete samples are given in Figure 3. As it can be seen from the figure, compressive strength of PVA Fiber reinforced concrete samples decreased by 9.08 % and 13.28 % on the 7 and 28 days compared to the reference samples, respectively. This decrease in compressive strength was shown to be caused by the deterioration of homogeneity due to aggregation caused by the fiber ratio added to the concrete and the stress occurring in each fiber in the concrete as a result of applied compressive strength test. This decrease in compressive strength of fiber-doped samples from agglomeration as shown in Figure 4.

Figure 3: Compressive strength tests results

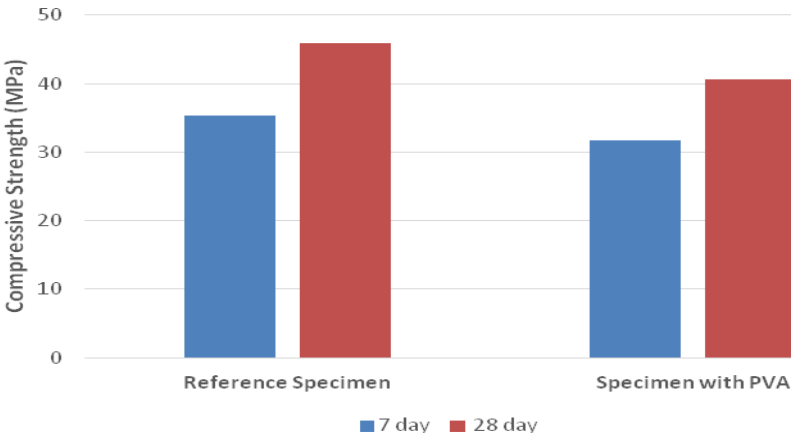
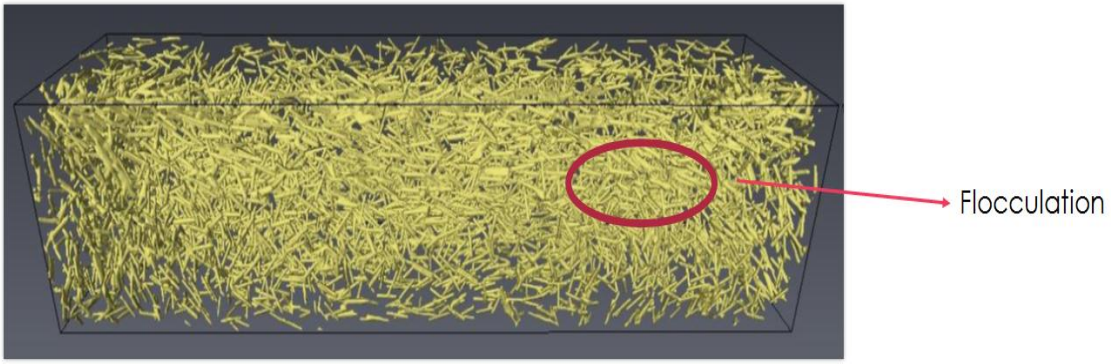


Figure 4: Compressive strength tests results



Charpy Impact Test Results

The Charpy Impact impact test was carried out on 3 samples of each production series (reference and PVA fiber doped) for 28-day samples. Sample dimensions were 40x40x160 mm³. In the mechanical test apparatus the pendulum (Figure 5) was raised to a height where it could have the potential energy previously determined. The sample was then placed so that it rested fully on the supports. After the sample was properly placed, the indicator of the dial on which the readings were made was initialized and the pendulum was released properly. The result was read from the dial after the experiment.

Figure 5: Impact test set up

In the calculation of the test results;

Impact Energy (N.mm/mm2) = M / A

M = The value in units of kgf.m read from dial (unit converted to N.mm)

A = Cross-sectional area of the sample (mm2) used.

The graph of average data showing the refraction energy of reference (Ref), PVA fiber doped (PVAF) concrete samples is given in Figure 6. As it can be seen from the figure, it has been seen that PVA Fiber doped concrete samples increased by 29.84% as a result of Charpy Impact impact test. Based on this, the growth of cracks under fibrous concrete is prevented; breakage occurs at larger loads, sufficient resistance to sudden loads or repeated loads and the increase in fibers in terms of the amount of energy absorbable under load may be among the advantages of fibrous concrete. In addition, as can be seen from the fracture geometry in Figure 7, while the PVA fiber-free concrete samples were crushed brittle, the fibrous samples were broken in a controlled manner, swallowing a large amount of energy when looking at the impact energy in the test results.

Figure 6: Impact fracture energy results of the mixes

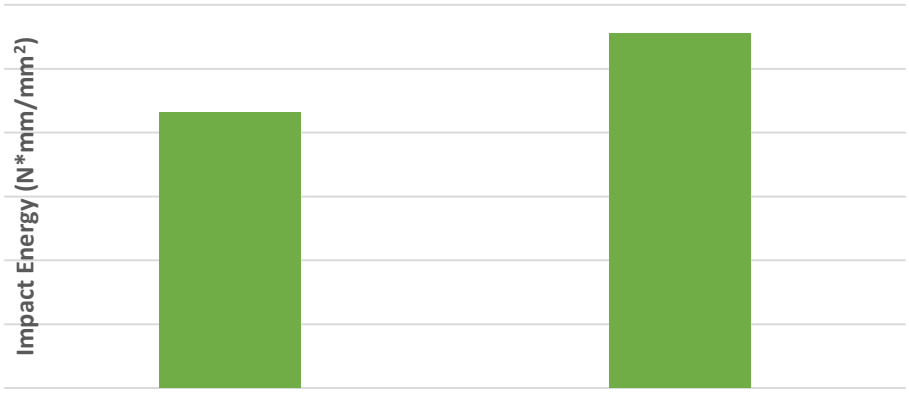
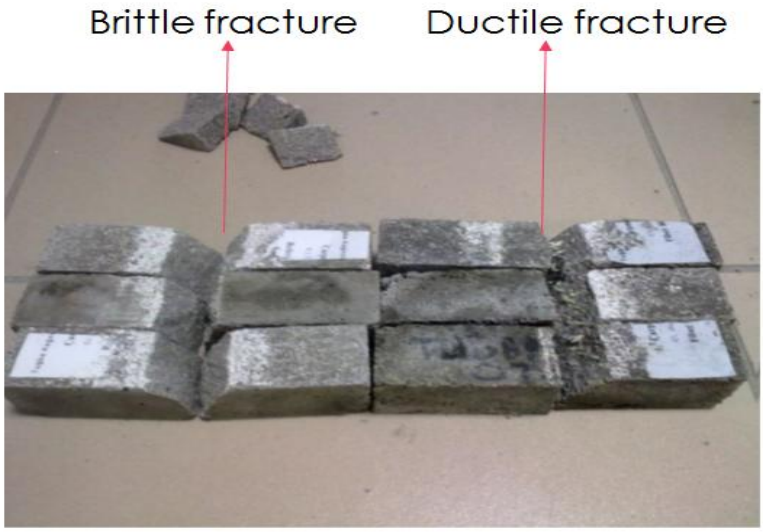


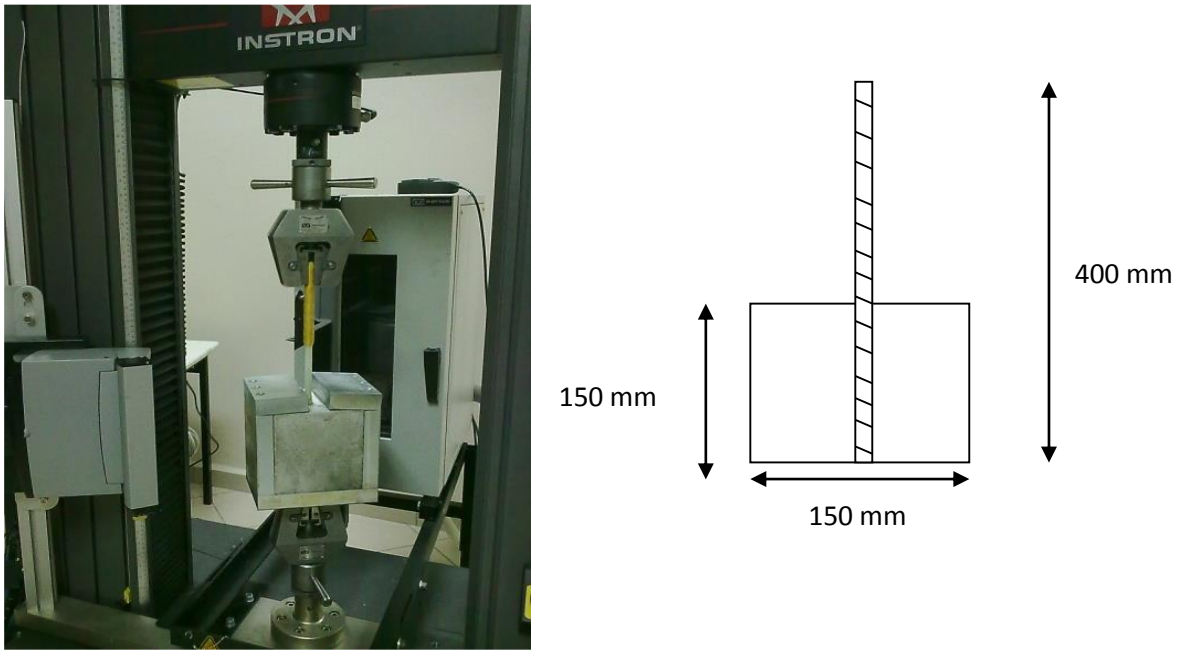
Figure 7: Fracture profiles of the mixes



Bond Strength Test Results

For adherence strength test, GFRP reinforcements with different surface properties of 400 mm length were inserted into the fresh concrete with no additives and PVA Fiber doped into 150x150x150 mm cube sample molds and placed into 150 mm (Figure 8).

Figure 8: Bond strength test set up



It was put into the curing tank for 28 days to complete the curing of concrete and gain strength. After 28 days, the samples removed from the cure were subjected to peel test with the help of the special apparatus created as shown in Fig.8. The rod ends were wrapped with Kevlar and resin so that the heads of the samples were not crushed and peeled off due to the pressure exerted by the pulling jaws during the experiment. In the experiments, the speed of the drawing machine was kept constant at 2 mm / min.

Calculation of adherence stress,

τ = Adherence Force / $\pi.\phi.l$ formulation was used.

In this formula;

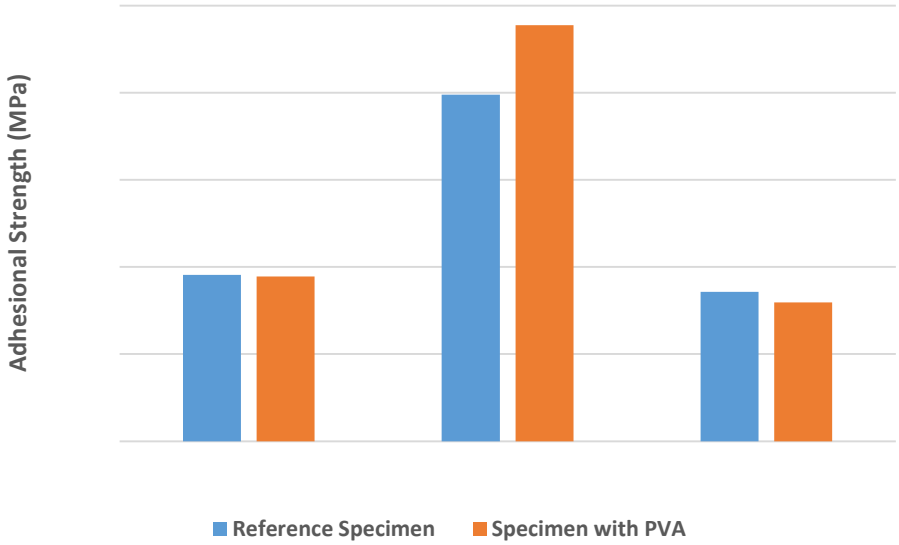
τ = Adherence stress

ϕ = Reinforcement diameter

l = Adherence length (length of reinforcement embedded in concrete)

Reference (Ref), PVA fiber doped (PVAF) concrete samples and FRP reinforcements of different surface properties are given in Figure 10.

Figure 10: Adhesion strength test results of the mixes



The addition of PVA fibers to the concrete resulted in an increase in the bond strength of the concrete. In fibrous concrete, the growth of the cracks under load effect is prevented and thus creates a positive effect on the mechanical properties of the concrete by bridging the cracks that may occur under the effect of large loads. As can be seen from the graph, the increase in bond strength of PVA fiber doped concrete samples is indicative of this.

As a result of the tests performed on control and PVA fiber reinforced concrete samples, it was found that the peel resistance was effective on the adherence of the reinforcement with concrete and the best result of the GRP reinforcement was that the CTP reinforcement was embedded in the flat surface concrete. The fiber wrapped to form a ribbed surface decreased the strength as it caused cross-section losses in the GRP reinforcement. Sand adherence between the GRP reinforcement and the concrete with a sand-coated surface.

CONCLUSIONS

Compressive and impact on control and PVA fiber-reinforced concrete samples, adherence strengths of GRP reinforcements on the same series and with different surface properties are examined and the results obtained are summarized as follows:

- Compressive strength of PVA fiber reinforced concrete samples decreased by 9.08 % and 13.28 % on the 7th and 28th day compared to the reference samples. This decrease in compressive strength was shown to be caused by the deterioration of homogeneity due to aggregation caused by the fiber ratio added to the concrete, and the stress on each fiber in the concrete as a result of the compressive strength test applied.
- As a result of the Charpy Impact impact test, PVA fiber reinforced concrete samples increased by 29.84 % compared to the reference samples. Based on this, the growth of cracks under fibrous concrete is prevented; breakage occurs at larger loads, sufficient resistance to sudden loads or repeated loads and the increase in fibers in terms of the

amount of energy absorbable under load may be among the advantages of fibrous concrete.

- The addition of PVA fibers to concrete resulted in an increase in the bond strength of concrete. In fibrous concrete, the growth of the cracks under load effect is prevented and thus creates a positive effect on the mechanical properties of the concrete by bridging the cracks that may occur under the effect of large loads. As can be seen from the graphs, especially after maximum load, the increase in bond strength of PVA fiber doped concrete samples is indicative of this.
- As a result of the tests performed on control and PVA fiber reinforced concrete samples, it was found that the peel resistance was effective on the adherence of the reinforcement with concrete and the best result of the GFRP reinforcement was that the CTP reinforcement with flat surface embedded in the concrete was the best result. The fiber wrapped to form a ribbed surface decreased the strength as it caused cross-section losses in the GRP reinforcement. Sand adherence between the GRP reinforcement and the concrete with a surface of sand is formed.

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Soil Improvement with Addition of Unburnt Tile Dust

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ABSTRACT

Due to our country is in the earthquake zone, subsoils under the buildings has gained great importance. Various improvement methods are used to prevent damages caused by soil. As in other sectors, the recycling of waste products is also increasing in construction technology day by day. In this study; it is tested whether the unburnt tile dust obtained as a waste product will provide improvement under laboratory conditions on soils having low bearing capacity. Unconfined compression tests are applied to the soil samples which their characteristic features determined by experimental studies in the geotechnical laboratory. Samples are prepared fresh and 7 days and 7 days samples are kept in vacuum to avoid water content lose. These samples are subjected to the same tests after 7 days. When the results of the experimental studies were examined, it was seen that 17 % increase in the carrying capacity with addition of unburnt tile dust to soil up to 10 %. It was observed that the samples which are kept for 7 days give better results than the fresh samples. It was also found that the used waste product dried the soil and reduced the saturation degree. The evaluation of the used waste product is one of the other positive results in terms of both environmental pollution and cost.

Keywords: Soil improvement, Unburnt Tile Dust, Unconfined Compression Test.

INTRODUCTION

Sub-soils must carry upper structure loads safely. If soil cannot carry the superstructure loads soil improvement must be done. Soil improvement is defined as improvement of soil properties when they are insufficient. Various improvement methods are used as soil improvement. Mostly chosen improvement methods are; compaction, mixing, grouting, stone columns, drains and dewatering. Adding cement with soil is the most popular mixing method, and also lime, fly ash is other additives. It is known that, every source is limited, and alternative sources should be found. Sustainability is the vey commonly used word nowadays. Effective waste management has a big part of the sustainable development. As in other sectors, the recycling of waste products is also very popular in construction technology.

Chu et al. (1993) investigated the suitability of the usage of fly ash on soil mixing. They provided improvement on some properties of the soil. Nicholson et al. (1993) tested lime usage as an additive on soil mixing method. The results showed positive improvement on the swelling soils. Öntürk (2011) mixed fly ash, lime and polisher dust with soil and investigated the improvement degree. Bilici et al. (2018) showed that different type of fly ash provides different level improvement on the clay type of soil. Çokca et al. (2009) mixed granulated blast furnace slag with expansive soils and observed positively results on the soil properties. Gör et al. researched the effects of different additives on the soil consistency. The improvement of geotechnical properties with adding blast-furnace slag investigated by Sivrikaya et al. (2014) and with adding oxygen furnace steel slag by investigated Yıldırım et al. (2015).

In this study; it is tested whether the waste unburnt tile dust will provide improvement on soils under laboratory conditions. The unconfined compression tests are conducted to reconstituted samples and test results are compered at the end of the study.

MATERIALS AND METHODS

Soil samples were taken from Eskisehir city center. Soil index tests are performed according to the standards such as sieve analysis, hydrometer test, consistency limits and specific gravity. Some soil properties are given in Table 1.

Table 1: Some soil properties

Specific Gravity	2.63
Amount of Sand / Silt / Clay (%)	23 / 65 / 12
Uniformity Coefficient	1,89
Coefficient of Gradation	0,25
Liquid limit (%)	45
Plastic limit (%)	28
Plasticity Index	17
USCS	ML

Standard proctor test is applied to soil sample and optimum water content is found as 22.5%. Unconfined compression test is conducted to soil sample which is prepared with optimum water content. Unconfined compression stress is determined as 1,90 kg/cm^2.

Similarly, waste unburnt tile dusts are taken from a tile factory operating in Eskisehir city center. Unburnt tile dust sample screen is given in Figure 1.

Figure 1: Tile dust

Reconstituted samples are prepared with adding the unburnt tile dust to soils by weight within the test program given in Table 2. Unconfined compression tests are performed to determine the strength properties of the doped samples. Unconfined compression test is the most widely used method for determining shear strength of soils. And, test is applied on the fresh samples and 7-days samples. 7-days samples are kept on vacuum machine to see whether a chemical reaction is occurred or not. Samples are prepared with 32,5 % water content because much water content decrease the strength.

Table 2: Test program

Test Number	Description
I	Soil + 5 % unburnt tile dust + 32,5 % water (Fresh)
II	Soil + 5 % unburnt tile dust + 32,5 % water (7-day)
III	Soil + 10 % unburnt tile dust + 32,5 % water (Fresh)
IV	Soil + 10 % unburnt tile dust + 32,5 % water (7-day)
V	Soil + 15 % unburnt tile dust + 32,5 % water (Fresh)
VI	Soil + 15 % unburnt tile dust + 32,5 % water (7-day)
Pure sample	Soil + 22,5 % water (optimum)

RESULTS

The unconfined compression tests are carried out to doped samples. The unconfined compression strengths are found in the range from 1,30 to 2,22 kg/cm^2 respectively. Test results are given in Figure 2 and 3. On the other hand, unit deformations are observed and given in Figure 4 and 5.

Figure 2: Test results-1

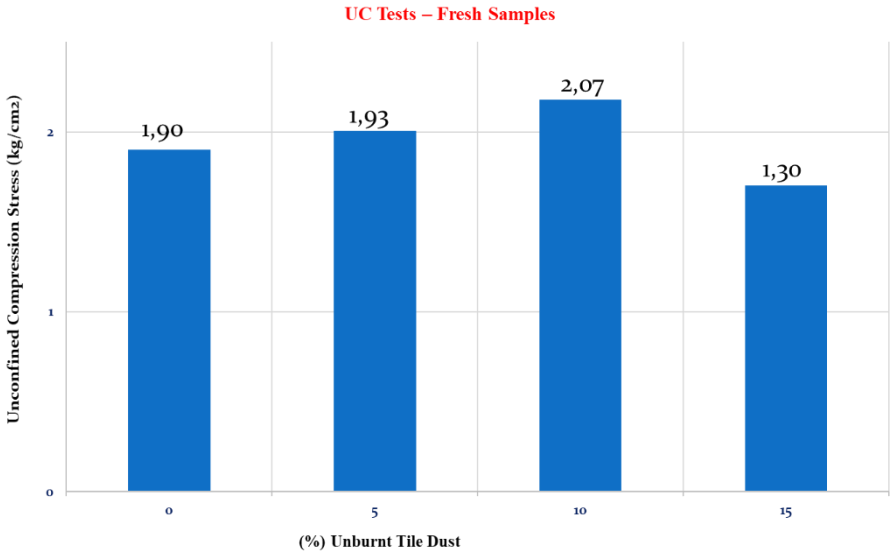


Figure 3: Test results-2

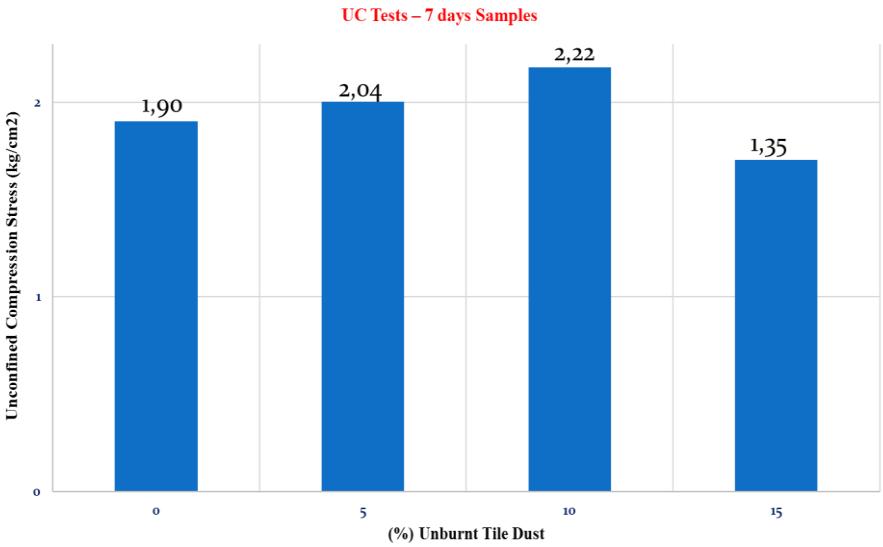


Figure 4: Test results-3

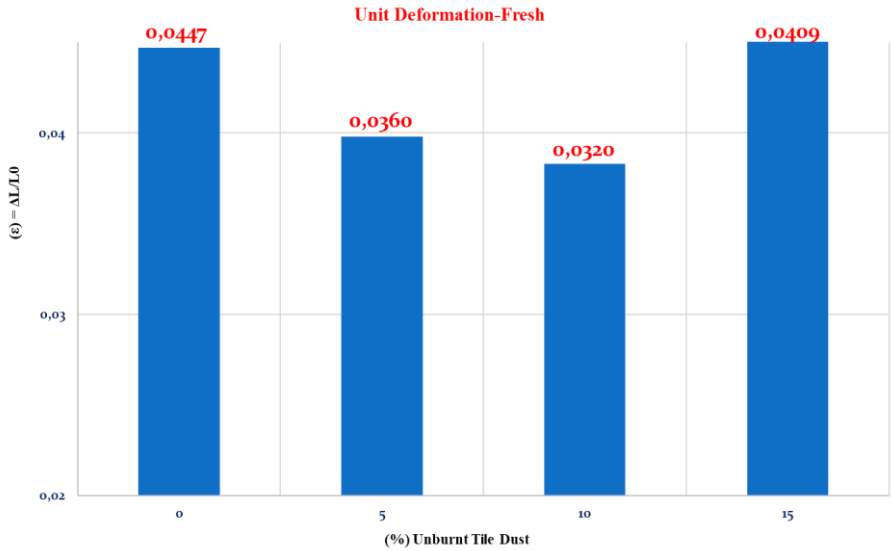
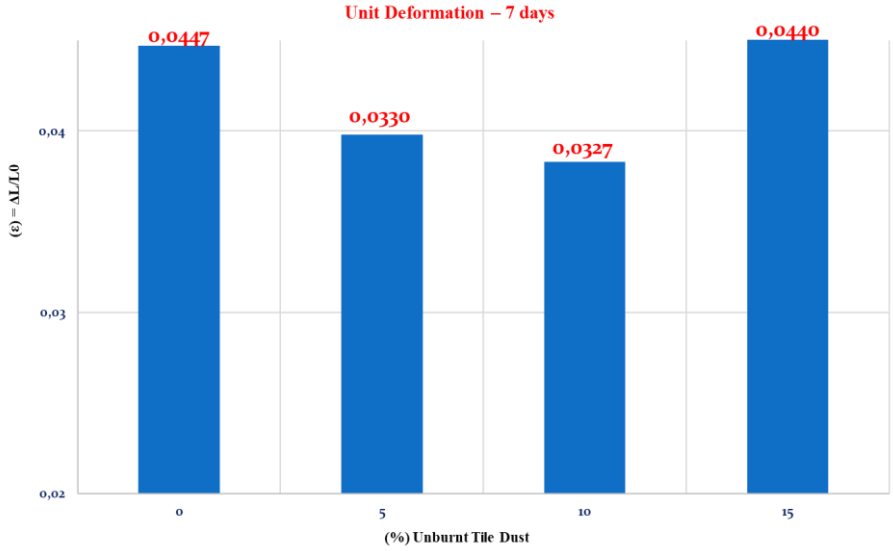


Figure 5: Test results-4



The unconfined compression tests results showed that with addition of unburnt tile dust increase the strength firstly. But there is a limit and it is the 10 percent, after that limit, adding the unburnt tile dust decrease the strength. Likewise, unit deformations firstly decrease with the adding unburnt tile dust but after limit, unit deformations increase. Adding 10 % unburnt tile dust provides optimum results for strength and unit deformation. On the other hand, the saturation degrees of the test samples are calculated, and the results are given in Figure 6 and 7. It can be seen from the figures; the saturation degrees are decrease with the addition of the unburnt tile dust. It may be result of the chemical reaction with the water and unburnt tile dust. Consequently, the volume of the water in the medium decrease with the adding unburnt tile dust.

Figure 6: Test results-5

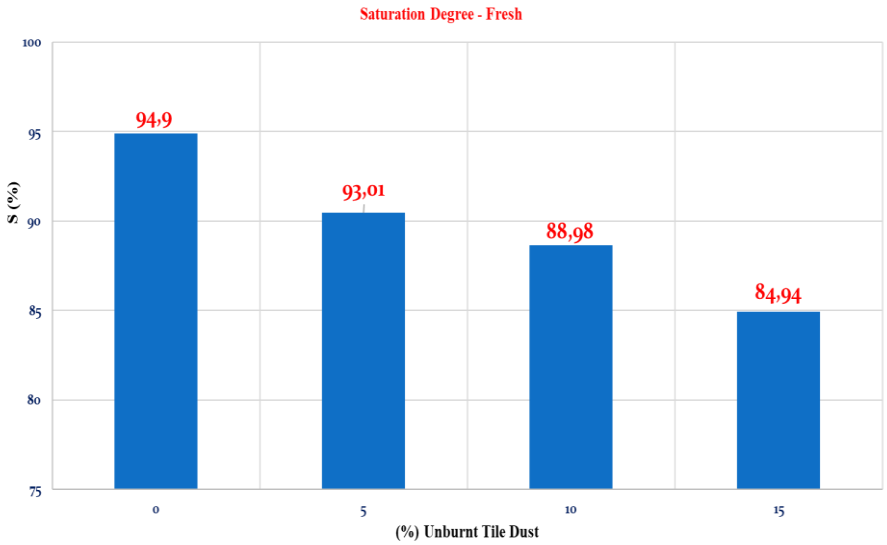
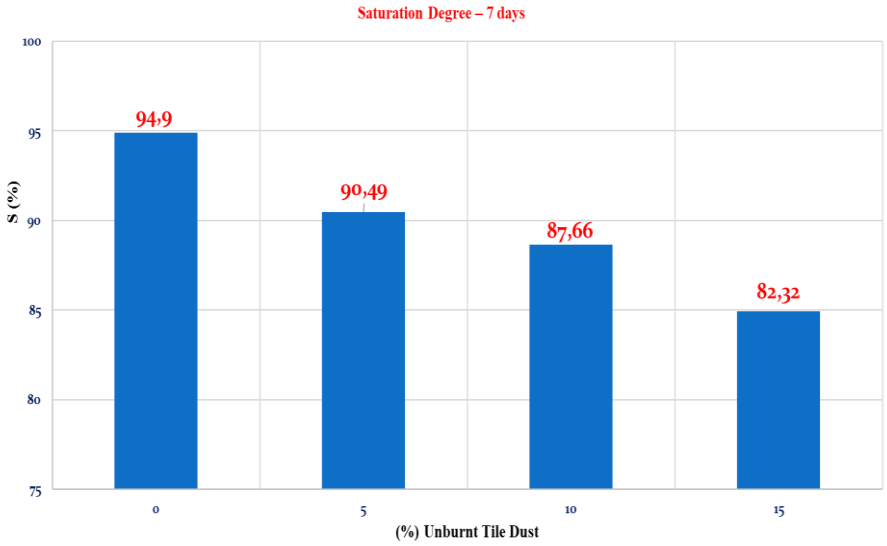


Figure 7: Test results-6



CONCLUDING REMARKS

Soil improvement is defined as improvement of soil properties when they are insufficient. As in other sectors, the recycling of waste products is also very popular in construction technology. In this study; it is tested whether the waste ceramic powder will provide improvement on soils under laboratory conditions. The unconfined compression test results are compered at the end of the study. When the results of the experimental studies are examined, it is seen that 17 % increase in the carrying capacity with addition of ceramic powder to soil up to 10 %. The evaluation of the used waste product is one of the other positive results in terms of both environmental pollution and cost.

ACKNOWLEDGEMENTS

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Patomorphology and Apoptosis in Experimental Diabetic Nephropathy

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ABSTRACT

The aim of this study vas evaluated by histopathologycal and apoptical of kidney damage in rats with streptozotocin induced diabetes. Sixteen rats were randomly divided into two groups as control group (n = 8) and rats with twice dose (streptozotocin, 60 mg/kg, ip) of diabetic group. At the end of the last given of streptozotocin 90. days, the rats were sacrificed and the kidneys were removed for histopathological and immunohistochemical examination. For histological analysis tissue sections were stained with hematoxylin–eosin, for the immunohistochemical studies sections were stained with caspase-3, caspase-8, caspase-9 and TUNEL assay method. Histopathologically, the kidney in the diabetic group showed glomerular sclerosis, thickening, and membrane hyalinization, tubular atrophy, tubular dilatation, cellular vacuolization, and reabsorption droplets in tubule lumens. In the interstitium inflammation, and fibrosis also were seen. Immunohistochemically, increased caspase-3 immunoreactivity in the tubular epithelial cells and few glomerular and interstitial cells. Caspase-8 and caspase-9 were reactive in tubules. In general, diffuse immunoreactivity in tubules, glomerules and interstitium were observed in TUNEL staining. These results indicate that all component in the kidneys of diabetic rats were damaged.

Keywords: Diabetic nephropathy, Histopathology, Apoptosis.

INTRODUCTION

Diabetes mellitus (DM) is a chronic disorder resulted from insufficient insulin excretion or ineffective insulin excretion, characterized by hyperglycemia and leads to impairment in carbohydrate, fat and protein metabolism. Incidence of DM is gradually increasing worldwide, as in our country according to World Health Organization (WHO) data (2006). While DM directly leads to many clinical symptoms, complications of the disease cause severe morbidity and mortality. Retinopathy, dermatitis, neurologic, cardio-vascular and renal impairment are the most common complications. Diabetic nephropathy (DN) which is seen in 44% of the patients and accepted as a clinical finding is usually overlooked due to the absence of evident findings at the first stages of the disease. The chronic period during which symptoms emerge and histo-pathologic damage is formed is defined as "end-stage renal failure" and the patients become dialysis-dependent at this stage. Therefore, it leads to high treatment costs and mortality. (Dereli et al, 1999; Estacio et al, 2000; Krolewski et al, 1996; Ozougwu et al, 2013)

While many factors play a role in DN development, genetic disorders, elevated plasma glucose, renin-angiotensin system, glomerular hyper-filtration and free oxygen radicals are among the important factors. Hyperglycemia and glucose toxication also play a role in patho-genesis of nephropathy. Chronic hyperglycemia leads to glomerular sclerosis through leading to an elevation in inflammatory mediators and nitric oxide release in arterial endothelium. However, hyperglycemia alone is not enough for nephropathy development. While glucose accumulation also leads to similar reactions, elevated glucose affects cells through causing cell proliferation and an increase in extra-cellular matrix and TGF-β. Excess glucose leads to a reduction in anti-oxidants like nicotinamide adenine dinucleotide phosphate (NADPH) and thereby an increase in free radicals in tissues. Increased free oxygen radicals cause damage in vascular endothelium. Consequently, Na+-K+ ATPase activity decreases in the cells and sodium accumulation occurs which results in edema and dysfunction. While these changes lead to inflammation and necrosis, they trigger apoptosis. The histo-pathologic findings in the acute phase are not pathognomonic for diagnosis of DN. Pathognomonic histologic findings develop with the impairment in vascular structure in chronic phase. Although histo-pathologic findings are mostly formed in glomerular structure, interstitial, tubular and vascular structures are also reported to be influenced. (Sarnak et al, 2003; Tunçdemir et al. 2018; Warram et al, 2000; Zhang et al, 1997; Phillips and Steadman, 2002)

The present study aims at investigation of patho-morphologic changes and apoptosis in diabetic nephropathy.

LITERATURE REVIEW

Diabetes mellitus is a chronic metabolic disease which develops from carbohydrate metabolism disorder and characterized by hyperglycemia, leads to damage in many tissues and organs. Diabetes-induced tissue damage mainly results from inflammatory, metabolic and vascular changes (Estacio et al., 2012; Krolewski et al., 1996; Ozougwu et al., 2013). Chronic renal failure which is defined as diabetic nephropathy and leads to significant mortality develops mainly due to hemodynamic factors. Renal disorder which is quite insidious

progresses without exhibiting clinical symptoms except proteinuria and results in end-stage renal failure (Dereli et al.,1999, Locatelli et al.,2004; Warram et al.,2000).

Krolewski et al. (1996) reported that micro-vascular damage developing from increased inflammatory factors like cytokine, chemokine and free radicals due to hyperglycemia and glycol-toxicity plays a major role in diabetic nephropathy although etio-pathogeneis is not fully explained yet.

Sarnak et al. (2003) stated that while elevated free radicals and cytokine release lead to vascular endothelium damage, they also trigger thrombosis and coagulation. Histo-pathologic lesions are formed in renal tissue, particularly in glmerules as the result of this damage in micro-vascular structure.

Mauer et al. (1990) have reported that this pathology in glomerules in diabetic nephropathy is quite important for diagnosis. While glomerular sclerosis is the most evident finding in the early period, thickening in Bowman's capsule and basal membrane also pull attention.

Philips and Steadman (2002) reported that they mostly encountered chronic findings in renal biopsy as it is accepted as end- stage nephritis. The changes in tubulo-interstitial tissue are observed together with glomerular hypertrophy. The authors also stated that the sclerosis in glomerular tissue could convert to a nodular structure and the thickening in glomerular capsule is quite prominent.

Kumar et al. (2004) observed arterio-sclerosis in interstitial arteries and glomerular capillary and stated that significant fibrozis was evident in tubulo-interstitial fields and tubular basal membrane thickening , tubular dilation and atrophy were also evident. Detected the presence of apoptosis both in tubules and interstitial tissue in biopsy specimens of the patients with diabetic nephropathy.

Tuncdemir et al. (2018) detected that oxidation markers like malondialdehyde (MDA), advanced oxidation protein products (AOPP) and protein carbonyl (PC) increase in real tissues of the rats with experimentally-induced diabetes in their comprehensive study. The authors also examined the renal tissues of diabetic rats immuno-histochemically with apoptotic, anti-apoptotic, caspase-3 and TUNEL methods and found apoptosis particularly in tubular cells and glomerular structures.

Zang et al. (1997) detected the presence of apoptosis in tubule epithelium cells of the rats with experimentally-induced diabetic nephropathy with immuno-histochemical methods. All three studies revealed that apoptosis was formed in tubular epithelium cells, particularly in proximal and distal tubules and they also revealed the presence of localized apoptotic cells in interstitial cells.

METHODOLOGICAL ASPECTS AND RESULTS

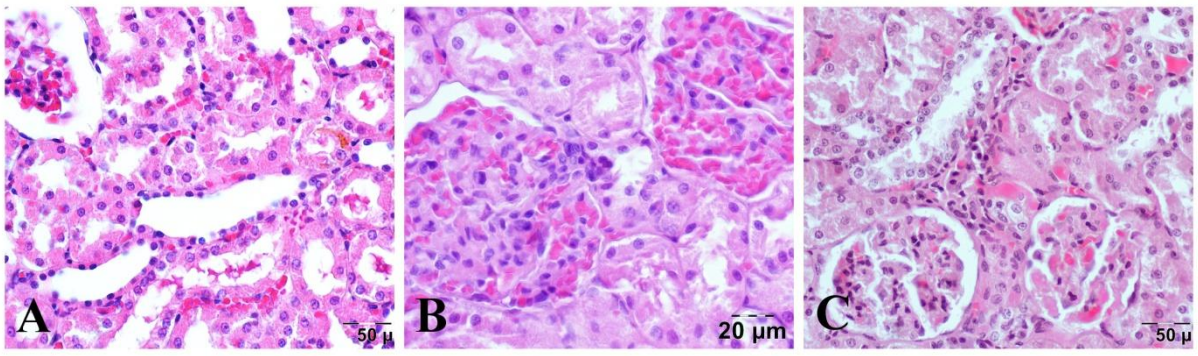
Methodological Aspects

A total of 16 male Wistar albino rats weighing 200-250 g, aged 5-6 weeks were used. Rats were adjusted to laboratory environment one week before the study. Rats were randomly divided to two groups as Group I (Control group) and Group II [Diabetic group which included the rats which were administered streptozotocin (STZ, 60 mg/kg, Sigma, MO, USA; 0.05 M citrate buffer; pH 4.5) twice daily with 3 day intervals] with 8 rats in each. Plasma glucose measurements were done at 48th h following STZ. The rats which were detected to have 16.7 mmol/L or above plasma glucose level were accepted as diabetic. Rats were anesthetized at 90th day following the last STZ administration and renal tissues were removed with proper methods and fixed with 10% buffered neutral formalin for histo-pathologic and immuno-histochemical examinations. The tissue samples were embedded in paraffin blocks. Sections of 5 µ were stained with hematoxylin-eosin (HE).

Immmuno-histochemical staining was done with streptavidin-biotin-peroxidase (ABC) method in accordance with primary antibody protocol. The sections were treated with pH 6.0 citrate buffer at 700 W for 20 min in microwave oven and incubated in caspase-3, caspase-8 and caspase-9 primary antibody, waited in diamino benzidine (DAB) for 3 min as chromogen. Harris hematoxylin was used for ground staining.

TUNEL (Terminal Dexynucleotidyl Transferase mediated Deoxyuridine Triphosphate Nick and Labeling) marking was done in accordance with the instructions of the manufacturer (In Situ Cell Death Detection Kit, POD, Roche, Germany).

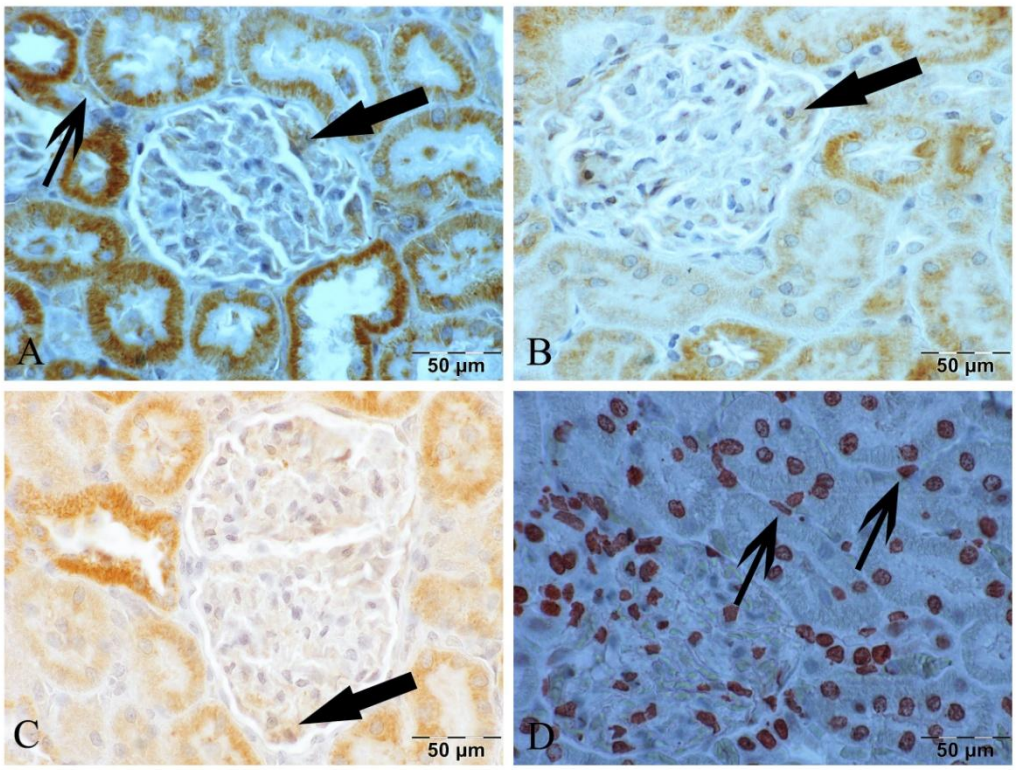
Figure 1: Histomorphological changing, HxE



Glomerules, tubules, interstititum and vascular parameters were evaluated histo-pathologically. While no pathologic lesions were detected in kidneys in control group, significant damage was detected in kidneys of the rats in study group (Figure 1). Significant hyperemia and mesengial cell proliferation were observed in glomerular capillary. Also, enlargement was detected in Bowman's capsule. Some glomerular structures were seen to be atrophic and cellular infiltrations were detected in surrounding tissues. Fibrosis was detected in peri-glomerular fields. Widespread atrophy and localized tubular dilations were observed in tubules. Protein aggregates were encountered in some tubule lumens.

Significant and widespread immune positivity pulled attention in kidneys with diabetic nephropathy in immuno-histochemical caspase-3, caspase-8, caspase-9 and TUNEL staining performed for detection of apoptosis (Figure 2). Tubule epithelium cells were seen to show intense positive reaction particularly against caspase-3 antibody. In addition, positive cells were detected in interstitial tissue, although not intense. Positive reaction was detected to be intense particularly in proximal tubules in staining done with caspase-8 and caspase-9 however immune positivity was detected also in distal tubules. Localized immune positivity was detected in glomerules and interstitium, too. Tubule epithelium and vascular endothelium were also seen to be widespread positive in almost every field of the tissue in TUNEL staining.

Figure 2: Apoptotic reaction of kidneys with diabetes. A: Caspase-3, B: Caspase-8, C: Caspase-9, D: TUNEL staining.



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Determination of the Effect of Different Agar Applications on *In Vitro* Shoot Regeneration of *Rotala rotundifolia* (Buch-Ham. ex Roxb) Koehne, A Medicinal Aquatic Plant

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ABSTRACT

Rotala rotundifolia (Buch-Ham. ex Roxb) Koehne is an aquatic and medicinal plant belonging to the Lythraceae family. It is known to be used in the treatment of certain diseases due to its medicinal property. In this study, the effects of different levels of agar-gelled media on *in vitro* propagation of *R. rotundifolia* were investigated. The nodal explants of *R. rotundifolia* were cultured in Murashige and Skoog (MS) nutrient medium containing 5.0, 6.0, 7.0 and 8.0 g/L agar and containing 0.20 mg/L Benzil Amino Purine (BAP). The pH of the nutrient medium was adjusted to 5.7 ± 0.1 using 1N NaOH and 1N HCl. Trials were carried out on petri dishes with 6 explants and 3 replicates. Shoot regeneration frequencies ranged from 66.66 to 100.00%. The highest shoot regeneration percentage (100%) were recorded in the MS nutrient medium using 5.0, 6.0 and 7.0 g/L of agar. The least shoot regeneration frequency was obtained in 8.0 mg/L agar application. The maximum number of shoots per explant (22.79 shoots/explant) was obtained in the culture medium with 6.0 g/L agar. The highest shoot length was determined as 1.46 cm in MS medium with 5.0 g/L agar. Different agar doses were effective on the number and length of shoots of plants. As a result, it was found that agar concentrations had a significant effect on *in vitro* propagation of *R. rotundifolia*.

Keywords: Agar, *R. Rotundifolia*, Gelling, Tissue Culture.

INTRODUCTION

Plants are over-collected from their natural environment for decoration, medicinal and many other purposes. This can lead to the extinction of the plant species and the death of other living species fed by these plant species. Therefore, there is an urgent need for the development of effective propagation methods that will enable large-scale proliferation and conservation of important plant species.

Tissue culture techniques, which are a biotechnological production method, are mainly based on the totypotency of the cells (García-Gonzáles et al., 2010). The cell's totipotensi feature is the ability of all living cells to form a genetically identical cell, followed by cellular division and differentiation to form tissues, organs, systems and individuals (García-Gonzáles et al., 2010).

Rotala rotundifolia (Buch-Ham. Eski Roxb) Koehne is among the medicinal plants. *R. rotundifolia* is used in the treatment of rheumatism and joint pain in Yunnan, China (Tan et al., 2009). Active compounds found in *R. rotundifolia* have been reported to have antioxidant activity through the production of 1,1-diphenyl-2-picrilhydrazil (DPPH) radical and superoxide anion, and compounds such as kaempferol and quercetin exhibit anti-HBV activity (Zhang et al., 2011).

In this study, the effects of different levels of agar-gelled media on *in vitro* propagation of *R. rotundifolia* were investigated.

MATERIALS AND METHODS

R. rotundifolia were obtained from aquarium markets in Konya, Turkey. The nodal explants were transferred to the Murashige and Skoog (1962) (MS) hormone-free basic nutrient medium. The nodal explants isolated from sterile plants were used in all trials. Ultrapure water was used in the media preparation.

In different plant agar trials, the explants were incubated in a MS nutrient medium containing 0.20 mg/L 6-Benzyl Amino Purine (BAP) for eight weeks. In experiments, MS basal medium with vitamins containing 3% sucrose (Duchefa) and 5.0, 6.0, 7.0 and 8.0 g/L plant agar (Duchefa) was used. The pH of the nutrient medium was adjusted to 5.7 ± 0.1 using 1N NaOH and 1N HCl and then sterilized under 1.2 atmospheric pressure at 120°C for 20 min. The cultures were incubated at a temperature of 24 ± 1°C and 16 hours of light photoperiod under white light flouresan (1500 lux).

The shoots cut approximately 2.5 cm long from the regenerated shoots were cultured in Magenta GA7® containers in MS media fortified with 0.25 mg/L of Indole-3-Acetic Acid (IAA) for *in vitro* rooting study for 4 weeks. Rooted shoots were then transferred to the aquarium medium to get accustomed to external conditions. Inside the aquarium, 24ºC temperature regulated thermostat and 16 hours lighting were used.

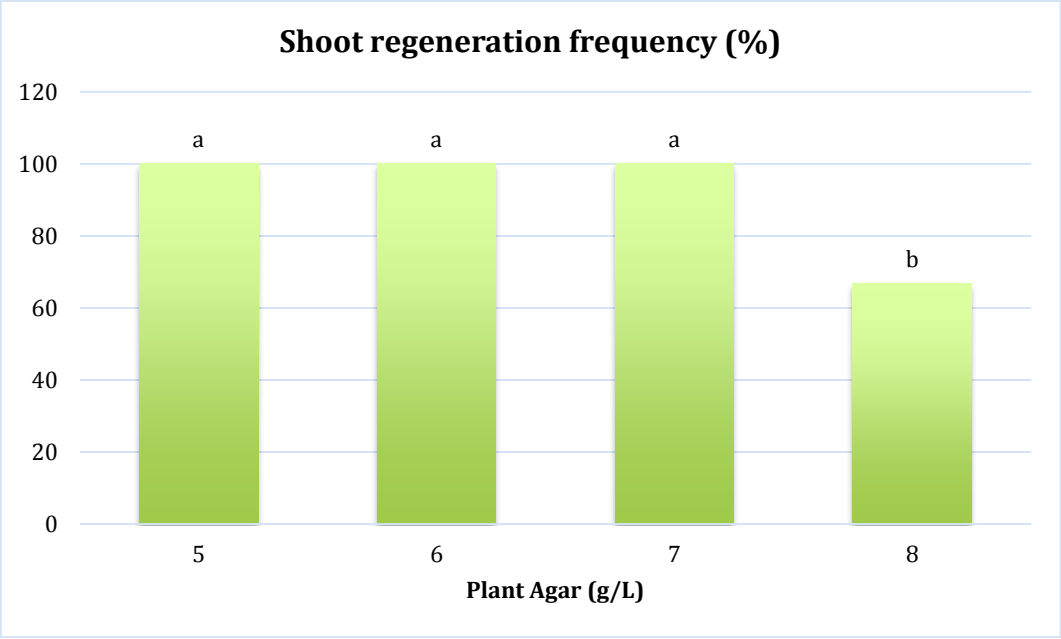
Trials were carried out on petri dishes with 6 explants and 3 replicates. The data obtained from the study were analyzed according to the randomized plot design with SPSS 21 for Windows program. Duncan tests were applied for Post Hoc tests.

RESULTS AND DISCUSSION

For *in vitro* shoot regeneration, *R. rotundifolia*'s nodal explants were cultured in MS medium with different agar concentrations. Similarly, agar studies with *Amygdalus communis* L. (Gürel anf Gülşen, 1998), *Gladiolus hybridus* Hort. cv. Wedding Bouquet (Gupta and Prasad, 2010), *Solanum tuberosum* (Mohamed et. Al., 2010), *Citrus jambhiri* Lush. (Singh and Kaur, 2011) and *Myrciaria dubia* (Araujo et al., 2016) were carried out.

Shoot regeneration rate was ranked between 66,66-100,00% (Figure 1). The 100% shoot regeneration rate was recorded in MS medium containing 5, 6 and 7 g/L agar.

Figure 1: Effects of different agar concentrations on shoot regeneration frequency of *R. rotundifolia.* All values are the means of triplicates ± SD (n=3). Vertical bars indicate standard error of three separate experiments. Different superscript letters indicate significantly different values ($p < 0.05$; DMRT)



The number of shoots per explant ranged from 17.58 to 22.79 in MS nutrient media containing different agar concentrations (Figure 2). The maximum number of shoots (22,79) was obtained in culture medium containing 6 g/L agar (Figure 3).

Figure 2: Effects of different agar concentrations on mean number of shoots per explant of *R. rotundifolia.* All values are the means of triplicates ± SD (n=3). Vertical bars indicate standard error of three separate experiments. Different superscript letters indicate significantly different values ($p < 0.05$; DMRT)

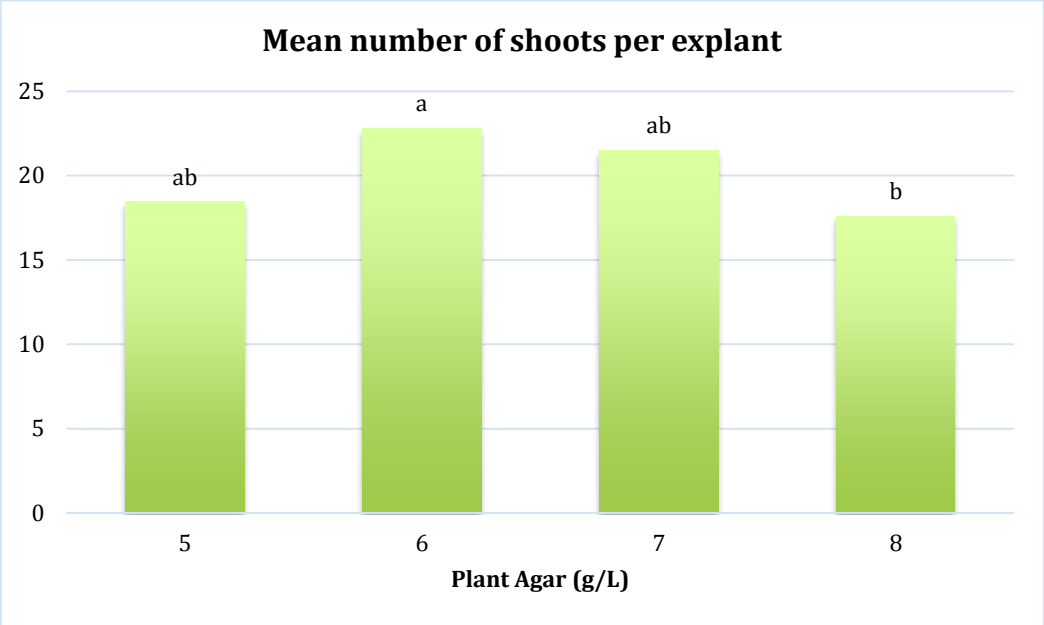
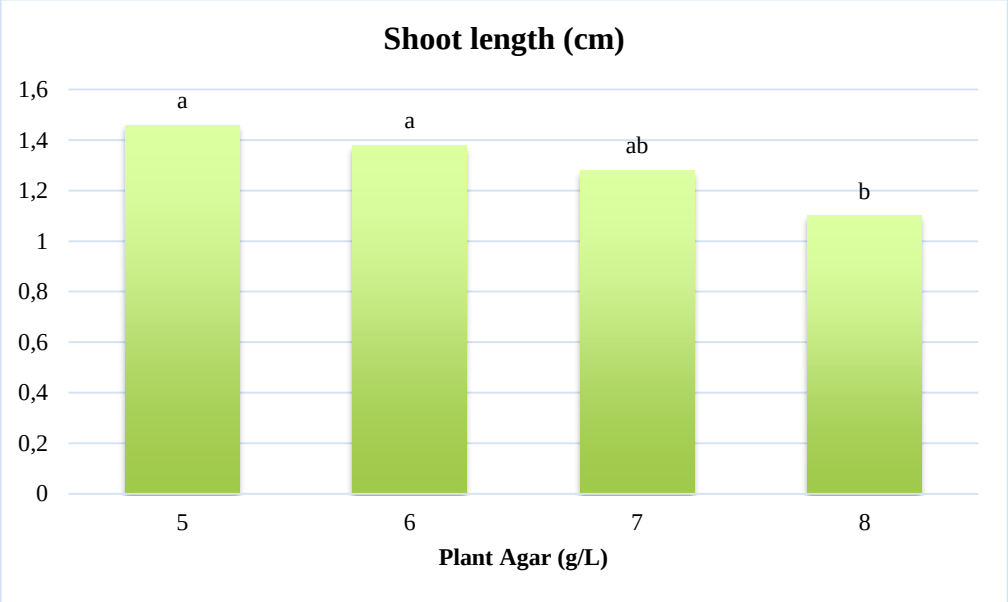


Figure 3: Regenerated shoots in culture medium containing 6 g/L agar

The lengths of the regenerated shoots were ranked between 1.10-1.46 cm (Figure 4). The longest shoots in culture medium were determined in MS nutrient medium containing 5 g/L agar with 1.46 cm.

Figure 4: Effects of different agar concentrations on shoot length of *R. rotundifolia.* All values are the means of triplicates ± SD (n=3). Vertical bars indicate standard error of three separate experiments. Different superscript letters indicate significantly different values ($p < 0.05$; DMRT)



The shoots produced in culture medium were rooted in MS medium containing 0.25 mg/L IAA. It was then successfully accustomed to the aquarium environment.

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Effect of Different Indole- 3- Butyric Acid and Naphthalene Aetic Acid on *in vitro* Rooting of *Limnophila aromatica* (Lamk.) Merr.

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ABSTRACT

Plants generally consist of root, stem and leaf parts. With the formation of these structures, a complete plant is obtained. The basic stages of *in vitro* production techniques are *in vitro* shoot regeneration and *in vitro* rooting. In this study, the effects of different concentrations of Indole- 3- butyric acid (IBA) and naphthalene acetic acid (NAA) (0.25, 0.50, 0.75 and 1.00 mg/L) on *in vitro* rooting of *Limnophila aromatica* (Lamk.) Merr produced by tissue culture were investigated. The earliest root formations were observed in Murashige and Skoog (MS) medium containing 0.25 mg/L IBA on day 14, followed by root formation in MS medium containing 0.50 mg/L IBA on day 16. The earliest root formation in NAA-containing MS medium was recorded at 20 days and in MS medium containing 0.25 mg/L NAA. In rooting medium, the number of roots per shoot ranged from 4,44 to 12.72 in the MS medium containing IBA, and between 2.27 and 7.61 in MS containing NAA. The highest number of root formation (12.72) in all rooting media was obtained in MS medium containing 0.25 mg/L IBA. Root length ranged from 1.87 cm to 3.41 cm in the MS medium containing IBA, and in the MS medium with NAA ranged from 1.31 cm to 2.86 cm. In all rooting media, the longest roots (3.41 cm) were obtained in MS medium containing 0.25 mg/L IBA. In general, the root lengths in the IBA-containing MS medium were found to be longer than the MS medium containing NAA. It was determined that the increase of IBA and NAA ratio in rooting mediums negatively affected root length.

Keywords: *In vitro* Rooting, IBA, NAA, *L. aromatica*, Root Formation**.**

INTRODUCTION

Plant growth regulators are one of the most important elements of tissue culture media. Haberlandt proposed the concept of totipotensi in 1902 which would form the basis on which plant tissue culture is based. According to this concept, each plant cell is capable of developing a complete plant, similar to the parent individual, when various environmental conditions such as appropriate nutrient, light and temperature are provided (Krikorian and Berquam, 1969).

Tissue culture is the technique of keeping any tissue (explant) or cells isolated from the plant in an artificial nutrient medium. Cells and tissues can divide to form roots, leaves, shoots, embryos or whole plants. Plant tissue culture is used in many commercial fields. Breeding and vegetative propagation of plants, production of virus-free plants, propagation of new plant varieties, protection of rare and endangered plants are some of them. In addition, plant tissue culture is used in the production of secondary metabolites in addition to intensive production of plants, the production of transgenic plants and the production of medicinal components from natural sources (Winkelmann and Geier, 2006).

The hormone-active substances in the plant are called "plant growth regulators. These regulators, which are present in the structure of plants or added synthetically from the outside, are widely used in agriculture. In this study, the effects of different concentrations of Indole-3- butyric acid (IBA) and naphthalene acetic acid (NAA) (0.25-1.00 mg/L) on *in vitro* rooting of *Limnophila aromatica* (Lamk.) Merr produced by tissue culture were investigated.

MATERIAL AND METHODS

L. aromatica was used as plant material in the study. The plants were kept under running tap water for 15 minutes before surface sterilization was applied. Surface sterilization of the plants was carried out with commercial bleach (20% NaOCl) for 10 min. After 3 minutes of rinsing for 5 min, shoot tip explants were isolated and transferred to hormone-free Murashige and Skoog (1962) (MS) food medium.

Previously produced shoots were used in the experiments. MS nutritional salts and 3% sucrose (Duchefa) were used in the preparation of rooting media. 0.65% agar (Duchefa) was added to the culture medium for rooting medium. In the experiments, different concentrations (0.25, 0.50, 0.75 and 1.00 mg / L) of IBA and NAA were added to the MS nutrient medium. The culture medium was adjusted to pH 5.7 ± 0.1 with 1N NaOH and 1N HCl and sterilized in an autoclave (1.2 atm pressure - 20 min at 120 ° C).

Regenerated *L. aromatica* shoots were cut to 2.5 cm length and transferred to rooting medium. In the studies, 6 shoots were placed in each magenta and applied with 3 replications. White LED lights were used as the light source and the experiments were finalized after 8 weeks. The data were analyzed with SPSS 16 for Windows (IBM Package, Armonk, NY, USA) and Duncan tests were used for Post Hoc tests.

RESULTS AND DISCUSSION

Regenerated *L. aromatica* shoots were cut to 2.5 cm length and rooting studies were performed on MS media containing IBA and NAA at different rates (0.25-1.00 mg/L). The earliest root formations in MS medium containing IBA were observed in MS medium containing 0.25 mg/L IBA on day 14 and then in MS medium containing 0.50 mg/L IBA on day 16. The earliest root formation in MS medium containing NAA was recorded on day 20 and in MS medium containing 0.25 mg/L NAA. Similarly, *in vitro* rooting using IBA or NAA has been reported in *Ruta graveolens* L. (Ahmad et al., 2010), *Bacopa monnieri* (L.) Wettst (Sharma et al., 2010), *Passiflora foetida* L. (Shekhawat et al., 2015), banana (Guranna et al., 2017), *Phoenix dactylifera* L. (Emoghene et al., 2018), *Terminalia arjuna* (Choudhary et al., 2018), *Lysimachia nummularia* L. (Dogan, 2019a) and *Rotala rotundifolia* (Buch-Ham. ex Roxb) Koehne (Dogan, 2019b).

At the end of eight weeks, the number of roots per shoot and root length data were taken and variance analysis was performed (Table 1).

Table 1: Analysis of variance of *in vitro* rooting of *L. aromatica* shoots at different doses of IBA and NAA.

Source of variance	Degree of freedom	Number of Roots per Shoot (pcs)		Root length (cm)	
		Mean square	F	Mean square	F
Medium	7	33.11	86.03**	1.68	24.53**
Error	16	0.39		0.07	-
General Total	23	-	-	-	-

** Significant at p <0.01 level

As seen in the analysis of variance, a significant difference was found between the media in terms of root number and root length per shoot at the level of 0.99 (p <0.01). Duncan test results are given in Table 2 to determine the significance level of this difference (Table 2).

While the number of roots per shoot in rooting medium ranged from 4.44 to 12.72 in MS medium containing IBA, it ranged from 2.27 to 7.61 in MS medium containing NAA. The highest number of root formation (12.72 units) in all rooting media was recorded in MS medium containing 0.25 mg / L IBA. The minimum number of root formation (2.72) was recorded in MS medium containing 1.00 mg/L NAA. As the IBA and NAA rates increased in all rooting environments, there were decreases in the number of roots emerging from shoots.

Table 2: Duncan test results to determine the effect of different doses of IBA and NAA on in vitro rooting of *L. aromatica* shoots

Growth Regulators	Root length (cm)
0.25 mg/L IBA	3.41a
0.50 mg/L IBA	3.08a
0.75 mg/L IBA	2.33bc
1.00 mg/L IBA	1.87cd
0.25 mg/L NAA	2.86ab
0.50 mg/L NAA	2.19c
0.75 mg/L NAA	1.52d
1.00 mg/L NAA	1.31d

The difference between the means indicated by different letters in the same column is significant at $p < 0.01$ level.

Root length ranged from 1.87 cm to 3.41 cm in MS medium containing IBA, and between 1.31 cm and 2.86 cm in MS medium containing NAA. In all rooting media, the longest roots (3.41 cm) were obtained in MS medium containing 0.25 mg/L IBA, while the shortest roots (1,31 cm) were obtained in MS medium containing 1.00 mg/L NAA. In general, the root lengths in the medium containing IBA were longer than the medium containing the NAA. It was determined that the increase of IBA and NAA ratio in rooting environments affected the root length negatively.

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Effect of Bread Wheat Varieties on Grain Sterol (Campesterol, Stigmasterol snd Betasitosterol) Concentration of Zinc Applications

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ABSTRACT

Plant sterols are a group of steroid alcohols with various bioactive characteristics for human health. Phytosterols inhibit cholesterol absorption in intestines and thus reduce blood cholesterol levels. Zinc is plant micronutrient which is involved in many physiological functions its inadequate supply will reduce crop yields. In this study, the effect of zinc (Zn) applications on the concentration of Campesterol, Stigmasterol and Betasitosterol of two different bread wheat cultivars (Yunus and Osmaniyem) in the greenhouse conditions was investigated. Zinc applications ($ZnSO_4.7H_2O$) were carried out in 1.0 (Control) and 5.0 (Zn 5) mg Zn kg^{-1} doses as the soil fertilizing. Zinc application showed statistically significant increases in grain Zn concentrations of both Yunus and Osmaniyem varieties. Zinc application has resulted in an increase of 49% in grain Zn concentration of Yunus varieties and 137% in Osmaniyem varieties. Parallel to the increase in the Zn concentration by Zn application, an increase of 42% in the concentration of Campesterol, 57% in the concentration of stigmasterol and 21% in the concentration of betasitosterol was observed in the grain of Yunus varieties. Similarly, there was a rise of 11% in the concentration of Campesterol, 18% in the concentration of stigmasterol and 11% in the concentration of betasitosterol of the Osmaniyem varieties. It is observed that the possibility of Zn participating in stain of Campesterol, Stigmasterol and Betasitosterol seems to be high.

Keywords: Zinc, Campesterol, Stigmasterol, Betasitosterol, Bread Wheat.

INTRODUCTION

Plants are another effective factor in combating diseases. Carotenoids in plants, antioxidant vitamins, phenolic compounds, terpenoids, sterols, indoles and fibers have been reported to play an important role in reducing the risk of chronic disease (Schauss et al., 2006). In particular, sterols in plants are called phytosterols. Phytosterols are steroid alcohols belonging to the Triterpene family (Nurmi, 2012). Phytosterols are found in plants as free alcohols or as their precipitates (Nurmi, 2012). Phytosterols are found naturally in vegetable products, especially vegetable oils. In a study on the effects of phytosterols on human health, it has been reported that individuals have low-density lipoprotein i.e. cholesterol-lowering effects with phytosterol intake, but the magnitude of cholesterol-lowering between individuals may vary depending on various factors (Rudkowska, 2010). In addition to the cholesterol-lowering effects of phytosterols, positive effects on health such as anti-inflammatory (anti-inflammatory), anti-atherogenic (supporting cardiovascular health and preventing heart attack, stroke and other cardiovascular diseases and plaque formation), antioxidant and anticancer are also seen (Rudkowska, 2010). Although cereals and cereal products contain low amounts of phytosterol from oilseeds, cereals are more involved in human nutrition compared to consumption rates (Taşan, 2008). It is reported that the major sterols found in wheat in large amounts are Beta-sitosterol, Campesterol, and Stigmasterol (Moreau et al., 2002). Bread and other cereals obtained from wheat are grouped as cereals and foods made from cereals in terms of phytosterol concentrations (El, 2008). As being also more bread consumption in Turkey, a large portion of people's energy needs is met from the bread. Especially B group vitamins, especially Ca, Fe, Zn and mineral substances such as amino acids, high in the shell and embryo portion of wheat, is found in low concentrations in the endosperm (Kotancilar et al., 1995). Phytosterols in wheat are important for human health and their importance has been demonstrated in many studies. Increasing the amount of phytosterol in plants will cause a decrease in the amount of serum cholesterol in humans consuming these plants. Although there are various studies on the amount and variety of phytosterol amounts of cereal and cereal products, the scarcity of the knowledge is expressed by Piironen et al. (2000). There has not been much research on the relationship between phytosterols and plant nutrients.

In this study, the effect of zinc (Zn) applications on the concentration of Campesterol, Stigmasterol and Betasitosterol of two different bread wheat cultivars (Yunus and Osmaniyem) in the greenhouse conditions was investigated.

LITERATURE REVIEW

Phytosterols by inhibiting the absorption of cholesterol in the intestine, blood, and LDL (low-density protein) cholesterol levels have a lowering effect (Taşan et al., 2006). Jones et al. (2000) reported that sterols reduce serum cholesterol and LDL cholesterol levels.

Ye et al. (2010) reported that β-sitosterol is effective against carcinogenesis (cancer cell), prostate cancer, and colon cancer in their research on the production of herbal medicine from β-sitosterol. Similarly, Yamaya et al. (2007) reported that β-Sitosterol has anti-cancer effect and this is important for human health.

Karaoğlu and Kotancılar (2001) reported that dietary fiber in cereal products reduces the risk of cancer in the digestive tract and that cereals have positive effects on blood cholesterol levels and coronary heart disorders.

When the effects of daily use of phytosterols on human health are examined, interesting results are obtained. Some studies have shown that cholesterol decreases in both men and women when sterol ester (a mixture of campestanol and sitostanol) margarines are used for at least one year (Piironen and Lampi, 2004). Sterols cannot be synthesized in the human body (Mathur, 2012), and the sterols used in nutrition are gaining increasing attention recently due to their relationship with public health (Yücel, 2006).

In some studies, the amount of phytosterol to be taken daily at least 186-310 mg /day (Nurmi et al., 2008), 150-400 mg /day (Cantrill, 2008) and 150-440 mg /day (Koschutnig et al., 2010).

Cereals are generally described as a good source of sterol (Dutta, 2003). Phytosterol and especially phytosterol, which are the most valuable human compounds in terms of human health, are understood to have significant potential in the formation of a healthy diet in whole grain flours and various cereal fractions (embryo, bran) (Taşan, 2008).

On some cereal products, Normen et al. (2002), in general, the distribution of phytosterol was reported to be β-sitosterol 62%, Campesterol 21%, Stigmasterol 4%, β-sitostanol 4% and Campestanol 2%.

Tosun et al., 2019, grain Campesterol, Stigmasterol and Betasitosterol concentrations of 20 different bread wheat cultivars were determined and the relationships between phytosterols and grain mineral nutrients were identified. Correlations analysis revealed that Campesterol had significant positive correlations with nitrogen (r=0.356**) and manganese (r=0.327*) and significant negative correlations with calcium (r= -0.432**) and zinc (r= -0.424**). Stigmasterol had significant negative correlations with calcium (r= -0.291*) and zinc (r= -0.466**) and significant positive correlations with manganese (r=0.256*). Betasitosterol had significant positive correlations with nitrogen (0.342**) and manganese (0.323*) and significant negative correlations with calcium (-0.387**), zinc (-0.468**) and phosphorus (-0.284*).

METHODOLOGICAL ASPECTS AND RESULTS

Methodological Aspects

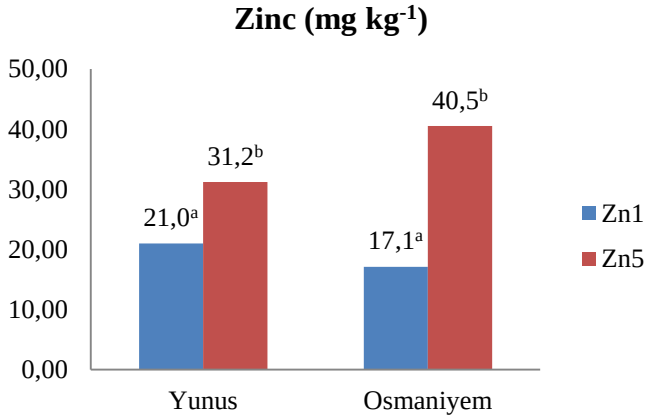
Yunus and Osmaniyem bread wheat varieties were used in the experiment carried out under greenhouse conditions. In the experiment, which was carried out in 4 replications according to randomized plot design, a soil was used with clay texture, low amount of ornate substance (0.12%), alkali character (pH: 8.82), very calcareous (17.8%) and low level of useful Zn concentration (0.11 mg Zn kg^{-1}). As a basic fertilizer for the establishment of the experiment in all pots 300 mg kg^{-1} N (in the form of Ca $(NO_3)_2.4H_2O$), 100 mg kg^{-1} P (in the form of KH_2PO_4), 50 mg kg^{-1} S (in the form of $CaSO_4.2H_2O$) and 2.5 mg kg^{-1} Fe (Fe-EDTA form) was

applied to the soil by mixing as a solution. Zinc doses were given 1 mg kg^{-1} Zn (Zn1) for low (control) Zn applications and 5 mg kg^{-1} Zn (Zn5) ($ZnSO_4.7H_2O$ form) for high Zn applications. Water requirement of the plants was made with pure water until harvest time and with a moisture content close to the field capacity (around 70%). Plants were harvested at the end of the ripening spike. The harvested grain samples were burned in the microwave device according to wet burning method (Kaçar and İnal, 2008) and Zn concentrations were determined in ICP-OES (Inductively coupled plasma optical emission spectrometer) device (Kaçar and İnal, 2008). The phytosterol compositions (Campesterol, Stigmasterol and Betasitosterol) found in the grains of the varieties used in the research were analyzed using the method of "994.10 (AOAC, 2000), Gas Chromatography-Mass Spectrometer (GC-). MS). The effects of zinc application on the grain Zn, Campesterol, Stigmasterol and Betasitosterol concentrations of the plants were determined to be statistically significant by one-way analysis of variance (ANOVA) test. The effects of the doses were subjected to the DUNCAN multiple comparison test. SPSS 21.0 package program was used for statistical analysis.

Results

It was observed that there were statistically significant ($p < 0.01$) increases in grain Zn concentrations of both Yunus and Osmaniyem cultivars with zinc application. While the Zn concentration was 21.0 mg kg^{-1} in the control (Zn 1) application of the dolphin cultivar, Zn concentration increased to 31.2 mg kg^{-1} in Zn 5 application. In the Osmaniyem cultivar, Zn concentration increased from 17.1 mg kg^{-1} in Zn 1 application to 40.5 mg kg^{-1} in Zn 5 application. With zinc application, concentration increase of 48.5% in the Yunus cultivar and 136.8% in Osmaniyem cultivar occurred (Figure 1).

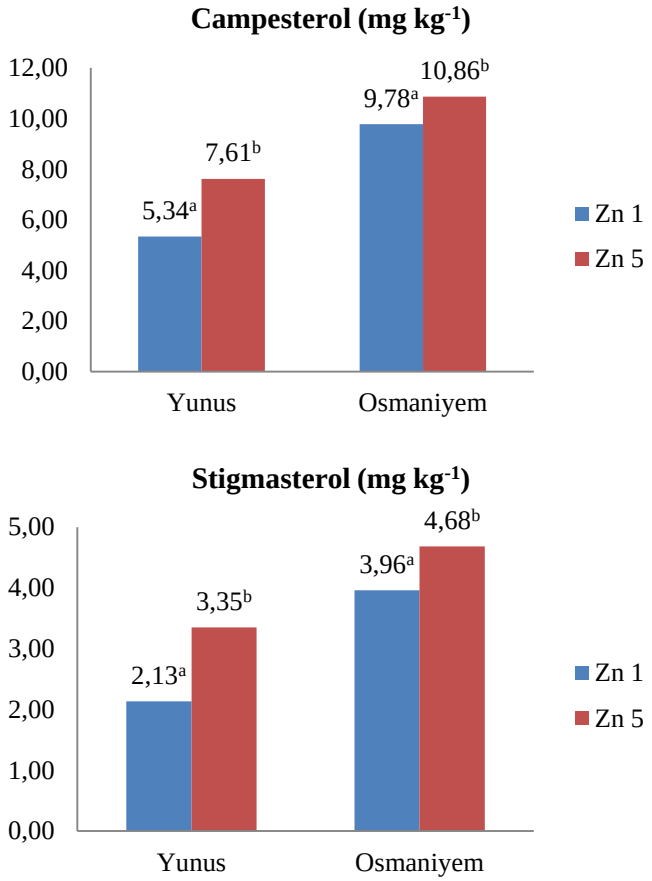
Figure 1: Effect of zinc applications on grain zinc concentrations

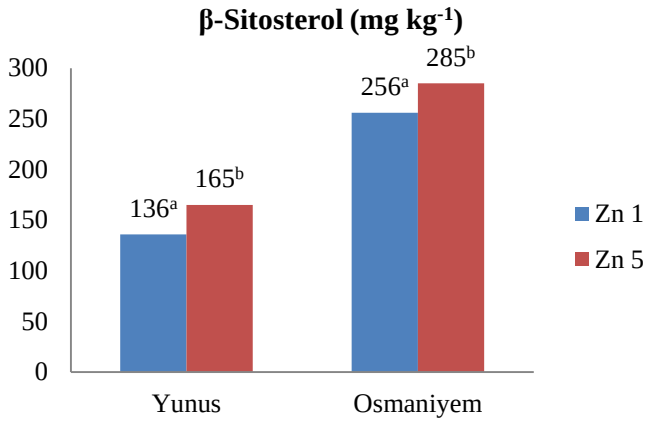


It was found that Zn applied at different doses compared to the control application doses from the soil at four different locations under field conditions led to increases in grain yield of paddy which ranged from 12% to 180% (Slaton et al., 2005). Yılmaz et al. (1997) reported an output of 34 mg kg^{-1} Zn concentration for the application in the field conditions of wheat plants from the soil and leaves with a control condition of 9 mg kg^{-1} grain Zn concentration.

Similar to the increase in Zn concentration in the grains of Yunus and Osmaniyem wheat varieties with Zinc application, Campesterol, Stigmasterol and Betasitosterol concentrations of all cultivars were also increased statistically significant ($p < 0.01$ and $p < 0.05$) (Figure 2). The concentration of Campesterol of Yunus Cultivar was 5.34 mg kg^{-1} under Zn 1 dose conditions and 7.61 mg kg^{-1} under Zn5 conditions (42.5% increase), Stigmasterol concentration was 2.13 mg kg^{-1} in Zn 1 dose and 3.35 mg kg^{-1} in Zn 5 dose. a (57% increase), Zn 1 dose of Betasitosterol concentration was 136 mg kg-1, while the dose of Zn 5 was 165 mg kg^{-1} (21% increase). Similarly, the Campesterol concentration of Osmaniyem cultivar was 9.78 mg kg^{-1} under Zn 1 conditions and 10.86 mg kg^{-1} under Zn 5 conditions (11% increase), Stigmasterol concentration was 3.96 mg kg^{-1} in Zn 1 dose and 4.68 mg kg^{-1} in Zn 5 dose (18% increase), while the concentration of Betasitosterol in Zn 1 dose was 256 mg kg^{-1}, Zn 5 dose with 285 mg kg^{-1} was seen to increase (11%) (Figure 2).

Figure 2: Effect of zinc applications on grain Campesterol, Stigmasterol and Betasitosterol concentrations.





The most important function of zinc in the plant is the direct involvement in protein synthesis and the role of more than 300 enzymes directly or indirectly. Zinc is especially involved in the structure of the hormone auxinin (IAA) in the plant, and therefore, the growth points of the plants require a high level of Zn (Marschner, 1995; Çakmak, 2000). Plant sterols are an important component of the interaction between the free hydroxyl group protein and phospholipids. Sterols participate in the control of cell membrane-bound metabolic processes involving the action of several specific sterols. Sterols also play an important role in cell and growth processes in plants as precursors for brassinosteroids (Piironen et al., 2000). Betasitosterols, a fraction of sterols, have been reported to strengthen plant membranes and regulate the water permeability of the phospholipid double layer in the cell membrane (Ness, 2003; Schaller, 2004; Banas et al., 2005). In addition, Lindsey et al. (2003) reported that there is a relationship between plant hormones and sterol synthesis. As it can be seen from the literature, it is thought that there is a relationship between Zn and plant sterols because zinc is involved in important metabolic events such as the integrity of the hormone auxinin (IAA) and the integrity of phospholipid and sulfhydryl membranes and plant sterols are included in similar components. Because the increase in the concentration of Campesterol, Stigmasterol and Betasitosterol in parallel with the increase of grain Zn by soil and leaf application of Zn confirms this thesis.

CONCLUDING REMARKS

In recent years, scientific studies have clearly demonstrated the relationship between balanced nutrition, diet and diseases, and epidemiological studies point to the role of diet in the prevention of chronic diseases. Changing nutritional habits to consume more fruits, vegetables and cereals is an effective and practical approach to the prevention of chronic diseases. With such an approach, it is emphasized that the number of cancer cases in the USA can be reduced by one third. Today, there are not many studies about the relationship between plant sterols and plant nutrients. According to the results, it has been found out that zinc element may be related to synthesis of Campesterol, Stigmasterol and Betasitosterol. The data obtained will contribute to the basic knowledge needed for further research on the genetic and biochemical basis of the relationship between plant sterols and nutrients.

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Some Quality Parameters of Buffalo Milk and Dairy Products Produced in Cukurova Region

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ABSTRACT

In this study, 15 buffalo milk sample, 20 buffalo yogurt sample, 20 buffalo cream sample, 10 buffalo White cheese sample and 10 buffalo Tulum cheese sample were collected from local markets in Cukurova region and some chemical and physical analyses were performed on these samples. As a result of these analyses; the average composition of buffalo milk was found as; 16.90±0.88% dry matter content, 7.30±0.56% fat content, 4.36±0.48% protein content, 0.53±0.08% ash content, 1.032±0.002 g/cm^3 density, 6.63±0.13 pH value and 0.20±0.01% titratable acidity. The average analyses results of buffalo yogurt were found as; 19.36±1.34% dry matter content, 6.54±1.02% fat content, 0.64±0.06% total nitrogen content, 4.09±0.42% protein content, 1.36±0.50% ash content, 15.57±3.13 ppm acetaldehyde content, 0.025±0.008 mg/g tyrosine content, 11.93±3.32% whey separation, 59.95±22.17 10^{-1}mm curd firmness, 4.20±0.09 pH value and 1.38±0.15% titratable acidity. The average analyses results of buffalo cream were found as; 85.31±0.82% dry matter content, 78.00±0.75% fat content, 4.01±0.05% protein content, 0.43±0.09% ash content, 58.70±9.21 10^{-1}mm curd firmness, 4.55±0.08 pH value and 0.15±0.16% titratable acidity. The average analyses results of buffalo White cheese and Tulum cheese were found as; 42.86±2.07% and 65.56±3.28% dry matter content, 19.85±3.70% and 36.2±2.39% fat content, 2.88±0.30% and 2.46±0.21% total nitrogen content, 18.40±1.95% and 15.71±1.34% protein content, 3.88±0.61% and 3.52±0.32% ash content, 0.57±0.13% and 0.64±0.04% salt content, 1.33±0.28% and 0.98±0.05% salt in dry matter content, 0.16±0.06% and 0.15±0.01% water soluble nitrogen (WSN) content, 5.48±2.17% and 6.00±0.64% ripening degree, 0.04±0.03% and 0.05±0.02% trichloro acetic acid (TCA)-soluble nitrogen, 0.11±0.11% and 0.13±0.13% phosphotungstic acid (PTA) soluble nitrogen, 97.20±31.05 10^{-1}mm and 16.4±5.79 10^{-1}mm curd firmness, 5.88±0.18 and 5.19±0.20 pH value and 0.32±0.09% and 0.68±0.11% titratable acidity, respectively. As a result of this study is aimed to contribute to the literature in order to eliminate the existing information about buffalo milk products.

Keywords: Buffalo Milk, Buffalo Milk Products, Physicochemical Properties.

INTRODUCTION

Anatolian buffaloes (*Bubalus bubalis)* are black in color, mostly domestic animals and are defined as water-dependent. Therefore, it cannot be cultivated in arid climates. Buffalo can be used for plowing and carrying loads, as well as their meat and milk (Aksu et al., 2013). Today, buffalo breeding and buffalo products have an important place in organic animal production and as the demand for organic products increases, these products become reasonable choices for the consumer (Atasever and Erdem, 2008; Şahin and Yıldırım, 2012).

The average of obtained milk amount from an Anatolian water buffalo is annually 800-900 kg (Adam, 1975; Borghese, 2012). The fat, protein and dry matter content of water buffalo milk is quietly high. Water buffalo milk contains 40-60 % more protein, fat and calcium, 18 % more dry matter than cow milk. Water buffalo milk has the greatest fat amount between all milk types. Clot firmness of water buffalo milk is 1.5 times greater than cow milk (Khan and Iqbal, 2009). Furthermore, tocopherol amount which is a natural antioxidant and peroxidase activity of water buffalo milk are 2-4 times greater than cow milk. It is more resistant to oxidative changes than cow milk (Aksu et al, 2013). Because of these properties of water buffalo milk, it can be preferred to use in making of dairy products such as yogurt, butter, cheese and ice cream (Adam, 1975; Okur, 2014).

Water buffalo yogurt is the product which reflects the characteristic properties of water buffalo milk ideally. In water buffalo yogurt production there is no requirement of enrichment or thickener addition process to develop consistency because of high dry matter content of water buffalo milk (Akgün and Yazıcı, 2010; Nguyen et al, 2014a). Water buffalo milk or ewe milk which have high dry matter content were generally used in production of traditional yogurts because of yogurt skimmings amount importance. However, because of cow milk using is more than other milks, it has become inevitable to use of cow milk in yogurt production recently (Yıldırım and Yıldırım, 2010).

The most popular product which is produced by using water buffalo milk in various regions is water buffalo cream (Soysal et al, 2013). According to Turkish Food Codex of Cream notification, buffalo cream is defined as a product which is obtained by boiling of water buffalo milk at 92°C, holding at this temperature at least for two minutes and cooling appropriately to technique (Anon, 2003). Water buffalo milk is the most suitable milk type to make cream because of its high fat and dry matter contents (Şahan et al, 2004). However nowadays, because of insufficiency of water buffalo breeding in our country, cow milk can also be used in cream production (Dereli and Şevik, 2011).

Water buffalo milk is generally used in making of soft cheeses. The water buffalo milk coagulation time which is carried out after addition of rennet enzyme in the cheese production is shorter than cow milk coagulation time, because of including more calcium content of water buffalo milk than cow milk. However, maturation time of cheeses produced by water buffalo milk is longer than maturation time of cheeses produced by cow milk. Moisture retention of water buffalo cheeses is less and acid formation is slow in these cheeses. For this reason, maturation rate of them is slow. When maturation time of cow cheeses is approximately 45

days, it is 60 days in cheeses which are produced by water buffalo milk (Adam, 1975; Ulutürk, 2009; Okur, 2014).

According to the Turkey Statistical Institute data, the total number of buffaloes in Turkey was 178397 in 2018. The total amount of milk obtained from these buffaloes throughout the country was 75742 tons. The Mediterranean region is the region where buffalo milk production and buffalo milk production are least performed. Therefore, buffalo milk is not easily accessible especially in cities such as Adana and Mersin in the Çukurova region. When the 2018 regional statistics data are analyzed; It was determined that there were 390 buffaloes in Adana and 71 buffaloes in Mersin, 127 tons of buffalo milk was obtained from these buffaloes in Adana and 33 tons of buffalo milk in Mersin (TÜİK, 2019).

Buffalo milk and its products are very valuable in our country due to the limited production amount. It is an important type of milk due to the high nutritional value of buffalo milk and the wide range of areas it can be used in the dairy industry. Especially in the Çukurova region, the production of buffalo milk and products is carried out by very few family businesses and the number of products on the market is quite low. In this research, it was aimed to determine some physical and chemical properties of buffalo milk, buffalo yogurt, buffalo cream, buffalo White cheese and buffalo Tulum cheese samples which were collected from Çukurova local markets. Comprehensive information on the composition and other properties of these products has not been reached in the literature. There is no data on the product features offered for sale especially in Çukurova region.

MATERIAL AND METHODS

Materials

15 samples of raw buffalo milk, 20 samples of buffalo yogurt, 20 samples of buffalo cream, 10 samples of White buffalo cheese and 10 samples of buffalo Tulum cheese for the study were collected from local producers in Mersin and Adana in Çukurova Region. Samples were brought to Çukurova University, Faculty of Agriculture, Department of Food Engineering, Milk Technology Laboratory and some compositional properties were examined.

Methods

pH value: The pH values of buffalo milk product samples were determined with the use of Testo 230 brand pH meter (Cemeroğlu, 1992).

Titratable acidity (T.a): The acidity of the samples was determined according to the alkali titration method and 0.1 N NaOH solution was used as the alkali. The results are given in terms of % lactic acid (TSE, 2002).

Dry matter content (D.m): The amount of dry matter was determined gravimetrically by drying the samples at 100℃ until constant weighing (IDF, 2005).

Fat content: Fat ratios of the samples were determined according to Gerber method (TSE, 2002).

Protein content: Micro Kjeldahl method was used for protein content analysis and total nitrogen amounts were multiplied by factor 6.38 (IDF, 2014).

Density: Densities of milk samples were determined using lactodensimeter (Oysun, 2011).

Ash content: The percentage of ash content was calculated after about 5 gram of samples were weighed in the porcelain crucibles which were drying in the drying oven and cooling in the desiccator before and burning the samples at 550℃, cooling in the desiccator and weighing (Kurt et al., 2007).

Salt content: Determination of salt in cheese samples was determined according to Mohr titration method (TOKB, 1983).

Acetaldehyde content: It was determined iodimetrically according to the method specified by Less and Jago (1969).

Tyrosine content: Spectrophotometrically determined according to Hull (1947).

Whey separation: 25 grams of sample were taken onto coarse filter papers and allowed to filter for 120 min at 4 ± 1ºC. The amount of serum obtained was weighed and the amount of serum separation calculated (Tamime et al., 1996).

Curd firmness (CF): Measurements were performed with the help of SUR BERLIN PNR 6 penetrometer at 3 ± 1ºC and the results were given in 1/10 mm of penetration depth of the penetrometer head in 10 seconds (Alagöz, 1992).

Water soluble nitrogen content (WSN) and ripening degree: Water-soluble nitrogen content and ripening degree of cheeses were determined according to the method defined by Kuchroo and Fox (1982) and Hayaloğlu (2003).

12% Trichloro acetic acid (TCA)-soluble nitrogen: TCA-soluble nitrogen of cheeses was determined according to the method defined by (Polychroniadou et al., 1999).

5% Phosphotungstic acid (PTA) soluble nitrogen: PTA-soluble nitrogen of cheeses was determined according to the method defined by (Jarrett et al., 1982).

RESULTS AND DISCUSSION

In this section, the results obtained from the analysis of buffalo milk, yogurt, cream, White cheese and Tulum cheese samples were interpreted by comparing them with the values reported in the literature.

pH value, titratable acidity, dry matter content, fat content, protein content, ash content and density analysis were performed for buffalo milk samples obtained from Çukurova region. As a result of the research, the data on the composition properties of buffalo milk samples are given in Table 1.

The yield and composition characteristics of buffalo milk and milk products can be affected by some environmental factors. These factors may be; genotype, lactation period, calving year and season, number of births, feeding level and quality (Şahin and Ulutaş, 2014; Akın et al., 2016; Şekerden, 2016).

Table 1: Some properties of buffalo milk samples obtained from Cukurova region (n=3)

Milk	pH	T.a (%)	D.m (%)	Fat (%)	Protein (%)	Density (g/cm^3)	Ash (%)
1	6.71	0.22	16.54	6.50	4.82	1.035	0.58
2	6.62	0.18	15.46	7.50	4.23	1.035	0.51
3	6.70	0.18	17.20	8.00	3.36	1.033	0.42
4	6.68	0.19	17.36	7.50	4.35	1.028	0.46
5	6.50	0.20	16.84	7.50	4.5	1.033	0.52
6	6.67	0.21	16.96	8.00	4.63	1.035	0.58
7	6.63	0.20	17.20	6.50	3.25	1.034	0.63
8	6.64	0.20	18.00	7.00	4.31	1.029	0.48
9	6.72	0.20	18.31	7.00	4.46	1.030	0.47
10	6.54	0.18	15.69	7.00	4.72	1.035	0.66
11	6.62	0.18	15.87	6.50	4.87	1.032	0.59
12	6.23	0.20	16.02	7.50	4.61	1.032	0.61
13	6.85	0.22	18.30	7.00	4.23	1.035	0.60
14	6.74	0.23	16.95	8.00	4.29	1.033	0.40
15	6.62	0.21	16.87	8.00	4.80	1.034	0.47
Av.	**6.63±0.14**	**0.20±0.02**	**16.90±0.89**	**7.30±0.56**	**4.36±0.48**	**1.030±0.00**	**0.53±0.08**

As a result of the pH value analysis, the minimum value was determined as 6.23 while maximum was 6.74. The Turkish Food Codex Communiqué on Raw and Heat Treated Drinking Milk does not specify any criteria for the pH value of buffalo milk. Some researchers determined pH values of buffalo milk as 6.81 (Ahmad et al., 2008), 6.58-6.78 (Kashwa, 2016), 6.76-6.91 (Han et al., 2012), 6.73 (Sales et al., 2018), 6.48 (Thakur et al., 2018) and 6.71-6.81 (Uttamrao et al., 2019). Buffalo milk obtained from Cukurova region has lower pH value in comparison with many researchers' findings except for Kashwa (2016) and Thakur et al. (2018). The reason of that may be environmental conditions in Çukurova region.

Average titratable acidity of buffalo milk samples was found as 0.20%. The Turkish Food Codex Communiqué on Raw and Heat Treated Drinking Milk states that titratable acidity of buffalo milk should be between 0.14-0.22% (Anon., 2000). The result is appropriate to this statement. Some researchers found titratable acidity values of buffalo milk samples as 0.16% (Khan et al., 2007), 0.14-0.20% (Şekerden and Avşar, 2008), 0.13% (Prajapati et al., 2017), 0.15% (Sales et al., 2018) and 0.14% (Singh et al., 2018). All these values were similar with the obtained result.

The total dry matter content of buffalo milk samples was found between 15.46% and 18.31%. The Turkish Food Codex Communiqué on Raw and Heat Treated Drinking Milk does not provide a direct value for the dry matter values of buffalo milk. Dry matter contents of buffalo milk samples were determined by many researchers such as 17.35% (Choudhary et al., 2017), 15.9% (Chaudhary et al., 2017), 11.45-18.52% (Uttamrao et al., 2019), 16.1% (Çınar et al., 2019), 13.70-15.46% (El-Loly et al., 2019) and 11.91% (Fangmeier et al., 2019). The result obtained from the research is very close to the results obtained by other researchers.

The average fat content of buffalo milk samples was determined as 7.30%. The Turkish Food Codex Communiqué on Raw and Heat Treated Drinking Milk states that the amount of buffalo milk fat should be at least 7.00% (Anon., 2000). It was determined that the fat content of buffalo milk samples obtained from Cukurova region was suitable for the statement. Some researchers found the fat content of buffalo milk samples as 7.56% (Choudhary et al., 2017), 6.45% (Chaudhary et al., 2017), 7.70% (Manvelion et al., 2017), 6.1% (Aggerwal et al., 2019), 6.96% (Çınar et al., 2019) and 5.60% (Fangmeier et al., 2019). These values showed that buffalo milks from Çukurova region had higher fat content than some buffalo milks from India (Anand and Karnal), Brasil and some provinces of Turkey such as Afyonkarahisar, Balıkesir, Diyarbakır, İstanbul, Kayseri and Samsun. This difference may be related with environmental conditions such as session or temperature.

Buffalo milk samples' average protein content was 4.36%. The Turkish Food Codex Communiqué on Raw and Heat Treated Drinking Milk states that the protein content of buffalo milk should be at least 5.5% (Anon., 2000). The result obtained from the research was lower than the value stated by Food Codex. It is reported that protein ratios in buffalo milk vary according to species, pregnancy status, seasons, lactation stages and breast structure (Boro et al., 2018). Other researchers determined the protein content of buffalo milk samples as 4.34% (Choudhary et al., 2017), 3.77% (Chaudhary et al., 2017), 4.76% (Manvelion et al., 2017), 4.34% (Aggerwal et al., 2019), 4.88 % (Uttamrao et al., 2019), 3.48% (Çınar et al., 2019), 3.01-3.97% (El-Loly et al., 2019) and 4.30% (Fangmeier et al., 2019). These values were found close to obtained result.

The average density of buffalo milk samples obtained from Çukurova region was found as 1.030 g/ml. In the Turkish Food Codex Communiqué on Raw and Heat Treated Drinking Milk, the density of buffalo milk is stated as 1.028 g/ml (Anon., 2000). This value was found close to obtained result. Some researchers determined the density of buffalo milk samples as 1.029-1.030 g/ml (Şahin et al., 2014), 1.032 g/cm^3 (Prajapati et al., 2017) and 1.032 g/ml (Sales et al., 2018). These values were also found close to obtained results.

Buffalo milk samples obtained from Çukurova region had ash content 0.53% on average. In the Turkish Food Codex Communiqué on Raw and Heat Treated Drinking Milk, no value regarding the ash values of buffalo milk was reported. Some other researchers determined the ash contents of buffalo milk samples as 0.82% (Choudhary et al., 2017), 0.70% (Chaudhary et al., 2017), 0.68% (Aggerwal et al., 2019), 0.78-1.60% (Uttamrao et al., 2019), 0.66-0.85% (El-Loly et al., 2019) and 0.95% (Fangmeier et al., 2019). All these values were higher than the obtained result. The amount of ash represents the total amount of minerals present in milk samples and the major components in the ash content, including oxide and chloride of mineral elements (Viorica, 2017). It was concluded that the mineral content of buffalo milk samples from Çukurova region was lower than the other regions' milk samples.

Some properties of buffalo yogurt samples obtained from Cukurova region were given at Table 2. These properties were pH value, titratable acidity, dry matter, fat, nitrogen, protein, ash, acetaldehyde, tyrosine contents, whey separation and curd firmness values.

Table 2: Some properties of buffalo yogurt samples obtained from Cukurova region (n=3)

Yogurt	pH	T.a (%)	D.m (%)	Fat (%)	Nitrogen (%)	Protein (%)	Ash (%)	Acetaldehyde (ppm)	Tyrosine (mg/g)	Whey separation (%)	C.F (10^{-1}mm)
1	4.01	1.16	17.36	6.40	0.58	3.69	0.90	10.45	0.02	18.25	46.00
2	4.23	1.19	18.20	7.80	0.52	3.30	0.99	21.01	0.02	8.46	41.00
3	4.19	1.27	17.56	8.00	0.72	4.60	0.96	12.98	0.02	10.72	21.00
4	4.26	1.27	20.45	7.60	0.65	4.13	0.80	12.76	0.02	14.52	73.00
5	4.24	1.37	21.00	6.20	0.64	4.06	1.17	20.02	0.02	13.24	51.00
6	4.18	1.31	19.45	8.00	0.63	4.04	2.63	17.71	0.02	15.76	86.00
7	4.02	1.64	19.63	4.80	0.60	3.80	1.16	11.00	0.06	12.12	42.00
8	4.29	1.42	20.65	7.40	0.68	4.31	1.23	10.89	0.03	17.32	101.00
9	4.27	1.71	21.25	6.00	0.75	4.76	1.33	16.61	0.03	10.88	100.00
10	4.28	1.68	20.45	4.20	0.78	5.01	1.41	16.06	0.03	12.60	27.00
11	4.27	1.32	18.36	5.60	0.63	4.00	0.99	15.95	0.03	4.96	54.00
12	4.20	1.34	17.85	7.20	0.61	3.92	1.02	13.53	0.03	7.84	41.00
13	4.00	1.24	17.64	6.60	0.67	4.29	1.65	16.94	0.03	9.56	60.00
14	4.19	1.32	18.45	6.80	0.56	3.55	1.37	14.30	0.03	10.24	56.00
15	4.19	1.42	20.95	7.00	0.70	4.47	0.88	16.94	0.02	12.65	81.00
16	4.30	1.48	21.07	6.40	0.61	3.86	1.46	20.35	0.02	8.47	63.00
17	4.26	1.30	19.45	5.80	0.67	4.26	1.65	14.74	0.03	11.54	58.00
18	4.19	1.49	19.04	5.80	0.56	3.55	2.42	19.03	0.02	13.98	46.00
19	4.21	1.38	20.45	7.00	0.67	4.26	2.11	16.06	0.03	15.02	70.00
20	4.20	1.37	18.04	6.20	0.64	4.10	1.25	14.08	0.03	10.47	82.00
Av.	**4.20 ±0.09**	**1.38 ±0.15**	**19.37 ±1.35**	**6.54 ±1.02**	**0.64 ±0.07**	**4.10 ±0.42**	**1.37 ±0.51**	**15.57 ±3.13**	**0.03 ±0.01**	**11.93 ±3.32**	**59.95 ±22.18**

The average pH value of buffalo yogurt samples obtained from Çukurova region were determined as 4.20. Some researchers determined pH values of buffalo yogurt samples as 3.68-4.42 (Ismail et al., 2017), 4.49-4.78 (Ghoneem et al., 2018) and 4.32 (Yadav et al., 2018). These values were generally close to obtained result. However, the obtained result was lower than the results stated by Ghoonem et al. (2018). The reason of this situation could be environmental factors and buffalo milk used as raw material compositions.

As a result of the buffalo yogurt analysis, the average titratable acidity of samples was found 1.38%. Some values were determined by other researchers about titratable acidities of buffalo yogurt samples such as 0.20-1.00% (Nguyen et al., 2014b), 0.88-1.03% (Akgün et al., 2016), 1.48-1.99% (Ismail et al., 2017), 1.00-1.13% (Al-Manhel and Niamah, 2017) and 0.68-1.05% (Ghoneem et al., 2018). The obtained results were found close to other researchers' findings.

Buffalo yogurt samples obtained from Çukurova region had 19.37% dry matter content on average. Other researchers stated the content of dry matter of buffalo yogurt samples as 17.87% (Erkaya and Şengül, 2011), 23.6% (Bezerra et al., 2012), 17.70-18.01% (Ghoneem et al., 2018), 13.11-14.11% (Yadav et al., 2018) and 14.91-16.61% (El-Shibiny et al., 2018). According to these findings, buffalo yogurt samples from Çukurova region had generally higher dry matter content of other samples except for the value stated by Bezerra et al. (2012).

The average fat content of buffalo yogurt samples was found as 6.54% while some researchers determined this value as 8.40% (Erkaya and Şengül, 2011), 6.1% (Bezerra et al., 2012), 7.1-7.2% (Ghoneem et al., 2018), 3.25% (Yadav et al., 2018) and 3.5-5.9% (El-Shibiny et al., 2018). The obtained result of fat content was found lower than Erkaya and Şengül (2011) and Ghoneem et al. (2018), higher than Yadav et al. (2018) and El-Shibiny et al. (2018) and close to Bezerra et al. (2012). These differences might be based on production methods of yogurt samples.

The protein content of buffalo yogurt samples was found by using nitrogen content value. At this research, the average nitrogen content was 0.64% and protein content was 4.10%. The nitrogen content of buffalo yogurt was stated as 0.68-0.73% by El-Shibiny et al. (2018). Some researchers stated the protein content of buffalo yogurt samples as 4.67% (Erkaya and Şengül, 2011), 3.1% (Bezerra et al., 2012) and 3.98-4.30% (Yadav et al., 2018). These findings were generally found close to obtained results of nitrogen and protein content.

The average ash content of buffalo yogurt samples was found as 1.37%. Some researchers defined this value as 0.87% (Erkaya and Şengül, 2011), 0.7% (Bezerra et al., 2012), 1.14-1.17% (Ghoneem et al., 2018), 0.81-0.92% (Yadav et al., 2018) and 0.74-1.17% (El-Shibiny et al., 2018). According to these findings, it was concluded that the mineral composition of buffalo yogurt samples from Çukurova region was higher than other researchers' findings.

Acetaldehyde content of buffalo yogurt samples was determined as 15.57 ppm on average. It was stated by other researchers as 28.4-34.6 ppm (Vijayendra and Gupta, 2013), 27.5-33.2 ppm (Vijayendra and Gupta, 2014) and 13.4-25.9 ppm (El-Shibiny et al., 2018). The

obtained result was lower than other researchers' findings. Therefore, it was concluded that yogurt samples had less yogurt flavor.

The average tyrosine content of buffalo yogurt samples was 0.03 mg/g. This value was stated by other researchers as 0.36-0.46 mg/g (Vijayendra and Gupta, 2013), 0.3-0.4 mg/g (Vijayendra and Gupta, 2014) and 0.34% (Ghoneem et al., 2018). Determination of tyrosine is used to determine the amount of amino acid released as a result of proteolysis caused by yoghurt cultures (Şahan et al., 2004). This result showed that proteolytic activity of buffalo yogurt samples from Çukurova region was lower.

The amount of whey separation of buffalo yogurt samples was found 11.93% on average while other researchers found it as 20.2% (Bezerra et al., 2012), 14.00-18.00% (Nguyen et al., 2014b) and 28.50-45.33% (Akgün et al., 2016). This value was lower than other researchers' findings and it showed that the curd quality of buffalo yogurts in Cukurova region was higher.

The average curd firmness value of buffalo yogurt samples was determined as 59.95 10^{-1} mm while other researchers stated it as 45.00-75.00 g force (Nguyen et al., 2014b) and 55.00-70.00 g force (Nguyen et al., 2014c). These findings were found close to obtained result.

Table 3: Some properties of buffalo cream samples from Cukurova region (n=3)

Cream	pH	T.a (%)	D.m (%)	Fat (%)	Protein (%)	C.F (10^{-1}mm)	Ash (%)
1	4.42	0.09	85.98	78.61	4.05	56.00	0.41
2	4.56	0.08	86.46	79.05	4.07	50.00	0.31
3	4.52	0.08	84.55	77.30	3.96	48.00	0.30
4	4.55	0.10	84.36	77.13	3.95	62.00	0.51
5	4.55	0.13	85.12	77.82	4.00	59.00	0.49
6	4.41	0.10	85.65	78.31	4.03	57.00	0.44
7	4.46	0.10	84.12	76.91	3.94	69.00	0.41
8	4.62	0.08	86.47	79.06	4.07	60.00	0.38
9	4.52	0.82	85.98	78.61	4.05	80.00	0.28
10	4.58	0.09	85.32	78.01	4.01	70.00	0.60
11	4.62	0.12	86.23	78.84	4.06	42.00	0.52
12	4.61	0.10	84.16	76.95	3.94	64.00	0.43
13	4.57	0.09	84.57	77.32	3.97	53.00	0.46
14	4.70	0.08	84.61	77.36	3.97	51.00	0.48
15	4.68	0.15	85.39	78.07	4.01	49.00	0.39
16	4.50	0.17	86.18	78.79	4.06	71.00	0.38
17	4.56	0.25	85.07	77.78	3.99	53.00	0.43
18	4.48	0.13	85.31	78.00	4.01	60.00	0.37
19	4.45	0.10	86.43	79.02	4.07	64.00	0.51
20	4.60	0.14	84.30	77.07	3.95	56.00	0.63
Av.	**4.55±0.08**	**0.15±0.16**	**85.31±0.82**	**78.00±0.75**	**4.01±0.05**	**58.70±9.22**	**0.44±0.09**

At the Table 3, some properties of buffalo cream samples from Cukurova region were given. From the table, it could be seen the average pH value of buffalo cream was found 4.55. It was stated by other researchers as 6.20-7.20 (Akalın et al., 2006), 6.42 (Şenel, 2011) and 6.40-7.20 (Siddique et al., 2011). The pH value of buffalo cream samples obtained from Çukurova region was lower than other researchers' findings. The reason of this situation might be the climatic conditions and storage time of the samples.

The average titratable acidity of buffalo cream samples was determined as 0.15%. Some values were determined by other researchers about titratable acidities of buffalo cream samples such as 0.09-0.20% (Akalın et al., 2006), 0.08% (Şenel, 2011) and 0.4-0.7% (Siddique et al., 2011). These findings were found close to obtained result.

The total dry matter content of buffalo cream samples was 85.31% on average. Other researchers stated the content of dry matter of buffalo cream samples as 67.75% (Akalın et al., 2005), 67.80-77.55% (Akalın et al., 2006), 65.92% (Şenel, 2011), 83.0-89.0% (Siddique et al., 2011) and 87.0% (Parmar and Khamrui, 2017). According to these data, it could be said that buffalo cream samples obtained from Çukurova region was in the group which had higher dry matter contents.

The average fat content of buffalo cream samples was 78.00%. Some researchers stated the fat content of buffalo cream samples as 65.00% (Adam, 1955), 65.34% (Akalın et al., 2005), 63.00-73.75% (Akalın et al., 2006), 55.00-75.00% (Siriken and Erol, 2009) and 58.00% (Şenel, 2011). It could be seen that the fat content of buffalo cream samples obtained from Çukurova region was higher than findings of other researchers.

Buffalo cream samples' protein content was determined as 4.01% on average while other researchers stated it as 0.83-5.90% (İzmen and Eralp, 1967), 3.3% (Yılmaz Baytok, 1999) and 3.50% (Anon., 2005). These findings were found close to obtained result.

The average curd firmness of buffalo cream samples was found 58.70 10^{-1}mm. No studies have been found about curd firmness value of buffalo cream samples or cream samples obtained by other animals. Therefore there has been no opportunity to compare different data.

The ash content of buffalo cream samples was found 0.44% on average. This value was stated by other researchers as 0.50% (Yılmaz Baytok, 1999), 1.77% (Akalın et al., 2005) and 0.40% (Anon., 2005). The ash content of buffalo cream obtained from Çukurova region was lower than finding of Akalın et al. (2005), but it was close to other researchers' findings.

Some properties of buffalo White cheese and Tulum cheese samples obtained from Cukurova region were given at Table 4. These properties were pH value, titratable acidity, dry matter, fat, total nitrogen, protein, ash, salt, salt in dry matter, water soluble nitrogen contents, ripening degree, 12% TCA soluble nitrogen content, 5% PTA soluble nitrogen content and curd firmness values.

Table 4: Some properties of buffalo White cheese and Tulum cheese samples obtained from Cukurova region (n=3)

Properties	Cheeses	1	2	3	4	5	6	7	8	9	10	Average
pH	White	5.64	5.69	6.03	5.59	6.08	5.82	6.07	5.99	5.92	6.00	**5.88±0.18**
	Tulum	4.95	4.99	4.98	5.41	5.44	5.40	5.21	5.34	5.04	5.10	**5.19±0.20**
T.a (%)	White	0.47	0.49	0.32	0.33	0.26	0.27	0.26	0.25	0.27	0.26	**0.32±0.09**
	Tulum	0.85	0.89	0.56	0.56	0.65	0.65	0.69	0.68	0.58	0.69	**0.68±0.11**
D.m (%)	White	42.41	42.14	42.49	43.27	44.02	41.87	41.70	38.93	45.71	46.08	**42.86±2.07**
	Tulum	71.09	68.33	62.39	62.69	65.25	64.25	60.15	68.15	67.13	66.21	**65.56±3.29**
Fat (%)	White	15.50	16.00	23.00	22.00	22.00	22.50	17.00	15.00	20.00	25.50	**19.85±3.70**
	Tulum	35.00	40.00	35.00	40.00	36.00	38.00	36.00	35.00	33.00	34.00	**36.20±2.39**
Total nitrogen (%)	White	3.07	2.75	3.35	3.32	2.94	2.72	2.86	2.80	2.68	2.34	**2.88±0.31**
	Tulum	2.26	2.58	2.17	2.46	2.16	2.55	2.55	2.44	2.77	2.70	**2.46±0.21**
Protein (%)	White	19.56	17.57	21.40	21.19	18.76	17.38	18.27	17.89	17.10	14.90	**18.40±1.95**
	Tulum	14.40	16.45	13.85	15.72	13.75	16.24	16.26	15.60	17.69	17.20	**15.72±1.34**
Ash (%)	White	4.39	4.21	4.63	4.78	3.60	3.30	3.04	3.17	3.83	3.93	**3.89±0.61**
	Tulum	3.23	3.18	3.59	3.77	3.99	4.00	3.15	3.55	3.24	3.51	**3.52±0.32**
Salt (%)	White	0.66	0.68	0.75	0.59	0.61	0.51	0.33	0.40	0.61	0.57	**0.57±0.13**
	Tulum	0.68	0.71	0.60	0.61	0.62	0.65	0.65	0.71	0.60	0.61	**0.64±0.04**
Salt in d.m (%)	White	1.55	1.63	1.77	1.37	1.39	1.21	0.80	1.03	1.34	1.25	**1.33±0.29**
	Tulum	0.96	1.04	0.96	0.97	0.96	1.01	1.08	1.04	0.89	0.92	**0.98±0.06**
WSN (%)	White	0.17	0.21	0.12	0.18	0.10	0.14	0.29	0.11	0.10	0.15	**0.16±0.06**
	Tulum	0.15	0.17	0.15	0.16	0.12	0.13	0.15	0.14	0.15	0.15	**0.15±0.01**
Ripening degree (%)	White	5.51	7.77	3.57	5.35	3.48	5.15	10.25	3.85	3.61	6.30	**5.49±2.18**
	Tulum	6.62	6.65	7.12	6.37	5.73	5.20	5.70	5.56	5.33	5.74	**6.00±0.64**
TCA soluble N (%)	White	0.02	0.03	0.02	0.03	0.08	0.06	0.01	0.02	0.10	0.02	**0.04±0.03**
	Tulum	0.04	0.03	0.04	0.12	0.07	0.04	0.05	0.05	0.07	0.05	**0.05±0.03**
PTA soluble N (%)	White	0.04	0.21	0.20	0.04	0.05	0.39	0.03	0.08	0.05	0.05	**0.11±0.12**
	Tulum	0.09	0.42	0.07	0.34	0.05	0.06	0.06	0.10	0.06	0.10	**0.13±0.13**
Curd firmness (10^{-1}mm)	White	118.00	87.00	172.00	102.00	89.00	75.00	55.00	84.00	94.00	96.00	**97.20±31.06**
	Tulum	15.00	14.00	19.00	23.00	10.00	5.00	16.00	20.00	18.00	24.00	**16.40±5.80**

As a result of the cheese analysis, the average pH value of buffalo White cheese was found as 5.88 and pH value of buffalo Tulum cheese was found 5.19. These values were stated by other researchers as 4.75-6.48 (Abbas et al., 2018), 6.48 (Choudhary et al., 2019), 4.62-4.90 (Gulzar et al., 2019) and 5.32-6.43 (Tirloni et al., 2019). When the results were considered, it was concluded that the pH value interval of buffalo cheeses was wide. Therefore, the pH values of White and Tulum cheeses from Çukurova region were found appropriate according to this interval.

The average titratable acidities of buffalo White and Tulum cheese samples were determined as 0.32% and 0.68%, respectively, while other researchers found this value as 0.31% (Chaudhary et al., 2017), 0.57% (Choudhary et al., 2019) and 0.92-2.32% (Gulzar et al., 2019). These findings were found close to obtained result.

Dry matter contents of buffalo White and Tulum cheese samples obtained from Çukurova region were determined as 42.86% and 65.56% on average, respectively. Some researchers determined dry matter contents of different buffalo cheese samples such as Khoa was 76.84% (Chaudhary et al., 2017), Labneh was 34.33-34.83% (Ismail et al., 2017), Khoa was 76.06% (Choudhary et al., 2019) and Mozzarella was 53.77-55.77% (Gulzar et al., 2019). Khoa is a cheese type which has similar texture with Tulum cheese. According to the results, Tulum cheese had lower dry matter content than Khoa. Dry matter content of White cheese sample was between dry matter contents of Labneh and Mozzarella cheeses. It was an expected result.

Buffalo White cheese samples had 19.85% fat content and buffalo Tulum cheese has 36.20% on average. Some researchers stated the fat content of different buffalo cheese samples as 16.6% (Ismail et al., 2017) for Labneh, 31.50% (Chaudhary et al., 2017) for Khoa, 35.24% (Aggerwal et al., 2019) for Khoa, 35.13% (Choudhary et al., 2019) for Khoa and 22.00-22.46% (Gulzar et al., 2019) for Mozzarella. The fat contents of buffalo Tulum cheese and Khoa were found similar. Mozzarella cheese had higher fat content than White cheese while Labneh had lower, as it was expected.

The average total nitrogen contents of buffalo White and Tulum cheeses were found 2.88% and 2.46% respectively. Consequently, the average protein contents of buffalo White and Tulum cheeses were calculated as 18.40% and 15.72%, respectively. Some values were determined by other researchers about protein contents of different buffalo cheese samples such as 20.68% (Chaudhary et al., 2017) for Khoa, 17.60 % (Aggerwal et al., 2019) for Khoa, 17.56% (Choudhary et al., 2019) for Khoa and 25.10-25.26% (Gulzar et al., 2019) for Mozzarella. According to these data, the protein content of cheeses which were obtained from Çukurova region was lower when they were compared with the literature.

The average ash contents of buffalo White and Tulum cheeses were determined as 3.89% and 3.52%, respectively, while other researchers stated ash contents of different cheese types as 1.87% (Ismail et al., 2017) for Labneh, 3.54% (Chaudhary et al., 2017), 2.74% (Aggerwal et al., 2019), 2.74% (Choudhary et al., 2019) and 2.32-2.33% (Gulzar et al., 2019)

for Khoa. It was possible to say that depending on the ash content, the mineral contents of White and Tulum cheeses were higher when they were compared with the literature.

Salt contents of buffalo White and Tulum cheese samples obtained from Çukurova region were determined as 0.57% and 0.64%, respectively. Salt in dry matter contents were calculated depending on salt contents and dry matter contents of the samples. The average salt in dry matter contents of buffalo White and Tulum cheeses were 1.33% and 0.98%, respectively. Some researchers stated the salt content of different buffalo cheese samples as 2.7-2.9% (Kumar et al., 2014) for Feta cheese, 0.45-1.84% (Murtaza et al., 2014) for Cheddar, 1.86-1.92% (Murtaza et al., 2017) for Cheddar and 2.00% (Al-Mosway, 2018) for White Iraqi cheese. According to these data, it was possible to conclude that the salt content of White and Tulum cheeses supplied from Çukurova region were lower than other researchers' findings.

WSN contents of buffalo White and Tulum cheeses were determined as 0.16% and 0.15% on average, respectively. Ripening degrees were calculated depending on WSN contents of the samples. The average ripening degrees of buffalo White and Tulum cheeses were found 5.49% and 6.00%, respectively. Other researchers stated the content of WSN of different buffalo cheese samples as 0.45% (Chaudhary et al., 2017) for Khoa, 0.22-0.31% (Abbas et al., 2018) for UF soft cheese and 0.12-0.67% (Al-Mosway, 2018) for White Iraqi cheese. Other researchers' findings about WSN contents of cheeses were higher than WSN contents of White and Tulum cheese samples. Dimitreli et al. (2017) stated the ripening degree of White soft cheese was 9.70% on average. The ripening degree of White and Tulum cheeses supplied from Çukurova region was found lower. These results showed that buffalo cheeses from Çukurova region were not ripened as much as other cheeses in the literature.

The average TCA soluble nitrogen contents of buffalo White and Tulum cheeses were determined as 0.04% and 0.05%, respectively. Yazıcı et al. (2010) stated the TCA soluble nitrogen content of buffalo Mozzarella cheese was between 0.06-0.15%. TCA soluble nitrogen contents of White and Tulum cheeses were found close to lower limit of Mozzarella cheese. Therefore, their TCA soluble nitrogen contents might be in the acceptable limit.

The average PTA soluble nitrogen contents of buffalo White and Tulum cheeses were found 0.11% and 0.13%, respectively. With the help of phosphotungoustic acid, free amino acids other than lysine and arsine and low molecular weight peptides can be separated (Sousa et al., 2001). Yazıcı et al. (2010) stated the PTA soluble nitrogen content of buffalo Mozzarella cheese was between 0.01-0.05%. PTA soluble nitrogen contents of buffalo White and Tulum cheeses were higher than Mozzarella cheese. Therefore, it was concluded that the amount of free amino acids and low molecular weight peptides of White and Tulum cheeses were higher than buffalo Mozzarella.

Curd firmness of buffalo White and Tulum cheeses were 97.20 10^{-1} mm and 16.40 10^{-1} mm on average, respectively. Ahmed et al. (2011) stated the curd firmness of buffalo Mozzarella cheese was between 34.00-68.00 10^{-1} mm. Mozzarella cheese is harder than White cheese but softer than Tulum cheese. Therefore, this was an expected result.

CONCLUSION

As a conclusion of the research, buffalo milk, yogurt, cream and White and Tulum cheese samples had some similarities and dissimilarities with other buffalo cheese types in the literature. Buffalo milk samples supplied from Çukurova region had lower pH value and mineral content while they had higher fat content when they were compared with the literature. Buffalo yogurt samples had higher dry matter and mineral contents, lower acetaldehyde content which means less yogurt flavor, lower tyrosine content which means lower proteolytic activity and lower whey separation amount which means higher curd quality, when they were compared with the literature. Buffalo cream had lower pH value, higher dry matter and fat contents when they were compared with the literature. Buffalo White and Tulum cheese samples had lower protein, salt, WSN contents, ripening degrees while they had higher mineral and PTA soluble nitrogen contents when they were compared with the literature. Also, buffalo Tulum cheese had lower dry matter content according to other cheeses in the literature.

Buffalo milk is a very important food due to its high nutritional value and wide range of uses. However, buffalo breeding cannot come to the fore due to the insufficiency of cultivation areas, high cost and difficulty of production, and buffalo milk and products are produced only to meet local demand in certain regions. However, due to the high fat and dry matter ratio, buffalo milk gives a different structure, color and flavor to the product it is processed, and these products are more favored by many consumers than the products obtained from other milk. There are not enough resources and studies in the national and international literature on buffalo milk products. In particular, no data was found regarding the products found in the Cukurova region. Determining and recording the properties of these valuable products in the region is considered to contribute significantly to the literature.

Considering the possibilities of using buffalo milk, it is thought that buffalo breeding should be more important. In recent years, important steps have been taken in this regard thanks to the support given per animal and amount of milk by the relevant ministry. It would be beneficial to continue the incentive given to buffalo milk and to carry out research on the subject. With this research, it is thought that the value of buffalo milk products will be revealed and thus the production amount of the products can be increased.

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Subacute Sclerosis Panensefalitis and Nursing Approach: Case Report

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ABSTRACT

Subacute sclerosing panencephalitis (SSPE) is one of the progressive and fatal diseases of the central nervous system which is frequently seen in childhood and early adolescence. The development of measles virus infection before the age of two is a risk factor for SSPE. Although primary measles infection did not differ according to gender, SSPE was more common in men (male / female ratio: 3/1). It has been proven that the effective measles vaccine reduces the incidence of the disease and that the measles vaccine does not cause SSPE. It occurs approximately 7-10 years after natural measles infection and neurological symptoms develop slowly. Regression of myoclonus with involuntary movements, mental, neurological, extrapyramidal and pyramidal symptoms, deserebre or decorticated posture, increase in extensor hypertonus, deserebre rigidity, hyperthermia, excessive sweating, irregular respiration and stridor can be seen. In this case report, we aimed to draw attention to the nursing care of SSPE. An 8-year-old male patient was admitted to the outpatient clinic with complaints of inability to speak, walk, communicate with the environment, loss of balance and seizure for two months. It has been stated that the patient has involuntary contractions on the right side of the body for the last ten days. The patient's history revealed that his vaccines were incomplete and he had measles infection when he was about two years old. SSPE was diagnosed as a result of clinical symptoms and examinations. Nursing activities play a key role in prevention, early diagnosis, treatment, care and rehabilitation of SSPE which has severe symptoms and results in death. Therefore, nurses should provide accurate, reliable and sufficient information to their family members about the disease. The patient should be assisted to the extent that he or she can perform daily life activities. Eating and drinking function should be supported as long as the patient can perform. As long as the patient is able to perform the defecation function, the patient should be appropriately positioned and encouraged to use sliders. After the patient loses control of the defecation, it should be ensured to maintain defecation function and the hygiene of the defecation should be given importance. The elimination of secretions and the maintenance of respiration should be supported. Passive exercises should be performed in the bed to the extent that the patient can tolerate. In order to prevent the development of negative emotions as loneliness, the patient should be given the message in you are "valuable".

Keywords: Subacute Sclerosing Panencephalitis, Nursing Care, Measles.

INTRODUCTION

Subacute Sclerosing Panencephalitis (SSPE) is a progressive, fatal disease that develops as a result of permanent infection of the Central Nervous System (CNS) with measles virus, which is frequently seen in childhood and early adolescence (Campbell et al., 2005). The pathogenesis of the disease, which was first described by Gadoth in 1933, is no fully known (Gadoth, 2012). It is thought that the disease develops as a result of defects in cellular immunity composed in permanent infection in the CNS. In addition, an experience of measles infection before the age of 2 is considered as a risk factor for SSPE disease. There is a latent period of 4-10 years between the development of measles infection and the initial findings of SSPE. It has been proven that the incidence of the disease decreases with effective measles vaccine (Gutierrez, Issacson et al., 2010; Bellini et al., 2005). In countries with an extended immunization program, the incidence of SSPE is reported to be lower. While the incidence of SSPE in the world is one in a million, it is 0.461 in a million in our country (Onal et al., 2006).

The symptoms such as personality change, behavioral problems and school failure constitute the initial stage of the disease and usually begin at the age of 8-10 years in SSPE. In Stage 2, mental losses, periodic myoclonus and related falls occur. While extrapyramidal findings, diffuse rigidity and unresponsiveness are seen in stage 3, autonomic dysfunction, coma, akinetic mutism, irregular breathing, excessive sweating, hyperthermia and stridor can be seen in stage 4 (terminal). The course of SSPE also affects the parents due to treatment methods, activity restriction and long-term effects and gets many burdens on the family. In addition to the responsibility for care of the disease, psychological problems experienced by the child and parents (anger, depression, anxiety and guilt), uncertainties about the future of the child, treatment and care costs increase the burden in the family (Schönberger et al., 2013).

The diagnosis of SSPE is made by the increasement of measles antibody titer in the cerebrospinal fluid (CSF) and spesific electroencephalogram (EEG) findings in the patient with clinical signs. Although there is no treatment for SSPE, isoprinosine and interferon-alpha combined therapy is the preferred treatment (Dimova and Bojinova, 2004).

Nursing interventions (prevention, early diagnosis, treatment and rehabilitation) play a key role in the prevention of SSPE, which progresses with very severe symptoms and results in death 1-3 years after the onset of initial symptoms. Nurses can provide protection against SSPE by effective vaccination and community health education. The second intervention in relieving the burden of disease is early diagnosis. Early diagnosis is very important in terms of early intervention, development of complications and controlling the progression of the disease. After the diagnosis of SSPE, the nurse is responsible for the treatment, observation of side effects and rehabilitation and care of the disease (Tosun, 2016). In this case report, nursing diagnoses of a child with SSPE and nursing interventions applied to these diagnoses are examined.

CASE REPORT

An 8-year-old male patient was admitted to a university hospital with complaints of crying attacks, inability to speak, walk and communicate with the environment, loss of balance and seizures for the last two months. It was determined that the patient's complaints started as myoclonic seizures in the head, body and extremities and there was an increase in the complaints of falls over time. It was learned that the patient who was admitted to different hospitals with the existing complaints was diagnosed with epilepsy and sodium valporate treatment was started and was transferred the patient to the university hospital because of the increasing complaints.

In the anamnesis of the patient, there was no consanguinity between the mother and father, no abnormal condition in the prenatal and postnatal history of patient, the patient was not vaccinated with MMR and had a history of measles infection at the six years. The patient's body weight was 19kg (25-50p) and height was 118cm (25-50p). He was conscious, had poor speech flow, had myoclonic seizures including head, body and extremities and had frequent falls due to seizure attacks. Other neurological findings were normal. His blood and urine laboratory results were normal, but measles IgG 11.8 m/dl and measles IgG index were positive on CSF examination. High-voltage discharges were detected in the patient's diaphragmatic EEG. The patient was diagnosed with Stage 3 SSPE. The patient was started isoprinosine (100mg/kg/day), carbamazepine (20mg/kg/day), vitamin A (30mg/day) and vitamin E (400IU/day).

NURSING APPROACH

In the nursing approach of dependent patient with SSPE who could not perform daily life activities;

- ✓ Accurate, reliable and sufficient information about the disease and care of the child for parents must be provided.
- ✓ The patient should be supported to perform daily life activities. It should be remembered that daily life activities will become increasingly dependent.
- ✓ It should be supported to nutrition of patient. The patient who loses swallowing function with the progression of the disease should be fed with a nasogastric/orogastric tube. Measures should be taken to prevent the development of complications such as infection related to nasogastric/orogastric feeding.
- ✓ Defecation and miction functions should be supported in order to maintain the evacuation function of the patient. Even if the patient loses control of the excretory, it should be ensured that the excretory functions are maintained and hygiene is maintained.
- ✓ The patient's respiratory functions must be supported. For the elimination of secretions, fluid support should be provided, postural drainage should be performed, the environment should be ventilated and moistened.
- ✓ Patient should be mobilized. Passive exercises should be performed to the extent the patient can tolerate.

- ✓ Complementary and alternative medicine (CAM) can be used for mild pain in the patient such as aromatherapy and massage. Analgesics should be given correctly with CAM methods in moderate and severe pain.
- ✓ The increasing dependence of the patient may cause the formation of pressure ulcers. In order to prevent pressure ulcers that may develop, the patient's position can be changed every two hours, performed skin massage, performed passive exercises and air bed can be used.
- ✓ In order to prevent negative feelings such as deterioration of self-esteem and loneliness in the patient, the message "you are valuable" should be given to the patient and negative feelings can be prevented by performing activities such as story reading, speaking, keeping promises and listening to music with together.
- ✓ Home care for a patient with SSPE is important as well as care in hospital. For this reason, the parents should be included in the nursing care plan. The participation of the parents in the care of child with SSPE should be supported in order to protect the family integrity and strengthen the family physically and emotionally. The parents should be prepared for the grief process and provide good death to the patient

Table 1: Nursing diagnoses in the case report

*** Inadequate self-care**
*** Ineffectiveness in maintaining health**
*** Falling in self-esteem**
*** Anxiety**
*** Deterioration of continuity of family processes**
*** Change in role performance**
*** Physical mobility deterioration**
*** Risk of liquid volume imbalance**
*** Risk of constipation**
*** Risk of impaired respiratory function**
*** Risk of difficulty in the role of caregiver**
*** Loneliness risk**
*** Risk of weakness**

CONCLUSIONS

Nursing care play a key role prevention of SSPE, which is a progressive and fatal disease. It is important to have effective measles vaccine in the prevention of SSPE. It should be implementedn isoprinosine and interferon-alpha combined therapy. Holistic approach was applied to the child and his/her family in nursing care. Also, the family of child with SSPE should be prepared for the grieving process.

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The Biomechanical Analysis of the Snatch Lifts in Elite Turkish Women Weightlifters

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ABSTRACT

The purpose of the study was to evaluate the kinematics of the snatch technique of elite Turkish women weightlifters who participated in the 21st World Women Weightlifters Championship. Successful snatch lifts of four elite women weightlifters in 48, 53 and 63 kg body weight categories were analyzed. The lifts were recorded using 2 cameras (PAL). Points on the barbell and body were manually digitized by using Ariel Performance Analysis System. The results showed that the maximum height was 112-118 cm, and that the vertical velocity of the barbell ranged from 1.64 to 1.96 $m.s^{-1}$ in the second pull. After the second pull, the barbell continued to move vertically, and the travel distance of the barbell was 21-29 cm. After the barbell reached maximum height, the barbell began to descend due to the gravity until the barbell fixed over the head in the squat position. This travel of the barbell, named as the drop distance, was in a range of 10-17 cm. Meanwhile, the duration of the turnover under the barbell of the body was found in a range of 0.44-0.64 s. The amount of horizontal displacement of the barbell ranged from -2 cm to 8 cm during the first pull and from -1 cm to 12 cm during the second pull. When the barbell began to descend from peak height, the horizontal displacement of the barbell ranged from 2 to -17 cm. As a result, it was revealed that the performance of elite Turkish women weightlifters was similar to the results of previous studies analyzing the snatch performance in elite women weightlifters.

Keywords: Snatch, Kinematic, Woman Weightlifter, World Weightlifting Championship.

INTRODUCTION

The snatch is a technical event of the 2 lifts contested in the Olympic weightlifting (Schilling et al., 2002). This snatch technique is strongly dependent on explosive strength, flexibility, and skill (Garhammer, 1991, Garhammer and Gregor, 1992, Gourgoulis et al., 2002, Ikeda et al., 2012). The snatch consists of pulling the barbell from the floor to the overhead position in 6 phases: the first pull, the transition phase, the second pull, the turnover under the barbell, the catch position, and rising from the squat position (Baumann et al., 1988, Gourgoulis et al., 2000). The first five phases are considered to be the most important phases of the lift (Baumann et al., 1988, Gourgoulis et al., 2000).

The popularity of women's weightlifting has grown in recent decades, and women competitors achieved Olympic status at the 2000 Games in Sidney, Australia (Hoover et al., 2006). Thus, in the past, there was a lack of data related to the characteristics of the snatch technique of elite female weightlifters (Gourgoulis et al., 2002). However, the skills of the women weightlifters in the snatch technique have been shown in a few studies published in recent years (Akkus, 2012, Gourgoulis et al., 2002, Hoover et al., 2006). Many factors can influence the success of the snatch technique (Stone et al., 1998). Thus, many biomechanical parameters should be studied to understand subtleties of the snatch technique. The most questioned kinematic parameters are height of the barbell, its horizontal displacement and vertical velocity (Garhammer, 2001). During the pull, the barbell moves both in vertical and horizontal direction. Garhammer (1985) reported three key positions for the horizontal movement of the barbell in the snatch. The barbell moves toward the lifter, during the first pull, away from the vertical reference line drawn through the bar just prior to lift-off. This movement is a positive value. The second horizontal movement of the barbell during the second pull is often negative value as it moves away from the lifter crossing the vertical reference line. The third movement is the distance of the barbell from the vertical reference line just after it began to descend from maximum height. The last horizontal movement is generally positive. The horizontal movement of the barbell during the pull should be considered an effective application of muscle power without excessive displacement in the barbell (Isaka et al., 1996). It was reported that although the barbell moved in a vertical and anteroposterior direction at the same time, its pathway did not cross the vertical reference line that projected upward from the initial position of the bar (Gourgoulis et al., 2009). Hoover et al. (2006) reported that the barbell moved between -3 cm and 8 cm (positive value indicates a movement of the barbell toward the weightlifter, and negative value indicates a movement of the barbell away from the weightlifter) during the first pull. As regards the second pull, it was shown that the barbell displaced in a range of -14 and 13 cm, and finally, that the barbell displaced in a range of -3 and 21 cm from to vertical reference line just after it began to descend from maximum height (Hoover et al. 2006). Another important parameter in the snatch is the duration of the turnover under the barbell (elapsing time from a moment which the barbell reached its maximum velocity until the lifter catches the barbell in the squatting position). In literature, this duration was between 0.30-0.38 s for men weightlifters and between 0.30-0.70 s for women weightlifters. The other biomechanical parameters are the vertical displacement and velocity of the barbell and power output. The maximum vertical velocity values of the barbell for women weightlifters were 1.94-

2.21 $m.s^{-1}$. Maximum barbell height showed a change between 0.85-1.19 m for women weightlifter (Hoover at al. 2006). The purpose of this study was to investigate the kinematics of the snatch technique of elite Turkish women weightlifters.

METHODOLOGICAL ASPECTS AND RESULTS

Methodological Aspects

The data of this descriptive study were collected only from Turkish female weightlifters in 3 categories in the 2010 World Weightlifting Championship. The successful lifts and physical characteristics of Turkish women weightlifters in the championship were presented in Table 1.

Table 1: The physical characteristics of women weightlifters competed in A group

Subject	Category (kg)	Age (years)	Body weight (kg)	Attempts (kg)		
				1	2	3
1	48	27	47.88	90	93	-
2	48	22	47.72	87	90	-
3	53	28	52.89	-	90	-
4	63	26	62.43	108	-	111

Procedures

Data Collection Instrument

The snatch lifts were recorded using 2 digital cameras (Sony DCR-TRV18E, Tokyo, Japan), which captured images at 50 fields per second. The lift-off of the barbell was used to synchronize the 2 cameras.

Data Collection

Two digital cameras were positioned on the diagonal level of the platform at a distance of 9 m from the weightlifters, forming an approximate 45° angle with the sagittal plane of the weightlifters. To determine the 3-dimensional kinematic data of the barbell and the angular kinematics of the hip, knee, and ankle joints during the snatch lifts, 1 point on the barbell and 5 points on the body were digitized using the Ariel Performance Analysis System (APAS, San Diego, CA, USA). The digitized points included the little toe, ankle, knee, hip, and shoulder on the right side of the body. In addition to these points, the digitized point on the barbell was located on the medial side of the right hand.

Results

Maximum barbell height, maximum barbell velocity, the amount of the vertical displacement of the barbell after maximum barbell velocity, drop distance, and the duration of the turnover under the barbell were presented for the successful snatch lifts of the elite Turkish female weightlifters in Table 2. In the snatch, the maximum vertical velocity of the barbell was 1.64-1.96 $m.s^{-1}$, and the maximum height of the barbell was 112-128 cm. When the

weightlifter's body moved down under the barbell after the barbell reached its maximum velocity in the second pull, the amount of the vertical displacement of the barbell was in a range of 21-29 cm. When the barbell reached its maximum height, its vertical velocity slowed and continued to drop until the barbell was caught on overhead position. This drop distance found in this study was 10-17 cm. After the second pull, the duration of the turnover under the barbell was 0.44-0.64 s.

Table 2: Kinematics of the snatch lifts

Weightlifters	Bar mass (kg)	Maximum barbell height (cm)	Maximum barbell velocity ($m.s^{-1}$)	Vertical displacement of the barbell after maximum barbell velocity (cm)	Drop distance (cm)	The duration of the turnover under the barbell (s)
W1	90	115.15	1.83	21	11	0.48
W1	93	112.66	1.64	21	10	0.44
W2	87	122.59	1.96	29	13	0.56
W2	90	123.24	1.87	25	14	0.54
W3	90	121.54	1.77	28	16	0.64
W4	108	128.19	1.88	27	16	0.56
W4	111	125.38	1.78	27	17	0.56

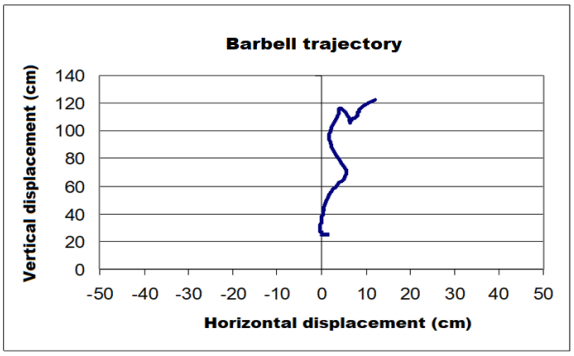
It was observed in the present study that, in some lifts, the barbell moved away from the weightlifters (-2 cm) during the first pull crossing the vertical reference line, while in other lifts, it moved toward the weightlifters (8 cm) without crossing the vertical reference line. Similarly, during the second pull, the barbell moved away from the weightlifters (-1 cm) crossing the vertical reference line of the barbell in some lifts and, in other lifts, toward the weightlifters (12 cm) without crossing the vertical reference line. Horizontal displacement of the barbell after it began to descend from its maximum height ranged between 2- 17 cm (Table 3).

Table 3: The horizontal displacement of the barbell in the snatch lifts.

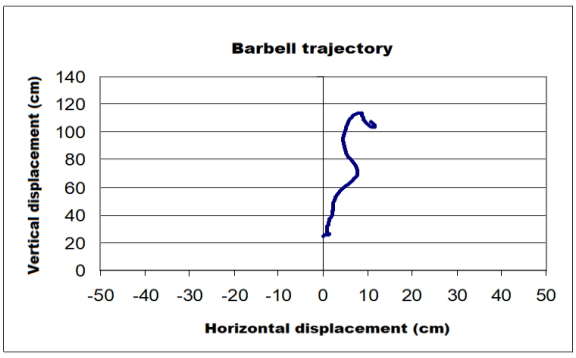
Weightlifters	Bar mass (kg)	Horizontal displacement in the first pull (cm)	Horizontal displacement in the second pull (cm)	Horizontal displacement after the barbell began to descend from maximum height (cm)
W1	90	1	5	2
W1	93	2	5	3
W2	87	-2	7	9
W2	90	8	12	17
W3	90	-2	1	6
W4	108	4	0	7
W4	111	4	-1	7

The barbell trajectories of the snatch lifts were presented in Figure 1 for elite Turkish female weightlifters. When the trajectories were analyzed, it was found that they were similar to those reported in literature, except for weightlifter 2.

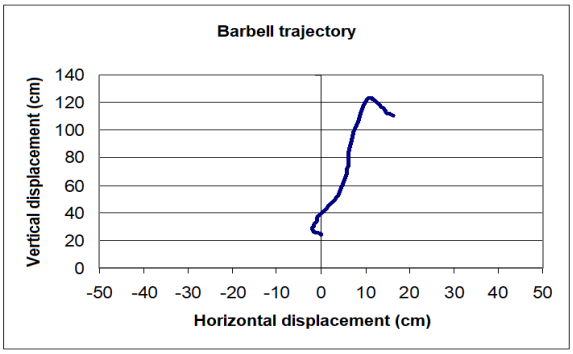
Figure 1: The barbell trajectories in the snatch lifts of female weightlifters.



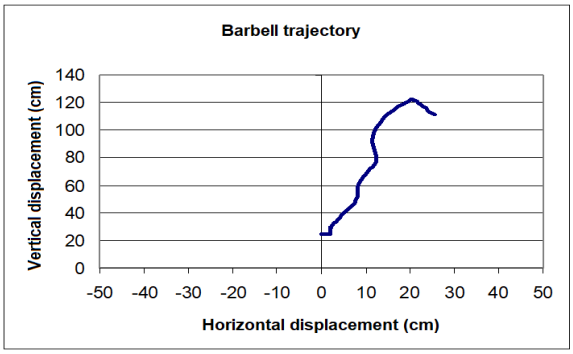
W1: 90 kg snatch performance



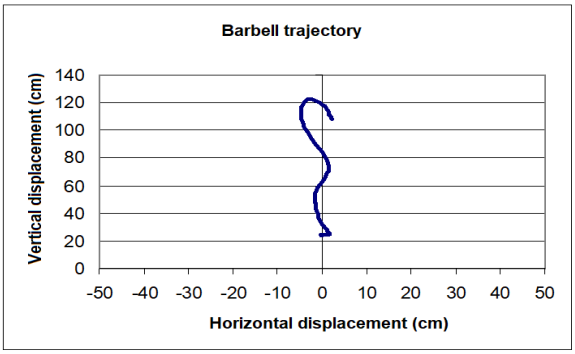
W1: 93 kg snatch performance



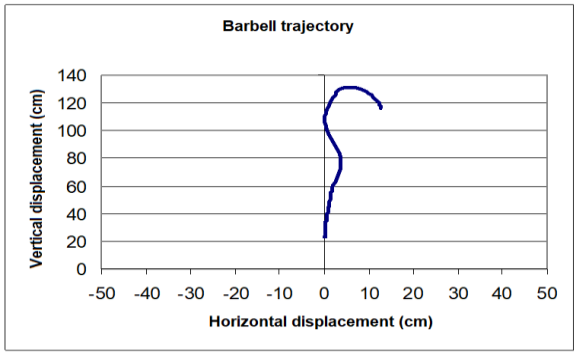
W2: 87 kg snatch performance



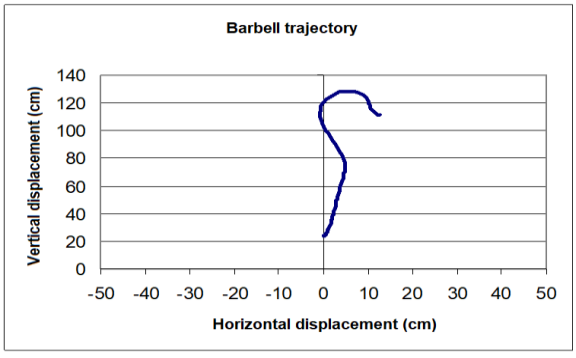
W2: 90 kg snatch performance



W3: 90 kg snatch performance



W4: 108 kg snatch performance



W4: 111 kg snatch performance

CONCLUDING REMARKS

Hoover et al. (2006) reported that maximum height and the vertical velocity of the barbell was 89-11 cm and 1.35-1.92 $m.s^{-1}$ in female weightlifters in 69 kg category, respectively. In the present study, it was found in the snatch lifts of elite female weightlifters that maximum height and the vertical velocity of the barbell was 112-128 cm and 1.27-1.96 $m.s^{-1}$, respectively. When the barbell reached its maximum vertical velocity during the second pull, the upper body extended fully, at which point, the force applied to the barbell began to decrease. The vertical distance covered by the barbell after its maximum vertical velocity ranged between 21 and 29 cm.

In the snatch lifts, greater negative values observed in the horizontal displacement of the barbell after it reaches its maximum height indicate that the weightlifter steps forward to catch the barbell, and conversely, greater positive values in horizontal displacement of the barbell mean that the weightlifter steps backward. In the present study, all values of the horizontal displacement of the barbell were found to be positive; in other words, women weightlifters in this study stepped backward to catch the barbell after it reached its maximum height.

As a result, it was revealed that the performance of elite Turkish women weightlifters was similar to the results of previous studies analyzing the snatch performance in elite women weightlifters.

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Examination of Nursing Theses on Complementary and Alternative Therapies Related to Pain in Newborns in Turkey

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ABSTRACT

Objective: This descriptive study was conducted to examine the thesis of nursing practice related to complementary and alternative therapies related to pain in newborns in Turkey.

Method: In this study, National Council of Higher Education Dissertation Center Data Base were screened by keywords which is "pain in newborn", "complementary", "alternative therapies", "complementary and alternative therapies". At the end of the study, 25 theses were determined in the Department of Nursing between 1998-2019 and the information about these theses were obtained. Two theses, which do not have sufficient data in the imprint information and whose full text could not be reached, were excluded from the study and a total of 23 theses were evaluated in the research.

Results: All of the theses studies (23 theses) were experimental studies. 16 of the theses were made at the master's level and 7 of them were at the doctoral level. The most studied subject in theses was pain due to invasive intervention (18 theses). The most commonly used complementary and alternative treatment methods in the theses were; developmental position (3 theses), hot application (1 thesis), acupressure (1 thesis), amniotic fluid odor (1 thesis), bath (1 thesis), breast milk odor (2 theses), lavender scent (1 thesis), breastfeeding (4 theses), music therapy (4 theses), mother voice (5 theses), mother heart sound (1 thesis), massage (1 thesis), kangaroo care (8 theses) and fetal position (5 theses). Complementary and alternative medicine methods used in 12 theses were found to be effective on pain reduction.

Conclusion: In recent years, pain in the newborn is one of the major areas of interest in pediatric nursing research. It may be said that complementary and alternative treatment methods used to reduce pain attract the attention of nurses have postgraduate education in the field of pediatric nursing in our country.

Keywords: Nursing, Complementary and Alternative Treatment Methods, Pain in the Newborn.

INTRODUCTION

Pain is defined as a special sensation with physical, psychological, social and cultural aspects (Uyan, 2006). It was accepted until the end of 1980s that newborns did not feel pain and could not remember because of their physical immaturity. Investigation of newborn pain and its effects was started in the late 1980s, and studies have shown that pain has felt since fetal life. The ability of the infant to respond to pain has developed from at 20-24 gestational weeks (Debyshire, 2006).

Although many systems of the newborns are immature, it is understood that the nervous systems are well developed anatomically and functionally, newborns can feel and remember the pain. Newborns learn by experiencing pain and their initial pain experience is considered to have a significant impact on subsequent pain perceptions. Healthy newborns experience pain-causing interventions such as vaccination and heel-stick sampling within the scope of the newborn screening program from the first moments of their lives (Dinçer et al., 2011). Painful interventions may interfere with parental-infant interaction, behaviors of newborn, adaptation to extrauterine life of newborn, and adversely affect the growth and development of newborn. In addition, newborns experience metabolic and physiological problems due to painful interventions. These problems include excessive protein expenditure, electrolyte imbalance, metabolic acidosis, cardiac and pulmonary insufficiency, sepsis and death (Aliefendioğlu and Güzoğlu, 2015; Akcan and Polat, 2017). In order to reduce these pain-related problems, neonatal pain should be evaluated in a timely and identified correctly.

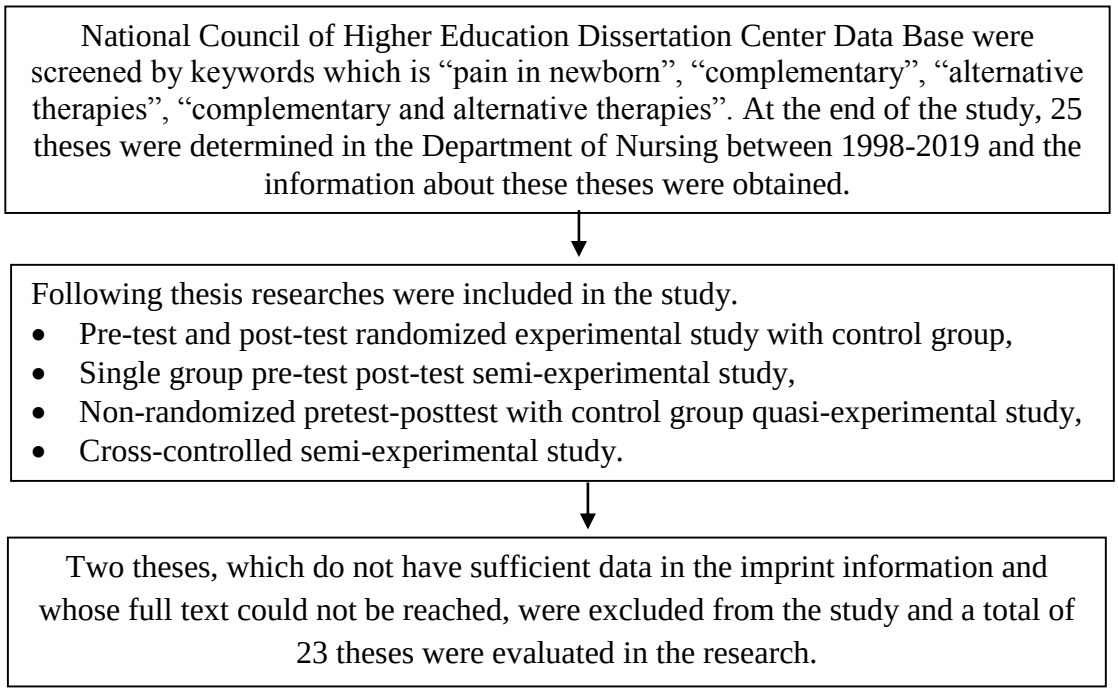
Many pharmacological and non-pharmacological methods have been used to reduce pain in newborns. Pain management in the newborn is provided by using these methods alone or in combination. Nowadays, however, interest in non-pharmacological methods is increasing. Complementary and alternative medicine (CAM) is frequently used as a non-pharmacological method in reducing pain. CAMs are among the nursing interventions. CAMs applied to newborns include pacifier use, breast milk, changing position, oral sucrose, reducing environmental stimuli, embracing, listening to music, massage and touch (Çağlayan, 2014; Mangat et al., 2018; Pillai Riddell et al., 2015) found that non-pharmacological methods have an effect on the management of acute pain in preterm and term newborns (Pillai Riddell et al., 2015). This descriptive study was conducted to examine the thesis of nursing practice related to complementary and alternative therapies related to pain in newborns in Turkey.

MATERIALS AND METHODS

In this study, National Council of Higher Education Dissertation Center Data Base were screened by keywords which is “pain in newborn”, “complementary”, “alternative therapies”, “complementary and alternative therapies”. At the end of the study, 25 theses were determined in the Department of Nursing between 1998-2019 and the information about these theses were obtained. Two theses, which do not have sufficient data in the imprint information and whose full text could not be reached, were excluded from the study and a total of 23 theses were evaluated in the research.

Based on these theses, information about CAMs used for pain in the newborn is presented. CAMs used for pain in the theses include position changing, hot application, acupressure, music, amniotic fluid/breast milk/lavender odor, bathing, mother voice/mother heart sound, kangaroo care and fetal position.

Figure 1: Research flow chart



RESULTS AND DISCUSSION

The nursing thesis included in this study were evaluated with variables such as year of publication, type, research method, used CAMs, sample size, pain assessment tools and the results of study. It was determined that 73.9% (17 theses) of the theses were master theses and 21.7% of them were made in 2018 (5 theses). When the theses were evaluated according to the aims of the study, it was found that 88.2% (15 theses) of the master theses were examined in newborn pain during the invasive procedure and 11.8% (2 theses) were examined the effect of CAMs on colic pain. It was found that all of the doctoral theses (6 theses) examined the effect of CAMs on pain relief during invasive procedures.

The most commonly used CAMs in the theses were; developmental position (3 theses), hot application (1 thesis), acupressure (1 thesis), amniotic fluid odor (1 thesis), bath (1 thesis), breast milk odor (2 theses), lavender odor (1 thesis), breastfeeding (4 theses), music therapy (4 theses), mother voice (5 theses), mother heart sound (1 thesis), massage (1 thesis), kangaroo care (8 theses) and fetal position (5 theses).

Of the theses; 69.5% (16 theses) were designed in experimental design with pre-test and post-test control group. In 56.5% of the theses (13 theses), power analysis was performed for the sample size and power analysis was evaluated over β=0.80. Neonatal Infant Pain Scale (NIPS) was used to evaluate the pain level in 60.8% (14 theses) of the theses. It was determined

that CAMs used to reduce pain were effective in all theses (23 theses). It was detected that only 30.4% (7 theses) of 23 nursing theses were published in international refereed journals.

CAMs are widely used in the world to reduce pain caused by various reasons. Nowadays, it is seen that nurses, who are among health professionals, frequently use CAMs to reduce pain (Khorshid and Yapucu, 2005). Non-pharmacological methods of pain control in the newborn include as acupuncture, acupressure, changing position, amniotic fluid and lavender odor, non-nutritive breastfeeding, breastfeeding, oral sucrose/glucose solution, kangaroo care, swaddling, therapeutic massage, music therapy, and fetal position etc. (Mangat et al., 2018). It is seen that the majority of these methods are used in the theses.

Fetal position, maternal heart sound, swaddling, amniotic fluid, mother and lavender odor, changing position and acupressure applications were effective in reducing pain in the newborn. In a systematic review by Meek and Huertas (2012), it was stated that preterm newborns calmed down with kangaroo care, non-nutritive suction and swaddling methods and became immediately stable. Hebb et al. (2005) stated that kangaroo care, swaddling, fetal position, therapeutic touch, massage, music therapy methods provide comfort for newborns and create analgesic effects.

CONCLUSIONS AND RECOMMENDATIONS

It is determined that the majority of theses are master thesis, designed in experimental design with pre-test and post-test control group, the effects of CAMs on pain during invasive procedure are examined, CAM methods are effective in reducing pain and theses are not converted into publication to a large extent. However, the contribution of the researches to the scientific world depends on the sharing of the research results. In this respect, it is necessary to be investigated the reasons for unpublished thesis, to be published all theses and to be allowed access to other academicians in the field. In addition, CAMs can be used alone for mild pain in newborns. They can be used in combination with pharmacological methods in moderate, severe and chronic pain. It may be suggested that nurses should be directed more to evidence-based studies examining the effect of CAMs on pain reduction.

Table 1: Samples of nursing theses about CAMs for pain in newborn

Theses	Research Type	Sample Size	Intervention	Consclusions
Neriman Caglayan (2011) (Master thesis)	Single-group pretest-posttest quasi-experimental study	41 preterm newborns	Fetal position	* It was found that the pain scores of the newborns who were given fetal position were lower than the routine position during and after the painful procedure.
Dilek Kucuk Alemdar (2013) (Doctoral thesis)	Non-randomized pretest-posttest quasi-experimental study with control group	Experimental=32 Control=30 Preterm newborns	Mother heart sound	* It was found that Premature Infant Pain Profile (PIPP) scores of experimental group during the aspiration procedure had lower and there was no significant difference before and after aspiration.
Zeynep Erzurumluoglu (2014) (Master thesis)	Pre-test and post-test randomized experimental study with control group	Experimental =37 Control=37 Term newborns	Swaddling	* It was found that the pain mean scores of the newborns who were swaddling and no swaddling were increased during and after the procedure, and the pain mean scores after the procedure were lower.
Esma Akcan (2014) (Doctoral thesis)	Pre-test and post-test randomized experimental study with control group	Lavender odor =27 Breast milk odor=24 Amniotic fluid odor=26 Control=25 Term newborn	The odor of amniotic fluid, breast milk and lavender	* While NIPS values of newborns were similar before heel-stick, NIPS scores during and after heel-stick were lower in breast milk, lavender and amniotic fluid groups. * It was found that lavender during heel-stick, breast milk and amniotic fluid odor after heel-stick were more effective than other groups.
Ayse Kahraman (2015) (Doctoral thesis)	Single-group pretest-posttest quasi-experimental study	33 preterm newborns	Position changing	* NIPS scores in the prone position had lower than the supine position.
Ozlem Karabiyik Oğurlu (2017) (Master thesis)	Pre-test and post-test randomized experimental study with control group	Experimental=40 Control=340 Term newborn	Dry hot application	* NIPS score was found to be higher in the control group.

Sibel Serap Ceylan (2017) (Doctoral thesis)	Cross-controlled quasi-experimental study	35 preterm newborns	Swaddling bath and wiping bath	* It was found that stress and pain levels of the newborns in swaddling bath the were lower than wiping bath method.
Tanju Ogul (2018) (Master thesis)	Non-randomized pretest-posttest quasi-experimental study with control group	Experimental=32 Control=31 Term newborn	Acupressure	* The NIPS scores of the acupressure group during the procedure and after the procedure were lower.
Merve Ezen (2018) (Master thesis)	Pre-test and post-test randomized experimental study with control group	Breast milk odor=30 Different breast milk odor=30 Control = 30 Term Newborn	The odor of breast milk and different breast milk	* Their Neonatal Pain Agitation Sedation Scale (N-PASS) score in their breast milk group was found to be lower.
Vildan Apaydin Cırık (2019) (Doctoral thesis)	Pre-test and post-test randomized experimental study with control group	Swaddling=33 Fetal position=32 Breast milk =31 Swaddling+breast milk=30 Fetal position+breast milk=31 Control=33 Preterm Newborn	Breast milk, swaddling, fetal position	* Compared to the swaddling+breast milk group, it was found that the breast milk group felt 6.074, the fetal position group 5.914, the fetal position+breast milk group 2.968, the control group 12.396 and the wrapping group felt 7.385 times more pain.

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Comparative Evaluation of *In Vitro* Anti-Alzheimer's Potentials of Several Lichenic Substances

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ABSTRACT

Alzheimer's disease is considered as the most common progressive neurodegenerative disorder and its prevalence is increasing from day to day due to aging of human populations. To make matters worse up to date exact modifying treatment options has not been explored yet. Interestingly, in recent times lichens are being considered as natural sources of novel pharmaceuticals since they contained a great variety of pharmacologically active substances. In this investigation, the effects of isolated three lichenic substances: diffractaic acid (DA), usnic acid (UA) and friedelin (FDL) against $A\beta_{1-42}$-induced neurotoxicity were comparatively evaluated on differentiated human SH-SY5Y neuroblastoma cells. The different concentrations of lichenic substances (25, 50 and 100 μM) and $A\beta_{1-42}$ fragments (30 μM) were applied into neuron-like cell cultures for 24 h and 48 h. Cell viability rates were assesed by using LDH leakage assay. Our results indicated that $A\beta_{1-42}$ fragments caused significant ($p < 0.05$) cell death rates substantially with increasing LDH release. Likewise, the highest concentration of DA (100 μM) was found to be neurotoxic. On the contrary, all tested concentrations of UA and FDL did not lead to cytotoxicity. Moreover, UA and FDL attenuated the elevated levels of LDH by $A\beta_{1-42}$ exposure in a concentration and time depended manners. FDL was the most active anti-Alzheimer agent. In a conclusion our results first revealed that lichenic substances especially FDL could be a new source of natural anti-Alzheimer's agents and needs to further in vivo evaluation as a valuable candidate molecule.

Keywords: Lichen, Diffractaic Acid, Usnic Acid, Friedelin, Anti-Alzheimer's Activity, SHSY-5Y Model.

INTRODUCTION

In many senile plaques and neurons that are normally found in very old people, clumps of entangled curved protein fragments generate Alzheimer's disease (Sandhya & Kannayiram, 2018). The clearest information about Alzheimer's disease is that age is a major risk factor. In relatively few cases, heredity also plays a role. In other words, if one of the genes carrying Alzheimer's mutations is inherited from the family, the disease eventually catches the person (Akinyemi, Mukaetova-Ladinska, Attems, Ihara, & Kalaria, 2013; Fan et al., 2019). Hereditary cases appear at an early age compared to others. However, in the vast majority of cases, there is no clear genetic inheritance of this kind, nor is there any known risk factor outside age. In both species, brain pathology and cognitive impairment are the same, and a common molecular mechanism works (Matilla-Dueñas et al., 2017; Nagasaka et al., 2005).

Molecular pathology is one of the main causes of Alzheimer's disease. Amyloid beta 1-42 ($A\beta_{1-42}$) is the most toxic to the peptides that contain the first 42 amino acids after the beta secretase site. Toxic agglomerates caused by $A\beta_{1-42}$ lead to impaired function of the surrounding brain cells and eventually to death (Buckingham, Jones, Brown, & Sattelle, 2009; Tabira, 2010). Therapeutic processes for inhibiting $A\beta_{1-42}$-induced neurotoxicity with different drugs have become prominent (Das & Basu, 2017; Sohma, 2016). At this point, the importance of natural components is great.

Lichens have been involved in the treatment of many diseases through their numerous primary and secondary metabolites (Emsen, Aslan, Togar, & Turkez, 2016; Emsen, Turkez, Togar, & Aslan, 2017). In particular, lichen secondary metabolites have properties that are not present in other living things. This is due to the fact that lichens contain two living groups (fungi and algae) in their structure (Emsen & Aslan, 2018). Numerous trials have shown that lichen compounds and extracts have the potential to exhibit numerous biological activities such as anticancer, antiviral, anti-inflammatory, antimicrobial and antioxidant (Emsen, 2019; Emsen & Aslan, 2018; Emsen et al., 2016, 2017; Grujičić et al., 2014). Such pharmacological studies give hope to use lichens in many different therapeutic purposes. Considering the above-mentioned properties of lichens, in the present study, the effects of isolated three lichenic substances, diffractaic acid (DA), usnic acid (UA) and friedelin (FDL) against $A\beta_{1-42}$-induced neurotoxicity were comparatively evaluated on differentiated human SH-SY5Y neuroblastoma cells.

MATERIALS AND METHODS

DA, UA and FDL were purchased from Sigma-Aldrich Group (Germany). SH-SY5Y cells were obtained from ATCC (USA). The fragments of amyloid β 1-42 protein were provided from the Company of Sigma (USA).

SH-SY5Y cell cultures were incited in DMEM:F12 (1:1) media containing FBS (15%) and penicillin/streptomycin (1%). To be able to differentiate SH-SY5Y into neuron-like cells, normal media were mutialeted to media containing 10 μg/mL retinoic acid and incubated for additional 5 days. Then, media were supplemented with retinoic acid and brain derived

neurotrophic factor (BDNF, 25 ng/mL). When the cells reached to 70-80% confluence, the cells were treated with several concentrations of DA, UA and FDL (25, 50 and 100 μM) and $A\beta_{1-42}$ (30 μM) for 24h and 48h.

For measuring lactate dehydrogenase (LDH) release, LDH Cytotoxicity Assay Kit (Cayman Chemical Company, USA) was used according to the provider's manual. Briefly, the neuron-like cells were transferred into 48-well plates. The combination of lichenic substances and amyloid β fragments were added into well plates for 24h and 48h. After these durations, 100 μL supernatant were obtained from the cell cultures. The supernatants were mixed with 100 μL of reaction mixture then transferred to a fresh 48-well plate and incubated for extra 30 min at room temperature. Finally, the absorbance of the cultures was determined at 490 nm using a microplate reader (Marinelli et al., 2017).

For statistical comparisons, the obtained data was analyzed using one-way analysis of variance (ANOVA) and Fishers Least Significant Difference (LSD) test by use of the statistical program SPSS software (version 20.0, SPSS, Chicago, IL, USA). Median inhibition concentrations (IC_{50}) at 24 and 48 h were calculated with regression analysis by probit.

RESULTS AND DISCUSSION

LDH release analysis was performed in order to determine anti-proliferative activities on Alzheimer's disease model. In this context, the LDH levels of different concentrations of DA, UA and FDL (25, 50 and 100 μM) and $A\beta_{1-42}$ (30 μM) on the cells were measured alone and in combination.

As shown in Table 1, time-dependent LDH activity correlation was determined in all trials. $A\beta_{1-42}$ alone gave 61.4% after 48 h. LDH activity rates of $A\beta_{1-42}$ on different cells were measured. LDH releasing levels showed that emodin to $A\beta_{1-42}$ overexpression induced the protective effect of hippocampus cells (Du et al., 2019). The neuroprotective effect were researched on $A\beta_{1-42}$-induced injury using cell-based assays and LDH levels were measured (Li et al., 2018). In another study, $A\beta_{1-42}$-induced injury of PC12 cells as an in vitro model of Alzheimer's disease was tested and LDH release on PC12 cells was measured (Yang et al., 2017). In the present study, LDH ratio on differentiated human SH-SY5Y neuroblastoma cells rose with DA compound. Maximum LDH activities caused by DA (100 μM) + $A\beta_{1-42}$ were defined as 70.7% after 48 h. Likewise, after 24 and 48 h, DA (100 μM) alone yielded the highest LDH activity (12.2% and 15.5%, respectively) rate among lichen compounds. However, only 15.5% of LDH level was statistically ($p < 0.05$) significantly higher than the control (-). In combined methods, the highest concentration of DA was not effective in lowering the LDH rate caused by alpha. Scientists have discovered different compounds such as curcumin (Lu et al., 2017), tongluoxingnao effervescent tablets (Fu et al., 2016) and Z-ligustilide (Xu, Yang, & Li, 2016) which inhibit alpha-induced damage in SH-SY5Y cells.

When UA and FDL were used alone, their LDH rates were similar. None of the LDH ratio revealed by the trials of UA and FDL was significant ($p > 0.05$) compared to the control (-). When combined applications were examined, it was observed that the applications of 25,

50 and 100 μM concentrations of UA and FDL all changed LDH levels statistically ($p < 0.05$) compared to control (-) and $A\beta_{1-42}$. LDH rates that were significantly ($p < 0.05$) reduced by UA and FDL compared to $A\beta_{1-42}$ were important for the trial. At the end of 48 hours, 61.4% LDH levels caused by $A\beta_{1-42}$ were reduced by UA (100 μM) to 33.1%. The most prominent ratio of all trials belongs to FDL. FDL (100 μM) application significantly ($p < 0.05$) reduced the LDH level in the cells by up to 18%. The anticancer activity of FDL glioblastoma cells was studied and discovered to cause oxidative DNA damage on the cancerous cells (Emsen, Engin, & Turkez, 2018).

Table 2 showed IC_{50} values based on LDH activities of the compounds on the cells. According to these values, the lowest value belonged to FDL after 48 h (13.80 μM). This means that FDL was the compound that minimizes $A\beta_{1-42}$-induced damage.

Table 1: Effect of lichenic substances on LDH levels in Alzheimer's disease model in vitro

Groups	LDH levels (as %)	
	24 h	48 h
Control (-)	$0^{\#}$	$0^{\#}$
$A\beta_{1-42}$ (30 μM)	58.1*	61.4*
DA (25 μM)	$2.9^{\#}$	$3.7^{\#}$
DA (50 μM)	$5.6^{\#}$	$7.2^{\#}$
DA (100 μM)	$12.2^{\#}$	$15.5^{*\#}$
UA (25 μM)	$1.4^{\#}$	$2.5^{\#}$
UA (50 μM)	$2.9^{\#}$	$3.7^{\#}$
UA (100 μM)	$4.7^{\#}$	$6.2^{\#}$
FDL (25 μM)	$1.2^{\#}$	$1.8^{\#}$
FDL (50 μM)	$2^{\#}$	$2.7^{\#}$
FDL (100 μM)	$3.8^{\#}$	$4.2^{\#}$
DA (25 μM) + $A\beta_{1-42}$	$51.1^{*\#}$	$52.3^{*\#}$
DA (50 μM) + $A\beta_{1-42}$	57.4*	59.2*
DA (100 μM) + $A\beta_{1-42}$	$65.5^{*\#}$	$70.7^{*\#}$
UA (25 μM) + $A\beta_{1-42}$	$46.5^{*\#}$	$55.2^{*\#}$
UA (50 μM) + $A\beta_{1-42}$	$33.3^{*\#}$	$45.2^{*\#}$
UA (100 μM) + $A\beta_{1-42}$	$28.5^{*\#}$	$33.1^{*\#}$
FDL (25 μM) + $A\beta_{1-42}$	$44.2^{*\#}$	$38.6^{*\#}$
FDL (50 μM) + $A\beta_{1-42}$	$32.1^{*\#}$	$30.2^{*\#}$
FDL (100 μM) + $A\beta_{1-42}$	$16.4^{*\#}$	$18^{*\#}$

*$p < 0.05$ as compared to control (-) group; $^{\#}p < 0.05$ as compared to $A\beta_{1-42}$ treated group.

Table 2: IC_{50} values of tested compounds based on $A\beta_{1-42}$ combined applications (µM)

Compound	24 h IC_{50} (limits)	48 h IC_{50} (limits)
DA	23.29^{c} (0-40.98)	22.58^{b} (2.28-36.12)
UA	17.71^{a} (0.87-30.48)	35.32^{c} (16.24-50.20)
FDL	20.51^{b} (9.38-28.77)	13.80^{a} (1.87-23.69)

Values followed by different superscript letters in the same column differ significantly at $p < 0.05$.

There are studies in which lichen compounds and extracts are used alone or in combination. *Dermatocarpon intestiniforme* provided increased resistance of DNA against $HgCl_2$-induced genetic damage on human lymphocytes (H. Turkez & Dirican, 2012). *Xanthoria elegans* reduced dose dependent manner, indicating its protective role towards cells from mitomycin C exerted injury in human lymphocytes (Hasan Turkez, Aydin, & Aslan, 2012). It was revealed that different extracts of *Physcia semipinnata* exhibited cytotoxic/cytostatic activities against HeLa, LS174 and A549 cells (Tomović et al., 2019).

The findings of this investigation clearly indicated that DA, UA and FDL modulated $A\beta_{1-42}$-induced cytotoxicity in differentiated human SH-SY5Y neuroblastoma cells due to their strong detoxifying nature. In a conclusion our results first revealed that tested lichenic substances especially FDL could be a new source of natural anti-Alzheimer's agents and needs to further in vivo evaluation as a valuable candidate molecule.

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Introduce of Post Algebra to Ternary and Real Semigroups

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ABSTRACT

Our basic idea in this paper is to build an circular connection between ternary semigroups, real semigroups and Post Algebras. We introduce the notion of ternary semigroups like a structure of $(S, 1,0,1)$ which represent a class of real semigroups with additional individual constants: $-1, 0, 1$, underlining the notation of real semigroups. An important part of our work is constructing an ternary semigroup by using two 2-structures and an defined isomorphism between them. The axioms for real semigroups involve another ternary relation called transversal representation denoted by D^t definable in terms of D (basic ternary relation of real semigroup) without involving quantifiers, so:$a \in D^t \Leftrightarrow a \in D(b,c) \wedge -b \in D(-a,c)$. The subject matter of the paper is the connections of the first significant class of real semigroups: Post Algebra, an generated structure of Lukasiewizc Algebra introducing and istinguished element c, verifying¬ c = c called center. If Pis Post Algebra, then the structure$(P, \underline{\triangle}, \perp, \underline{c}, T)$ is ternary semigroup, Osymmetric difference, relation defined in P . On the same conditions the structure $(B(P), \underline{\triangle}, D_p, \perp, T)$ is Boolean Algebra, $D_P$new ternary relation defined with $x \in D(x,y) \Leftrightarrow y \wedge z \wedge \underline{c} \leq x \leq y \vee z \vee \underline{c}, \forall x, y, z \in P$,and the main part, proving that the other structure$(P, \underline{\triangle}, \perp, \underline{c}, D_P, T)$ is an real semigroup, using the previous results of $D^t$and so called Kleene inequality.

Keywords: Ternary Semigroup, Real Semigroup, Lukasiewicz Algebra, Post Algebra, Boolean Algebra.

INTRODUCTION

Ternary semigropus, this class of (commutative, unitary) semigroups with additional individual constants, $-1, 0, 1$ underlies the notion of real semigroup, moreover, a ternary semigroup is a nonempty set together with a ternary multiplication which is associative. We will define the ternary semigroup in real plane, because of the real semigroup and their conectivities.

Definition 1. The structure $(S,\cdot, 1, 0, -1)$, with individual constants $-1, 0, 1$, and a binary operator "$\cdot$ ", such that:

[TS1] $(S,\cdot)$ is a commutative semigroup with unit [TS2] $x^3 = x$, $\forall x \in S$
[TS3] $-1 \neq 1$ and $(-1)(-1) = 1$
[TS4] $x \cdot 0 = 0$, $\forall x \in S$
[TS5] $\forall x \in S, x = (-1) \cdot x \Rightarrow x = 0$

is called *Ternary semigroup*. We shall write $-x$for $-1 \cdot x$. The semigroups verifying conditions [TS1] and [TS2] (no constants other than 1) will be called 3-semigroups.

Definition 2. The structure $(G,\cdot, 1, 0)$, is called 2-structure if and only if it satisfy the conditions:

[S1] $(G,\cdot, 1)$ is a commutativ semigroup with unit [S2] $x^2 = x$, $\forall x \in G$
[S3] $x \cdot 0 = 0, \forall x \in G$

Note that the invertible elements of a 3-semigroup in particular, those of a ternary semigroup are exactly the elements a such that$a^2 =1$. Scaling the identity [S2] by x yields that a 2-semigroupis automatically 3-semigroup. If $G$is a ternary semigroup, the set $Id(G)$of idempotents of Gisa 2-semigroup with the induced multiplication. The set $Id(G)$isalsoa 2-semigroup under the operation $x \odot y = -(x \cdot y)$, with constants 1 and 0.

The class of 2-semigroups is clearly an equational class. Moreover, 2-semigroups are in essence the same thing as bounded *join-semilattices*. Indeed, if $G$is a 2-semigroup, it is obvious that the binary relation: $a \leq b \Leftrightarrow b = ab$is a partial order which makes Ginto a bounded *join-semilattice*, where join is product, 1 is the first element, and 0 is the last element. Conversely, if L is a bounded *join-semilattice* with first element $\perp$and last element T, then Lis a 2-semigroup where the product of two elements $a, b$is the join $a \vee b$, the unit is$\perp$, and the absorbent element 0 is T.

The structures introduced in the paper are the algebraic counterparts of the n-valued propositional calculus developed independently by Lukasiewicz and Post in the earlys1920s. They were introduced by Moisil and Rosenbloom in the early 40s. Here we shall only consider the case $n = 3$. We begin by summarizing some basic notions and results about Lukasiewicz and Post algebras of order 3. To define the real semigroup, we

enrich the language $\{\cdot, 1, 0, 1\}$ of ternary semigroups with a ternary relation D, and the resulting language will be like $\{\cdot, D, 0, 1, -1\}$.

Definition 3. The operator $D^t$is called *transversal representation* and defined by

$$a \in D^t(b,c) \Leftrightarrow a \in D(b,c) \wedge -b \in D(-a,c) \wedge -c \in D(b,-a)$$

Definition4. A real semigroup is a ternary semigroup together with a ternary relation Dsatisfying the following axioms:

[RS0] $c \in D(a,b)$ if and only if $c \in b,a$
[RS1] $a \in D(a,b)$
[RS2] $a \in b,c$ implies $ad \in D(bd,cd)$
[RS3] If $a \in D^t(b,c)$ and $c \in D^t(d,e)$, then there exist $x \in D^t(b,d)$such that$a \in D^t(c,e)$
[RS4] $e \in D(c^2a, d^2b)$ implies $e \in D(a,b)$
[RS5] If $ad = bd, ae = be$and$c \in D(d,e)$, then $ac = bc$
[RS6] $c \in D(a,b)$ implies

$$c \in D^t(c^2a, c^2b)$$

[RS7] $D^t(a,-b) \cap D^t(b,-a) f = \oslash$
[RS8] $a \in D(b,c)$ implies $a^2 \in D(b^2,c^2)$

Definition 5. A three-valued Lukasiewicz algebra [**?**] is a structure $(L, \wedge, \vee, \neg, \nabla, \mathrm{T})$ fulfilling the following requirements:

[L1] $(L, \wedge, \vee, \mathrm{T})$ is a distributive lattice with last element T
[L2] The unary operator ¬called *negation*, verifies the De Morgan laws:

(i) $\neg\neg x = x$
(ii) $\neg(x \wedge y) = \neg x \wedge \neg y$

[L3] The unary operator ∇, called the possibility operator, verifies:

(i) $\neg x \vee \nabla x = \mathrm{T}$
(ii) $x \wedge \neg x = \neg x \wedge \nabla x$

(iii) $\nabla(x \wedge y) = \nabla x \wedge \nabla y$

Post Algebra of order 3 is a three-valued Lukasiewicz algebra with a distinguished element$\underline{c}$, verifying $\neg \underline{c} = \underline{c}$.

Definition 6. The unary operator ∆called necessity operator, is defined by

$$\Delta\, x = \neg\nabla\neg x$$

The operators $\triangle$and $\nabla$are also called modal operators.

Proposition 1. Then the modal operators $\nabla$and $\triangle$satisfy the following conditions:

(a) $\triangle x \leq x \leq \nabla x$
(b) $\triangle \bot = \nabla \bot = \bot, \triangle T = \nabla T = T$if and only if the Lukasiewicz algebra has a center$\underline{c}$, then $\triangle \underline{c} = \bot$and $\nabla \underline{c} = T$
(c) $\triangle$ and $\nabla$are latticehomomorphisms
(d) $\triangle {}^2 x = \triangle x$ and $\nabla^2 x = \nabla x$
(e) $\nabla \triangle x = \triangle x$and $\triangle \nabla x = \nabla x$
(f) $\nabla x \wedge \neg \nabla x = \bot$ and $\triangle x \vee \neg \triangle x = \bot$
(g) $\nabla x = x$ if and only if $x \vee \neg x = T$ and $\triangle x = x$if and only if $x \wedge \neg x = \bot$
(h) If $\triangle x = \triangle y$and $\nabla x = \nabla y$ then $x = y$
(i) If the Lukasiewicz algebra has a center $\underline{c}$, then

$$x = (\underline{c} \wedge \nabla x) \vee \triangle x = (\underline{c} \vee \triangle x) \wedge \nabla x$$

Definition 7. Symmetric difference $\underline{\triangle}$is defined in Post algebras asfollows:

$$x \mathbin{\underline{\triangle}} y = (x \wedge \neg y) \vee (y \wedge \neg x)$$

Proposition 2. Symmetric difference defined in Definition 7. satisfies the following conditions:

(i) $\underline{\triangle}$iscommutative
(ii) $x \mathbin{\underline{\triangle}} \bot = x$
(iii) $x \mathbin{\underline{\triangle}} T = \neg x$
(iv) $x \underline{\triangle} \underline{c} = \underline{c}$
(v) $x = \neg x$ implies $x = \underline{c}$
(vi) $\underline{\triangle}$is associative
(vii) $x \mathbin{\underline{\triangle}} x \mathbin{\underline{\triangle}} x = x$.

MAIN RESULTS

CONSTRUCTION OF AN TERNARY SEMIGROUP FROM 2-STRUCTURE

Construction: Let G and H be 2-semigroups and let $f: G \to H$be an isomorphism of two 2-semigroups. Let $T = (G \times \{a\}) \cup ((H \backslash \{0\} \times \{b\})$ be a disjoint union. We define a binary operator $*$ on T as follows:

$$z * w = \begin{cases} \big((x \cdot y), a\big), & z = (x,a) \in G \times \{a\}, \quad w = (y,a) \in G \times \{a\} \\ (y \cdot f(x), b), & z = (x,a) \in G \times \{a\}, \quad w = (y,b) \in (H\backslash\{0\} \times \{b\}, y \cdot f(x) \neq 0 \\ (0,a), & z = (x,a) \in G \times \{a\}, \quad w = (y,b) \in (H\backslash\{0\}, y \cdot f(x) = 0 \\ (y \cdot f(x), b), & z = (x,b) \in (H\backslash\{0\} \times \{b\}, \quad w = (y,a) \in G \times \{a\}, x \cdot f(y) \neq 0 \\ (0,a), & z = (x,b) \in (H\backslash\{0\} \times \{b\}, \quad w = (y,a) \in G \times \{a\}, x \cdot f(y) = 0 \\ (f^{-1}(x)f^{-1}(y), a), & z = (x,b) \in (H\backslash\{0\} \times \{b\}, \quad w = (y,b) \in (H\backslash\{0\} \times \{b\} \end{cases}$$

Proposition 3. $(T,*, 1_{T,} 0_T, -1_T)$ is ternary semigroup, where $1_T = (1,a), 0_T = (0,a), -1_T = (1,b)$. Moreover, the set *Id(T)* of idempotents of T is $G \times \{a\}$, and hence isomorphic to *G*.

Proof: Let $z \in T$. The element $(1,b) * z$ will be denoted by -*z*. from the definition of $*$, we have that if $z \neq (0,a)$, then $z \in G \times \{a\}$ if and only $-z \in (H\{0\} \times \{b\})$. In particular, $z = -z$ if and only if *z* = (0, *a*). Is easy to show that (0, *a*) is the absorbent element (1, *a*) is the unit of $*$, and $*$ is commutative.

From the first clause of the definition of $*$, the identity $z^3 = z$ holds if $z = (x,a), x \in G$. If

$z = (y,b)$ with $y \in H\{0\}$, then $z^2 = \Big(\big(f^{-1}(y)\big)^2, a\Big) = (f^{-1}(y), a)$. We also have $y^2 = y \neq 0$.

Hence, $z^3 = z * z^2 = (y,b) * (f^{-1}(y), a) = (y \cdot f(f^{-1}(y), b)) = (y^2, b) = (y,b) = z$

The continuous work of proofing the property, consider the fact about previous defined relation.

Fact: Let $x, y, z \in T$. Then,

a) $-(-z) = z$
b) $x * (-y) = (-x) * y = -(x * y)$
c) $x = y$ if and only if $-x = -y$

Let us now prove associativity. Given $x, y, z \in G$, we must show

$$\text{(i)} x * (y * z) = (x * y) * z$$

The identity (i) is clear if $x, y, z \in G \times \{a\}$ or if one of x, y, z is zero. Suppose, then, $x, y, z \neq 0$. Using the fact above, the proof of (i) reduces to the case where $x, y, z \in G \times \{a\}$.

If, $x \notin G \times \{a\}$ and $y, z \in G \times \{a\}$, item (b) of the Fact gives $-\big(x * (y * z)\big) = -x * (y * z)$ and $-\big((x * y) * z\big) = \big(-(x * y)\big) * z = (-xy) * z$. Since $x \neq 0$ and $x \notin$ G $\times$ {a}, we have $-x \in G \times \{a\}$.

By the case where all three factors are $in G \times \{a\}$, we get $-\big(x * (y * z)\big) = -(x * y) * z$, and (i) follows, then, by item (c) of the Fact. The cases where more than one factor is not in $G \times \{a\}$, are dealt with in a similar way. The $Id(T) G \times \{a\}$is the first and last clauses in the definition of $*$. Other cases of the definition are proved similarly.

THE REAL SEMIGROUP STRUCTURE OF A POST ALGEBRA

Example 1. The ternary semigroup $3 = \{1,0,-1\}$ has a unique structure of real semigroup, with representation given by: $D_3(0,0) = \{0\}$; $D_3(0,1) = D_3(1,0) = D_3(1,1) = \{0,1\}$;
$D_3(0,-1) = D_3(-1,0) = D_3(-1,-1) = \{0,1\}$; $D_3(1,-1) = D_3(-1,1) = \mathbf{3}$;

and transversal representation given by:

$$D_3^t = (0,0) = 0;\ D_3^t = (0,1) = D_3^t = (1,0) = D_3^t = (1,1) = 1;\ D_3^t = (0,-1) = D_3^t = (-1,0) = D_3^t = (-1,-1) = -1;\ D_3^t = (1,-1) = D_3^t = (-1,1) = \mathbf{3}$$

Proposition 4. Every Lukasiewicz algebra satisfies the so-called *Kleene inequality*:$\forall x, y, x \wedge \neg x \leq y \vee \neg y$. This inequality implies that the center in a Post algebra is necessarily unique, and: $x \wedge \neg x \leq \mathrm{c} \leq y \vee \neg y$

Example 2. (a) Every Boolean algebra B with its usual negation becomes a Lukasiewicz algebra upon defining $\nabla x = x$. Boolean algebras are never Post algebras. The existence of a center $\underline{c}$ such that $\neg\underline{c}=\underline{c}$, and the laws$\underline{c} \vee \neg\underline{c}=T$ and $\underline{c}\wedge \neg\underline{c}=\perp$ lead to a collapse: $\underline{c}=\perp=\mathrm{T}$ (b) The simplest Post algebra is the three-element chain $\mathbf{3} = \{\perp, \underline{c}, T\}$ with $\perp<\underline{c},<\mathrm{T}$ $\neg\perp=\mathrm{T}$, $\neg\mathrm{T}=\perp$, $\neg\underline{c}=\underline{c}$,and the operator ∇ defined by $\nabla\perp=\perp$ and $\nabla\underline{c}= \nabla\mathrm{T} = \mathrm{T}$

Theorem 1. Let $\underline{P}$ be a Post algebra. Then $(P, \underline{\triangle}, \perp, \mathrm{T})$ is a ternary semigroup where $\perp$ is the unit, $\underline{c}$ is the absorbent element, and T is the distinguished element -1.

Proof: It only remains to prove the $\triangle$ is associative.

Let $x, y, z \in P$, then, $x\underline{\triangle}(y\underline{\triangle}z) = x\underline{\triangle}((y \wedge \neg z) \vee (z \wedge \neg y)$. The De Morgan laws and distributivity give:

$x\underline{\triangle}(y\underline{\triangle}z) = (x \wedge \neg y \wedge \neg z) \vee (x \wedge y \wedge z) \vee (x \wedge \neg y \wedge y) \vee (x \wedge z \wedge \neg z) \vee (y \wedge \neg x \wedge \neg z) \vee (z \wedge \neg x \wedge \neg y)$
$(\mathrm{x}\underline{\triangle}\mathrm{y})\underline{\triangle}z = (x \wedge \neg y \wedge \neg z) \vee (x \wedge y \wedge z) \vee (z \wedge \neg y \wedge y) \vee (z \wedge x \wedge \neg x) \vee (y \wedge \neg x \wedge \neg z) \vee (z \wedge \neg x \wedge \neg y)$

Note that the terms$(x \wedge \neg y \wedge \neg z)$, $(x \wedge y \wedge z)$, $(y \wedge \neg x)$,$(z \wedge \neg x \wedge \neg y)$appear in both formulas. On the other hand, Kleene's inequality implies $x \wedge y \wedge \neg y \leq (x \wedge z) \vee (x \wedge \neg z)$.
Hence, $x \wedge y \wedge \neg y \leq (x \wedge z \wedge y \wedge \neg y) \vee (x \wedge \neg z \wedge y \wedge \neg y) \leq (x \wedge y \wedge z) \vee$
$\vee (x \wedge \neg z \wedge \neg y \leq (x\underline{\triangle}y)\underline{\triangle}z$.

By similar reasons, is easy to prove that $x \wedge z \wedge \neg z \leq (x\underline{\triangle}y)\underline{\triangle}$.

These inequalities, together with propositions of the symmetric difference given above, show $x\underline{\triangle}(y\underline{\triangle}z) \leq (x\underline{\triangle}y)\underline{\triangle}z$, and a similar argument proves the reverse inequality.
Now we prove that: $x\underline{\triangle}x\underline{\triangle}x = x$

Since $x\underline{\Delta}x = x \wedge \neg x$, we have $x\underline{\Delta}x\underline{\Delta}x = x\underline{\Delta}(x \wedge \neg x) = \big(x \wedge (x \vee \neg x)\big) \vee \big((x \wedge \neg x) \wedge \neg x\big) = (x \vee x \wedge \neg x) = x$

Proposition 5. If $x \in B(P)$ then $c \in D_P(y,z)$, $y \wedge z \leq x \leq y \vee z$

Proof: For the non-trivial implication ($\Longrightarrow$), assuming $x \in D_P(y,z)$, this means that $y \wedge z \wedge \underline{c} \leq x \leq y \vee z \vee \underline{c}$ applying to these inequalities the operators $\underline{\Delta}, \nabla$and using $\underline{\Delta}x = \nabla x = x$ we get $\nabla y \wedge \nabla z \leq x \leq 1$ and $0 \leq x \leq \underline{\Delta}y \vee \underline{\Delta}z$; the conclusion follows, then, from:

$$y \wedge z \leq \nabla y \wedge \nabla z \text{ and } \underline{\Delta}y \vee \underline{\Delta}z \leq y \vee z.$$

Theorem 2. Let *P* be a Post algebra. The structure $(B(P),\underline{\Delta}, D_P, \perp, \mathrm{T})$ is a Boolean algebra.

Theorem 3. Let *P* be a Post algebra, *h* and homomorphism of *P* into **3**-structure and let $x, y, z \in P$. Then,

(i) $x \leq y$ if and only if for each $h, h(x) \leq h(y)$
(ii) $x \in D_P(y,z)$ if and only if for each h, either $h(x) = 0$ or $h(x) = h(y)$ or $h(x) = h(z)$.
(iii) $x \in D_P^t(y,z)$ if and only if for each h, either $h(x) = 0$ and $h(y) = \neg h(z)$ or $h(x) = h(y)$ or $h(x) = h(z)$.

Theorem 4. Let *P* be a Post algebra, then transversal representation takes the following form: for $x, y, z \in P$, $x \in D_P^t(y,z) \Leftrightarrow (y \wedge \nabla z) \vee (z \wedge \nabla y) \leq x \leq (y \vee_\Delta z) \wedge (z \vee_\Delta y)$

Theorem 5. Let *P* be a Post algebra satisfying above mentioned transversal representation, then the structure $(P,\underline{\Delta}, \perp,\underline{c},\mathrm{T}D_P)$ is a Real semigroup.

Proof: The verification of all axioms for Real semigroup, except [RS3] is straightforward truth-table truth-table checking, so we will prove just the [RS3].For [RS3], we prove weak associativity and $D_t(y,z) \neq \emptyset$ for all $y, z \in P$which, together, are equivalent to strong associativity.

a) For all $y, z \in P, D^t \neq \emptyset$

By the characterization of $D^t(y,z)$ in *Theorem 4*, it sufficies to prove $(y \wedge \nabla z) \vee (z \wedge \nabla y) \leq (y \vee_\Delta z) \wedge (z \vee_\Delta y)$, which, in turn, amounts to proving that each term of the disjuction in the left-hand side is$\leq$ than each term of the conjunction in the right-hand side. By symmetry it is enough to show:

(1) $y \wedge \nabla z \leq y \vee_\Delta z$

(2) $y \wedge \nabla z \leq z \vee_\Delta y$

(1) is trivial. (2) can be proved by truth-table checking, taking into account that the elements of

the form $\nabla x, \Delta x$ are Boolean and hence never take value 0 in **3**. To illustrate the argument we do this prove. Let $h \in X_P, if\ h(y \wedge \nabla z) = 1\ or\ h(z \vee \Delta y) = -1$ there is nothing to prove because is trivial form of proving.

- If $h(z \vee \Delta y) = 1$, then $h(z) = h(\Delta y) = 1$. Since $h(y \wedge \nabla z) \in \{0, -1\}$ and $h(\Delta y) \neq -1$ whence $h(\Delta y) = 1$, which implies $h(z) \neq 1$, contradiction.
- If $h(z \vee \Delta y) = 0$, since $h(\Delta y) \neq 0$. But $h(\Delta y) \neq -1$ whence $h(\Delta y) = 1$, which implies $h(y) \in \{0,1\}$. But $h(y) = 1$ gives $h(y \wedge \nabla z) = 1$, excluded by assumption. Then, $h(y) = 0$, and hence $h(y \wedge \nabla z) = h(y) \wedge h(z) = 0 \wedge \nabla 0 = 0 = h(z \vee \Delta y)$.

b) If $x \in D(y, z)$ and $z \in D(s, t)$, there is $u \in P$ so that $u \in D(y, z)$ and $x \in D(u, t)$.

To complete the prove of the theorem we need to prove the following fact.

Fact: We claim that the element $u = (\Delta x \wedge \neg \Delta t) \vee (y \wedge s)$ does the job of elements *x* and *z*, with the properties: $(*)\ y \wedge z \wedge \underline{c} \leq y \vee z \vee \underline{c}$ and (**) $s \wedge t \wedge \underline{c} \leq z \leq s \vee t \vee \underline{c}$.

Now we need to prove that:

$$(*) y \wedge s \wedge c \leq u \leq y \vee s \vee \underline{c} \text{ and } (**) u \wedge t \wedge \underline{c} \leq x \leq u \vee t \vee \underline{c}$$

Proof: $(*)$ Proving the left inequality of the definition of *u* is easy, we will prove the other side. For doing that is enough to show $\Delta x \wedge \neg \Delta t \leq y \vee s \vee \underline{c}$. Since $\nabla \underline{c} = \perp$, applying the operator Δ to $(*)$ and $(**)$ gives $\Delta x \leq \Delta y \vee \Delta s \vee \Delta t \leq y \vee s \vee \Delta t$. Hence, $\Delta x \wedge \neg \Delta t \leq (y \wedge \neg \Delta t) \vee (s \wedge \neg \Delta t) \vee (\Delta t \wedge \neg \Delta t) \leq y \vee s \leq y \vee s \vee \underline{c}$, as required.

$(**)$ For the left inequality we have:

$$u \wedge t \wedge \underline{c} = \big((\Delta x \wedge \neg \Delta t) \vee (y \wedge s)\big) \wedge t \wedge \underline{c} = (\Delta x \wedge \neg \Delta t \wedge t \wedge \underline{c}) \vee (y \wedge s \wedge t \wedge \underline{c}) \leq x \vee (y \wedge s \wedge t \wedge \underline{c})$$

The left inequalities in $(*)$ and $(**)$ give $y \wedge s \wedge t \wedge \underline{c} \leq y \wedge z \wedge \underline{c} \leq$ x

For the right inequality in $(**)$ we note that

$u \vee t \vee c = (\Delta x \wedge \neg \Delta t) \vee (y \wedge s) \vee t \vee c) = (\Delta x \vee (y \wedge s) \vee t \vee c) \wedge (\neg \Delta t \vee t \vee c \vee (ys)$ since $\neg \Delta t \vee t =$ T we get $u \vee t \vee c = \Delta x \vee \Delta c \vee t \vee (y \wedge s)$

From the Proposition 1.(a) yields $x = (c \vee \Delta x) \wedge \nabla x \leq \Delta x \vee \underline{c}$ and hence $x \leq u \vee t \vee \underline{c}$, completing the proof of $(**)$, so in the end we proved that Post algebras are real semigroups.

CONCLUSIONS

Builded circuit connection between the above mentioned structures is the main part of the paper. We start the work by giving the definitions which are important for the following process. The fist part is the construction of an ternary semigroup by an 2-structure, only by defining of the ternary operator and proving the needed axioms for being ternary semigroup. The second main part our work is proving the theorems which build that connection. We proved that $(P, \underline{\triangle}, \perp, c, >)$ is an ternary semigroup, where the $P$is an Post algebra and we also proved that the structure $(P, \underline{\triangle}, \perp, \underline{c}, T, D_P)$ is real semigroup where P is also an Postalgebra.

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Determination of Career Stress Levels of University Students

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ABSTRACT

Aim: The aim of the study is to determine the career stress levels and the influencing factors of the Health Services Vocational School (HSVS) students

Material-Method: Erciyes University and Erzincan Binali Yıldırım University "First Aid and Emergency Program" and "Medical Documentation and Secretarial Program" students participated in this cross-sectional study (n = 253). The data were collected through 'Personal Information Form' and 'Career Stress Scale'. Anova and t-test were applied in statistical analysis.

Finding: The career stress scale average ($\bar{x}$ = 2.30) was determined. Participants were found to have a higher average of "job seeking pressure" dimension average ($\bar{x}$ = 2.89) than "career ambiguity and information lack" ($\bar{x}$ = 2.30) and "external conflict" ($\bar{x}$ = 1.94) dimensions.

Results: As a result, the students' career stress levels according to demographic variables; In women, students who are 18 and under age group, first grade, non-internship, section preference order 6 and above, fewer friends and Erzincan Binali Yildirim University students were higher determined.

Keywords: Career stress, university students, medical documentation and secretary, first and immediate help.

Üniversite Öğrencilerinin Kariyer Stresi Düzeylerinin Belirlenmesi

ÖZET

Amaç: Sağlık Hizmetleri Meslek Yüksekokulu (SHMYO) öğrencilerinin kariyer stresi düzeylerini ve etkileyen faktörleri belirlemektir.

Materyal-Metot: Kesitsel tipteki bu çalışmaya Erciyes Üniversitesi ve Erzincan Binali Yıldırım Üniversitesi "İlk ve Acil Yardım Programı" ve "Tıbbi Dokümantasyon ve Sekreterlik Programı" öğrencileri katılmıştır (n=253). Veri toplama aracı olarak 'Kişisel Bilgi Formu' ve 'Kariyer Stresi Ölçeği' kullanılmıştır. İstatistiksel analizde gruplar arası karşılaştırmalarda nicel değişkenler için bağımsız iki örneklem t testi ve Anova uygulanmıştır. Değerlendirmelerde anlamlılık düzeyi p<0.05 kabul edilmiştir.

Bulgular: Kariyer stresi ölçeği ortalaması ($\bar{x}$=2,30) olarak belirlenmiştir. Katılımcıların "iş bulma baskısı" boyut ortalaması ($\bar{x}$=2,89) "kariyer belirsizliği ve bilgi eksikliği" ($\bar{x}$=2,30) ve "dışsal çatışma" ($\bar{x}$=1,94) boyutlarına göre ortalamalarının daha yüksek olduğu saptanmıştır.

Sonuç: Öğrencilerin kariyer stresi düzeyleri demografik değişkenlere göre kadınlarda, 18 ve altı yaş grubunda olan öğrencilerde, 1. sınıfta eğitim gören, staj yapmayan, bölüm tercih sırası 6 ve üzeri olan, arkadaş sayısı az olan ve Erzincan Binali Yıldırım Üniversitesinde eğitim gören öğrencilerde daha yüksek olduğu belirlenmiştir.

Anahtar Kelimeler: Kariyer stresi, üniversite öğrencileri, tıbbi dokümantasyon ve sekreterlik, ilk ve acil yardım.

GİRİŞ

Üniversite yaşamı başlangıcından bitimine kadar pek çok stres verici olayın ortaya çıkmasına ortam hazırlayan bir süreçtir. Öğrenciler için heyecan verici olabildiği kadar başa çıkılması gereken çok sayıda koşul yaratan bu süreçte öğrencilerin yaşadıkları stres verici olaylar ve bu olaylarla başa çıkabilme becerileri bazı bilişsel değişkenlerle ilişkilidir.

Öğrenciler üniversite yıllarında birçok stres kaynağı ile karşı karşıya kalkmaktadır. Bu stres kaynakları finansal kaygılar, akademik kaygılar, sosyal kaygılar, kariyer kaygısı vb. olabilmektedir (Özden & Sertel-Berk, 2017). Öğrenicilerin kariyer kaygısı ise bu çalışmanın asıl konusunu oluşturmaktadır.

Üniversiteye giriş dönemi, literatürde beliren yetişkinlik olarak ifade edilen ve 18-25 yaşları arasını kapsayan bir dönemi işaret etmektedir. Ergenlik ve yetişkinlik arasında olan bu dönemde bireyler "kimlik arayışı, istikrarsızlık, kendine odaklanmışlık hissi ve sonsuz olanaklara sahip olma inancı" gibi durumlarla karşılaşmaktadır (Doğan & Cebioğlu, 2011). Bu dönemde öğrenciler bir yandan yeni fırsatları değerlendirmeye çalışırken öte yandan farklı sorunlarla başa çıkmak zorundadır.

Robbins ve Judge (2017)'e göre, "stres, bireyin arzu ettiği şeylerle ilgili bir fırsat, talep ya da kaynakla karşılaştığı ve elde edeceği sonucun hem belirsiz hem de önemli olduğunu algılamadığı dinamik bir durumdur" (Robbins & Judge, 2017). Başka bir ifadeyle stres, "çevrenin potansiyel tehditlerine fiziksel ve duygusal tepki" olarak ifade edilmektedir. Bu tanım birey ile çevre arasında bir uyum sorunu olduğunu gösterir. Stres düzeyi yüksek olan bireyler sürekli yorgunluk, tansiyon ya da yüksek kan basıncı gibi sorunlarla karşı karşıya kalmaktadır (Şimşek & Çelik, 2011).

Aslında stres, genellikle olumsuz bir durum olarak algılansa da, olumlu bir durumda olabilmektedir. Potansiyel bir kazanım sağladığında stres bir fırsattır (Robbins & Judge, 2017). Çünkü insanın belli amaçlara yönelik davranabilmesi ve başarılı olabilmesi için belirli bir oranda stres gereksinimi vardır. Bu durum optimum stres düzeyi olarak adlandırılmaktadır (Yıldırım, 1995).

Stres kaynakları çevresel ve kişisel olmak üzere iki kategoride incelenebilmektedir. Çevresel faktörler ekonomik, politik ve teknolojik olmak üzere üç ana türü mevcuttur (Robbins & Judge, 2017). Kişisel stres kaynakları çoğu kez onların kişiliklerini ortaya çıkaran huylar, mizaçları, karakterleri ve yetenekleri olabilir; yani stresin kaynağı bizzat bireyin kendi kişiliği olabilir. Diğer bir ifadeyle kişisel stres kaynakları ailesel sorunlar, ekonomik sorunlar ve doğal kişilik özellikleridir (Tengilimoğlu, Işık, & Akbolat, 2017).

Üniversite öğrencilerinin stres faktörleri üzerinde yapılan bir çalışmada öğrencilerin stres düzeyini yükselten durumların kendi hedefleri ve aileye karşı sorumluluk, ders yükü ve yoğunluğu, başarılı olmak zorunluluğu hissi ve mezuniyet sonrası iş bulamama korkusu olduğu belirtilmektedir. (Durak Batıgün & Atay Kayış, 2014). Öğrencilerin tüm bu stres kaynakları

içerisinde üst sıralarda kariyerlerine ilişkin konuların aldığı bilinmektedir (Bamuhair, et al., 2015).

Günümüzde yaşam koşullarının hızla değişmesi ve beklentilerinin sürekli artması, üniversite öğrencilerinin üzerindeki baskının artmasına neden olmaktadır. Bireyler sürekli artan bir hızla stres altında yaşamını devam ettirmek zorundadır. Bu nedenle stresin kontrol altına alınması ve yönetilebilir bir psikolojik durum olduğunun farkına varılması gerekmektedir (Tengilimoğlu, Işık, & Akbolat, 2017).

Genel bir ifadeyle kariyer, yaşam boyu bir uğraş ve bir iş olarak tanımlanmaktadır. Kapsamlı bir şekilde ifade etmek gerekirse kariyer, bir kimsenin normal olarak genç yaşlarda ilerleme umuduyla girdiği ve emekli oluncaya kadar sürdürdüğü onur verici bir iş olarak görülebilmektedir. (Tortop, Aykaç, Yayman, & Özer, 2007). Şimşek ve Çelik (2011)'e göre, "kariyer, seçilen bir meslekte ilerleme ve bunun sonucunda daha fazla para kazanma, sorumluluk üstlenme, saygınlık, erk ve prestij elde etme" olarak ifade edilmektedir. Türk Dil Kurumu'na göre kariyer "Bir meslekte zaman ve çalışmayla elde edilen aşama, başarı ve uzmanlık" olarak ifade edilmektedir (www.tdk.gov.tr). Kariyer sahibi olmakla birey hiyerarşik olarak örgütlenmiş ve içinde çeşitli kademelerde görevleri bulunan bir kümenin üyesi olmaktadır.

Kariyer bazen bireysel ilerleme bazen de mesleki gelişme olarak ifade edilmektedir (Noe, 2009). Genel anlamda kariyer yaşam boyu süren bir uğraştır. Diğer bir ifadeyle kariyer "kişinin yaşamı boyunca edindiği işe ilişkin deneyim ve faaliyetlerle ilgili olarak algıladığı tutum ve davranışlar dizisidir. (Şimşek & Çelik, 2011).

Üniversite öğrenimi süreci öğrenciler için mezuniyet sonrası hedefleri oluşturma ve kariyer planı yapmada oldukça önemlidir. Fakat üniversite öğrencilerinin çoğunluğunda kariyer kararları ile ilgili büyük sorunlar yaşamakta ve bu sorunların büyük bir bölümünün psikolojik sıkıntılar (kaygı, depresyon vb.) çok olduğu ve psikolojik olarak iyilik düzeylerinin düşük olduğu görülmektedir (Fouad, et al., 2006).

Uluslararası literatür incelendiğinde birçok araştırmada kariyer seçiminde, öğrenci algılarının oldukça büyük etkiye sahip olduğu ortaya konmaktadır (Serin, Soran, & Kılıç, 2014). Birey açısından kariyer kişinin bilgi, beceri ve amaçları üzerine şekillenmektedir. Kariyer oluşumunda bireyi yönlendiren faktörleri içsel ve dışsal olarak ayırmak mümkündür. İçsel faktörlerin içerisinde en önemli olanı bireyin kişiliğidir. Dışsal faktörlerden en belirleyici olanı ise sosyal özgeçmişidir. Sosyal özgeçmiş aile, çevre, eğitim, sosyo-ekonomik olgular vb. faktörlerden oluşmaktadır. Bu faktörler zamanla bireyin dışardan etkilenmesine ve bunun sonucunda iç tepkilerinin ve beklentilerinin oluşumuna katkıda bulunmaktadır (Şimşek & Çelik, 2011).

Jang (2000) üniversite öğrencileri üzerinde okul ile ilgili, ilişki ile ilgili, ders dışı stres kaynaklarını, aile kaynaklı stres kaynaklarını ve kariyerle ilgili stres kaynaklarını incelemiş ve öğrencilerin stres düzeylerinin en yüksek olduğu konunun kariyer ile ilgili olduğunu ortaya koymuştur. Ayrıca Kim (2003)'in öğrenciler üzerine yaptıkları araştırmalarda incelenen çeşitli

stres faktörleri arasında kariyer stresinin en yüksek sırada yer aldığını saptamıştır (Akt. Choi vd., 2010). Bunun yanı sıra Seth (2002) öğrencilerin iş piyasasında gelecekteki istihdam şanslarını artırmak için yüksek dereceli puan ortalamalarını sağlama konusunda endişeli olduklarını ortaya koymaktadır (Seth, 2002) .

Bu çalışma "Araştırma Üniversitesi" unvanına sahip olan ve olmayan iki farklı üniversitede eğitim gören önlisans öğrencilerinin kariyer stresi düzeylerinde bir farklılık olup olmadığını belirlemeyi amaçlamaktadır.

YÖNTEM

Mayıs-Haziran 2018 tarihleri arasında yürütülen, kesitsel tipteki bu çalışmanın evreni Erciyes Üniversitesi (ERÜ) SHMYO ile Erzincan Binali Yıldırım Üniversitesi (EBYÜ) SHMYO'da ortak programlar olan "Tıbbi Dokümantasyon ve Sekreterlik (TDS)" ve "İlk ve Acil Yardım (İAY)" programlarında eğitim gören 350 öğrenci oluşturmaktadır. Araştırmada örneklem seçimine gidilmemiş ve çalışmaya gönüllü olarak katılmayı kabul eden tüm öğrencilere (n=253) anket uygulanmıştır. Verilerin toplanmasında araştırmacılar tarafından hazırlanan 'Kişisel Bilgi Formu' ve Choi ve arkadaşları (2011) tarafından üniversite öğrencilerinin kariyerle ilgili stres kaynaklarını ve zorlanmalarını ölçmek amacıyla geliştirilen ve ölçeğin Türkçe uyarlaması/ geçerlilik-güvenilirlik çalışması Özden ve Sertel-Berk (2017) tarafından yapılan Kariyer Stresi Ölçeği (KSÖ) kullanılmıştır. Kişisel bilgi formu öğrencilerin cinsiyet, yaş ve eğitim bilgileri gibi sosyo-demografik bilgileri edinmeye yönelik sorulardan oluşmaktadır. Öğrencilerin kariyer stresi düzeylerini ölçen KSÖ ise toplam 20 maddeden ve 3 alt boyuttan (kariyer belirsizliği ve bilgi eksikliği, iş bulma baskısı ve dışsal çatışma) oluşmaktadır. Yanıtlayıcılardan ifade edilen durumlara kendileriyle ilgili olarak ne düzeyde katıldıklarını "Hiç katılmıyorum (1)" ile "Tamamen katılıyorum (5)" arasında değişen 5'li Likert tipi bir ölçekte değerlendirmeleri istenmektedir. Ölçekten alınabilecek en düşük puan 20 en yüksek puan ise 100'dür. Alınan yüksek puan, yüksek düzeyde kariyer stresine işaret etmektedir. Kariyer Stres düzeyini ölçmeye yönelik 20 maddenin, güvenirlik düzeyini elde etmek için Chronbach's Alpha (α) katsayısı hesaplanmış ve çalışmanın güven düzeyi 0,92 olarak tespit edilmiştir. Boyutlara göre ise; Kariyer belirsizliği ve bilgi eksikliği boyutu için Chronbach's Alpha (α) değeri (0,90); dışsal çatışma boyutu için (0,77) ve son olarak iş bulma baskısı boyutu için de (0,82) olarak belirlenmiştir

Verilerin değerlendirilmesi bilgisayar ortamında istatistik programı aracılığıyla yapılmış ve önemlilik düzeyi $p<0.05$ olarak alınmıştır. Verilerin değerlendirilmesinde t-testi ve Anova analizi ile karşılaştırmalar yapılmıştır.

Çalışmaya başlamadan önce 31.05.2018 tarihli EBYÜ İnsan Araştırmaları Etik Kurulu'ndan yazılı izin alınmıştır. Ayrıca ölçeğin kullanılmasına dair yazarlarından gerekli izinler alınmıştır. Çalışmaya katılan öğrencilere araştırmanın amacı açıklanmış ve veri toplama araçları hakkında bilgi verilmiştir. Araştırmanın yürütülebilmesi için her iki kurumun SHMYO Müdürlüklerinden yazılı izin alınmıştır.

BULGULAR

Bu bölümde araştırmanın katılımcıların demografik dağılımı, ortalamalar, standart sapmalar, t-testi ve Anova analizi sonuçlarına yer verilmektedir.

Katılımcıların çoğunluğu kadın (%77,5) ve 19-21 yaş (%81,0) aralığındadır. %29,2'si sağlık lisesi mezunu ve %52,6'sı 1. Sınıf öğrencisidir. Ayrıca katılımcıların %56,5'i TDS programında eğitim görmekte ve çoğunluğu bölüm stajını (%72,9) yapmıştır.

Tablo 1: Kariyer Stres ve Alt Boyutlarına Ait Tanımlayıcı İstatistikler

Ölçek Boyutları	$\bar{X}$±SD
Kariyer Stres Ölçeği	2,30±0,81
Kariyer Belirsizliği ve Bilgi Eksikliği	2,10±0,91
Dışsal Çatışma	1,94±0,93
İş Bulma Baskısı	2,89±1,04

Kariyer stres ölçeği ve alt boyutlarına ait tanımlayıcı istatistikler incelendiğinde; kariyer stres ölçeği ortalaması 2,30 olarak tespit edilmiştir. Buna göre öğrencilerin genel stres düzeyinin orta ölçekli olduğu ifade edilebilir. Boyutlara ait tanımlayıcı istatistiklere bakıldığında, boyutlar arasında en yüksek değerin (2,89) "İş bulma baskısı" boyutuna, en düşük değerin ise (1,94) "Dışsal çatışma" boyutuna ait olduğu görülmektedir. (Tablo 1).

Kariyer stres ölçeği boyutları (Kariyer belirsizlik ve bilgi eksikliği, dışsal çatışma, iş bulma baskısı) demografik değişkenlerle karşılaştırıldığında; iş bulma baskısı boyutu ile cinsiyet ve yaş değişkenleri arasında istatistiksel olarak anlamlılık tespit edilmiştir ($p<0.05$) (Tablo 2). Yaş değişkeni için yapılan analizde 18 ve ↓ yaş grubundaki katılımcıların ortalamalarının, 25 ve ↑ yaş grubundaki katılımcılardan daha yüksek olduğu belirlenmiştir. Buna göre; 25 ve üstü yaş grubunda bulunan katılımcıların kariyer stresi düzeylerinin daha düşük olduğu görülmektedir.

Kariyer stresi ölçeği boyutlarından dışsal çatışma ile sınıf değişkeni arasında istatistiksel olarak anlamlılık saptanmıştır ($p<0.05$) (Tablo 2). Ortalamalar incelendiğinde 1. sınıfların dışsal çatışma boyutuna kariyer stresi düzeylerinin yüksek olduğu saptanmıştır.

Öğrencilerin bölüm stajını yapma durumları ile kariyer stres boyutları karşılaştırıldığında; kariyer belirsizlik ve bilgi eksikliği, dışsal çatışma ve iş bulma baskısı boyutlarında istatistiksel olarak anlamlı farklılık saptanmıştır ($p<0.05$) (Tablo 2). Ortalamalar incelendiğinde staj yapan öğrencilerin yapmayanlara göre kariyer stresi düzeylerinin düşük olduğu ifade edilebilir.

Bölüm tercih sırası değişkeni ile kariyer belirsizlik ve bilgi eksikliği boyutu arasında istatistiksel olarak anlamlı farklılık saptanmıştır($p<0.05$) (Tablo 2). Bölüm tercih sırası değişkeni için yapılan analizde bölümü tercih sırası arttıkça kariyer stres düzeylerinde de bir artış gözlemlenmektedir.

Tablo 2: Çeşitli değişkenlere göre kariyer stresi ölçeğinin puanlarının dağılımı

		n	Kariyer Belirsizlik ve Bilgi Eksikliği x̄±S	Dışsal Çatışma x̄±S	İş Bulma Baskısı x̄±S
Cinsiyet	Kadın	196	2,11±0,89	1,89±0,90	2,99±1,02
	Erkek	57	1,99±0,96	2,08±1,01	2,54±1,04
	"p" değeri				0,004
Yaş	18 ve ↓*	19	2,36±0,91	2,35±1,01	3,42±0,89
	19-21	205	2,09±0,91	1,92±0,93	2,86±1,03
	22-24	24	2,08±0,89	1,90±0,84	2,88±1,15
	25 ve ↑*	5	1,50±0,50	1,20±0,20	2,00±0,51
	"p" değeri				0,030
Lise Türü	Düz Lise	45	2,22±0,91	2,10±0,85	2,86±1,04
	Anadolu	63	2,11±1,01	1,90±1,06	2,82±1,04
	Lisesi	32	2,26±0,80	1,82±0,86	2,94±1,06
	İHL	74	1,91±0,86	1,93±0,89	2,93±0,99
	Sağlık Lisesi	39	2,15±0,87	1,92±0,93	2,91±1,15
	Diğer				
	"p" değeri				
Sınıf	1.Sınıf	133	2,15±0,92	2,06±0,94	2,94±1,02
	2.Sınıf	120	2,04±0,90	1,80±0,90	2,83±1,06
	"p" değeri			0,029	
Bölüm	İAY	110	2,17±0,93	1,97±0,94	2,89±1,07
	TDS	143	2,00±0,87	1,89±0,92	2,89±1,00
	"p" değeri				
Bölüm Stajı	Yaptı	182	2,02±0,90	1,84±0,89	2,81±1,03
	Yapmadı	71	2,29±0,92	2,17±0,98	3,09±1,04
	"p" değeri		0,035	0,011	0,048
Bölüm Tercih Sırası	1-2 arası*	115	1,88±0,85	1,85±0,94	2,72±1,03
	3-5 arası	59	2,22±1,01	2,10±0,90	3,00±0,98
	6 ve ↑*	79	2,31±0,85	1,94±0,93	3,05±1,06
	"p" değeri		0,003		
Üniversite	ERÜ	120	1,93±0,87	1,70±0,82	2,68±1,02
	EBYÜ	133	2,25±0,92	2,15±0,97	3,07±1,03
	"p" değeri		p=0,006	0,000	0,003
Yakın Arkadaş Sayısı	0-Hiç Yok*	8	2,48±1,09	2,56±1,08	3,33±0,95
	1-2 arası	102	2,10±0,95	2,01±0,96	3,05±1,08
	3 ve daha fazla*	143	2,07±0,86	1,85±0,88	2,75±0,99
	"p" değeri				0,036

Öğrencilerin eğitim gördüğü üniversite ile kariyer stresi boyutları karşılaştırıldığında; kariyer belirsizlik ve bilgi eksikliği, dışsal çatışma ve iş bulma baskısı boyutlarında istatistiksel olarak anlamlılık saptanmıştır ($p<0.05$) (Tablo 2). Ortalamalar incelendiğinde ERÜ' de eğitim gören öğrencilerin kariyer stresi düzeyleri EBYÜ' de eğitim gören öğrencilere göre daha düşük düzeyde olduğu saptanmıştır.

Son olarak öğrencilerin yakın arkadaş sayıları ile kariyer stres boyutları karşılaştırıldığında; iş bulma baskısı boyutunda istatistiksel olarak anlamlılık tespit edilmiştir ($p<0.05$) (Tablo 2). Hiç yakın arkadaşı olmayan öğrencilerin ortalamaları, 3 ve daha fazla sayıda yakın arkadaşı olan öğrenciler ile karşılaştırıldığında daha yüksek olduğu belirlenmiştir.

SONUÇ

Öğrenciler üniversite hayatları boyunca stres veren birçok duruma maruz kalmaktadırlar. Stres genellikle toplum baskısı, çevredekilerin düşünceleri, önceki başarısızlıklar, sınav kaygıları, mezuniyet sonrası hemen iş bulma düşüncesi, akademik konular, finansal kaygılar, sosyal ilişkiler, kariyer süreci veya aşırı mükemmeliyetçi olma gibi sebeplerden ortaya çıkmaktadır. Bu çalışmada da öğrencilerin eğitim hayatları boyunca karşılaştıkları stres kaynaklarının düzeyini ölçmek ve bu stres kaynaklarıyla başa çıkma yolları konusunda bilgi vermektir.

Üniversite öğrencilerinin kariyer stresi düzeylerinin demografik verilere göre farklılık gösterip göstermediğini saptamak amacıyla yapmış olduğumuz bu çalışmada, kariyer stres ölçeği boyutlarından iş bulma baskısı cinsiyet ve yaş değişkenine göre istatistiksel olarak anlamlılık göstermektedir. Kadınların ve 18 yaş altı öğrencilerin iş bulma baskılarının daha yüksek olduğu saptanmıştır. Literatürdeki bazı çalışmalar bu bulguları desteklemektedir (Cahir ve Morris, 1991; Humphrey vd. 1998; Moulds, 2003: 396). Bu çalışmaların ortak sonucu kadın öğrencilerin erkeklere göre daha yüksek stres düzeyine sahip olduğudur.

ERÜ ve EBYÜ öğrencileri arasında kariyer stresi düzeylerinde anlamlı farklılık saptanmış ve ERÜ' de eğitim gören öğrencilerin kariyer stresi düzeylerinin tüm alt boyutlarda daha düşük olduğu ortaya koyulmuştur. ERÜ' nün "Araştırma Üniversitesi" unvanına sahip olması, bulunduğu ilin büyükşehir olması ve öğrencilerin mezuniyet sonrasında çalışabilecekleri çok sayıda kamu ve özel kurum/kuruluş olmasının bu sonuca neden olduğu düşünülmektedir.

Bölüm stajını yapan öğrencilerin kariyer stresi düzeylerinin tüm alt boyutlarda daha düşük olduğu bulunmuştur. Bu durumun iş başında eğitimin öğrencilerin kendilerine olan güvenlerini yükseltmesi sonucunda kariyerlerine ilişkin stres düzeylerini etkilemekte ve birebir alanında çalışanlarla iletişim kurması bu durumun ortaya çıkmasına neden olduğu düşünülmektedir. Buna ek olarak yakın arkadaş sayısı incelendiğinde arkadaş sayısı arttıkça iş bulma baskısı alt boyutunda stres düzeylerinin düştüğü görülmektedir. Yakın arkadaş sayısının fazla olması bireylerin sosyal çevresinin geniş olmasıyla yakından ilgilidir. Sosyal çevre stresle başa çıkmada oldukça önemli bir faktördür. Yakın arkadaşlarla paylaşılan mutluluk, üzüntü ve dertler, yapılan ortak paylaşımlar öğrencilerin kaygılarını bir hayli düşürmektedir (Durna, 2006).

Sonuç olarak öğrencilerin kariyer stresi düzeyi orta seviyededir. Bununla birlikte en yüksek puanın "iş bulma baskısı" alt boyutunda olduğu saptanmıştır. Bu araştırmaya katılan öğrencilerin ders müfredatları incelendiğinde kariyer yönetimi vb. derslerin ders müfredatında yer almadığı belirlenmiştir. Bu doğrultuda öğrencilerin kariyer stresi düzeylerinin azaltılması

ve iyi bir kariyer planlaması yapabilmesi amacıyla ders müfredatına kariyer yönetimi vb. derslerin koyulması veya kariyer yönetimi ile ilgili eğitim, konferans, seminer gibi faaliyetlerin yapılması önerilmektedir.

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Bir Üniversite Hastanesinde Hasta Düşmelerinin Kök Nedenlerinin Araştırılması

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ÖZET

Amaç: Hastane düşmeleri sık karşılan hastaların yaşam kalitesini ve tedavilerini olumsuz etkileyen, gerekli önlemler alındığında önlenebilir risklerden biridir. Bu çalışmada, Erciyes Üniversitesi Sağlık Uygulama ve Araştırma Merkezi (SUAM) hasta düşmelerinin kök nedenlerin belirlenmesi amaçlanmıştır.

Materyal-metod: Tanımlayıcı tipteki bu çalışma Ekim 2018-Mart 2019 tarihleri arasında, Erciyes Üniversitesi SUAM'ın tüm kliniklerinde meydana gelen hasta düşmeleri araştırmasının örneklerini oluşturmuştur (n:79). Araştırmanın verileri araştırmacılar tarafından oluşturulan "Düşen Hasta Değerlendirme Formu" ile toplanmıştır. Hastaların düşme riskleri erişkinlerde Itaki, çocuklarda Harizmi düşme riski değerlendirme ölçekleri ile değerlendirilmiştir. Itakide değerlendirme beş ayrı zaman diliminde yapılır, minör ve majör olmak üzere toplam 19 risk faktöründen oluşur, Toplam Puan 5 ve 5 in üzerinde puan alan hastalar düşme yönünden yüksek riskli olarak kabul edilir. Harizmi düşme riski beş ayrı değerlendirme zamanından oluşur, 9 risk faktöründen değerlendirilir. Toplam puan 15 ve 15'in üstünde olan hastalar ile 0-6 yaş hastalar yüksek riskli kabul edilir. Risk değerlendirmesi, hastanın başka bir bölüme transferinde, postoperatif dönemde, düşme olaylarında ve durum değişiklerinde tekrarlanarak kaydedilmştir. Verilerin analizinde sayı - yüzde dağılımları kullanılmıştır. Bir hasta dört kez, iki hasta iki kez düşmüş olup, her düşme olgusu ayrı değerlendirilmiştir.

Bulgular: 01 Ekim 2018 - 31 Mart 2019 tarihleri tarihler arasında Erciyes Üniversitesi SUAMne 95822 hasta yatmış olup, bu dönem için düşme oranı 0,0824 olarak hesaplanmıştır. Düşen hastaların yaş ortancası 66.5 yıldır (min:1, max:91), % 54.4'ü erkektir ve %64.6'sı refakatçısıyla kalmaktadır. Hastaların ilk yattıklarında yapılan risk değerlendirmesinde % 89.9 u, düşmeden önce yapılan son risk değerlendirmesinde de %86.1'i riskli kabul edilmiştir. Hastaların %79.7'sinin en az bir kronik hastalığı vardır ve %87.3'ü düzenli ilaç kullanmaktadır. Hastaların %82.3'ünün düşme riski figürü mevcuttur ve düşen hastaların %94.9'una kısıtlama uygulaması yapılmıştır. Düşen hastaların %55.7 si 65 yaş ve üzeri gruptandır. Düşmelerin %38.5 i, 24.00-07.59 saatleri arasında, % 35.9'u, 16.00-23.59 saatleri arasında, %25.6 sı 08.00-15.59 saatleri arasında gerçekleşmiştir. Düşmelerin %29.5'i hastaların yattığı ilk günde, %53.9'u da ilk dört günde gerçekleşmiştir. Düşmeler en fazla %43.0'ı hasta odasında, %38.0'ı tuvalette ve %12.7'si koridorda meydana gelmiştir.

Sonuç: Düşen hastaların çoğu yatışlarından itibaren riskli kabul edilmiş hastalardır. Düşen hastaların çoğu yaşlı, ve en az bir kronik hastalığa sahip kişilerdir. Düşmelerin en fazla yaşlı hastalarda, hastaneye ilk yatılan günlerde ve mesai dışı, akşam-gece saatlerinde gerçekleşmiş olması dikkat çekicidir. Yaşlı hastaları düşme açısından daha dikkatli takip edilmelidir. Hastalara yattıkları andan itibaren çevre tanıtımının iyi yapılması yatılan ilk günlerdeki düşmelerin azaltılmasında faydalı olacaktır.

Anahtar Kelimeler: Hasta güvenliği, kök neden analizi, hasta düşmeleri.

Root Cause Analysis of Fallings in A University Hospital

ABSTRACT

Objective: Falling events at hospital were frequently met risks affecting the treatment of patients negatively. This study was aimed to determine the root cause analysis of fallings in Erciyes University Health Application and Research Center (EUSUAM).

Materials and methods: The universe of this descriptive study included falled patients in EUSUAM between October 2018 and March 2019 (N:79). Data of the study have been collected by the "Evaluation Form of the Falled Patient" created by researchers. Itaki scale in adults and Harizmi scale in children were used to, evaluate the falling risk of the patients. Number, percent distribution and mean distributions were used in the analysis.

Findings: Fall-down rate of the patients for this period was calculated as 0.0824. The mean age of falled patients was 66.5 years, 54.4% of them were male and 64.6% of them stayed with a companion. The rate of risky considered patients was 89.9% at the admission to hospital and 86.1% at the last risk assessment before falling. Rate of the patients with a chronic disease was 79.7% and 87.3% of them was using medication regularly. Clover figure has been used for 82.3% and restriction application has been performed for 94.9% of falled patients. Most of the falled patients (55.7%) were aged 65 and over, 38.5% of the fall-down events were occurred between 24.00-07.59 hours, 53.9% of them occurred in the first four days of the hospitaliation, 43.0% of them occurred in the patient room.

Conclusion: It is noteworthy that fall-down events occurred most frequently in elderly patients, in the first hospitalized days, and during evening-night hours. Elderly patients should be followed up more carefully in terms of falling down. Good introduction of the environment at the admission to hospital will be beneficial in terms of reducing the fall down events.

Keywords: Patient safety, Root Analysis, Patient Fall-down Events.

GİRİŞ

Hastane düşmeleri sık karşılan hastaların yaşam kalitesini ve tedavilerini olumsuz etkileyen, gerekli önlemler alındığında önlenebilir risklerden biridir. Dünya Sağlık Örgütü'nün tanımına göre düşme "farkında olmaksızın yer, zemin ya da diğer alçak seviye üzerine yığılma; mobilya, duvar ya da diğer objeler üzerine doğru bilinç dışı pozisyon değişikliği" olarak ifade edilmektedir (World Health Organization [WHO], 2007).

Düşmelere bağlı yaralanmaların önlenmesi dünyanın birçok bölgesinde hükümetlerin sağlık politikalarında yer almaktadır. Ülkemizde de, hasta güvenliğini tehdit eden durumlardan biri olan düşmelerin önlenmesine yönelik düzenlemeler, T.C. Sağlık Bakanlığı, Türkiye Sağlık Hizmetleri Genel Müdürlüğü, Sağlıkta Kalite ve Akreditasyon Daire Başkanlığı tarafından yayınlanan Sağlıkta Kalite Standartlarında tanımlanmıştır. Hasta düşmelerinin önlenmesine yönelik; risk faktörlerinin ne şekilde belirleneceği, hastaların risk düzeylerinin nasıl değerlendirileceği (hangi hastalara risk değerlendirmesi yapılacağı, risk değerlendirmesinde hangi ölçeğin kullanılacağı, risk düzeylerinin nasıl tanımlanacağı gibi), belirlenen risklere göre ne tür önlemler alınacağı (hasta/hastalık bazlı önlemler, çevresel önlemler gibi), gerçekleşen düşme olaylarına yönelik izlem süreçlerinin (gerçekleşen düşme olaylarının ne zaman, nasıl ve kime bildirileceği, sonuçların nasıl değerlendirileceği gibi) tanımlanması gerektiği vurgulanmıştır. Standartta düşme riski değerlendirmesi; hastanın hizmet alacağı bölüme kabulünde, bölümler arası transferinde, postoperatif dönemde, hastanın durumunda meydana gelecek bir değişiklik olması halinde ve bir düşme olayı gerçekleştiğinde tekrarlanmalıdır denilmektedir (SKS, 2016).

Sağlık Kuruluşları Akreditasyonu Ortak Komisyonu raporunda; ABD'de hastanelerde her yıl yüz binlerce hastanın düştüğünü, bunlarında % 30-50 oranında yaralanma ile sonuçlandığını, yaralanan hastalara ilave tedavilerin gerektiğini, bununda hastanede kalış süresini uzattığını, bir düşme sonrası yaralanma maliyetinin de kişi başı yaklaşık 14.000 dolar olduğunu belirtilmiştir (JCI, 2015).

Hasta düşmeleri için ana risk faktörlerini WHO, biyolojik (yaş, cinsiyet), davranışsal (riskli davranışlar, çoklu ilaç kullanımı, çevresel (kaygan zemin, yetersiz aydınlatma, vb.) ve sosyoekonomik (düşük gelir, eğitim eksikliği, vb.) olmak üzere dört boyuta ayırmıştır (World Health Organization [WHO], 2007).

Düşmelere neden olabilecek risk faktörlerinin belirlenmesi ve hastanın kabulü ile başlayan tanılama aşamasında bir model, ölçek ya da skorlama sisteminden yararlanılarak düşme riskinin belirlenmesi, gerekli bakım girişimleri ve koruyucu önlemlerin zamanında alınmasını sağlarken aynı zamanda hastanın zarar görmesini de engelleyecektir (Mollaoğlu, Fertelli ve Tuncay 2013).

Ülkemizde yapılan bir araştırmada; hasta düşmelerini önlemek ve hasta güvenliğini sağlamak için hemşire ve diğer sağlık profesyonellerinin hastaları düşme risk faktörleri açısından değerlendirmesi gerektiği vurgulanmıştır (Yaşar ve Türk, 2018).

Bu çalışmada, Erciyes Üniversitesi Sağlık Uygulama ve Araştırma Merkezi (SUAM) hasta düşmelerinin kök nedenlerin belirlenmesi amaçlanmıştır.

Materyal-metod: Tanımlayıcı tipteki bu çalışma Ekim 2018-Mart 2019 tarihleri arasında, Erciyes Üniversitesi Sağlık Uygulama ve Araştırma Merkezi (SUAM)'nin tüm kliniklerinde meydana gelen hasta düşmeleri, araştırmanın örneklerini oluşturmuştur (n:79). Araştırmanın verileri araştırmacılar tarafından oluşturulan "Düşen Hasta Değerlendirme Formu" ile toplanmıştır. Hastaların düşme riskleri erişkinlerde Itaki, çocuklarda Harizmi düşme riski değerlendirme ölçekleri ile değerlendirilmiştir. Itakide değerlendirme beş ayrı zaman diliminde yapılır, minör ve majör olmak üzere toplam 19 risk faktöründen oluşur, Toplam Puan 5 ve 5 in üzerinde puan alan hastalar düşme yönünden yüksek riskli olarak kabul edilir. Harizmi düşme riski beş ayrı değerlendirme zamanından oluşur, 9 risk faktöründen değerlendirilir. Toplam puan 15 ve 15'in üstünde olan hastalar ile 0-6 yaş hastalar yüksek riskli kabul edilir. Risk değerlendirmesi, hastanın başka bir bölüme transferinde, postoperatif dönemde, düşme olaylarında ve durum değişiklerinde tekrarlanarak kaydedilmştir. Verilerin analizinde sayı - yüzde dağılımları kullanılmıştır. Bir hasta dört kez, iki hasta iki kez düşmüş olup, her düşme olgusu ayrı değerlendirilmiştir.

Bulgular ve Tartışma: 01 Ekim 2018 - 31 Mart 2019 tarihleri tarihler arasında Erciyes Üniversitesi SUAM'a 95822 hasta yatmış olup, bu dönem için düşme oranı 0,0824 (düşen hasta sayısı/ hizmet verilen tüm hasta hasta sayısı x100) olarak hesaplanmıştır. Joint Commission on Accreditation of Healthcare Organization (JCAHO) 2007 yılı raporlarında düşme oranının % 0,17 ile 2,5 arasında değiştiği belirtilmektedir (Joınt Commission on Accredititation of Healthcare Organizations Sentinel Event Hotline, http:// www.jointcommission.org ; 2007).

Düşen hastaların yaş ortancası 66.5 yıldır (min:1, max:91), % 54.4'ü erkektir. Yapılan çalışmalarda cinsiyet ve düşme riski açısından farklı sonuçlar görülmektedir. Hendrich II düşme riski ölçeğinin skorlama bölümünde erkek cinsiyeti risk faktörü olarak görülmektedir. Ege üniversitesinde 2014 yılında yapılan çalışmada erkek cinsiyet ile yüksek düşme riski düzeyi arasında anlamlı bir ilişki görülmüştür. Mollaoğlu ve ark.(2013) yaptığı çalışmada kadın bireylerin %51,7 oranında yüksek düşme riski olduğunu bulmuşlardır.

Hastaların %55.7 si 65 yaş ve üzeri gruptandır. Yapılan bir çalışmada; 61-80 yaş grubunda yer alan bireylerin düşme riskinin yüksek olduğu belirlenmiştir (Mollaoğlu, Fertelli ve Tuncay 2013). Barış, İntepeler ve Yeginboy (2016) retrospektif çalışmalarında, kliniklerde toplam 1622 düşme raporu incelenmişler ve ciddi düşmelerin; %69.2'sinin 60 yaş ve üzeri hastalarda gerçekleştiğini belirtmişlerdir. WHO raporuna göre, her yıl 65 yaş ve üzeri bireylerin düşme oranı %28 - %35 arasında iken, bu oran 70 yaşından sonra %32 - %42'ye çıkmaktadır.

Hastaların ilk yattıklarında yapılan risk değerlendirmesinde % 89.9 u, düşmeden önce yapılan son risk değerlendirmesinde de %86.1'i riskli kabul edilmiştir.

Hastaların %79.7'sinin en az bir kronik hastalığı vardır ve %87.3'ü düzenli ilaç kullanmaktadır. Erdem ve Atay "Acil servise başvuran bireylerde düşme riski ve etkileyen faktörler" isimli çalışmalarında; kronik hastalığa sahip olma durumu ile düşme riski arasında

istatistiksel olarak anlamlı bir fark olduğunu bulmuşlardır. Acil Serviste Hasta Düşme Riskinin Belirlenmesi isimli çalışmada da, acil servise başvuran hastaların kronik hastalık ile düşme riski düzeyi ve sürekli ilaç kullanımı ile düşme riski arasında istatistiksel olarak anlamlı fark olduğu bulunmuştur (Tanrıkulu ve Sarı, 2017).

Hastaların %82.3'ünün düşme riski figürü mevcuttur ve düşen hastaların %94.9'una kısıtlama uygulaması yapılmıştır. "Kocaeli Üniversitesi Araştırma ve Uygulama Hastanesinde Yatan Hastalarda Düşme Sonuçlarının Değerlendirilmesi" isimli çalışmada; koruyucu güvenlik önlemlerin alınmasına ve ortam kaynaklı olmamasına rağmen eğitim verilen bireylerde, baş dönmesi nedeniyle daha çok düşme görüldüğü saptanmıştır (Bozdemir, Küçükberber ve Özmen, 2016). JCAHO (Joint Commission on Accreditation of Healthcare Organizations - Sağlık Kuruluşlarının Akreditasyonu Birleşik Komisyonu) düşme riskini azaltmaya yönelik; yatak alarmı kullanılması, yatak kenarlarının kaldırılması, hasta ve ailenin eğitimi, çağrı sisteminin düzenlenmesi, alçak yatakların kullanılmasını önermektedir (Suzanne, 2005).

Düşmelerin %38.5 i, 24.00-07.59 saatleri arasında, % 35.9'u, 16.00-23.59 saatleri arasında, %25.6 sı 08.00-15.59 saatleri arasında gerçekleşmiştir.

Düşmelerin %29.5'i hastaların yattığı ilk günde, %53.9'u da ilk dört günde gerçekleşmiştir. Düşmeler en fazla %43.0'ı hasta odasında, %38.0'ı tuvalette ve %12.7'si koridorda meydana gelmiştir. Düşen hastaların %64.6'sı refakatçısıyla kalmaktadır. Savcı ve arkadaşlarının çalışmasında; düşme riski yüksek hastaların yataktan düşmelerini önlemek üzere, hemşirelik önlemleri arasında hastanın yanında sürekli refakatçi bırakmak bunu sırası ile yatak kenarlığının yükseltilmesi, fiziksel tespit edici kullanımının izlendiği bulunmuştur.

Sonuç: Düşen hastaların çoğu yatışlarından itibaren riskli kabul edilmiş hastalardır. Düşen hastaların çoğu yaşlı, ve en az bir kronik hastalığa sahip kişilerdir. Düşmelerin en fazla yaşlı hastalarda, hastaneye ilk yatılan günlerde ve mesai dışı, akşam-gece saatlerinde gerçekleşmiş olması dikkat çekicidir. Yaşlı hastaları düşme açısından daha dikkatli takip edilmelidir. Hastalara yattıkları andan itibaren çevre tanıtımının iyi yapılması yatılan ilk günlerdeki düşmelerin azaltılmasında faydalı olacaktır.

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Hemşirelerde Duygusal Emek Davranışı ile Tükenmişlik Düzeyi Arasındaki İlişkinin İncelenmesi

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ÖZET

Amaç: Bu çalışmada, hemşirelerin duygusal emek ve tükenmişlik düzeylerinin incelenmesi, duygusal emek davranışının tükenmişlik düzeyine etkisinin belirlenmesi ve duygusal emek ile tükenmişliği etkileyen faktörlerin saptanması amaçlanmıştır.

Materyal-Metod: Kesitsel tipteki bu çalışma Ocak-Şubat 2019 tarihleri arasında, Aksaray Eğitim ve Araştırma Hastanesi'nde görev yapan klinik, poliklinik, yoğun bakım, ameliyathane ve acil ünitelerinde çalışan 199 hemşire üzerinde yürütülmüştür. Araştırmada veri toplama aracı olarak, hemşirelerin demografik ve sosyo-kültürel özelliklerini içeren kişisel bilgi formu, Duygusal Emek Ölçeği ve Maslach Tükenmişlik Ölçeği kullanılmıştır. Verilerin istatistiksel analizinde gruplar arası karşılaştırmalarda nicel değişkenler için bağımsız iki örneklem *t* testi ve tek yönlü Varyans Analizi uygulanmış, değişkenler arasındaki ilişkinin değerlendirilmesinde de Pearson Korelasyon Katsayısı hesaplanmıştır. Değerlendirmelerde anlamlılık düzeyi $p<0.05$ olarak kabul edilmiştir.

Bulgular: Hemşirelerin en yüksek puanı Duygusal Emek Ölçeği alt boyutlarından duygusal çaba harcama boyutundan ve Maslach Tükenmişlik Ölçeği'nin kişisel başarı hissi boyutundan aldıkları görülmektedir. Hemşirelerin duygusal tükenme alt boyut puanları ile duygusal çaba harcama alt boyut puanları arasında, duygusal tükenme ile gerçek duyguları bastırma alt boyut puanları arasında, tükenmişlik toplam puanı ile duygusal çaba harcama ve gerçek duyguları bastırma alt boyut puanları arasında pozitif yönde ve düşük düzeyde anlamlı bir ilişki saptanmıştır. Kişisel başarı hissi alt boyut puanları ile yüzeysel davranış alt boyut puanları arasında ise negatif yönde ve düşük düzeyde anlamlı bir ilişki söz konusudur ($p<0.05$).

Sonuç: Hemşirelerin, Maslach Tükenmişlik Ölçeği kişisel başarı boyutundan düşük puan, duygusal tükenme ve duyarsızlaşma boyutlarından ise yüksek puan almaları tükenmişliğin yüksek düzeyde olduğunu göstermektedir.

Anahtar Kelimeler: Hemşire, duygusal emek, tükenmişlik düzeyi, sağlık sektörü.

Analysis of Relationship between Burnout Level and Emotional Labor Behaviour in Nurses

ABSTRACT

Objective: The aim of this study was to determine the emotional labor and burnout levels of nurses and to evaluate the effect of emotional labor behavior on burnout level and to investigate the factors affecting emotional labor and burnout.

Materials and methods: This cross-sectional study was conducted on 199 nurses working in clinical, polyclinic, intensive care, operating room and emergency units in Aksaray Training and Research Hospital between January-February 2019. In the study, personal information form including demographic-sociocultural characteristics of nurses and Emotional Labor Scale and Maslach Burnout Scale were used as data collection tools. In the statistical analysis, independent samples t-test and one-way analysis of variance were used for quantitative variables. Pearson correlation coefficient was calculated in the evaluation of the relationship between the variables. Significance level was accepted as $p < 0.05$.

Results: It was found that nurses received the highest score from the emotional effort expenditure dimension and the highest score from the Maslach Burnout Scale from the sense of personal achievement dimension. There was a positive and low-level correlation between emotional exhaustion sub-dimension scores and emotional effort expenditure sub-dimension scores of nurses, between emotional exhaustion and suppression of real emotions, Maslach burnout total score, and emotional effort expenditure and actual emotion suppression subscale scores. It was. There was a negative and low-level correlation between the scores of personal accomplishment subscale scores and surface behavior subscale scores ($p < 0.05$).

Conclusion: In our study, Nurses, Maslach Burnout Scale scores lower than the personal achievement dimension, emotional exhaustion and depersonalization scores high scores indicate that burnout is high.

Keywords: Nurse, Emotional Labor, Burnout, Healthcare Sector.

GİRİŞ

Hizmet sektörünün gösterdiği hızlı değişime bağlı olarak yeni kavramların gündeme gelmesi söz konusu olmuştur. Duygusal emek de bu kavramlardan biri olarak nitelendirilmektedir (Kaya ve Tekin 2018). Özellikle bazı mesleklerde insan unsurunun ön plana çıkması, duygu yoğunluğunu da beraberinde getirmiş ve duyguların yönetilmesi giderek daha çok önem kazanmıştır (Somunoğlu İkinci ve Ünalan, 2018). Bununla birlikte hizmet sektörüne verilen önemin artmasına bağlı olarak ortaya çıkan rekabet ortamında çalışanlara yönelik beklentiler yükselmiş ve bu beklentilerin karşılanması sürecinde çalışanların tükenmişlik hissi ile karşı karşıya kalmaları kaçınılmaz olmuştur (Özen ve Yüceler 2019).

Sağlık sektörü açısından bakıldığında gerek hastaların hissettiklerinin anlaşılması ve etkili bir iletişim kurulması gerekse artan beklentilerin karşılanması sürecinde çalışanların tükenmişlik yaşamaları duygusal emek ve tükenmişlik kavramının birlikte ele alınması ihtiyacını doğurmuştur. Bu düşüncelerden hareketle hazırlanan bu çalışmada hemşirelerin duygusal emek ve tükenmişlik düzeylerinin incelenerek, duygusal emek davranışının tükenmişlik düzeyine etkisinin belirlenmesi amaçlanmıştır. Bu amaçla öncelikle duygusal emek ve tükenmişlik kavramları kısaca açıklanacak, sağlık sektöründeki yansımalarına yer verilecek ve sonrasında da yapılan araştırmanın bulguları ve öneriler ele alınacaktır.

DUYGUSAL EMEK KAVRAMI VE SAĞLIK SEKTÖRÜ

Duygusal emek kavramı ilk olarak 1983 yılında Hochschild tarafından yapılan bir açıklamada ele alınarak; duyguların dışarıdan da fark edilebilecek düzeyde beden dili ile yönetilmesi şeklinde tanımlanmıştır (Kerse ve Özdemir, 2018).

Duygusal emek; yüzeysel davranış, derinlemesine davranış ve samimi davranış olmak üzere başlıca üç başlık altında ele alınmaktadır. **Yüzeysel davranış** adından da anlaşılacağı gibi, bireyin hissetmediğini hissediyormuş gibi gösterme davranışını; **derinlemesine davranış,** duyguların düzenlenmesini ve bireyin yansıtması gereken duyguyu gerçekten hissederek davranmasını; **samimi davranış** ise, içinden geldiği gibi son derece doğal davranmasını ifade etmektedir (Değirmenci Öz ve Baykal, 2017).

Sağlık sektöründe özellikle hastalar ile yoğun olarak kurulan yüz yüze iletişimin, hastaların kendilerini güvende hissedecekleri bir ortamın yaratılma ihtiyacının ve empati yapılmasına duyulan gerekliliğin duyguların yönetilmesini gündeme getirdiği vurgulanmakta ve özellikle de hemşirelerin duygusal emek davranışını daha çok sergiledikleri ifade edilmektedir (Değirmenci Öz ve Baykal, 2017).

TÜKENMİŞLİK VE SAĞLIK SEKTÖRÜ

Tükenmişlik, Maslach tarafından bir sendrom olarak nitelendirilmekte, çalışanların yaptıkları işin bir gereği olarak karşı karşıya kaldıkları durumun sonucunda yaşadıkları fiziksel bitkinlik, çaresizlik, umutsuzluk ve yorgunluk duygularını çalışma ortamına, yaşamlarına ve bireylere karşı olumsuz olarak yansıtmaları şeklinde tanımlanmaktadır. Duygusal tükenme,

duyarsızlaşma ve kişisel başarının azalması şeklinde kendini gösteren tükenmişlik, örgütler açısından da önemli ve aşılması gereken bir tehlike olarak kabul edilmektedir (Yıldırım ve Erul, 2013). En yaygın tükenme türü olarak ifade edilen **duygusal tükenmede** birey, kurduğu iletişimlerin yoğunluğuna bağlı olarak kendini duygusal anlamda aşırı yük altında hissetmekte, **duyarsızlaşmada** hizmet sağladığı kişiler ile arasına mesafe koyma eğilimi göstermekte, **kişisel başarının azalmasında** da işlerini eskisi gibi iyi yapamadığı hissine kapılmaktadır (Gün Eroğlu, 2014).

Sağlık sektöründe özellikle hemşirelerin ve doktorların insanlar ile sürekli iletişim halinde olma, aşırı iş yükü, terminal dönem hastalarına bakım verme zorunluluğu, tehlikeli çalışma ortamı, yoğun iş temposu ve uğradıkları mobbing gibi çeşitli nedenlere bağlı olarak daha çok stres ve gerginlik yaşadıkları ifade edilmektedir. Literatürde, yapılan müdahalelerin duygusal sorumluluk ve duygusal emek davranışı sergileme ihtiyacını beraberinde getirmesinin de çalışanların stresini yükselttiği ve bu duruma bağlı olarak duygusal emek ile tükenmişlik arasında pozitif yönlü bir ilişkini ortaya çıktığı vurgulanmaktadır (Yılmaz ve Arslan 2017).

YÖNTEM

Evren ve Örneklem

Kesitsel tipteki bu çalışmanın evrenini Aksaray Eğitim ve Araştırma Hastanesi'nde Ocak-Şubat 2019 tarihlerinde görev yapan toplam 410 hemşire oluşturmuştur. Araştırmada örneklem seçme yoluna gidilmiş, PASS 11 örneklem hesaplama programında %95 güven aralığında 199 hemşire örneklem sayısı olarak hesaplanmıştır. Örneklem seçilirken çalışmaya gönüllü olarak katılmayı kabul edenler arasında tabakalı örnekleme yöntemi ile klinik, poliklinik, yoğun bakım, ameliyathane ve acil ünitelerinden ağırlıklandırılarak basit rastgele örneklem seçim yöntemi kullanılmıştır.

Veri Toplama Araçları

Araştırmada veri toplama aracı olarak, hemşirelerin demografik ve sosyo-kültürel özelliklerine yönelik kişisel bilgi formu, Duygusal Emek Ölçeği ve Maslach Tükenmişlik Ölçeği (MTÖ) kullanılmıştır. Veri toplama araçları, katılımcılara gönüllülük prensibi esas alınarak yüz yüze görüşme tekniği ile uygulanmıştır.

Duygusal Emek Ölçeği

Oral ve Köse'nin (2011), Grandey'in, Brotheridge ve Lee'nin çalışmasından yararlanarak geliştirdiği ve hekimlerle gerçekleştirdiği tez çalışmasında kullandığı soruların Türkçe'ye çevrilmesiyle elde edilmiş olan Duygusal Emek Ölçeği, adı geçen yazarlar tarafından yapılan faktör analizi sonucunda 4 boyut ve 11 maddeden oluşan likert tipinde bir ölçektir. Bu dört boyut; yüzeysel davranış (1., 2. ve 10. sorular), derinlemesine davranış (12. ve 22. sorular), duygusal çaba harcama (14., 17., 19. ve 21. sorular) ve gerçek duyguları bastırma (4. ve 7. sorular) olarak adlandırılmıştır. Ölçeğin boyutlarından herbiri ayrı ayrı değerlendirilmekte, ayrıca ölçek toplam puanı hesaplanmamaktadır. Bu araştırmada ölçeğin Cronbach's Alpha (α) değeri ise 0.79 olarak bulunmuştur.

Maslach Tükenmişlik Ölçeği

Maslach ve Jackson (1981) tarafından tükenmişlik düzeyini belirlemek amacıyla 1981 yılında geliştirilen ve Ergin'in 1992 yılında geçerlik ve güvenirlik çalışmalarını yaptığı Maslach Tükenmişlik Ölçeği, duygusal tükenme (1., 2., 3., 6., 8., 13., 14., 16. ve 20. sorular), duyarsızlaşma (5., 10., 11., 15. ve 22. sorular) ve kişisel başarı (4., 7., 9., 12., 17., 18., 19. ve 21. sorular) boyutlarını belirleyici özelliklere sahip 22 maddeden ve üç alt boyuttan oluşan, beşli likert tipi bir ölçektir. Ölçekten alınabilecek en düşük ve en yüksek değerler duygusal tükenme boyutu için 0-36, duyarsızlaşma boyutunda 0-20, kişisel başarı boyutu için de 0-32'dir. Duygusal tükenme ve duyarsızlaşma boyutlarından yüksek puan almak, kişisel başarı boyutundan ise düşük puan almak tükenmişliğin yüksek olduğunu ortaya koymaktadır. Bu araştırmada ölçeğin Cronbach's Alpha (α) değeri ise 0.74 olarak hesaplanmıştır.

İstatistiksel Analiz

Araştırma verilerin analizinde SPSS 25.0 paket programı kullanılmıştır. Verilerin normal dağılıma uygunluğu Shapiro-Wilk testi ile değerlendirilmiştir. Gruplar arası karşılaştırmalarda nicel değişkenler için bağımsız iki örneklem *t* testi ve tek yönlü Varyans Analizi uygulanmış, çoklu karşılaştırmalarda da Post- Hoc test istatistiklerinden Tukey yöntemi kullanılmıştır. Değişkenler arasındaki ilişkinin değerlendirilmesinde ise Spearman Korelasyon Katsayısı hesaplanmıştır. Değerlendirmelerde anlamlılık düzeyi $p< 0.05$ olarak kabul edilmiştir.

BULGULAR

Bu çalışma Aksaray Eğitim ve Araştırma Hastanesi'nde çalışan 199 hemşire üzerinde yapılmıştır. Araştırma grubunu oluşturan bireylerin çoğunluğunun 31-35 yaş grubu aralığında olup, %70.4'ü evli, %63.8'i kadın, %60.8'i lisans mezunu, %27.6'sının meslekte çalışma süresi de 16 yıldan fazla olduğu saptanmıştır. Hemşirelerin %39.2'si bu kurumda çalışma süresinin 1-5 yıl arasında olduğunu belirtirken, %33.2'si yoğun bakım kliniklerinde çalışmakta, %12.6'sı sürekli gece vardiyasında, %3.5'i sürekli gündüz vardiyasında, %83.9'u ise her iki vardiyada da çalıştığını belirtmiştir. Nöbet tutanların tuttukları nöbet sayısı aylık ortalaması 9.22 olduğu saptanmıştır. Araştırma grubundaki hemşirelerin; %68.3'ü "Mesleğinizi isteyerek mi seçtiniz?" sorusuna evet cevabını vermiş, %54.8'i "Yine hemşirelik mesleğini seçer miydiniz?" sorusuna hayır cevabını vermiş, %58.8'i "Koşullarınız uygun olsa mesleği bırakır mısınız?" sorusuna evet yanıtını vermiştir.

Duygusal Emek Ölçeği alt boyut puanlarına bakıldığında en yüksek puan ortalamasının 10.13±3.61 puan ile *duygusal çaba harcama* boyutunda olduğu daha sonra sırasıyla 7.05±2.53 puan ile *yüzeysel davranış* boyutu, 6.88±1.68 puan ile *gerçek duyguları bastırma* boyutu, 5.44±2.99 puan ile *derinlemesine davranış* boyutunda olduğu tespit edilmiştir.

Tablo 1: Hemşirelerin Duygusal Emek Ölçeği ve Maslach Tükenmişlik Ölçeğinden Aldıkları Puanların Dağılımı

Ölçekler ve Alt Boyutları	Min.	Max.	Mean	Std. Deviation
Duygusal Emek Ölçeği				
Yüzeysel Davranış	3	14	7.05	2.53
Derinlemesine Davranış	2	36	5.44	2.99
Duygusal Çaba Harcama	4	20	10.13	3.61
Gerçek Duyguları Bastırma	2	10	6.88	1.68
Maslach Tükenmişlik Ölçeği				
Duygusal Tükenme	9	36	28.67	7.80
Duyarsızlaşma	5	20	11.57	3.86
Kişisel Başarı Hissi	18	32	29.37	4.78
Toplam Puan	46	105	69.63	10.10

MTÖ'de toplam puan ortalaması 69.63±10.10 olarak saptanmıştır. Ölçeğin alt boyutlarında en yüksek puan ortalaması 29.37±4.78 puan ile *kişisel başarı hissi* boyutunda daha sonra sırasıyla *duygusal tükenme ve duyarsızlaşma* boyutunda olduğu tespit edilmiştir. MTÖ kişisel başarı boyutundan düşük puan almak tükenmişliğin yüksek düzeyde olduğunu, duygusal tükenme ve duyarsızlaşma boyutlarından yüksek puan almak ise tükenmişliğin yüksek düzeyde olduğunu ortaya koymaktadır (Tablo 1).

MTÖ alt boyutlarından Duyarsızlaşma boyutu ile yaş, meslekte çalışma yılı, mesleği isteyerek seçme, yeniden mesleği seçme ve mesleği bırakma durumları arasında istatistiksel açıdan anlamlı bir farklılık vardır. Yaşın ilerlemesine ve meslekte çalışma süresinin artmasına bağlı olarak duyarsızlaşma boyutu puanları azalmıştır. Mesleği istemeyerek seçenlerin, yeniden bu mesleği seçmek istemeyenlerin ve mesleği bırakmak isteyen hemşirelerin duyarsızlaşma boyutu puanları ise yüksektir ($p<0.05$) (Tablo 2).

MTÖ alt boyutlarından *duygusal tükenme* boyutu ile hemşirelerin yürüttükleri görev, çalışma şekli, mesleği isteyerek seçme, yeniden mesleği seçme ve mesleği bırakma durumları arasında istatistiksel açıdan anlamlı bir farklılık vardır. Klinikte ve yoğun bakımda çalışan, her iki vardiyada da çalışan (gece ve gündüz), mesleği isteyerek seçmeyen, yeniden bu mesleği seçmek istemeyen ve mesleği bırakmak isteyen hemşirelerin duygusal tükenme boyutu puanları yüksektir. Ayrıca, MTÖ alt boyutlarından *kişisel başarı* boyutu ile hemşirelerin yeniden mesleği seçme ve mesleği bırakmak isteme durumları arasında istatistiksel olarak anlamlı farklılık vardır ($p<0.05$) (Tablo 2).

Duygusal Emek Ölçeği alt boyutlarından Derinlemesine Davranış boyutu ile medeni durum, eğitim durumu ve kurumdaki çalışma yılı arasında da istatistiksel açıdan anlamlı bir fark bulunmuştur Hemşirelerin çalışma yılının artmasına bağlı olarak hastaların duygularını hissetme açısından daha iyi düzeyde oldukları düşünülmektedir ($p<0.05$) (Tablo 2).

Aylık nöbet sayısı ile MTÖ puanları incelendiğinde *aylık nöbet sayısı-duygusal tükenme* alt boyutu arasında pozitif yönde düşük düzeyde anlamlı ilişki saptanmıştır ($r= 0.141$, $p<0.05$).

Tablo 2: Çeşitli Değişkenlere Göre Duygusal Emek Ölçeği ve Maslach Tükenmişlik Ölçeği Puanlarının Dağılımı

Değişkenler	n(%)	Duygusal Emek Ölçeği Alt Boyutları				Maslach Tükenmişlik Ölçeği Alt Boyutları			
		Yüzeysel Davranış	Derinlemesine Davranış	Duygusal Çaba Harcama	Gerçek Duyguları Bastırma	Duygusal Tükenme	Duyarsızlaşma	Kişisel Başarı Hissi	Toplam Puan
Yaş									
20-25	27(13.6)	99.76	92.02	94.50	111.74	90.69	117.81	96.61	98.15
26-30	44(22.1)	103.16	85.16	90.01	106.35	111.89	111.68	89.45	109.22
31-35	41(20.6)	85.80	103.24	101.51	87.67	109.43	104.83	96.04	106.89
36-40	44(22.1)	107.74	115.00	114.56	103.58	95.88	98.82	112.61	102.73
41+	43(21.6)	102.53	101.76	97.34	94.22	88.92	73.47	103.79	82.37
p değeri		0.471	0.151	0.338	0.365	0.239	**0.008***	0.395	0.209
Cinsiyet									
Kadın	127(63.8)	97.71	97.84	94.30	96.90	104.08	98.80	101.23	103.85
Erkek	72(36.2)	104.03	103.81	110.06	105.47	92.80	102.11	97.83	93.22
p değeri		0.454	0.478	**0.043***	0.303	0.184	0.696	0.689	0.211
Medeni Durum									
Evli	140(70.4)	104.34	105.23	107.12	102.52	101.78	95.56	102.91	101.19
Bekar	59(29.6)	89.71	87.59	83.10	94.03	95.79	110.53	93.09	97.19
p değeri		0.100	**0.046***	**0.007***	0.332	0.503	0.093	0.271	0.654
Eğitim Durumu									
SML	21(10.6)	113.36	127.98	110.90	101.43	107.31	120.43	109.43	114.86
Ön lisans	45(22.6)	111.74	117.77	116.78	102.37	104.74	99.70	97.02	104.89
Lisans	121(60.8)	92.38	90.31	93.32	100.41	97.57	96.68	98.76	95.75
Lisansüstü	12(6)	109.42	82.13	85.33	84.46	93.92	98.83	107.13	98.54
p değeri		0.138	**0.003***	0.071	0.799	0.803	0.381	0.819	0.495
Yürütülen Görev									
Klinik Hemşiresi	61(30.7)	108.58	105.51	110.05	107.74	111.16	99.48	100.27	109.34
Acil Hemşiresi	39(19.6)	101.64	102.51	104.68	95.62	90.22	111.26	101.01	94.87
Yoğun Bakım H.	66(33.2)	93.77	95.02	93.39	95.49	111.23	105.21	92.98	108.92
Ameliyathane H.	15(7.5)	79.20	98.37	102.07	105.67	67.87	88.23	114.57	75.97
Diğer Birimler	18(9)	107.53	95.53	78.31	95.08	68.94	68.08	110.50	66.78
p değeri		0.345	0.866	0.231	0.718	**0.003***	0.083	0.633	**0.017***

Meslekte Çalışma Yılı									
1 yıldan az	8(4)	91.56	81.25	89.56	138.06	92.56	114.44	101.63	101.06
1-5 yıl	37(18.6)	104.24	93.69	87.93	97.54	89.55	111.76	92.28	93.22
6-10 yıl	52(26.1)	87.52	90.90	99.11	94.67	116.48	116.16	92.41	114.92
11-15 yıl	47(23.6)	100.88	114.22	102.69	94.80	94.80	90.66	112.36	99.04
16+	55(27.6)	109.42	103.42	108.18	105.60	96.97	82.69	101.56	91.12
p değeri		0.360	0.217	0.535	0.275	0.188	**0.014***	0.434	0.255
Kurumdaki Çalışma Yılı									
1 yıldan az	43(21.6)	95.97	88.90	97.63	94.45	107.83	109.85	88.47	103.55
1-5 yıl	78(39.2)	98.51	101.33	101.60	106.10	92.21	99.10	111.21	98.79
6-10 yıl	41(20.6)	113.24	105.06	104.77	98.27	113.63	105.22	86.52	107.26
11-15 yıl	23(11.6)	83.39	85.85	80.74	93.87	103.65	91.83	113.80	106.52
16+	14(7)	109.18	135.14	116.07	98.21	73.43	72.93	89.79	63.86
p değeri		0.313	**0.048***	0.392	0.799	0.107	0.267	0.068	0.155
Çalışma Şekli									
Sürekli gece	25(12.6)	90.46	98.94	79.00	89.98	73.46	89.04	121.02	81.92
Sürekli gündüz	7(3.5)	78.00	86.79	99.00	76.43	79.79	93.29	125.14	94.57
Gündüz ve gece	167(83.9)	102.35	100.71	103.19	102.49	104.82	101.92	95.80	102.93
p değeri		0.366	0.814	0.145	0.311	**0.025***	0.550	0.061	0.227
Mesleği İsteyerek Seçme									
Evet	136(68.3)	98.47	100.89	98.39	97.15	91.75	94.71	103.69	92.71
Hayır	63(31.7)	103.31	98.08	103.47	106.14	117.81	111.41	92.02	115.74
p değeri		0.579	0.746	0.562	0.296	**0.003***	**0.046***	0.182	**0.009***
Yeniden Mesleği Seçme Durumu									
Evet	37(18.6)	86.61	99.19	98.45	93.18	55.99	64.39	127.23	60.27
Kararsız	53(26.6)	99.99	105.15	105.19	96.65	79.76	90.25	117.11	88.43
Hayır	109(54.8)	104.55	97.77	98.00	103.94	124.78	116.83	82.44	119.11
p değeri		0.257	0.738	0.744	0.532	**0.000***	**0.000***	**0.000***	**0.000***
Mesleği Bırakma Durumu									
Evet	117(58.8)	105.93	99.60	104.24	104.74	120.11	114.44	88.26	116.89
Kararsız	45(22.6)	94.73	102.76	97.01	90.78	82.01	82.71	117.31	87.83
Hayır	37(18.6)	87.66	97.92	90.23	96.23	58.28	75.36	116.08	61.39
p değeri		0.187	0.923	0.400	0.333	**0.000***	**0.000***	**0.003***	**0.000***

* $p<0.05$

Tablo 3: Hemşirelerin Duygusal Emek Ölçeği ve Maslach Tükenmişlik Ölçeğinden Aldıkları Puanlar Arasındaki Korelasyon Matrisi

Ölçekler ve Alt Boyutları		Duygusal Emek Ölçeği			
		Yüzeysel Davranış	**Derinlemesine Davranış**	**Duygusal Çaba Harcama**	**Gerçek Duyguları Bastırma**
Maslach Tükenmişlik Ölçeği	**Duygusal Tükenme**	r= 0.137 p= 0.053	r= 0.028 p= 0.693	**r= 0.173** **p<0.05***	**r= 0.172** **p<0.05***
	Duyarsızlaşma	r= 0.096 p= 0.178	r= 0.041 p= 0.566	r= 0.138 p= 0.053	r= 0.090 p= 0.204
	Kişisel Başarı Hissi	**r= -0.165** **p<0.05***	r= 0.037 p= 0.600	r= 0.030 p= 0.678	r= -0.082 p= 0.248
	Toplam Puan	r= 0.099 p= 0.165	r= 0.070 p= 0.325	**r= 0.211** **p<0.05***	**r= 0.141** **p<0.05***

* p<0.05

Çalışmada hemşirelerin duygusal tükenme alt boyut puanları ile duygusal çaba harcama alt boyut puanları arasında, duygusal tükenme ile gerçek duyguları bastırma alt boyut puanları arasında, MTÖ toplam puanı ile duygusal çaba harcama ve gerçek duyguları bastırma alt boyut puanları arasında pozitif yönde, düşük düzeyde anlamlı ilişki tespit edilmiştir. Ayrıca kişisel başarı hissi alt boyut puanları ile yüzeysel davranış alt boyut puanları arasında negatif yönde ve düşük düzeyde anlamlı ilişki saptanmıştır (p<0.05) (Tablo 3).

TARTIŞMA

Çalışmanın Duygusal Emek Ölçeği alt boyut puanları incelendiğinde en yüksek puan ortalamasının duygusal çaba harcama boyutunda en düşük puanın ise derinlemesine davranış boyutunda olduğu tespit edilmiştir. MTÖ'nin alt boyutlarında ise, en yüksek puan ortalaması kişisel başarı hissi boyutunda olup, daha sonra sırasıyla duygusal tükenme ve duyarsızlaşma boyutlarında olduğu tespit edilmiştir. Bu durum tükenmişliğin yüksek düzeyde olduğunu ortaya koymaktadır. Hemşirelerin hastalarla iletişimleri sırasında karşısındaki bireyin hissettiklerini hissetmek için duygularını yönetme çabasına girmelerinin yüksek tükenmişlik hissetmelerine yol açtığı söylenebilir. Elde edilen sonuçlar Akgün (2015) tarafından hemşireler üzerinde yapılan çalışma ile benzerlik göstermektedir.

Çalışmada hemşirelerin yaşları azaldıkça duyarsızlaşmalarının arttığı tespit edilmiştir. Literatürde çalışma bulgularımıza benzer şekilde yaş ile duyarsızlaşma alt boyutu arasında anlamlı bir ilişki olduğunu belirten çalışmalar mevcuttur (Yılmaz ve Arslan, 2017).

Çalışmamızda, eğitim durumu ile duygusal tükenmişlik arasından anlamlı bir farklılık olmadığını tespit edilmiştir. Diğer taraftan eğitim durumu ile duygusal emek ölçeğinin derinlemesine davranış alt boyutu arasında anlamlı bir farklılık olduğu bu farklılığın sağlık meslek lisesi mezunu olan hemşirelerden kaynaklandığı, eğitim seviyesi düştükçe derinlemesine davranışın arttığı ortaya konmuştur. Literatürde, eğitim düzeyi ile tükenmişlik arasındaki ilişkiyi ortaya koyan pek çok çalışma mevcuttur (Demir, 2004; Arifoğlu 2000; Basım ve Şeşen, 2006; Kocabaş, 2014; Özen ve Yüceler, 2019; Koçak ve Gürsoy, 2018).

Çalışmamızda hemşirelerin yürüttükleri görev ile duygusal emek davranışları arasından anlamlı bir farklılık bulunmamıştır. Tunç ve diğerleri (2014) tarafından yapılan

çalışmada yoğun bakım ve klinik servis hemşirelerinin çalıştığı ortamın karakteristik özelliklerine dikkat etmeksizin empati eğilimi gösterdiklerine ve duygusal emek stratejilerini kullandıklarını ifade ederek benzer sonuçlar bulmuştur. Bunun yanı sıra çalışmamızda hemşirelerin yürüttükleri görev ile tükenmişlik ölçeği toplam puanı ve duygusal tükenme alt boyutu arasında istatistiksel açıdan anlamlı bir farklılık bulunmuş, bu farkın klinik ve yoğun bakım hemşirelerinden kaynaklandığı tespit edilmiştir. Akgün (2015) çalışmasında da klinik hemşirelerinin duygusal tükenme ve duyarsızlaşma puan ortalamalarını sorumlu hemşirelerinkinden anlamlı düzeyde yüksek olduğunu ortaya koymuştur.

Çalışmada kurumdaki çalışma yıllarına göre duygusal emek arasında anlamlı bir farklılık olduğu saptanmıştır. Derinlemesine davranış alt boyutunda, 16 yıldan daha fazla süredir kurumda çalışan hemşireler diğer gruplara göre daha yüksek puana sahip olduğu tespit edilmiştir. Bu sonuç, Özen ve Yüceler (2019) tarafından yapılan çalışma sonuçları ile benzerlik göstermektedir.

Çalışmada hemşirelerin çalışma şekli ile MTÖ duygusal tükenme alt boyutu arasında istatistiksel olarak anlamlı bir farklılık olduğu bu farkın gündüz ve gece vardiyalı olarak çalışan hemşirelerden kaynaklandığı tespit edilmiştir. Hemşirelerin hem gece hem gündüz çalışmaları fiziksel ve duygusal olarak daha fazla yıpranmalarına, sosyal hayatlarında ve aile yaşantılarında düzen kurmakta zorlanmalarına ve daha fazla duygusal tükenme yaşamalarına neden olabilmektedir. Bu sonuç, Akgün (2015) tarafından yapılan çalışmanın sonuçları ile benzerlik göstermektedir.

Çalışmada hemşirelerin mesleğini isteyerek seçme durumu ile MTÖ toplam puanı, duygusal tükenme ve duyarsızlaşma alt boyut puanları arasında istatistiksel olarak anlamlı bir farklılık olduğu saptanmıştır. Hemşirelik mesleğini bilinçli olarak isteyerek seçenlerin daha az tükenmiştik yaşadıkları görülmektedir. Elde edilen bu sonuç, Akgün (2015) tarafından yapılan çalışmanın sonuçları ile benzerlik göstermektedir.

Çalışmada yeniden mesleği seçme durumu ile MTÖ toplam puanı ve tüm alt boyut puanları arasında istatistiksel olarak anlamlı bir farklılık olduğu saptanmıştır. MTÖ toplam puanı, duygusal tükenme ve duyarsızlaşma alt boyutuna ait puan ortaları incelendiğinde yeniden meslek seçme şansı karşısında hemşire olmak istemeyenlerin isteyenlere göre daha yüksek puan aldıkları tespit edilmiştir. Kişisel başarı hissi alt boyutunda ise yeniden hemşirelik mesleğini seçmek isteyenlerin puan ortalamaları daha yüksektir. Elde edilen sonuçlar, literatürdeki bir çok çalışma ile benzerlik göstermektedir (Cerit ve ark., 2016; Yılmaz ve Arslan, 2017; Akgün 2015).

Çalışmada mesleği bırakma durumu ile MTÖ toplam puanı ve tüm alt boyut puanları arasında istatistiksel olarak anlamlı bir farklılık olduğu saptanmıştır. MTÖ toplam puanı, duygusal tükenme ve duyarsızlaşma alt boyutuna ait puan ortaları incelendiğinde mesleğini bırakmak isteyen hemşirelerin, mesleği bırakmada kararsız olanlar ve mesleği bırakmak istemeyen hemşirelere göre daha yüksek puan aldıkları tespit edilmiştir. Kişisel başarı hissi alt boyutunda ise kararsız ve mesleğini bırakmak istemeyenlerin puan ortalamaları daha yüksektir. Literatürdeki çalışmalarda da belirtildiği gibi duygusal tükenme arttıkça işten ayrılma niyeti de

artış göstermektedir. Flynn ve diğerleri (2009) tarafından diyaliz hemşireleri ile yapılan çalışmada hemşirelerin tükenmişlik nedeniyle işten ayrılma niyetlerinin yüksek olduğu ortaya koyulmuştur.

Çalışmanın bulgularına göre gerçek duygularını bastırmaya çalışan ve duygusal çaba harcayan hemşirelerin tükenmişlik düzeylerinin yüksek olduğu, özellikle de duygusal tükenmişlik yaşadıkları tespit edilmiştir. Hemşireler duygularını sürekli kontrol etmek zorunda kalan meslek grupları arasında ön sıralarda yer almaktadır. Yoğun stres altında, sık sık kriz durumlarıyla karşılaşan hemşireler hastalarla iletişim kurabilmek için yoğun duygusal çaba harcamakta ve samimi duygularını sergileyememektedirler. Bu durum hemşirelerin yorulmalarına ve tükenmelerine neden olmaktadır. Literatürdeki birçok çalışma da bu bulguyu destekler durumdadır (Köse ve diğerleri 2011; Yıldırım ve Erul 2013). Ayrıca kişisel başarı hissi yüksek olan hemşirelerin daha az yüzeysel davranış göstermekte oldukları saptanmıştır. Mesleklerini özenle yapan ve başarılı olan hemşireler hastalarla yüzeysel iletişimde bulunmak yerine daha dikkatli ve derinlemesine iletişim kurmayı tercih etmelidirler.

SONUÇ ve ÖNERİLER

Yapılan açıklamalardan da anlaşılacağı üzere sağlık sektörü kendine has özellikleri olan, duygusal emek davranışı ile tükenmişlik sendromunun yaygın olarak görüldüğü sektörlerden biridir. Hastalar ile kurulacak olan iletişimde başarılı olunması, hastaların beklentilerinin karşılanması ve empati yapılabilmesi sürecinde duygusal emek davranışına duyulan ihtiyaç her geçen gün artmaktadır. Bununla birlikte yoğun çalışma temposu, yapılan işin stresli olması, yaşam ile ölüm arasında görev yapmanın yükü gibi birçok faktöre bağlı olarak da hemşirelerin tükenmişlik düzeyleri yükselmektedir.

Bu nedenle hemşirelere yönelik olarak düzenlenecek olan hizmet içi eğitimlerde; hasta ile etkileşimde duyguların yönetilmesine, duygusal emek davranışının kazandırılmasına ilişkin farkındalık yaratılması büyük önem taşımaktadır. Bu noktada dikkat edilmesi gereken bir diğer husus da hemşirelerin duyguları yönetme açısından gösterdikleri çabanın düzeyi ve ne derece başarılı olduklarıdır. Araştırma sonucunda da görüldüğü gibi yoğun duygulara maruz kalmak da tükenmişliği yükselten faktörler arasında yer almaktadır. Bu nedenle hemşirelerin stres ve tükenmişlik sendromu ile başa çıkma konusunda da bilinçlendirilmesi büyük önem taşımaktadır. Ayrıca hastane yöneticileri hastane ortamından kaynaklanan ve çalışanların tükenmişlik yaşamalarına neden olan faktörlerin tespitine ve çözümlenmesine ilişkin öneriler geliştirmeli ve bu açıdan kararlı yaklaşımlar sergilemelidir. Çalışan motivasyonunun sunulacak hizmetin kalitesine olan etkisi unutulmamalıdır.

Hemşirelik mesleğini isteyerek seçmeyen, yeniden seçmek istemeyen ve mesleği bırakmak isteyen hemşirelerin tükenmişlik düzeylerinin yüksek olduğu noktasından hareketle, meslek seçimi aşamasında öğrencilere yeterli ve doğru yönlendirmenin yapılmasının ve bu mesleğe yatkın olup olmadıklarının belirlenmesinin büyük katkı sağlayacağı öngörülmektedir. Hemşirelik eğitimi sırasında da duygusal emek ve tükenmişlik sendromuna ilişkin farkındalık yaratacak düzenlemelerin yapılmasının ve ders içeriklerinin bu çerçevede güncellenmesinin faydalı olacağı düşünülmektedir.

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