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f) Surgical technique: Are the articles in which the surgical techniques are processed in details.
Structure
Abstract (average 200-400 word)
Surgical technique
Conclusion
References (most 15)

g) Differential Diagnosis: Are the case reports which have current value. Includes reviews for similar diseases.
Structure
Abstract (average 100-150 word)
Topics related to the subject.
Conclusion
References (3-5 inter)

h) Original Images: Rarely seen annotated medical images and photographs in the literature.

Structure

300 words of text and original images about the subject

References (3-5 inter)

ı) What is Your Diagnosis? Are the articles prepared as in questions and answers about rarely seen diseases which differ in the diagnosis and treatment?
Structure
Topics related to the subject.
References (3-5 inter)

i) Questions and Answers: Are the texts written in form of questions and answers about scientific educative –instructive medical issues.

MIDDLE BLACK SEA JOURNAL OF HEALTH SCIENCE

AUGUST 2020 **VOLUME 6** **ISSUE 2**

CONTENTS

EDITORIAL

2020 Second issue…

We publish the second issue of our journal in 2020 while our country and the world are still struggling with our Covid -19 pandemic. We continue to take care not to disrupt our academic studies while we are fighting with this infectious disease as a country in this challenging period.

In this issue of our journal, there are 17 articles and 3 case report in the fields of dentistry, nursing, orthopedics, family medicine, gynecology, nephrology, emergency medicine, parasitology, neurosurgery, microbiology, medical biology, psychiatry, cardiology, biostatistics and medical informatics. Endless thanks to everyone who contributed in this issue.

We hope to publish the second issue of our journal on beautiful days.

PhD, Assoc. Prof. Ülkü KARAMAN

Editor

Middle Black Sea Journal of Health Science August 2020; 6(2):145-151

RESEARCH ARTICLE

Evaluation of Nursing Students' Knowledge Levels About Peripheral Intravenous Catheter Insertion Skill

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Abstract

Objective: Peripheral intravenous catherization procedures are frequently performed on hospitalized patients. The application of the peripheral intravenous catherization is one of the most frequently used invasive nursing procedures. Although peripheral intravenous catheterization is the most commonly performed basic nursing skill and it is the skill that causes the most anxiety during clinical practices. Thereforei this study was conducted to examine nursing students' levels of knowledge about peripheral intravenous catheterization.

Methods: This descriptive and correlational study's data were collected from 302 nursing students from February 2019 to April 2019 during the 2018-2019 academic year. The study data were collected using an introductory information form, the Peripheral Intravenous Catheterization Information Form and in face-to-face interviews.

Results: The students' mean score for knowledge levels about peripheral intravenous catheterization was 66.53 ± 15.00. The students who had graduated from vocational schools of health and the students who were in their fourth year of study had higher levels of knowledge about peripheral intravenous catheterization, and this was a statistically significant difference with the other students.

Conclusion: The nursing students' level of knowledge about peripheral intravenous catheterization increased with years of study, and they had moderately high levels of knowledge about it during their 4-year undergraduate education.

Key words: Peripheral intravenous catheterization, Nursing students, Nursing education

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Note: This study was presented as an oral presentation at the 5th National and 1st International Nursing Care Congress on December 6-8, 2019.

Introduction

The nursing profession is a practical discipline that requires both theoretical knowledge and practical skills to be combined in a harmonious way (Schoening et al., 2006). Nursing students should develop themselves affectively and achieve professional efficiency in psychomotor skills. In this context, nursing practices include the reflection of theoretical knowledge, affective competencies in the clinical setting, and psychomotor skills such as practice and management in care actions (Aydogan, 2016). Psychomotor skill; coordinated muscle activities used during the performance of a work, guided by conscious mental activity (Mete and Uysal, 2009; Sen, 2012).

Every psychomotor skill requires physical, cognitive and affective skills (Simsek et al., 2018).Peripheral intravenous catheterization (PIVC) is the most commonly performed basic nursing skill and one of the most important modern treatment methods used in hospitals (Aydın and Arslan, 2018; Kus and Buyukyılmaz, 2017; Sarı et al., 2016). PIVC is used commonly (Tokizawa et al., 2017) with approximately 80% of hospital patients (Rickard et al., 2012; van Loon et al., 2018; Webster et al., 2013). An average of more than 300 million PIVCs a year are performed in the United States and England (Abadi et al., 2013; Aydın and Gurol Arslan, 2018; Keleekai et al., 2016; Wallis et al., 2014). PIVC is one of the hardest nursing skills to teach and causes the most anxiety during clinical practices (Bayar et al., 2009; Erdem, 2018). Students feel so much anxiety because they do not think they have sufficient knowledge about and skills in PIVC, because they do "not/cannot get sufficient practice, and because PIVC is an invasive practice that can hurt patients (Houghton et al., 2013; Ozturk and Dinc, 2014).

Nurses' responsibilities include knowing the relevant vein anatomy well, determining the area where PIVC is to be performed, choosing the catheter that suits patients' age and treatment, knowing the proper PIVC methods and principles and knowing about potential complications (Uzun, 2019; Aydin and Gurol Arslan, 2018; Aygun and Erten, 2011; Carroll and Bennett, 2015). These competencies must be acquired by nursing students during their student days. However, the development of students' skills in practice is hindered by: insufficient numbers of academic staff and excessive numbers of students in nursing departments, insufficiencies in clinical practice fields, non-equipped and insufficient numbers of skill laboratories, discharging patients quickly and the recent rise in the importance of patient safety and patient rights. (Goris et al., 2014; Sendir, 2013; Sendir and Coskun, 2016). This study was conducted to evaluate nursing students' levels of knowledge about PIVC insertion skill.

The main research questions are as follows:

1. What are the students' levels of knowledge about PIVC?
2. Is there a difference among PIVC knowledge levels according to the socio - demographic characteristics of nursing students?

Methods

Study design population and sampling

This is a descriptive cross-sectional study. The descriptive cross-sectional survey questions were answered in 2019. The target population was nursing faculty students. The study population included 404 students in the nursing department of a faculty of health sciences in Turkey during the 2018-2019 academic year. The total number of samples was calculated as 252 according to 5% acceptable error, 99% confidence level. The sample was increased by 20% to avoid an effect of any possible loss of data, bringing the total to 302 students and 302 students participated in the study.

Ethical considerations

Before starting the research, the written consents of the research institution were obtained. The research protocol was approved by the ethics committee (Decision no: 2019/65). Students participating in the research signed their consent for participation in the study.

Data Collection Instruments

The study data were collected using an introductory information form, the PIVC Information Form and in face-to-face interviews.

Personal information form was prepared by the researchers considering relevant literature (Aydin and Arslan, 2018; Erdem, 2018). It included 7 questions related to sociodemographic characteristics such as age, sex, graduated high school, what class of students, whether they perceived themselves as suitable for the profession of nursing, and whether nursing was their choice.

The PIVC Information Form was developed in a postgraduate thesis entitled "An Examination of the Effect of Simulation-based Learning in Developing the Skill of Peripheral Intravenous Catheter Insertion." It includes 10 questions prepared by the researcher in accordance with the literature to determine students' levels of knowledge about PIVC. The lowest possible score is 0, and the highest is 100.

Higher PIVC scores indicate higher levels of knowledge about PIVC.

Data Collection

The data were collected by the researchers in the classroom between 10 to 15 minutes by using face to face interview technique.

Data and Statistical Analyses

The data were analyzed using the Statistical Package for Social Sciences 22.0 (SPSS 22.0). Descriptive statistics (percentage, mean, and standard deviation) were applied to students' demographic characteristics. Kolmogorov- Smirnov test was conducted to examine normal distribution. Independent-Sample T test was utilized for comparison of the quantitative data showing normal distribution. For data normal distribution, Anova test was used for comparison of groups more than two. The value of $p < 0.05$ was considered to be statistically significant.

Results

The study sample included 302 nursing students. Most of the participants were male (76.2%), and all of them were in the age group of 18 to 25 years old. Their mean age was 20.24 ±1.46. Of the participants, 64.9% had graduated from Anatolian high schools. The largest number of them were third year students (30.5%). Of the participants, 47.0% thought that nursing suited them partially, 71.6% chose nursing willingly, and 71.2% chose nursing because they think it will be easy to find a job after graduation (Table 1)

Table 1. Demographic characteristics of the nursing students

Variable	Categories	(%)	n	M	SD
Age (years)	18-25		302	20.24	1.46
Gender	Male	76.2	230		
	Female	23.8	72		
Year of study	1st Year	27.0	86		
	2nd Year	22.6	72		
	3rd Year	30.5	97		
	4th Year	19.8	63		
High school type	Vocational School of Health	18.9	57		
	Anatolian High School	64.9	196		
	Science High School	3.0	9		
	Other	13.2	40		
Believing nursing suits them	Yes	46.7	141		
	No	6.3	19		
	Partly	47.0	142		
Chose nursing	Willingly	216	71.5		
	Unwillingly	86	28.5		
Reasons for choosing nursing	Ease of employment	215	71.2		
	My family’s request	47	15.6		
	Want to be a nurse	35	11.6		
	Peer suggestions	5	1.7		

Table 2. PIVC Score

	n	Min-Max	Mean±SD (Median)
PIVC Score	302	25-100	66.53±15.00 (65)

Their mean score for knowledge about PIVC was 66.53 ± 15.00. Their lowest score was 25, and their highest was 100 (Table 2).

Table 3. Evaluation of the students' knowledge levels about PIVC according to their socio-demographic characteristics

Variable		n	Mean	SD	p	t- value	df
Gender	Male	230	66.63	14.75	0.851	0.187	300
	Female	72	66.25	15.86			
						F Value	
Year of study	1st Year	93	65.268	15.644	0.029	3.052	3
	2nd Year	91	64.120	13.836			
	3rd Year	78	68.141	15.936			
	4th Year	40	71.875	12.894			
High school type	Vocational School of Health	57	72.631	12.287	0.006	4.275	3
	Anatolian High School	196	65.510	15.892			
	Science High School	9	65.555	11.023			
	Other	40	63.125	12.744			
Believing nursing suits them	Yes	141	67.269	16.162	0.728	0.318	2
	No	19	65.526	11.890			
	Partly	142	65.950	14.228			
						t- value	
Chose nursing	Willingly	216	66.481	15.667	0.056	-0.107	300
	Unwillingly	86	66.686	13.297			
Reasons for choosing nursing	Ease of employment	215	66.255	15.672	0.568	0.675	3
	My family's request	47	68.723	12.089			
	Want to be a nurse	35	64.714	13663			
	Peer suggestions	5	71.000	20.736			

t=Independent –samples t-test F=One way Anova Test

Comparing the students' mean scores and their socio-demographic characteristics showed that gender, believing that the nursing profession suited them, choosing nursing willingly and the reasons for choosing nursing did not affect their mean score. However, high school type and year of study affected their levels of knowledge about PIVC. The students who had graduated from vocational schools of health and the students who were in their fourth year of study had higher levels of knowledge about PIVC, and this was a statistically significant difference with the other students (p=0.006, p=0.029) (Tablo 3).

Discussion

PIVC is one of the most invasive applications where students experience the most stress among nursing practices. (Forsberg and Engström, 2018). This practice is a difficult skill to learn for nursing students and can cause many complications if not done effectively (Kus and Buyukyilmaz, 2017). In order to avoid complications, students must have sufficient knowledge and psychomotor skills for PIVC application before encountering a real patient.

This study found the nursing students' mean PIVC score on the PIVC as 66.53 ±15.00. On a scale of 100, the students' levels of knowledge about PIVC were above the median value. As a result of the study they conducted with nursing students, Cevik et al. (2019) found that nursing students' mean score was 77.66±9.42, Ismailoglu and Zaybak (2018) found that nursing students' mean score was 65.56 ±12.91. In their study examining the students' level of knowledge regarding PIVC practice, Aydın and Arslan (2018) also found that nurses had moderately high levels of knowledge about PIVC. Our finding is in line with similar findings by prior studies. The nursing students had moderate levels of knowledge about PIVC throughout their education, which may be related to their not being able to perform it in practice very often.

In the study, female students were found to have higher PIVC score than male students. When similar studies in the literature were examined, it was found that there was no data for this finding. In the study, the high score of female students was interpreted as that women may be related to the development of fine motor skills than men.

When the PIVC scores of the students were examined according to the grade level of the study, it was determined that the students in the fourth grade had higher PIVC scores than the students in the other three study year. This finding of the study suggested that students in the fourth grade reinforced their theoretical knowledge with long-term clinical practice experiences.

Examining the high school from which students graduated and students' level of knowledge regarding PIVC practice found that students who had graduated from vocational schools of health had higher levels of knowledge about PIVC than students who had graduated from other high school types, and this difference was statistically significant ($p<0.05$). The students who attended vocational schools of health performed PIVC many times in clinical practices, which may be an effective way to acquire this skill. Similarly, the fourth-year students had higher levels of knowledge about PIVC than those in other years of study, and this difference was statistically significant ($p<0.05$). Being qualified in cognitive, affective and psychomotor fields is significant for efficient learning in nursing education (Eker et al., 2014). One of the fundamental points that Benner notes in her novice to expert model is that nursing knowledge is based on practice and improves with time (Koc et al., 2018). Study data obtained in the light of the literature indicates that students who perform or observe PIVC in the clinic have higher levels of knowledge about PIVC.

Limitations of the study

The study's significant limitation is the fact that it was restricted to a group of nursing students in Turkey. Therefore, the results cannot be generalized.

Conclusion

The nursing students had at least moderate levels of knowledge about PIVC throughout their education, but their levels of knowledge about PIVC also increased with years of study. Another factor that affected the students' level of knowledge about PIVC was the type of high school they attended. The students who had graduated from vocational schools of health had higher levels of knowledge about PIVC. Evaluating these results together shows that levels of knowledge about PIVC, one of the important psychomotor skills in nursing, increases with experience.

Ethics Committee Approval: Ethics committee approval was received for this study from Ordu University Clinical Research Ethics Committee. (KAEK 2019-65).
Peer-review: Externally peer-reviewed.
Author Contributions: Concept -HD; Design- HD, BKD, SC; Supervision-HD, BKD, SC; Materials-HD; Data Collection and/or Processing-HD; Analysis and/or Interpretation- HD, BKD; Literature Review-HD, BKD, SC; Writing- HD, BKD, SC Critical Review- HD, BKD, SC.
Conflict of Interest: No conflict of interest was declared by the authors.
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References

Abadi P, Etemadi Su, Abed Saeedi ZH. (2013). Investigating Role of Mechanical and Chemical Factors in the Creation of Peripheral Vein Inflammation in Hospitalization Patients in Hospital in Zahedan, Iran. Life Sci J 2013; 10 (1s): 379-383.

Aydin S, Arslan GG. Evaluation of Nurses' Knowledge Levels about Peripheral Intravenous Catheter Initiatives. DEUHEFED 2018; 11(4): 290-299.

Aydogan S. Ethical Problems of Nursing Students Related to Acquisition of Clinical Skills. Türkiye Biyoetik Dergisi 2016; 3(2): 120-123.

Aygun M, Erten HA New Approch In Nursing Practice: Ultrasound-Guided Periferal Intravenous Catheterization. HEMAR-G 2011; 1: 61-70.

Bayar K, Cadır G, Bayar B. Determination Thought and Anxiety Levels of Nursing Students Intended for Clinical Practice. TAF Preventive Medicine Bulletin 2009; 8(1): 37-42.

Carroll H, Bennett S. Guideline: Peripheral intravenous catheter (PIVC). Queensland Government 2015. Available from: https://www.health.qld.gov.au/__data/assets/pdf_file/0025/444490/icarepivc-guideline.pdf.

Cevik K, Midilli TS, Ergin E. The Relationship of Nursing Students' Knowledge and Skill Levels with Exam Anxiety Regarding Parenteral Drug Applications. Manisa Celal Bayar University Journal of Institute of Health Science 2019; 6(1): 31-38.

Eker F, Açıkgöz F, Karaca A. Occupational Skill Training through the Eyes of Nursing Students. DEUHEFED 2014; 7(4): 291-294.

Forsberg A, Engström Å. Critical care nurses' experiences of performing successful peripheral intravenous catheterization in difficult situations. J Vasc Nurs 2018;36(2):64-70.

Goris S, Bilgi N, Bayındır SK. Use of Simulation in Nursing Education. J DU Health Sci Inst 2014; 1(2): 25-29.

Houghton CE. Casey D, Shaw D, Murphy K. Students' Experiences of Implementing Clinical Skills in the Real World of Practice. JCN 2013; 22(13-14): 1961-1969.

Ismailoglu EG, Zaybak A. Comparison of the Effectiveness of A Virtual Simulator with A Plastic Arm Model in Teaching Intravenous Catheter Insertion Skills. CIN 2018; 36(2): 98-105.

Keleekai NL, Schuster CA, Murray CL, King MA, Stahl BR, Labrozzi LJ, et al. Improving Nurses' Peripheral Intravenous Catheter Insertion Knowledge, Confidence, And Skills Using A Simulation-Based Blended Learning Program: A Randomized Trial. Simulation in Healthcare 2016; 11(6): 376-384.

Koc Z, Çınarlı T, Sener A, Kızıltepe SK. Patrıcıa Benner: Clinical Wisdom and Skill Acquisition in Nursing Practices. ACU Sağlık Bil Derg 2018; 9(1): 1-12.

Kus B Buyukyilmaz F. Current Evidence for Prevention of the Complications Related to Peripheral Intravenous Catheterization: Systematic Review. FNJN 2017; 25(3): 209-217.

Mete S, Uysal N. Implementatıon of An Education Model for Nursing Skills Development. DEUHEFED 2009; 2(3): 115-123.

Ozturk D, Dinc L. Effect of Web-Based Education on Nursing Students' Urinary Catheterization Knowledge and Skills. Nurse Education Today 2014; 34(5): 802-808

Sarı D, Eser İ, Akbıyık A. Phlebitis associated with Peripheral Intravenous Catheters and Nursing Care. JHS 2016; 13(2): 2905-2920.

Schoening AM, Sittner AJ, Todd MJ. Simulated Clinical Experience, Nursing Students' Perceptions and Educators' Role. Nurse Educator 2006; 31(6): 253258.

Sen H. Guide Principles of Psychomotor Skills Teaching in Nursing: Sample of Chest Compression. DEUHEFED 2012; 5(4):180-184.

Sendir M. Use of Simulation in Women's Health Nursing Education. FNJN 2013; 21(3): 205-12.

Sendir M, Coskun EY. A Technological Step in Nursing Education: IM ventro-sim. JAREN 2016; 2(2): 103-108.

Simsek M, Çonoğlu G, Orgun F. Evaluation of Basic Nursing Skills Planned to be Acquired during Nursing Education. Ege Universitesi Hemşirelik Fakültesi Der. 2018; 34(1):1-25.

Rickard CM, Webster J, Wallis MC, Marsh N, McGrail MR., French V, et al.. Routine Versus Clinically Indicated Replacement of Peripheral Intravenous Catheters: A Randomised Controlled Equivalence Trial. The Lancet 2012; 380 (9847): 1066-1074.

Uzun Ş. "Intravenous fluid therapy". Aşti, T., Karadağ, A. (Eds.). Nursing Fundamentals: Science and Art of Nursing. Istanbul: Academy Press and Publishing, 2019. p.699-712

Van Loon FHJ, Buise MP, Claassen JJF, Dierick-van Daele ATM, Bouwman, ARA. Comparison of Ultrasound Guidance with Palpation and Direct Visualisation for Peripheral Vein Cannulation in Adult Patients: A Systematic Review and Meta-Analysis. BJA 2018; 121(2): 358-366.

Wallis MC, Mc Grail M, Webster J, Marsh N, Gowardman J, Playford EG, Rickard CM. Risk Factors for Peripheral Intravenous Catheter Failure: A Multivariate Analysis of Data from a Randomized Controlled Trial. Infection Control & Hospital Epidemiology 2014; 35(1): 63-68.

Webster J, Osborne S, Rickard CM, New K. Clinically-Indicated Replacement Versus Routine Replacement of Peripheral Venous Catheters. Cochrane Database of Systematic Reviews 2015; 14;(8): CD007798.

Tokizawa Y, Tsujimoto T, Inoue T. Duration of Vasodilation for Peripheral Intravenous Cannulation, as Induced by a Thermal Stimulus on the Forearm. BRN 2017; 19(2): 206-212.

Middle Black Sea Journal of Health Science August 2020; 6(2):152-157

RESEARCH ARTICLE

Severity of Mining Accidents in Amasya, Turkey: An Epidemiological Analysis

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Abstract

Objective: Injuries that result from work-related accidents, which may cause permanent disabilities and death, have been increasing more in less developed and developing countries. Underground coal mining has been defined as very dangerous in danger classification about workplace, occupational health and safety. The purpose was to assess the state of mining accidents, which have caused serious injuries and deaths in Amasya, part of the Central Black Sea Region in Turkey.

Methods: We retrospectively examined 327 patients who were admitted to the emergency service of the Amasya Suluova State Hospital in the Central Black Sea Region, where there are many mines, in terms of mining accidents between 2008 and 2012 using ICD codes.

Results: All of the patients were male, and the mean age was 39.5 ± 6.7 years. The injuries took place mainly during the 8 am to 5 pm shift (57.5%), on a Thursday (19.6%), in November (11.6%), in Autumn (28.1%) and in 2009 (36.1%). Isolated, unilateral upper extremity injuries were the most common (36.4%). A total of 54.1% of the accidents resulted in cuts, 34.6% resulted in fractures and 6.1% resulted in the loss of limbs, and 7.6% were transferred to a more equipped center. One patient who sustained upper extremity, chest and abdomen injuries died.

Conclusion: Mining accidents cause serious injuries and deaths in developing countries such as Turkey. We believe that collecting such regional data will contribute to the prevention of mining accidents.

Key words: Mining; accident; injury; epidemiology; analysis; Turkey

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Note: This study is presented as an oral presentation in Bone and Joint Congress in 2016 in Turkey

Introduction

According to the World Health Organization's 2000 data, 9% of all deaths in the world occur due to injuries, and each year, 5.2 million people lose their lives due to this reason (Davas Aksan et al., 2010). Although injuries usually take place during industrial activities, they can also take place at home, in traffic, in a public space or during sport activities (Trybus et al., 2006). Injuries that result from work-related accidents, which may cause permanent disabilities and death, have been increasing more in less developed and developing countries (Lee et al., 2005).

Mining stands out as a difficult industrial area in Turkey and in the world in terms of work-related accidents. Underground coal mining has been defined as very dangerous in danger classification about work place, occupational health and safety (Feyer et al., 2001; McGwin et al., 2002; Kowalski-Trakofler et al., 2003; Bio et al., 2007; Kunda et al., 2013; Liu et al., 2015; Bloch et al., 2018; Wilson and Wetten, 2019). Despite regulations and raising attention towards the reduction of risk factors, the mining industry is still associated with higher rates of injury than other industries (Lee et al., 2005, Maiti et al., 2004; Komljenovic et al., 2007; Kunda et al., 2013; Wilson et al., 2020). In terms of occupational diseases and occupational accidents, mining has caused a great number of workers to become permanently disabled or to die (Feyer et al., 2001, Ghosh et al., 2004).

This epidemiological study analyzed the patients who were admitted to the emergency service of the Amasya Suluova State Hospital as a result of accidents that took place in mines, and the consequences of the accidents were assessed. To our knowledge, no epidemiological study has been published on mining accident from Turkey as one of the leading countries in the world in terms of occupational diseases and accidents. The aim of the current study was to assess the state of mining accidents, which have caused serious injuries and deaths, in Amasya, Turkey.

Methods

The injury records of 327 patients who were admitted to the emergency service of the Amasya Suluova State Hospital between 2008 and 2012 were analyzed using ICD codes. The data were analyzed in terms of the patients' age; the hour, day, month, season, year, and area that the mining accident took place; the severity (cut, fracture, loss of limb) of the injury; and the necessity of being transferred.

All data were collected from archive of Amasya Suluova State Hospital to measure. The time of injury was grouped into three shifts (between 12 pm and 08 am, between 08 am and 5 pm, and between 5 pm and 12 pm). The ages of the patients were grouped as 16-24, 25-34, 35-44, 45-54, 55-64 and over 65 years old. The injured areas were categorized into upper extremity, lower extremity, pelvis, spine, head, abdomen, chest, isolated or multiple with inhalation, while the severity of the injury was assessed categorized into cut, fracture, loss of limb or presence of transfer.

In this retrospective study, permission was given by the regional ethics review committee of the Faculty of Medicine, Samsun Ondokuz Mayıs University in 2014 (B.30.2.ODM.0.20.08/1187 OMU KAEK 2014/770). In accordance with the approval, informed consent from the patients was not required. All study procedures were performed in accordance with the recommendations outlined in the Declaration of Helsinki.

All of the obtained results were statistically analyzed. The data were entered into SPSS (SPSS Inc., Chicago, IL, USA) and tested for their conformity to a normal distribution using the Shapiro-Wilk test. The data that conformed to a normal distribution are reported as the mean±standard deviation, and the data that did not conform to a normal distribution are stated as the median (min-max).

Results

All of the patients were male, and the mean age was 39.5±6.7 years. Most of the patients (180, 55%) were between the ages of 35 and 44 years old, and they had at least 10 years of work experience.

Most of the injuries (188-57.5%) took place during the 8 am to 5 pm shift. The injuries primarily took place on Thursday (64, 19.6%), in November (38, 11.6%), during the Autumn (92, 28.1%) and in 2009 (118, 36.1%), whereas they least frequently took place on Sunday (30, 9.1%), in February (17, 5.2%), during the Summer (71, 21.7%) and in 2008 (46, 14.1%).

Isolated unilateral upper extremity injury was the most common injury (119, %36.4). The number of patients with potential life-threatening injury and head trauma was 68 (20.7%). It was observed that 177 (54.1%) of the accidents resulted in a cut, 113 (34.6%) resulted in a fracture and 20 (6.1%) resulted in the loss of a limb. There were 25 (7.6%) patients who were transferred to a more equipped, higher trauma level center for various reasons. A patient who had injured both of his upper extremities, chest and abdomen in 2012 died. The data are summarized with the figures (Figs. 1-5).

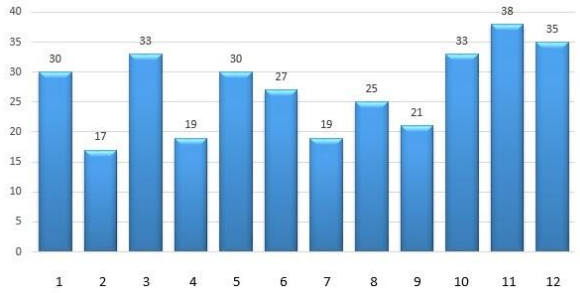

Figure 1. Distribution of cases by month. (the period from January to December is numbered from 1 to 12)

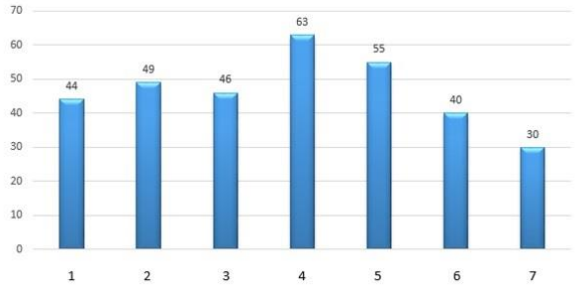

Figure 2. Distribution of cases by day. (the period from Monday to Sunday is numbered from 1 to 7)

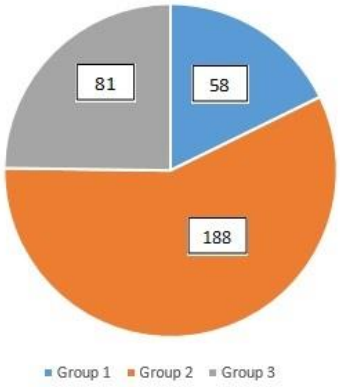

Figure 3. Distribution of cases by shift. (Group 1: 00-08 am, Group 2: 08 am-16 pm, Group 3: 16-00 pm)

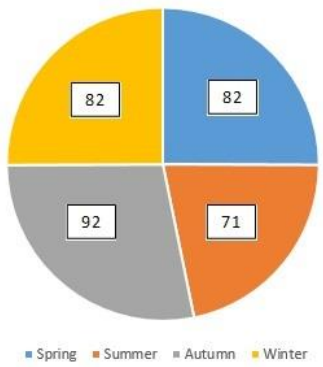

Figure 4. Distribution of cases by season

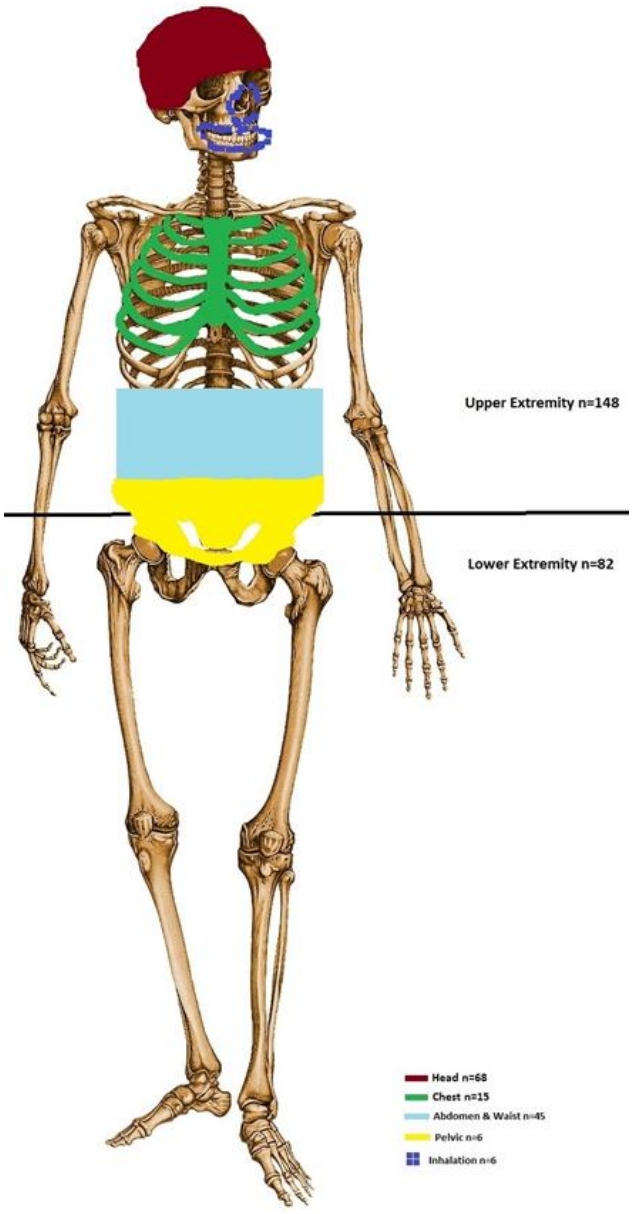

Figure 5. Injury areas on a skeleton

Discussion

In terms of occupational diseases and accidents, Turkey is one of the leading countries in the world, following Germany, Russia, America and Poland (Spada et al., 2016). In less developed and developing countries, such as Turkey, work-related injuries that may cause permanent disability and death have been increasing (Lee et al., 2005). Regarding the frequency of mining accidents, it can be observed that Turkey was the country with the second most number of accidents with 10 accidents occurring between 1970 and 1997; however, it became the country with the most accidents between 2000 and 2014 with 12 serious accidents (the most serious one was the Soma

mining accident that resulted in the death of 301 workers in 2014) (Spada et al., 2016).

Epidemiological studies are important for the passing of necessary laws to prevent these accidents as they provide understanding of the form and nature of injuries and determine the predisposing factors that cause accidents. Thus, the purpose of this study was to collect regional data by assessing the injuries that occurred as a result of mining accidents in the Central Black Sea region.

This epidemiological study analyzed the mining accidents in Suluova, Amasya, which has an important share of the mine production in the Central Black Sea region. These results were in line with the results of Stojadinovic et al. (Stojadinovic et al., 2012) who performed a 10-year study that analyzed underground mining accidents in Serbia; that study reported upper extremity injuries were the most frequent at 35.4%, followed by lower extremity injuries at 34.2%. In the same study, they reported that 91% of injuries were simple injuries, i.e., mostly finger cuts and contusions, followed by severe injuries causing disability at 8.6% and fatal injuries at 0.27%. In a study of Kyerematen-Amoah and Clarke (2015) assessing the injuries in a gold mine reported that 30.5% of the patients were admitted due to fractures, while 29.1% were contusions and 14% were lacerations. Sutherland (Sutherland et al., 2011) reported contusions and lacerations were most frequent (39.3%, 24.8%), followed by fractures (10.2%) and traumatic amputations (4.7%). In another study that assessed the risk factors in mines, it was reported that extremities were the most frequently affected areas, with knees and legs (33.3%) affected the most (Long et al., 2015). The same study reported that cuts, lacerations and contusions were the most frequent types of injuries (80%) (Long et al., 2015). Calys-Tagoe et al. (2015) reported that the most frequent injury areas were the extremities (upper extremity injuries were more frequent) and that the most frequent type of injury was a laceration at 57%.

Our study showed that accidents can occur at any age and experience level. On the contrary to what was expected, it was found that accidents were more frequent among workers who had 10 years of experience and middle-aged workers than among those with less experience and younger workers (180, 55%). These results were not in parallel with those from other studies in the literature that reported that less experienced mine workers had more accidents (Calys-Tagoe et al. 2015). Our result shows that preventive measures and training should be generalized in Turkey regardless of experience. In studies that were conducted on different dates to determine the reasons for work-related accidents in Turkey, it was concluded that in general, 80% of work-related accidents occurred due to human factors, 18% occurred due to physical and mechanical environmental factors and 2% occurred due to unexpected events (Camkurt et al., 2007).

Although most of the injuries were dependent on human factors (physiological, psychological, social), demographic factors (age, gender), injury time (hour, day, season), area and the number of injuries can also affect morbidity and mortality. Field studies indicated that people who work on rotating shifts and these variabilities are at a high risk for involvement in accidents and injuries (De Araújo Fernandes et al., 2013). It was observed that more than half of the injuries took place during the 08 am to 5 pm shift. The reason for this may be the fact that the mining work, the operations and all service and maintenance work are mostly performed during the first shift of the morning. We think that the miners in the first shift work as quickly as possible to avoid causing delays and problems for the second and third shifts, which may lead to accidents and injuries. In their 10-year study on underground mining accidents in Serbia, Stojadinovic et al. (2012) also reported that the greatest number of accidents occurred during the first shift for all years and that the average percentage of accidents during this shift was 44.5%. These results are similar to the results of our study. In their study about hand injuries, Davas Aksan et al. (Davas Aksan et al., 2010) reported that most patients were admitted to the hospital on a Monday, while patients were least frequently admitted on Sundays.

The limitations of our study include its retrospective design, the fact that the results came from the emergency service of only one hospital and the relatively small number of cases. The results of the study can be affected by simple injuries, which are not taken to hospital, unrecorded accidents that resulted in deaths or the number of miners who worked without insurance. However, despite all of these limitations, we believe that this study provides information about the epidemiology and severity of mining accidents in Turkey.

Conclusion

In conclusion, mining accidents cause serious injuries and deaths in developing countries such as Turkey. More extensive studies that characterize the rates, severity, risk factors and the socioeconomic results of such injuries are required. We believe that the establishment of a large-scale study that includes

these types of studies from all over the world will contribute to the prevention of mining accidents.

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Peer-review: Externally peer-reviewed.
Author Contributions: Concept – EU,AÇ,ÖŞ,SÖ,FK,HG ; Design EU,AÇ,ÖŞ; Supervision AÇ,ÖŞ,SÖ,FK,HG; Materials - EU,AÇ,ÖŞ; Data Collection and/or Processing - ÖŞ,SÖ,FK,HG.; Analysis and/or Interpretation - AÇ,ÖŞ,SÖ; Literature Review - EU,AÇ,ÖŞ,SÖ,FK; Writing - EU,AÇ; Critical Review – AÇ,HG.
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References

Bio FY, Sadhra S, Jackson C, Burge PS. Low back pain in underground gold miners in Ghana. Ghana Med J 2007; 41: 21-5.

Bloch K, Johnson LF, Nkosi M, Ehrlich R. Precarious transition: A mortality study of South African ex-miners. BMC Public Health 2018; 18: 862.

Calys-Tagoe BN, Ovadje L, Clarke E, Basu N, Robins T. Injury Profiles Associated with Artisanal and Small-Scale Gold Mining in Tarkwa, Ghana. Int J Environ Res Public Health 2015; 12: 7922-37.

Camkurt MZ. İşyeri Çalışma Sistemi ve İşyeri Fiziksel Faktörlerinin İş Kazaları Üzerindeki Etkisi. TUHIS İş Hukuku ve İktisat Dergisi 2007; 20: 80-106.

Davas Aksan A, Durusoy R, Ada S, Kayalar M, Aksu F, Bal E. Epidemiology of injuries treated at a hand and microsurgery hospital. Acta Orthop Traumatol Turc 2010; 44: 352-60.

De Araújo Fernandes S Jr, Stetner Antonietti L, Saba A, Paulino de Faria A, Maculano Esteves A, Tufik S, Túlio de Mello M. The Impact of Shift Work on Brazilian Train Drivers with Different Chronotypes: A Comparative Analysis Through Objective and Subjective Criteria. Med Princ Pract 2013; 22: 390-6.

Feyer AM, Williamson AM, Stout N, Driscoll T, Usher H, Langley JD. Comparison of work-related fatal injuries in the United States, Australia, and New Zealand: method and overall findings. Inj Prev 2001; 7: 22-8.

Ghosh AK, Bhattacherjee A, Chau N. Relationships of working conditions and individual characteristics to occupational injuries: a case-control study in coal miners. J Occup Health 2004; 46: 470-80.

Komljenovic D, Groves WA, Kecojevic VJ. Injuries in U.S. mining operations-a preliminary risk analysis. Safety Science 2007; 46: 792-801.

Kowalski-Trakofler KM, Barrett EA. The concept of degraded images applied to hazard recognition training in mining for reduction of lost-time injuries. J Safety Res 2003; 34: 515-25.

Kunda R, Frantz J, Karachi F. Prevalence and Ergonomic Risk Factors of Work-related Musculoskeletal Injuries amongst Underground Mine Workers in Zambia. J Occup Health 2013; 55: 211-7.

Kyerematen-Amoah E, Clarke EE. Injuries among Artisanal and Small-Scale Gold Miners in Ghana. Int J Environ Res Public Health 2015; 12: 10886-96.

Lee HY, Yeh WY, Chen CW, Wang JD. Prevalence and psychosocial risk factors of upper extremity musculoskeletal pain in industries of Taiwan: a national wide study. J Occup Health 2005; 47: 311-8.

Liu L, Wen F, Xu X, Wang L. Effective resources for improving mental health among Chinese underground coal miners: Perceived organizational support and psychological capital. J Occup Health 2015; 57: 58-68.

Long RN, Sun K, Neitzel RL. Injury Risk Factors in a Small-Scale Gold Mining Community in Ghana's Upper East Region. Int J Environ Res Public Health 2015; 12: 8744-61.

Maiti J, Chatterjee S, Bangdiwala SI. Determinants of work injuries in mines-an application of structural equation modeling. Inj Control Safety Promot 2004; 11: 29-37.

McGwin G Jr, Valent F, Taylor AJ, Howard HJ , Davis GG , Brissie RM , Rue LW 3rd. Epidemiology of fatal occupational injuries in Jefferson County, Alabama. South Med J 2002; 95: 1300-11.

Spada M, Burgherr P. An aftermath analysis of the 2014 coal mine accident in Soma, Turkey: Use of risk performance indicators based on historical experience. Accident Analysis and Preventation 2016; 87: 134-40.

Stojadinovic S, Syrkota I, Petrovic D, Denic M, Pantovic R, Milic V. Mining injuries in Serbian

underground coal mines-a 10-year study. Injury 2012; 43: 2001-5.
Sutherland DKB. Occupational injuries in a gold mining company in Ghana. Afr Newwslerr Occup Health and Saf 2011; 21: 8-10.
Trybus M, Lorkowski J, Brongel L, Hladki W. Causes and consequences of hand injuries. Am J Surg 2006; 192: 52-7.
Wilson KS, Kootbodien T, Naicker N. Excess Mortality Due to External Causes in Women in the South African Mining Industry: 2013-2015. Int J Environ Res Public Health 2020: 13; 17(6) E1875.
Wilson K. and Vetten M. National Institute for Occupational Health Research Day 2018. Occup Health S Afr 2019; 25: 24-34.

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RESEARCH ARTICLE

Our Surgical Results for Femoral Neck Fractures: A Demographic and Retrospective Cohort Study

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Abstract

Objective: Proximal Femur Fractures due to trauma in the form of falls have become a common health problem among advanced age groups worldwide.Proximal Femur Fractures occur in various anatomical regions due to low- and high-energy causes related to falls, traffic accidents, metastatic tumors and osteoporosis.

Method: We compared the WOMAC results in addition to post-operative ROMs between three groups covering healthy hip joints with no apparent pathology and operated hip joints in 34 cases.

Results: A total of 34 patients consisting of 19 males and 15 females were included in the study. The mean age was 62.91±5.13 years in the proximal femur fracture was due to a traffic accident in 3 patients and a fall in 31 patients. Osteoporosis was present in 21 patients and osteopenia in 6 patients, with no bone pathology in 4 patients. Mild postoperative limitations were present in abduction and adduction on the operated joint side but there was no significant difference ($p > 0.05$) between the other ROM values of the operated side and the healthy side

Conclusion: The quality of life increased in the post-operative period according to the surgical method used, the selection of the appropriate materials for the reconstructive surgery performed, and early diagnosis and treatment.

Key words: Trauma, osteoporosis, fracture, femoral neck

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Introduction

Proximal Femur Fractures due to trauma in the form of falls have become a common health problem among advanced age groups worldwide. The increase in the prevalence of osteoporosis and the population over the age of 65 increases the incidence of femoral neck fractures. Hip fracture has the highest morbidity and mortality rates among all osteoporotic fractures. Approximately 50% of hip fracture patients suffer permanent postoperative functional limitation compared to their pre-fracture state. The incidence of hip fractures is increasing in many countries, especially in Asian developing countries, and the total number of hip fractures is predicted to reach more

than five million by 2050. While 26% of all hip fractures occurred in Asia in 1990, this rate is predicted to reach 37% in 2025 and 45% in 2050. Femoral neck fractures will increase more significantly in males (310%) than in females (240%) (Gullberg et al., 1997). The socioeconomic effects of hip fracture can be considered in two ways: hip fractures increase morbidity and mortality in the elderly, and they increase health expenditure greatly in economic terms. There is therefore an urgent need to accurately evaluate the risk of hip fractures starting from the perspective of family medicine and then developing preventive and protective measures. Femoral neck fractures in the young age group are caused by trauma with exposure to high levels of energy. Various types of femoral neck fractures may be associated with multiple trauma. Early and accurate diagnosis is the most important criterion in the treatment of trauma patients. The risk of femoral head avascular necrosis and nonunion increases significantly with late diagnosis and treatment (Thuan and Swiontkowski, 2008; Butt et al., 2017; Patterson et al., 2018). Proximal Femur Fractures have been classified in various ways such as 1) as intra-capsular, extra-capsular (basal, trochanteric, subtrochanteric), 2) subcapital, medial, lateral, intertrochanteric, pertrochanteric, 3) according to the degree of angulation of the fracture line with the horizontal plane (Pauwels), 4) non-displaced due to fracture (Garden Type 1-2), displaced due to fracture (Garden Type 2-3), and 5) AO classification; subcapital (Type B1), transcervical (Tip B2), and displaced subcapital (Type B3). We performed surgical procedures according to classification 1 and 2 in our patients. Options in proximal femur fractures include Single or Double Lag Screw Proximal Femur Nail (PFN), 6.5 mm Cannulated Screw, Partial or Total Hip Prosthesis, and Dynamic Hip Screw (DHS) according to the type of the fracture, patient age, and bone density values (Gullberg et al., 1997; Malik et al., 2009; Li and Cole, 2015; Lin et al., 2015; Butt et al., 2017; Patterson et al., 2018).

Methods

Permission was obtained to conduct the study from the Kafkas University Ethics Committee with decision no 80576354-050-99/177.

Proximal femur fractures were detected in 34 patients between 2015 and 2019 according to the radiological and clinical examinations performed after referral to the Emergency Service by family physicians or other health institutions. Intracapsular and extracapsular fracture patients mostly underwent single and double lag screw proximal femur intramedullary nail implantation while cannulated triple screw implantation was used for the young patients with subcapital fractures, and partial hip prosthesis implantation for patients with extracapsular femoral neck fractures due to their advanced age (Figure 1,2,3,4). Group I consisted of patients who were implanted a single lag screw (PFNA) and cannulated screw (n = 11), Group II consisted of patients who were implanted a double lag screw (n = 10), and Group III consisted of patients with partial hip replacement (n = 13). In addition to the type of fracture, and according to the bone density quality, single lag screws and three cannulated screws were used in intracapsular fractures in the younger patients, double lag screws were used to provide better stability in those with intracapsular and extracapsular fractures, and partial hip prosthesis implantations were used in those with osteoporosis due to advanced age since the fracture improvement rate is low in elderly patients. Only patients with ROMs close to full on the healthy side hip joint and who had not undergone any surgery were included in our study. The movement capacities of the healthy and operated hip joints of our patients were measured with a Goniometer and recorded at the postoperative 3rd month. Besides, the WOMAC scores were determined and recorded at the postoperative 3rd month in all groups.

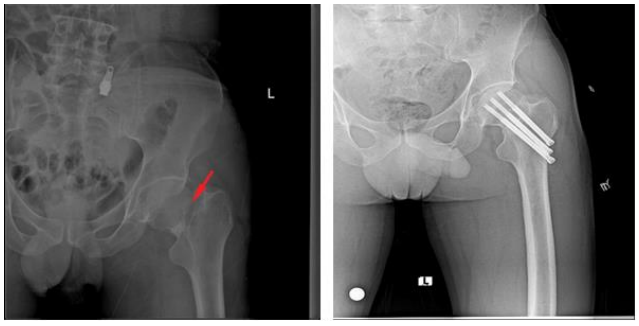

Figure 1. 37-year-old patient. Left intracapsular femoral neck fracture due to a traffic accident. Inverted triangular osteosynthesis with three 6.5 mm cannulated screws.

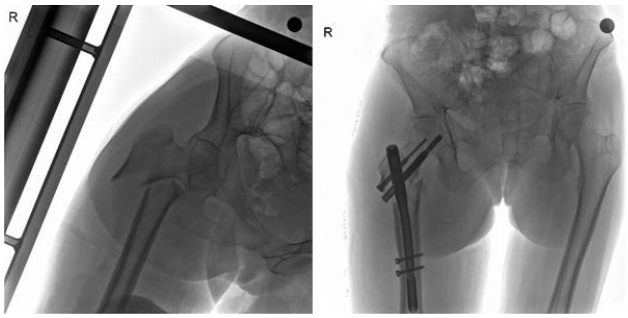

Figure 2. 55-year-old patient. Right extracapsular femoral neck fracture due to a traffic accident. Double Lag Screw PFN Implantation.

Figure 3. 49-year-old patient. Right extracapsular Rivers type femoral neck fracture. Single Lag Screw PFN Implantation

Figure 4. 93-year-old patient. Right intracapsular femoral neck fracture. Partial hip prosthesis implantation.

Statistical analysis

The normality test was applied to determine whether the data fit a normal distribution in the comparisons between the subgroups (Group I, II, III) for all parameters that were measured as regards the movement capacity. Since our data did not show a homogeneous distribution, Kruskal-Wallis analysis, which is one of the nonparametric tests, was applied to determine the difference between the groups for the measured parameters. Phenotypical correlation analysis was performed to determine the level of relationship between the parameters and WOMAC values in the subgroups (Group I, II, III) for all the measured parameters as related to movement capacity. The SPSS 20 software program was used for the descriptive statistics with the Kruskal-Wallis test while the Minitab 12 statistics software program was used for Phenotypical Correlation Analysis. The operated and non-operated extension values were removed in the correlation analysis because they were very close or the same between the patients. There was no significant difference between the groups in the Kruskal-Wallis analysis. The mean and standard error values of the groups are presented in Table 2.

Results

A total of 34 patients consisting of 19 males and 15 females were included in the study. The mean age was 62.91±5.13 years in Group I, 72.70±5.29 years in Group II, and 82.92±1.70 years in Group III. The proximal femur fracture was due to a traffic accident in 3 patients and a fall in 31 patients. Osteoporosis was present in 21 patients and osteopenia in 6 patients, with no bone pathology in 4 patients. Diabetes was present in 6 patients, Parkinson's disease in 2 patients, dementia in 5 patients, hypertension in 9 patients, chronic obstructive pulmonary disease (COPD) in 4 patients, nephropathy in 2 patients, goiter in 5 patients, smoking addiction in 17 patients, and alcohol abuse in 1 patient. The proximal femur fractures were on the right side in 17 patients and the left side in 17 patients. Peritrochanteric and reverse type proximal femur fractures were found in 14 patients, the lateral type in 8 patients, medial type in 6 patients, intertrochanteric type in 4 patients and subcapital type in 2 patients.

The parameters investigated in all the patient groups included Flexion, Extension, Internal Rotation, External Rotation, Abduction and Adduction capacity in both the healthy and operated hip joints. Whether the values were significant is summarized in Table 1 according to the correlation coefficients obtained by the comparison of these parameters. There was no significant difference in Flexion, Extension, Internal Rotation, or External Rotation between the healthy hip and operated hip joint. The operated hip joint capacity was close to that of the healthy hip, regardless of the group. The quality of life had not decreased due to the fracture at the post-operative 3rd month. A significant difference ($p<0.001$) was found between the movement capacity of the operated hips. There was minor limitation in postoperative abduction and adduction in the operated side compared to the healthy side. The hip joint correlation showed significant values for the healthy side hip ($p<0.01$, $p<0.05$) but not for the operated hip ($p>0.05$). The mean WOMAC (Western Ontario and McMaster Universities Osteoarthritis

Index) (scoring of joint-related functions in terms of pain, stiffness and physical functions) values were determined in all groups at the postoperative 3rd month. A higher WOMAC score indicates worse post-operative patient satisfaction. No statistically significant difference was found between the WOMAC scores of our groups; however, there was a numerical difference between Group I –II and Group III. Accordingly, our patients in Group I-II had better post-operative joint movement and physical activity scores, and lower pain and stiffness analysis scores. These data are presented in Table 2. A significant ($p<0.05$) correlation was found between the WOMAC and Age values. The disorders accompanying the proximal femoral fractures in all groups were also determined and are presented as percentages in Table 3, Table 4 presents the demographic features, fracture development mechanisms and the femoral neck fracture type of our patients.

Table 1. Correlation values (upper line) between the operated and non-operated hip movement capacities together with WOMAC values and the significance levels (lower line)

	Flexion Healthy	Flexion Operated	Internal Rotation Operated	Internal Rotation Healthy	External Rotation Operated	External Rotation Healthy	Abduction Operated	Abduction Healthy	Adduction Operated	Adduction Healthy	WOMAC
Flexion Operated	0.590 0.000***										
Internal Rotation Operated	0.305 0.080-	0.643 0.006**									
Internal Rotation Healthy	0.602 0.000***	0.443 0.009**	0.271 0.120-								
External Rotation Operated	0.171 0.333-	0.345 0.045*	0.501 0.003**	0.147 0.405-							
External Rotation Healthy	0.547 0.007**	0.327 0.059-	-0.092 0.604-	0.538 0.001***	0.306 0.078-						
Abduction Operated	0.494 0.003**	0.497 0.003**	0.554 0.001***	0.486 0.004**	0.313 0.071-	0.278 0.111-					
Abduction Healthy	0.314 0.070*	0.340 0.049-	-0.071 0.691-	0.237 0.177-	0.032 0.856-	0.456 0.007**	0.190 0.282-				
Adduction Operated	0.300 0.085-	0.380 0.027*	0.485 0.004**	0.491 0.003**	0.116 0.512-	0.188 0.288-	0.357 0.038*	0.111 0.530-			
Adduction Healthy	0.602 0.000***	0.297 0.088-	0.208 0.237-	0.489 0.003**	0.208 0.239-	0.289 0.097-	0.402 0.019*	0.217 0.218-	0.363 0.035*		
WOMAC	-0.370 0.031*	-0.409 0.016*	-0.286 0.102-	-0.477 0.004**	0.070 0.696-	-0.275 0.116-	-0.281 0.108-	-0.208 0.239-	-0.619 0.000***	-0.180 0.307-	
Age	-0.544 0.001***	-0.200 0.257-	-0.002 0.993-	-0.513 0.002**	0.009 0.958-	-0.387 0.024*	-0.286 0.101-	-0.461 0.006**	-0.161 0.363-	-0.662 0.000***	0.386 0.024*

(*): P<0.05; (**): P<0.01; (***): P<0.001; (-); P>0.05 Insignificant

Table 2. Movement capacities of the operated and non-operated hip joints and mean postoperative WOMAC values

Group	Extension Healthy	Extension Postop	Flexion Healthy	Flexion Postop	Internal Rotation Postop	Internal Rotation Healthy	External Rotation Postop	External Rotation Healthy	Abduction Posttop	Abduction Healthy	Adduction Posttop	Adduction Healthy	WOMAC Postop 3rd Month
Group I (n= 11)	5.00±0.00	1.46±0.16	119.09±3.68	99.09±3.15	20.00±1.35	31.82±1.22	19.09±1.63	28.64±2.34	23.18±1.39	33.64±2.44	18.18±1.82	25.45±1.57	22.39±2.36
Group II (n=10)	5.00±0.00	2.00±0.00	116.00±5.42	107.00±4.23	25.00±1.67	31.00±2.33	23.00±2.13	26.50±2.36	27.00±1.53	31.00±1.80	21.00±2.33	26.00±2.21	22.39±3.11
Group III (n=13)	5.00±0.00	2.00±0.00	109.23±3.66	103.85±2.90	23.85±1.40	28.46±1.54	25.38±1.44	26.15±1.40	23.08±1.33	30.77±1.32	18.08±1.33	20.77±1.37	27.64±5.17

Table 3. Disorders Accompanying Femoral Neck Fractures

Osteopenia	Osteoporosis	Diabetes Type II	Parkinson's	Dementia	Hypertension	COPD	Nephropathy	Alcohol Addiction	Smoking Addiction	Goiter
6	21	6	2	5	9	4	2	1	17	5
17.64%	61.76%	17.64%	5.88%	14.70%	26.47%	11.76%	5.88%	2.94%	50%	14.70%

Table 4. Demographic Features, Development Mechanisms and Types of Femoral Neck Fractures

Groups	Age	Female	Male	Right	Left	Peri-trochanteric	Lateral	Medial	Subcapital	Inter-trochanteric	Traffic accident	Falls (home, work, outside)
Group1 (n=11)	62.91±5.13	1(9,09%)	10(90,91%)	5(45.45%)	6(54.55%)	0(0%)	4(36.36%)	3(27%)	2(18.18%)	2(18.18%)	1(9.09%)	10(90.90%)
Group2 (n=10)	72.70±5.29	3(30%)	7(70%)	7(70%)	3(30%)	0(0%)	6(60%)	4(40%)	0(0%)	0(0%)	2(20%)	8(80%)
Group3 (n=13)	82.92±1.70	6(46.16%)	7(53.84%)	5(38.46%)	8(61.54%)	5(38.46%)	3(23.07%)	1(7.69%)	2(15.38%)	2(15.38%)	0(0%)	13(100%)

Discussion

Proximal Femur Fractures, which are commonly encountered in the elderly population, are usually pathological fractures due to osteoporosis. Proximal femur fractures in the young population are high-energy fractures and a serious health problem resulting in high nonunion and avascular necrosis (AVN) rates (Gullberg et al., 1997; Thuan and Swiontkowski, 2008; Malik et al., 2009; Li and Cole, 2015; Lin et al., 2015; Butt et al., 2017; Patterson et al., 2018). These fractures may occur due to Parkinson's disease, Alzheimer's disease, dementia, epilepsy, diabetic neuropathy, endocrine-metabolic diseases and in patients with alcohol or tobacco use, due to sprains and falls (Martyn, 2003; Thuan and Swiontkowski, 2008; Weil et al., 2015; Yamauchi et al., 2018). In our patients, osteoporosis was present in 21 patients, osteopenia in 6 patients, diabetes in 6 patients, Parkinson's disease in 2 patients, dementia in 5 patients, hypertension in 9 patients, chronic obstructive pulmonary disease (COPD) in 4 patients, nephropathy in 2 patients, goiter in 5 patients, smoking addiction in 17 patients, and alcohol abuse in 1 patient.

Proximal Femur Fractures require urgent and on-site intervention both in the younger age group (age <60 years) and in the elderly. Some authors have reported that intervention in the first 6-8 hours is required to ensure that the blood supply of the femoral neck is not impaired or that the impaired blood supply is restored. The AVN and nonunion rates are quite high in femoral neck fractures after late intervention (Martyn, 2003; Thuan and Swiontkowski, 2008; Yamauchi et al., 2018). Both young and elderly patients with hip pain should therefore be evaluated clinically and radiologically.

The gold standard in the treatment of femoral neck fractures consists of early diagnosis, using the appropriate surgical procedure, anatomical reduction, intraoperative capsular decompression and stable fixation for a cannulated screw or the PFN and DHS procedures. Early diagnosis and treatment are two important factors to ensure fracture healing without any complications. The patient with a proximal femur fracture should therefore be diagnosed at the time of the patient encounter so that treatment can be arranged (Braun et al., 1991; Parker, 2000; Ong et al., 2002; Bryant and Harley, 2007; Langford and Strauss, 2008; Lee et al., 2008; Thuan and Swiontkowski, 2008; Zlowodzki et al., 2008; Florschutz et al., 2015; Weil et al., 2015). All of our cases were evaluated at the emergency service and underwent surgery as soon as possible after a diagnosis was made clinically and radiologically. Postoperative avascular necrosis did not develop in 21 of our 34 patients thanks to our femoral neck and head protective surgical methods. There was also no infection in any of our patients. Deep vein thrombosis and concomitant pulmonary embolism were found in three patients in the third and fourth postoperative weeks.

Varization was found after PFN implantation in one patient. Revision was planned for this patient but could not be performed due to advanced cardiopulmonary disease. The patient continued his daily life using a single cane.

No prosthetic loosening, luxation, new fracture or implant failure was observed in any of the 34 patients in the postoperative period. Passive and active mobilization was started postoperatively in all of our patients. Some studies have reported permanent postoperative functional limitation compared to the pre-fracture values in approximately 50% of the patients (Gullberg et al., 1997). Post-operative hip movement was close to that of the intact hip after recovery. Two of our patients could only start active mobilization later due to advanced stage Parkinson’s disease and dementia. Calcium and Vitamin D3 were regularly started in all of our patients regardless of age. A minimum of 3 months is recommended to support the remodeling period of the fracture and to support porous healing of prostheses in cases of widespread regional vitamin D deficiency. Bisphosphonate derivatives were added to the treatment of the patients diagnosed with osteoporosis who had not received osteoporosis treatment or regular medical care. We found that WOMAC scores were lower in Group I and II compared to Group III with older age but there was no statistically significant difference. Our data are also supported by the literature (Braun et al., 1991; Thuan and Swiontkowski, 2008; Florschutz et al., 2015).

Multiple factors such as the femoral neck fracture type, patient age, presence of additional diseases, time and type of patient presentation, the bone quality of the patient, and patient habits and addictions that can negatively affect nutrition and healing by influencing the vascularity in the fractured bones all play a role (Gullberg et al., 1997; Thuan and Swiontkowski, 2008; Florschutz et al., 2015; Lin et al., 2015; Weil et al., 2015). Our cases in Group I and II underwent post-traumatic surgical stabilization within 4 to 48 hours. Partial hip prosthesis implantation was performed within 24 to 72 hours in Group III. The bone quality was better in Group I and II than in Group III. The joint movement ROMs were lower and the WOMAC scores were higher in Group III, despite the lack of statistical significance, due to

more significant comorbidity but with no difference regarding movement capacity and mobilization. Our patients in Group I-II had better post-operative joint movement and physical activity scores, and lower pain and stiffness analysis scores.

There was no infection in any of our patients. Deep vein thrombosis and concomitant pulmonary embolism were found in three patients in the third and fourth postoperative weeks. Postoperative avascular necrosis did not develop of our patients. This may also have decreased the socio-economic costs of femoral neck fracture.

Conclusion

Early diagnosis and treatment, correct selection of the surgical procedures and materials to be used according to the indications, the control of comorbidity with a multidisciplinary approach, early surgical intervention, post-operative initiation of medical treatment for osteoporosis, and early mobilization increase tolerability in the early period and decrease the revision surgery rate. We recommend studies on a larger number of patients and with a longer follow-up period according to different and detailed new indexes for better analysis of our correlations with higher reliability.

Ethics Committee Approval: The study was approved by the ethics committee of Kafkas University (Decision No: 80576354-050-99/177). The study was performed following the aid of the ethical standards down in the 1964 Declaration of Helsinki and its later amendments.
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References

Braun W, Rüter A, Wiedemann M, Kissing F. Femoral head preserving therapy in medial femoral neck fractures. A clinical study of the effects of treatment method on the outcome. Unfallchirurg 1991; 94(6): 325-30 (Article in German)

Bryant C, Harley J. Re: Parkinson's disease patients who fracture their neck of femur: a review of outcome data. Injury 2007; 38(10): 1222.

Butt FF, Hussain AS, Khan AM, Sultan MJ. Implants for extracapsular neck of femur fracture Dynamic hip screw versus intramedullary nailing. J Ayub Med Coll Abbottabad 2017; 29(4): 697-701.

Florschutz AV, Langford JR, Haidukewych GJ, Koval KJ. Femoral neck fractures: current management. J Orthop Trauma 2015; 29(3): 121-9.

Gullberg B, Johnell O, Kanis JA. World-wide projections for hip fracture. Osteoporosis Int; 1997: 407–13.

Langford J, Strauss E. Femoral Neck Fractures. Fix or Replace? Techniques in Orthopedics 2008; 23(3): 208-12.

Lee YS, Chen SH, Tsuang YH, Huang HL, Lo TY, Huang CR. Internal fixation of undisplaced femoral neck fractures in the elderly: A retrospective comparison of fixation methods. J Trauma 2008; 64: 155-62.

Li M, Cole PA. Anatomical considerations in adult femoral neck fractures: how anatomy influences the treatment issues? Injury 2015; 46(3): 453-8.

Lin PP, Kang HG, Kim YI, Kim JH, Kim HS. Minimally invasive surgery for femoral neck fractures using bone cement infusible hollow-perforated screw in high-risk patients with advanced cancer. Surg Oncol. 2015; 24(3): 226-31.

Malik AA, Kell P, Khan WS, Ihsan KM, Dunkow PJ. Surgical management of fractured neck of femur. Perioper Pract 2009; 19(3): 100-4.

Martyn J. Fractures of the hip. Surgery 2003; 21: 221–4.

Ong BC, Maurer SG, Aharonoff GB, Zuckerman JD, Koval KJ. Unipolar versus bipolar hemiarthroplasty: Functional outcome after femoral neck fracture at a minimum of thirty-six months of follow-up. J Orthop Trauma 2002; 16: 317-22.

Parker MJ. The management of intracapsular fractures of the proximal femur. J Bone Joint Surg (Br) 2000; 82-B: 937- 41.

Patterson JT, Tangtiphaiboontana J, Pandya NK. Management of Pediatric Femoral Neck Fracture. J Am Acad Orthop Surg. 2018: 26(12): 411-9.

Thuan V Ly, Swiontkowski MF. Management of femoral neck fractures in young adults. Indian J Orthop 2008; 42(1): 3-12.

Weil NL, van Embden D, Hoogendoorn JM. Radiographic fracture features predicting failure of internal fixation of displaced femoral neck fractures. Eur J Trauma Emerg Surg 2015; 41(5): 501-7.

Yamauchi K, Naofumi M, Sumida H, Fukuta S, Hori H. Comparison of morphological features in the femur between femoral neck fractures and femoral intertrochanteric fractures. Surg Radiol Anat 2016; 38(7): 775-80.

Zlowodzki M, Ayeni O, Petrisor BA, Bhandari M. Femoral neck shortening after fracture fixation with multiple cancellous screws: incidence and effect on function. J Trauma 2008: 64(1): 163-9.

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RESEARCH ARTICLE

Effect of Low Level Laser Therapy on Postoperative Pain After Single Visit Endodontic Treatment: A Placebo-Controlled Randomized Clinical Trial

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Abstract

Objective: To evaluate the effect of low-level laser therapy (LLLT) on postoperative pain after root canal treatment.

Methods: This study was designed as a randomized, single-blinded, placebo-controlled trial of 2 groups. Forty-two patients were included in the study according to the inclusion and exclusion criteria. The treatment procedures were performed by one operator. After local anesthesia and rubber dam isolation, access cavity preparation was performed by diamond burs with high-speed handpieces under the water cooling. Instrumentation of procedures was performed by Reciproc R50 files. Irrigation protocol was completed, canals were dried, filled with gutta-percha cones and AH Plus sealer. After chemo- mechanical instrumentation and root canal filling procedures, LLLT were applied for 60 seconds per tooth using Nd-YAG laser (λ=1064 nm, 100 mJ, 10 Hz, 1-W) The same procedures as in the laser group were performed, been completed but the laser was not activated in this group. These patients were assigned as a placebo group. Postoperative pain was measured and documented via the Visual Analogue Scale.

Results: The independent sample t-test was performed after normality and homogeneity tests. No statistically significant differences were detected between the groups in terms of demographic data (age and tooth number) (P > .05). No statistically significant difference was found between the groups at the 4th, 8th, 48th, and 72nd hours (p>.05). However, there was a statistically significant difference between groups at the 12th (p=.030) and 24th hours (p=.041).

Conclusion: LLLT can decrease postoperative pain after root canal treatment of single-rooted teeth.

Key words: Biostimulation, irreversible pulpitis, low level laser, single visit

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Introduction

Irreversible pulpitis is one of the most common reasons requiring root canal treatment (Boykin et al., 2003). However, root canal treatment may result in post-operative pain (Asnaashari et al., 2011). Various factors including the number of visits, the use of intracanal medicament, pulpal and periapical situation affect the formation of a flare-up (DiRenzo et al., 2002). Moreover, host factors such as age, gender, presence of periapical-induced preoperative pain, dental group, primary treatment or retreatment, and irritants inside the root canal system contribute to the increase in the frequency of flare-up. Furthermore, iatrogenic factors, for instance, debris extrusion in the periapical area, and deterioration of apical patency during preparation increase the incidence of flare-ups (Mashiko et al., 1985)

Attar et al., (2008) have recommended non-steroidal anti-inflammatory drugs, corticosteroids, and antibiotics to deal with undesired postoperative complications. Low-level laser therapy (LLLT) has been introduced in endodontics as a non-invasive non-pharmacotherapeutic and simple manipulation technique (Asnaashari et al., 2013). The main effects of this laser therapy include anti-inflammatory features, immune stimulation, analgesia, and induction of cell proliferation. LLLT increases phagocytosis synthesis, lymphatic drainage, and vasodilatation while reducing bradykinin synthesis and histamine release which mechanisms affect the inflammatory process (Rochkind et al., 1989). Additionally, LLLT provides faster tissue healing by rising of vascularization, support growth of fibroblasts and collagen formation, and changes in immunological reaction. According to the results of a systematic review and meta-analysis, LLLT also retards the beginning of pain, decreases both intensity and duration of pain after endodontic treatment and the use of analgesics is relatively reduced, even in some cases analgesic drugs are not needed (He et al., 2013). This study aimed to evaluate the effect of LLLT on postoperative pain after root canal treatment. The null hypothesis was that there is no difference between the groups in postoperative pain.

Methods

Study Design

This study was designed as a randomized, single-blinded, placebo-controlled trial of 2 groups.

Patients and Inclusion/Exclusion Criteria

The study was approved by the local ethics committee of Ordu University, and informed consent was received from all participants. Study subjects were selected among patients who presented to the Department of Endodontics, Faculty of Dentistry of Ordu University from September 2017 to March 2018.

Root canal treatment was planned for patients who diagnosed asymptomatic irreversible pulpitis and have a single root and single canal. Pulp vitality was assessed with cold spray (Endo ice refrigerant spray, Coltene/Whaledent Inc., Mahwah, NJ). The patient who included this study reported no preoperative pain and all selected teeth were vital. Adequate root canal fillings were included, and the extruded fillings were not considered in the study. Patients aged 15 to 45 years. Exclusion criteria related to teeth were swelling or sinus tract, acute pain, periodontal probing greater than 3mm, internal and external resorption, fractured and cracked tooth, percussion sensitivity, and periapical index classification 3, 4, 5 according to Orstavik et al. (1986). Exclusion criteria related to the systemic health of patients included diabetes, hypertension, and cardiovascular pathologies, the use of analgesics and/or antibiotics at least one week before treatment and using antidepressant drugs.

Sample Size Calculation

A pilot study was conducted to calculate the sample size of the study. Therefore, twenty patients were randomly assigned to two groups. The same protocol was used both in the pilot study and the main study. According to the results of the pilot study, a sufficient number of the sample was found as 38 patients for two 2 groups (power = 80%, significance level = 0.05, effect size = 0.80). Assuming that approximately 10% of patients may not respond, 21 patients were assigned to each group to ensure a representative sample.

Treatment Procedures

The treatment procedures were performed by one operator (G.A.). Initially, patients' age, gender, and tooth number were recorded by the operator. 1.5 mL 2% articaine with 0.012 mg epinephrine (Ultracaine DS Forte; Aventis, Istanbul, Turkey) was used as a local anesthetic. After rubber dam isolation, access cavity preparation was performed by diamond burs (ADIA Dental Burs, Istanbul, Turkey) with high-speed handpieces under the water cooling. A #10 K-type (Kerr Corporation, Orange, CA) file was inserted to root canal to determine working length using an apex locator (Raypex, VDW, Munich, Germany). The working length was set as 1 mm shorter than the apical foramen and confirmed with periapical

radiographs. Instrumentation of procedures was performed by Reciproc R50 files (VDW, Munich, Germany). Irrigation protocol was completed 5 mL 17% EDTA (Werax, Izmir, Turkey) and 15 ml 2.5% sodium hypochlorite (NaOCl) (Wizard, Istanbul, Turkey) with a side-vented needle (NaviTip needle; Ultradent Products Inc, South Jordan, UT). Subsequently, canals were dried with paper points and filled with gutta-percha cones and AH Plus sealer (Dentsply Maillefer, Tulsa, OK). Lateral cold condensation technique was used for obturation. Finally, the coronal access cavity was restored with temporary restorative material (Cavit G; 3M ESPE, St Paul, MN). It may be the effect of dental matrix bands on postoperative pain so permanent restoration was completed after the end of the experiment.

Randomization

Randomization was produced using a website (http://www.random.org) after the clinician (G.A.) was completed all treatment procedures. All procedures were conducted by one clinician (C.E.B.), and the assignment was concealed from the clinician who performed the laser applications (U.B.). Data analysis and interpretation were completed by the other researcher (C.F.).

Laser Group

After chemo- mechanical instrumentation and root canal filling procedures, LLLT was applied for 60 seconds per tooth using Nd-YAG laser (λ=1064 nm,100 ml, 10 Hz, 1-W [Deka smart file, DEKA, Italy]). The application of the laser was performed through the root canal and to the buccal mucosa over the apices of the target tooth. An application biostimulation tip was used to ensure a constant distance of 10 mm to the tissue.

Placebo Group

The same procedures as in the laser group were performed, but the laser was not activated in this group. These patients were assigned as a placebo group.

Pain Evaluation

Postoperative pain was measured and documented via a visual analog scale (VAS). VAS consists of a 100 mm line which is represented at one end by a sign 'no pain' and at the other end 'unbearable pain' (Figure 1). This form was given to each patient and they were instructed to mark according to the pain intensity at 4th, 8th, 12th, 24th, 48th and 72nd hours.

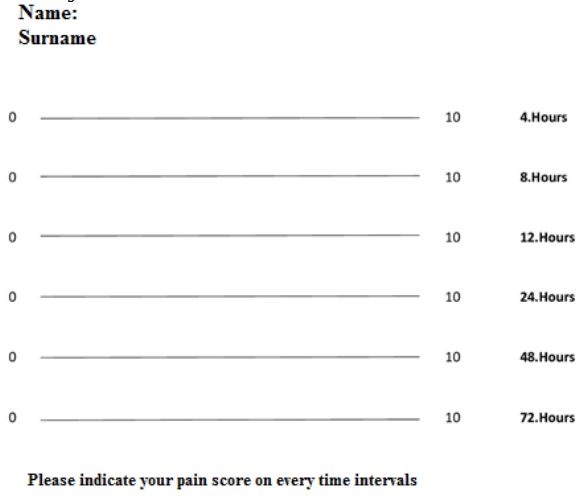

Figure 1. Visual Analog Scale

Statistical Analysis

The data were expressed displayed as mean ± standard deviation. The independent sample t-test was performed after the normality and homogeneity tests. A Chi-square test was performed in the analysis of the nominal data. $P< 0.05$ values were considered statistically significant. Statistical tests were performed with SPSS (Version 24.0, SPSS Inc., Chicago, IL).

Results

Table 1 shows descriptive statistics and postoperative sensitivity at different evaluation points. Figure 2 indicates the participation of patient numbers for each group. Aside from sex, no statistically significant differences were detected between the groups in terms of demographic data (age and tooth number) ($P >.05$). There was a statistically significant difference between groups at the 12th and 24th hours ($p<.05$). LLLT resulted in lower pain levels than the placebo group at 12nd and 24th hours. However, no statistically significant difference was found between the groups at the 4th, 8th, 48th, and 72nd hours ($p>.05$). During this study, no patient reported swelling, sinus tract, palpation pain and didn't need analgesics both in groups.

Table 1. Descriptive statistics and the results of statistical analysis regarding postoperative sensitivity in the laser and placebo groups at different evaluation points

Study Details and Pain Levels		LLLT Group (n=15)	Placebo Group (n=19)	P Value
Demographic data				
Age		30,86 ± 11,82	25,52±10,10	>,05
Sex	Men (n)	3	11	>,05
	Women (n)	12	8	
Postoperative pain levels at 4th hours		0,753±1,165	1,526±2,166	>,05
Postoperative pain levels at 8th hours		1,013±1,744	1,489±1,905	>,05
Postoperative pain levels at 12th hours		0,266±0,158	1,231±1,736	*<,05**
Postoperative pain levels at 24th hours		0,273±0,127	0,847±1,144	*<,05**
Postoperative pain levels at 48th hours		0,266±0,129	0,731±1,170	>,05
Postoperative pain levels at 72nd hours		0,306±0,212	0,678±1,163	>,05

* statistical difference (P=0,05)

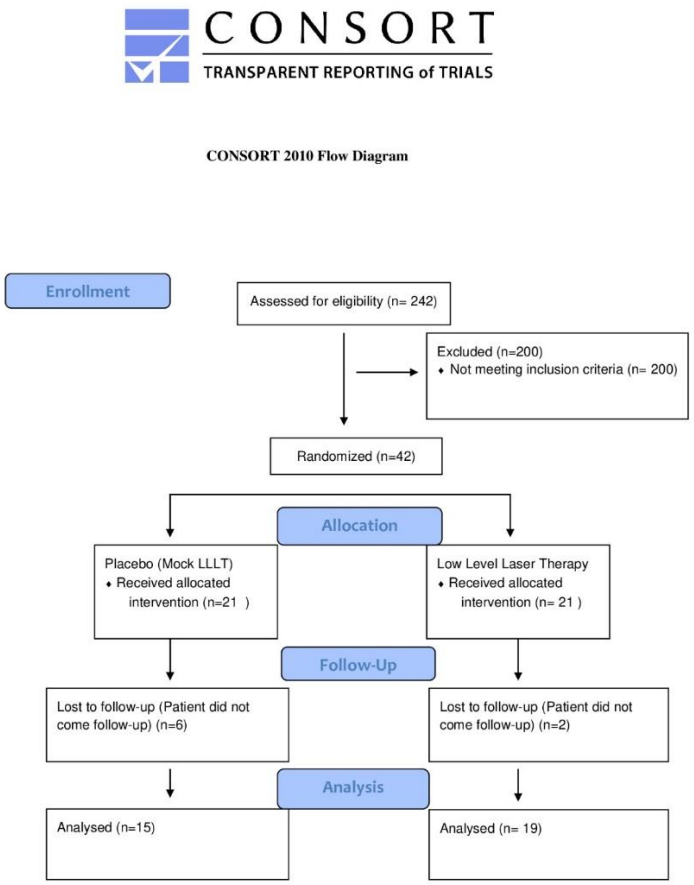

Figure 2. CONSORT diagram summarizing patients eligible for the study

Discussion

Postoperative pain after root canal treatment is an unpleasant situation both for patients and clinicians. The most common postoperative pain control agents include antibiotics, non-steroidal anti-inflammatory agents, and corticosteroids which can lead to undesirable effects in some patients who are pregnant or have a drug allergy (Attar et al., 2008a). Recently, LLLT has been considered as a helpful method to reduce post-op pain associated with root canal treatment due to its effective and non-pharmacological character. Researchers have described the main effects of LLLT as an anti-inflammatory, immune-stimulating, analgesic, and cell proliferation-inducing effects (Kreisler et al., 2004). When photons' light interacts with the cellular structure, its energy is absorbed by the cells, producing the expected therapeutic effect on tissues (Asnaashari et al. 2013a). The increased cellular energy of periapical tissue results in pain relief, nerve regeneration, wound healing, and immune system modulation (Barden et al., 2004).

In a study conducted by Asnaashari et al. (2011a), significant pain reduction was seen at 4, 8, 12 and 48 hours after the endodontic treatment in the LLLT group. Pawar et. al. (2014) reported the pain reduction effect of LLLT after the endodontic treatment of single root premolars. They concluded that reduction of pain was statistically significant in the LLLT group at 4th and 8th hours, but no statistically significant difference was found in pain reduction at 24th and 72nd hours. Arslan et al. (2017) examined the effect of LLLT on postoperative pain after root canal retreatment. Although they reported less pain in the LLLT group than in the placebo group in the first 4 days, they have found no statistically significant differences after 5 and 7 days. The null hypothesis was that there is no difference between the groups in postoperative pain. According to the results of the present study, significantly lower pain was found in the LLLT group at 12th and 24th hours between the groups, but no significant difference was found 8th, 48th, and 72nd hours. Thus, the null hypothesis was rejected. These differences between the results may originate from various factors such as using the type of laser, power of laser, inclusion criteria of the patient in studies.

The decrease in pain between the groups was similar after 24 hours, and no significant difference was found between 48 and 72 hours. According to the manufacturer, the complete disappearance of the effect of articaine varies between 60-225 min, so there was no significant difference between the groups in the first 8 hours. Alonso et al. (2012) reported that most of the pain occurred at 6th and 18th hours in the single visit root canal treatment which was significantly decreased after 24th hours. This result agrees with the findings of our study which no significant difference was found after 24th hours between LLLT and placebo groups.

According to the systematic review by Manfredi et al. (2016), there is no evidence to suggest that single-visit or multiple-visit root canal treatment is better than the other. On the other hand, there is a tendency for clinicians to perform single-visit endodontic treatment recently because of the benefits such as not requiring additional anesthetic injections, no need replacement of the rubber dam or intracanal medication, absence of inter visit leakage, loss of temporary seal, or any of the accidents that can and do occur between the visits (Attar et al., 2008b). Therefore, all root canal treatments were completed in single-visit in the present study.

Conclusion

Within the limitations of the present study, LLLT can decrease postoperative pain after root canal treatment of single-rooted teeth.

Ethics Committee Approval: The study was approved by the ethics committee of Ordu University (Decision No: 2017/136). The study was performed following the aid of the ethical standards down in the 1964 Declaration of Helsinki and its later amendments.
Peer-review: Externally peer-reviewed.
Author Contributions: Concept- C.E.B.; Design- G.A., C.F.; Materials- C.E.B., U.B.; Data Collection and Processing- G.A., U.B.; Literature Review- C.E.B., C.F.; Writing- G.A., U.B.; Critical Review- C.E.B., G.A.
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References

Alonso-Ezpeleta LO, Gasco-Garcia C, Castellanos-Cosano L, Martín-González J, López-Frías FJ, Segura-Egea JJ. Postoperative pain after one-visit root-canal treatment on teeth with vital pulps: Comparison of three different obturation techniques. Med Oral Patol Oral Cir Bucal. 2012;17(4).

Arslan H, Doğanay E, Karataş E, Ünlü MA, Ahmed HMA. Effect of Low-level Laser Therapy on Postoperative Pain after Root Canal Retreatment: A Preliminary Placebo-controlled, Triple-blind, Randomized Clinical Trial. J Endod. 2017;43(11):1765–9.

Asnaashari M, Mohebi S, Paymanpour P. Pain Reduction Using Low-Level Laser Irradiation in Single-Visit Endodontic Treatment. J Lasers Med Sci. 2011;2(4):139–43.

Asnaashari M, Safavi N. Application of Low-level Lasers in Dentistry (Endodontic). Rev Artic J Lasers Med Sci. 2013;4(2):57–66.

Attar S, Bowles WR, Baisden MK, Hodges JS, McClanahan SB. Evaluation of Pretreatment Analgesia and Endodontic Treatment for Postoperative Endodontic Pain. J Endod. 2008;34(6):652–5.

Barden J, Edwards JE, McQuay HJ, Moore RA. Pain and analgesic response after third molar extraction and other postsurgical pain. Pain. 2004;107(1–2):86–90.

Boykin MJ, Gilbert GH, Tilashalski KR, Shelton BJ. Incidence of endodontic treatment: A 48-month prospective study. J Endod. 2003;29(12):806–9.

DiRenzo A, Gresla T, Johnson BR, Rogers M, Tucker D, BeGole EA. Postoperative pain after 1- and 2-visit root canal therapy. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2002;93(5):605–10.

He WL, Li CJ, Liu ZP, Sun JF, Hu ZA, Yin X, et al. Efficacy of low-level laser therapy in the management of orthodontic pain: A systematic review and meta-analysis. Lasers Med Sci. 2013;28(6):1581–9.

Kreisler MB, Al-Haj H, Noroozi N, Willershausen B, Dhondt B. Efficacy of low-level laser therapy in reducing postoperative pain after endodontic surgery - A randomized double-blind clinical study. Int J Oral Maxillofac Surg. 2004;33(1):38–41.

Manfredi M, Figini L, Gagliani M, Lodi G. Single versus multiple visits for endodontic treatment of permanent teeth (Review) Summary of fındıngs for the maın comparıson. 2016;(12).

Mashiko K, Kanuma A, Kozawa T, KiWon Lee, Wu A, Zhihua Wang. Academia-industry collaboration in SoC design education wishes and reality. Proc 2004 IEEE Asia-Pacific Conf Adv Syst Integr Circuits [Internet]. 1985;11(11):18–21.

Orstavik D, Kerekes K, Eriksen HM. The periapical index: A scoring system for radiographic assessment of apical periodontitis. Dent Traumatol. 1986;2(1):20–34.

Pawar SS, Pujar MA, Makandar SD, Kaiser MI. Post endodontic treatment pain management with low-level laser therapy. 2014;8(2):60–3.

Rochkind S, Rousso M, Nissan M, Villarreal M, Barr-Nea L, Rees DG. Systemic effects of low-power laser irradiation on the peripheral and central nervous system, cutaneous wounds, and burns. Lasers Surg Med. 1989;9(2):174–82.

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RESEARCH ARTICLE

Evaluation of Job Insecurity in Individuals with Chronic Low Back Pain

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Abstract

Objective: It is natural for individuals who have chronic low back pain to perceive job insecurity because of the difficulty of finding a new job in either public or private sectors. In this study, we investigated the fear of losing job in individuals who admitted to our hospital with chronic low back pain by applying Job Insecurity Scale.

Method: Sociodemographic data form and Job insecurity scale were applied to patients working in the private sector, who admitted to our hospital with chronic low back pain. IBM SPSS Statistics 25.0 software was used in analysis. A value of $p < 0.05$ accepted to be statistically significant.

Results: A total of 118 people, 41 (34.7%) female and 77 (65.3%) male, participated in the study. Among patients with chronic low back pain, those who underwent surgery for low back pain, those with pain lasting more than 1 year, and those over the age of 50 years were found to have higher scores on the job loss anxiety scale.

Conclusion: Recent studies has shown that low back pain is the 2nd most frequent pain. We think that patients with chronic low back pain should be given psychological support because of the anxiety of losing job.

Key words: Chronic low back pain, job insecurity, Job loss anxiety

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Introduction

Pain is one of the most common symptoms affecting individual's bio-psycho-socially and impairing the quality of life. However, chronic pain challenges both individuals and physicians because it is difficult to treat. Low back pain that persists for more than 6 months is considered to be chronic and is generally due to mechanical low back pain (Braun et al, 2014; Will et al, 2018). In the literature, it has been noted that chronic low back pain is one of the most frequently observed musculoskeletal disorders (Oksuz, 2006). The posture of individuals with chronic low back pain is impaired in walking and sitting. This causes additional problems, such as numbness and tingling in the legs due to nerve

compression, and the development of atrophy due to muscles not working. Low back pain can have many causes, most of which are nonspecific. Specific causes include disc hernias, tumors, osteoporosis and rheumatoid arthritis (Koes, 2006).

It is natural for individuals who experience chronic back pain to feel job insecurity due to the difficulty of finding a new job in both the public and private sectors. In this study, we tried to investigate the fear of job loss due to chronic low back pain in individuals who were admitted to outpatient clinics of our hospital, by using a sociodemographic data form and the Job Insecurity Scale.

Methods

In this study, patients who were admitted to the Neurosurgery, Physical Therapy, and Family Medicine outpatient clinics of Inonu University Faculty of Medicine in June 2020, who were working in the private sector, and who volunteered to participate were included. Informed consent of the patients was obtained verbally. The sociodemographic data form and the Job Insecurity Scale were applied to the participants. Data were summarized by number (percent), mean ± standard deviation, and median (min-max) according to different variables. The suitability of numerical variables to normal distribution was examined by using Shapiro-Wilk test. In independent samples, the presence of a statistically significant difference between the sub-categories in terms of quantitative variables was examined using t-test and Kruskal-Wallis test. After the Kruskal-Wallis test, multiple comparison tests were examined using the Bonferroni-corrected Mann-Whitney U test. A value of $p < 0.05$ was accepted as statistically significant. IBM SPSS Statistics 25.0 software was used in the analysis. Ethics committee approval was received for this study from Nonclinical Research Ethics Committee of Inonu University.

The Job Insecurity Scale was developed by Ashford, Lee, and Bobko in 1989. The validity and reliability of the scale in Turkish was performed by Aslan et al in 2011. This scale consists of two parts and includes 13 questions. It is a five-answer Likert-type scale ranging between absolutely impossible and absolutely possible. The first part consists of 10 questions that measure perceived job insecurity and threat of losing job, and the second part consists of three questions that measure the level of job insecurity. In the first part, each answer is scored between 0 and 4 and the score increases as job insecurity increases. The second part is scored inversely, i.e., the answer “absolutely not possible” is scored 4 points, whereas “absolutely possible” is scored 0 points. In the reliability study of the scale, the α value was found to be 0.74–0.83. In the Turkish validity study conducted by Aslan, α was found to be 0.88, while reliability for 13th question was found to be α=0.78. To the best of our knowledge, there was no study using this scale.

Results

A total of 118 people, 41 (34.7%) female and 77 (65.3%) male, participated in the study. The average age was 35.42 ± 8.93 years. Fifty-seven (48.3%) of the participants were office workers. Considering the duration of working in the profession, 36 (30.5%) participants had been working in the same job for more than 5 years. Considering the duration of low back pain, 55 (46.6%) of the participants had low back pain for more than one year. Sociodemographic data of the participants are given in table 1.

In our study, the mean score of job insecurity was 24.48 ± 4.92. When compared according to gender, the mean score of the first part of the scale, which measured perceived threats of job insecurity and job loss, was 24.80 ± 5.06 in women and 24.31 ± 4.88 in men; this difference was not statistically significant ($p = 0.60$). When compared according to profession, the scores of those working in a job that required heavy lifting was higher (25.40 ± 6.07); however, this difference was not statistically significant ($p = 0.19$). When compared according to duration in the profession, the mean job insecurity score of those who had been working longer than 15 years was higher (25.33 ± 4.68), but again, there was no statistically significant difference. The mean score of those who had undergone surgery was statistically significantly higher than those who had no surgery ($p = 0.03$). When the scores of the Job Insecurity Scale were compared according to age group, the mean score of those who were older than 50 years of age was statistically significantly higher than those between the ages of 20 and 30 years ($p = 0.04$). The comparison of the mean scores of Job Insecurity Scale according to sociodemographic data of the participants is given in table 2.

Table 1: Sociodemographic data of the cases

	n	%
Gender		
Female	41	34.7
Male	77	65.3
Total	118	100.0
Type of profession		
Office work	57	48.3
Requiring physical activity	41	34.7
Predominantly heavy lifting	20	16.9
Total	118	100.0
Years in the profession		
0- 5 years	33	28.0
5 - 10 years	36	30.5
10 - 15 years	28	23.7
15 years	21	17.8
Total	118	100.0
Duration of low back pain		
6 months	21	17.8
6-12 months	42	35.6
>12 months	55	46.6
Total	118	100.0
Frequency of low back pain		
Only once	18	15.3
Once in a month	36	30.5
Once in a week	35	29.7
2-3 times a week	25	21.2
More than 4 times a week	4	3.4
Total	118	100.0
History of trauma		
Yes	37	31.4
No	81	68.6
Total	118	100.0
History of surgery		
Yes	37	31.4
No	81	68.6
Total	118	100.0
Duration of watching TV		
<3 hours	69	58.8
>3 hours	49	41.5
Total	118	100.0

Table 2: The comparison of the mean scores of job insecurity scale according to sociodemographic data of the participants

	Mean score	p
Gender		
Female	24.80±5.06	0.606
Male	24.31±4.88	
Type of profession		
Office work	23.63±5.09	
Requiring physical activity	25.22±3.89	0.191
Predominantly heavy lifting	25.40±6.07	
Years in the profession		
0- 5 years	22.91±4.47	
5 - 10 years	25.28±5.35	
10 - 15 years	24.68±4.85	0.173
15 years	25.33±4.68	
Duration of low back pain		
6 months	23.86±3.93	
6-12 months	25.55±4.65	0.219
>12 months	23.91±5.39	
Frequency of low back pain		
Only once	22.5 (16-30)	0.12
Once in a month	24 (15-34)	
Once in a week	25 (14-34)	
2-3 times a week	23 (16-37)	
More than 4 times a week	28 (24-35)	
History of trauma		
Yes	24.70±5.90	0.77
No	24.38±4.45	
History of surgery		
Yes	26.43±4.55	
No	23.59±4.85	**0.003**
Duration of watching TV		
<3 hours	25.13±5.23	
>3 hours	23.57±4.34	0.08

Discussion

In developing countries like ours, anxiety about losing a job may lead to psychological consequences, because being employed allows the individual to be financially beneficial and feel productive and socialized. Fear of losing a job causes anxiety and leads to diminished working performance in individuals. Chronic low back pain is a particularly important disease that may cause job loss, disability and anxiety (Mammadow, 2018).

In studies of chronic low back pain, the number of women with the condition is reported to be higher than the number of men, and this has been attributed to the fact that chronic low back pain may be a psychosocial pathological condition (Brinkhaus et al, 2006; Namgwa et al, 2016).

However, in some studies, the number of men with chronic low back pain was more than twice the number of women (Aslan, 2011; Mammadow, 2018). In our study, the number of men was almost two times higher than the number of women. This may be due to the fact that the number of working women is less than the number of working men, since our society is still patriarchal, and men engaged more frequently in work that requires heavy lifting. In the study by Aslan, the mean score of perceived job threat sub-dimension of the Job Insecurity Scale was 6.94 ± 5.34 (Aslan, 2011). In our study, it was 24.80 ± 5.06 in women and 24.31 ± 4.88 in men. The difference between our and Aslan's study may be because we

conducted this study on individuals with chronic low back pain and working in the private sector whereas Aslan's study was conducted on individuals working in information sector.

In Aslan's study, in which the Turkish validity of the Job Insecurity Scale was performed, the level of job insecurity was found to be higher in men than women (Aslan, 2011). In our study, women's anxiety scores were higher than men's. We suggest that this difference may be due to the fact that women are generally more anxious than men, and it is more difficult for women to find a job than men.

In our study, job insecurity anxiety was found to be statistically higher in those who had been suffering with low back pain for more than 1 year than those who had been suffering less than 1 year. This may be due to the fact that the patients who have chronic pain with limited treatment options may experience loss of productivity; therefore they have fear of losing their jobs (Ozkan, 1990).

In our study, we found that Job Insecurity Scale scores of patients who had undergone surgery due to low back pain were significantly higher than those who did not have surgery. This may be because patients who are suffering low back pain despite surgery may fear that they would remain untreated and that they would be unable to work, in time. We also found that the Job Insecurity Scale scores of the patients who were over 50 years of age were statistically significantly higher than those who were between 20 and 30 years of age. This may be because they think that finding a new job at advanced ages would not be easy. This condition may cause them to delay required therapy and consequently may worsen their condition. Therefore, we suggest that psychological support may be worthwhile for patients with low back pain.

In the study by Milliken et al, it was suggested that uncertainty about current job makes it difficult for individuals to make decisions about their future regarding their business and private life (Milliken, 1987). In our study, the Job Insecurity Scale scores of those who worked for more than 15 years, who had low back pain for 6–12 months, who had more than four low back pain a week, and who had trauma in the low back were found to be higher, however the differences were not statistically significant. This may be because those who have been working for a longer time may perceive the risk of losing job more strongly, and those who have trauma and have pain for between 6 months and 1 year may fear undergoing surgery or long-lasting treatments which can preclude them from working. In general, the uncertainty that occurs due to the lack of complete treatment may cause individuals to lose control and increase the feeling of helplessness (Wichert, 2001; Gokcek et al, 2018).

The fact that there are no other studies investigating the Job Insecurity Scale in the literature, except ours and the Aslan study increases the value of our study. However, a limitation of our study is that it was conducted only in a 3rd step hospital; therefore, it cannot be generalized to the general population.

Conclusion

In our study, the patients who underwent surgery for low back pain, those who have been suffering for more than 1 year, and those over 50 years old were found to have higher scores on the Job Insecurity Scale. In recent studies, it was reported that low back pain is the 2nd most common pain. Individuals with chronic low back pain may avoid surgery or may not participate in the suggested therapies due to the fear of being incapacitated and losing their jobs. We suggest that patients with chronic low back pain, in addition to receiving conventional therapies, should be given psychological support because of the anxiety of losing their job.

Ethics Committee Approval: The study was approved by ethics committee of Inonu University (Decision No: 2020/805). The study was performed following the aid of the ethical standards down in the 1964. Declaration of Helsinki and its later amendments.

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References

Aslan K. Investigation of the Effects of Job Insecurity and Job Losing Anxiety on Work Efficiency and Work Productivity: A Research in the Informatics Sector. Master's thesis, 2011.

Braun J, Baraliakos X, Regel A, Kiltz U. Assessment of spinal pain. Best Practice&Research Clinical Rheumatology 2014;28: 875-887.

Brinkhaus B, Witt CM, Jena S, Linde K, Streng A, Wagenpfeil S, Irnich D, Walther HU, Melchart D, Willich SN. Acupuncture in patients with chronic low back pain: a randomized controlled trial. Arch Intern Med. 2006:27:166(4):450-457.

Gokcek E, Kaydu A. The Effect of the Lomber Disc Hernia on Anxiety / Depression in Adults Van Tıp Derg 2018;25(3): 312-316.

Koes BW, van Tulder MW, Thomas S. Diagnosis and treatment of low back pain. BMJ 2006;332:1430–1434.

Mammadow E. The Relationship Between Pain, Quality of Life, Depression, Anxiety And Sleep In Patients With Chronic Low Back Pain Thesis 2018.

Milliken FJ. "Three types of perceived uncertanity about the environment: stage, effect, and response uncertanity", Academy of Management Review, 1987;12(1):133-143.

Namgwa KJ, Terkura A, William Y, Daniel MD, Cornilius EI. Depression in patients with chronic low back pain: A hospital-based study. Niger J Surg Res 2016;17:1-4.

Oksuz E. Prevalence, Risk Factors, and Preference-Based Health States of Low Back Pain in a Turkish Population. Spine 2006;31(25):968-972.

Ozkan S. Psychiatric Medicine: Consultation-liasion psychiatry. Klinik Psikofarmakoloji Bulteni; 1990;1(1):10-17

Wichert I. "Job in security and work intensification, The effects of an health and well-being", Burchell, Brendan (Editor), Job Insecurity&Work Intensification. 2001.

Will JS, Bury DC, Miller JA. Mechanical Low Back Pain. Am Fam Physician 2018 Oct 1;98(7):421-428.

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RESEARCH ARTICLE

Determination of the Microflora of Meatless Cig Kofte in the Black Sea Region of Turkey

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Abstract

Objective Meatless Cig Kofte (MCK) is a traditional product consumed frequently in Turkey. In recent years, MCK shops have been opened and offered to the public. It is important for public health because it is a risky food for microbial contamination. This study was conducted to investigate some microbiological quality of MCK sold in Black Sea region (Trabzon, Giresun, Ordu, Samsun) in Turkey.

Methods: In this study, a total of 120 MCK were sampled from different points of sales and examined for the microbiological quality of MCK in the Black Sea Region (Trabzon, Giresun, Ordu and Samsun). Data analysis of the study was conducted using SPSS 24 package program. Statistical significance was evaluated at $p<0.05$.

Results: According to the research results, the highest average TMAB (Total Mesophilic Aerobic Bacteria) value of MCK samples was determined in Giresun province (6.04 log cfu/g) and the lowest average value was found in Samsun province. While the average TPAB (Total Psychophilic Aerobic Bacteria) was determined as 1.82 log cfu/g in MCK samples collected from Samsun province, it could not be detected in Trabzon, Ordu and Giresun provinces. The average *S. aureus* value of MCK samples was determined in the highest province of Ordu (4.22 log cfu/g) and the lowest in Trabzon province (1.94 log cfu/g).

Conclusion: It was concluded that microbial quality was insufficient and hygiene rules were not taken into consideration in the provinces that were included in this study conducted in the Black Sea Region (Trabzon-Giresun-Ordu-Samsun).

Key words: Black Sea Region; meatless cig kofte; microbial quality; public health

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Introduction

MCK may include bulgur, red pepper, onion, garlic, various spices, tomato paste, tomato sauce, pepper paste, sugar, vinegar, pomegranate syrup, walnut, almond, hazelnut, water and some or all vegetable oils. In addition, when the necessary additives in accordance with the legislation are mixed and kneaded by hand or by machine until it reaches a certain consistency, it becomes ready for consumption without any heat treatment or freezing (TSE, 2018).

MCK, which is one of the ready-to-eat foods, is consumed without heat treatment. Inadequate

personnel hygiene during production, contamination from the tools and equipment, and the additives in the composition of MCK, can cause food poisoning (Ardıç and Durmaz, 2008).

Microbial analyses are performed to determine the quality of food products in terms of public health. There is a risk of spoilage occurrence during storage since no heat treatment and microbial inhibition treatment is applied to ready-to-eat foods until the time to sale (Delikanlı et al., 2014). Species of vegetable origin may include fertilizer, water, soil and the loads of animal-borne microorganisms. It is possible that microorganisms can get contaminated because of the spices used in the production of MCK.

The aim of this study is to investigate the MCK which is offered for sale in the Black Sea Region (Trabzon-Giresun-Ordu-Samsun) in terms of microbial quality. The reliability of MCK, which are liked and consumed by consumers, has been investigated in terms of public health.

Methods

Sample collection

In this study, a total of 120 MCK samples (30 grams from each city) were collected from different point of sales in the Black Sea Region (Trabzon, Giresun, Ordu and Samsun) between October, 2018 and January, 2019, and each sample was 200 grams. All MCK samples were carried in a mini cooler and brought to the Giresun University laboratory, and the analyses were initiated within an hour after sample collection (figure 1).

A. MCK Samples in block form B. Packaged MCK samples C. MCK Samples

Fig. 1. Samples of MCK, which is a traditional product sold at different points of sales. A. The Block MCK samples in chilled or frozen form. B. MCK samples in packaged form C. Ready-to-eat MCK samples

Determination of pH

The pH values of the MCKs were determined by using a digital pH meter (OHAUS, Starter 3000, Germany).

Microbiological analyses

The MCK samples, each of which weighed 10 grams, were brought to the laboratory under aseptic conditions and homogenized with 90 mL Maximum Recovery Diluent (MRD, Merck, Germany). Dilution of the solution obtained from 10^{-1} dilution up to 10^{-6} was made. The selective agar was inoculated with 0.1 mL of 2 parallels 3 replicas of each dilution. The inoculated petri dishes were incubated under appropriate conditions. The most probable number (MPN) method was used for the detection of *E. coli* and coliform microorganisms (Table 1) (Halkman, 2005; Andrews, 1992).

Statistical analysis

Data were analyzed using One way ANOVA and Duncan's post hoc tests by using IBM SPSS 24 software (SPSS Inc., Chicago, IL, USA) with a significance level of 5% (Table 1).

Microorganism	Medium	Incubation conditions	
		ºC	Time
TMAB	Plate Count Agar (PCA)	37 ºC	24-48 h
Yeast and Mold	Potato Dextrose Agar (PDA)	25-28 ºC	4-5 days
S. aureus	Baird Parker Agar (BPA)	37 ºC	24 h
TPAB	Plate Count Agar (PCA)	4,5 ºC	14 days
Coliform Microorganism	Laurly Sulfate Tryptose	30ºC	24 h
E. coli	Laurly Sulfate Tryptose	37 ºC	24 h

Results

As a result of TMAB analysis, significant differences were found in the MCK samples obtained from Trabzon and Giresun provinces. While the samples from Trabzon province gave the lowest value with an average value of 4.66, the samples obtained from Giresun province gave the highest value with an average of 5.44 (Table, 2).

As a result of TPAB analysis, significant differences were found in the MCK samples obtained from Trabzon and Samsun provinces. While the samples from Trabzon province had the lowest value with an average value of 0.65, the samples obtained from Samsun province had the highest value with an average of 2.74 (Table, 2).

As a result of *S. aureus* analysis, there was no significant difference between the MCK samples obtained from Giresun, Ordu and Samsun. While the MCK samples from Trabzon province had the lowest value with an average value of 2.24, the samples obtained from Samsun province had the highest value with an average of 3.72 (Table, 2).

According to yeast and mold analysis results, no statistically significant difference was observed in the samples obtained from 4 provinces. While the MCK

samples from Trabzon province had the lowest value with an average value of 3.37, the samples obtained from Samsun province had the highest value with an average of 4.52 (Table, 2).

As a result of coliform analysis, significant differences were found in the MCK samples obtained from Trabzon and Ordu provinces. The lowest value in the MCK samples was found in Trabzon province with an average of 2.09 and the highest value was found in the MCK samples obtained from Ordu province with 40.66 (Table, 2).

According to *E. coli* analysis, significant differences were found in the samples obtained from Trabzon and Ordu provinces. The lowest *E. coli* value was found in the MCK samples from Trabzon with an average of 1.25 and the highest value was found in the MCK samples obtained from Ordu province with 38.90 (Table, 2).

Table 2. TMAB, TPAB, *S. aureus* and yeast-mold analysis results of the MCK samples statistical analysis results table

Analysis	TRABZON	GIRESUN	ORDU	SAMSUN
Total Mesophilic Aerobic Bacteria (log cfu/gr)	4.66 ± 1.48^{a}	5.44 ± 0.81^{b}	5.25 ± 1.21^{ab}	5.18 ± 0.46^{ab}
Total Psychophilic aerobic Bacteria (log cfu/gr)	0.65 ± 1.70^{a}	1.83 ± 2.71^{ab}	1.94 ± 2.20^{ab}	2.74 ± 2.34^{b}
***S. aureus* (log cfu/gr)**	2.24 ± 2.01^{a}	3.42 ± 1.40^{b}	3.52 ± 1.22^{b}	3.72 ± 1.08^{b}
Yeast and Mold (log cfu/gr)	3.37 ± 2.15^{a}	3.51 ± 2.48^{a}	4.13 ± 2.15^{a}	4.52 ± 1.36^{a}
Coliform (MPN/gr)	4.57 ± 2.09^{a}	25.63 ± 41.34^{ab}	40.66 ± 51.10^{b}	26.23 ± 43.68^{ab}
***E. coli* (MPN/gr)**	1.25 ± 3.16^{a}	24.4 ± 41.39^{ab}	38.90 ± 51.46^{b}	25.11 ± 41.42^{ab}

Different letters of mean and standard deviation values in the same line show statistically significant differences between the groups. ($p<0.05$)

Table 3. Maximum and minimum pH values of MCK samples

	Min Value	Max Value
TRABZON	3.50	4.20
GIRESUN	3.89	4.35
ORDU	4.70	5.10
SAMSUN	3.51	5.15

Table 4. The number of TMAB, TPAB, *S. aureus* and Yeast-Mold findings of MCK samples sold in Trabzon, Giresun, Ordu and Samsun provinces in the Black Sea Region

		TMAB (log cfu/gr)	TPAB (log cfu/gr)	*S. aureus* (log cfu/gr)	Yeast and Mold (log cfu/gr)
TRABZON	**Minimum Value**	ND	ND	ND	ND
	Maximum Value	5.98	5.51	4.77	5.63
	Average Value	5.46	ND	1.94	4.57
GIRESUN	**Minimum Value**	4.35	ND	ND	ND
	Maximum Value	7.84	6.61	4.43	7.58
	Average Value	6.04	ND	2.07	2.54
ORDU	**Minimum Value**	ND	ND	ND	ND
	Maximum Value	7.38	6.13	4.46	6.59
	Average Value	5.81	ND	4.22	4.98
SAMSUN	**Minimum Value**	3.71	ND	ND	ND
	Maximum Value	5.98	5.55	5.38	5.85
	Average Value	5.15	1.82	3.96	5.03

* ND: not Detected

Table 5. The number of Coliform and *E. coli* analysis results of the MCK samples obtained from Trabzon, Giresun, Ordu and Samsun in the Black Sea Region

		Microorganism	
		***E. coli* (MPN/g)**	**Coliform (MPN/g)**
TRABZON	**Minimum Value**	ND	ND
	Maximum Value	15	4.3
	Average Value	1.25	2.09
GIRESUN	**Minimum Value**	ND	ND
	Maximum Value	110	110
	Average Value	24.40	25.63
ORDU	**Minimum Value**	ND	ND
	Maximum Value	110	110
	Average Value	38.90	40.66
SAMSUN	**Minimum Value**	ND	ND
	Maximum Value	110	110
	Average Value	25.11	26.23

* ND: not Detected

Discussion

The aim of this study is to examine the microbiological quality of MCK offered for sale in different provinces of the Black Sea region (Samsun, Ordu, Giresun and Trabzon) and to make an assessment in terms of Public Health. The results of 120 MCK samples collected for this purpose are presented in tables. The results of microbial analysis of 120 MCK samples are given in Tables.

It has been determined that the most important factor in S. aureus transmission to food in cases of food-borne intoxications is human (Akpınar et al., 2019).

S.aureus can be found in raw and processed foods, meat and meat products, salads, skin and nasal mucosa of healthy human (Erol, 2007). The presence of S. aureus in foods is due to the poor hygienic practices of the staff, cross contamination during preparation or improper storage (Pamuk et al., 2013). These bacteria can cause meningitis, septicemia, inflamed wounds and joint rheumatism in humans (Akpınar et al., 2019). High risk conditions during food preparation should be well explained to working personnel (Pamuk et al., 2013).

The number of S. aureus in MCK samples from Trabzon, Giresun, Ordu and Samsun provinces was determined as follows: 1.94 log cfu/gr, 2.07 log cfu/gr, 4.22 log cfu/gr, 3.96 log cfu/gr (as mean values). It can be stated that S. aureus values of the MCK samples collected from Trabzon and Giresun provinces are low, and S. aureus values of the MCK samples collected from Ordu and Samsun provinces are high when compared to the average S. aureus results (5.03x103 log cfu/g) of the research on the MCK samples collected from Diyarbakır province by Vural and Yeşilmen (2003).

The temperature range for the development of S. aureus' is 6.7-47.8°C and the optimum is 35-37°C. S. aureus can be easily eliminated during pasteurization or cooking. Also, the optimal pH range for the development of S. aureus is 6.0-7.1, and most of the strains can reproduce at pH values between 4.4-10 (Erol, 2007).

The minimum and maximum pH values of Trabzon, Giresun, Ordu and Samsun provinces were as follows; 3.50-4.20, 3.89-4.35, 4.70-5.10 and 3.51-5.15 (Table 3). In a study by Kurt et al. (2019), the pH of MCK was found out to be in the range of 3.99-4.84. Compared to the minimum pH value (3.99) found by Kurt et al. (2019) , it was found that the MCK samples collected from Trabzon, Giresun and Samsun provinces have lower pH values, and the MCK samples from Ordu province have higher pH values. When compared to the pH values of this present study, it can be stated that the maximum pH values (4.84) found in the MCK samples by the same researchers are higher than the samples collected from Trabzon and Giresun provinces, and Ordu and Samsun samples have higher pH values.

In a study where Cerit et al. (2014) analyzed MCK obtained from Sakarya province, the pH value was found in the range of 4.8-5.2. When compared with the results of their study, it can be stated that the minimum (4.8) and maximum (5.2) values were higher than the pH values of the samples collected from all the provinces examined in this research.

The pH values of the research results are within the range of the pH value (3.5-5.5) given for the

Tartar a la turca (Meatless) at the Turkish Standards Institute (TSE, 2018).

Determination of TMAB and yeast-mold presence in foods reveals the microbial quality of food (Delikanli, 2014). These analyzes are indicative of whether the points of food sales obey the hygiene and sanitation rules. The average value of TMAB in MCK samples was determined as 5.46 log cfu/g, 6.04 log cfu/g, 5.81 log cfu/g, 5.15 log cfu/g in Trabzon, Giresun, Ordu and Samsun provinces, respectively (Table 4).

The mean value of TMAB in MCK samples was determined as folows: Trabzon; 5.46 log cfu/g, Giresun; 6.04 log cfu/g, Ordu; 5.81 log cfu/g, Samsun; 5.14 log cfu/g in Trabzon, Giresun, Ordu and Samsun provinces respectively (Table 4).

The average TMAB values of the study were found out to be lower when compared to the study conducted by Kardeş (2017) (average 7.86 log cfu/g). It can be stated that the average TMAB values of samples obtained from Trabzon, Giresun and Ordu provinces are high when compared to the findings (1.6x105 cfu/g) of the study by Cerit et al. (2014), while the average values of the samples obtained from Samsun province are low.

The average TPAB values of the study were found out to be lower when compared to the study conducted by Aslan et al. (2012) (average 4.54 log cfu/g).

The average number of yeast and mold in MCK samples from Trabzon, Giresun, Ordu and Samsun provinces are as follows respectfully; 4.57 log cfu/g, 2.54 log cfu/g, 4.98 log cfu/g, 5.03 log cfu/g. The results of this study (on average) were found to be lower when compared to the results (7.44 log cfu/g) of the study of MCK obtained from Siirt province by Kardeş (2017). The yeast mold average values of MCK samples collected from all provinces studied in this research were found to be low compared to the values (7.44 log cfu/g) of the study done by Kardeş (2017) on MCK samples obtained from Siirt province. When the findings of this study are compared with the average yeast-mold results (3.32 log cfu/g) of the study on MCK samples by Cerit et al. (2014), the average values of the samples collected from Giresun province are lower compared to their research findings and the average values of the samples collected from Trabzon, Ordu and Samsun provinces are higher. When the findings of this study are compared in terms of the number of yeast-mold with the research on MCK offered for the consumption in the center of Bursa the results (2.9x104 cfu/g) found by Delikanli et al. (2014) are lower than the average value obtained from the samples collected from Trabzon, Ordu and Samsun provinces, while they are higher than the samples collected from Giresun province.

When compared to the results (2.9x104 cfu/g (4.46 log cfu/g) of the study on MCK samples obtained from the center of Bursa by Delikanli et al. (2014), in terms of the number of yeast-mold, the average value of samples collected from Trabzon, Ordu and Samsun provinces is high and the average value of samples collected from Giresun province is low. The most important group in Food Microbiology is coliform microorganisms and they are evaluated as the indicators of hygiene in foods. For some foods, they are intended to 'disappear' in a certain amount of samples, while in many foods, plant and soil origin coliforms are allowed to be present in certain numbers. For this purpose, counting or presence-absence tests are applied in coliform group analyses (Akpinar et al., 2019).

Average coliform microorganisms in MCK samples collected from Trabzon, Giresun, Ordu and Samsun provinces are 2.09 MPN/g, 25.63 MPN/g, 40.66 MPN/g, 26.23 MPN/g respectively. When compared to the results of this present study, the average coliform microorganism value (3.7x101 MPN/g) of the MCK samples obtained from Sakarya province by Cerit et al. (2014) is higher than Trabzon, Giresun and Samsun provinces and lower than Ordu province.

Coliform group bacteria are considered as a hygiene indicator in foods (Akpinar et al., 2019). Non-pathogenic strains of *E. coli*, one of the coliform group members, are found in the normal intestinal flora of all humans and generally all those that are warm-blooded (Erol, 2007). The presence of *E. coli* in samples of food, environment etc. indicates direct fecal contamination. *E. coli* can often be found in many foods due to poor hygienic conditions (Akpınar et al., 2019).

The findings of this study on the determination of average *E. coli* count are as follows: 1.25 MPN/g, 24.40 MPN/g, 38.90 MPN/g, 25.11 MPN/g respectively for Trabzon, Giresun, Ordu and Samsun provinces. When compared with the average values of this study, the average *E. coli* value (1.6x101 MPN/g) of the study by Cerit et al. (2014) is lower than Giresun, Ordu and Samsun provinces and higher than Trabzon provinces.

In the literature search, microbiological, serological and histological studies were mostly used on the meatballs (including raw meat), and different parameters were used.

Conclusion

As a result, MCK, as a food product ready for consumption is traditionally consumed in Turkey. Since the materials of the MCK are not heat treated and the preparation stage is manual, they can create food safety problems for the consumer under unhygienic production conditions. In addition, depending on the production and storage conditions, the first hygienic quality of raw materials is important for microbial development. In MCK which is sold by retail, production can be made under conditions that do not comply with hygiene and sanitation rules, and the product may be spoiled because of storing it under inappropriate temperature conditions. Many indicator and pathogen microorganisms can be found and develop in the composition of MCK, which is dangerous for human health. In this study, microbial quality of MCK ready for consumption has been examined in four pilot provinces in Black Sea Region. According to the research findings, it is stated that production and sales conditions of MCK affect the microbial flora of personnel hygiene and sanitation.

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References

Akpinar M, Petek A, Bagder Elmaci S, Halkman AK, Halkman B, Kocaker N, Kolcuoglu G, Omeroglu PY, Ozcelik F, Sagdas OE, Sancar BC, Yildirim G, Yilmaz A. Food Microbiology. Basak Printing and Promotion Services Limited Company 2019. Ankara, Turkey.

Andrews W. Manuals of Food Quality Control. 4. Microbial Analysis. FAO Consultant Food and Drug Administration Washington DC, USA. 1992.

Ardic M., Durmaz H. Determination of changes occurred in the microflora of cig kofte (raw meat balls) at different storage temperatures. İnternational Journal of Food Science Technology 2008; 43:805-809. https://doi.org/10.1111/j.1365-2621.2006.01519.x

Aslan S, Kara R, Akkaya L, Yaman H. Microbiological quality of raw meatballs sold in Afyonkarahisar, Academic Food 2012; 10(4): 24-27. https://hdl.handle.net/20.500.12462/4669

Cerit I, Deniz G, Yuleci T, Ergun BE, Aygun MG, Karaduman I, Can C, Demirkol O. Determination of physico-chemical properties and monosodium glutamate content of meatless raw meatballs for sale in Sakarya province. Journal of Food Technologies Electronics. 2014; 9(3):10-17.

Delikanli B, Sonmez B, Ozdemir Y. Microbiological quality of meatless raw meatballs offered for consumption in the center of Bursa. Journal of Harran University Veterinary Faculty. 2014; 3(1):13-17. https://dergipark.org.tr/en/pub/huvfd/issue/29577/317289

Erol I. Food Hygiene and Microbiology. 1st Ed. Positive Printing. 2007. Ankara, Turkey.

Halkman K. Merck Food Microbiology Applications, 1st Ed., Basak Printing Limited Company, 2005, Ankara, Turkey.

Kardes, M. Microbiological quality of raw meatballs served for consumption in Siirt province. Master Thesis. Siirt University İnstitute of Science. Food Engineering Department. November 2017, Siirt, Turkey.

Kurt S, Ceylan HG. Fener M. Microbiological quality of raw meatballs for sale in Adiyaman, ADYUTAYAM 2019; 7(2):57-68.

Pamuk S, Gurler Z, Yildirim Y, Ertas N. The microbiological quality of ready to eat salads sold in Afyonkarahisar, Turkey. Kafkas Univ Vet Fak Derg. 2013; 19(6):1001-1006.

TSE. Tartar a la turca (Meatless), Turkish Standardization İnstitute, TS 13804, January 2018.

Vural A, Yesilmen S. A research on the microbiological quality of raw meatballs for sale in Diyarbakir. Turkish Journal of Microbial Society 2003; 33:350-355.

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RESEARCH ARTICLE

Clinical Outcomes of Patients Undergoing Kyphoplasty due to Vertebral Compression Fracture: A Retrospective Examination of 52 Patients

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Abstract

Objective: Osteoporosis, vertebral colon hemangiomata and metastatic tumors are among the causes of vertebral fractures. When treating vertebral fractures, the patient is rested, analgesic anti-inflammatory therapy and kyphoplasty are performed, and if there is an unstable fracture and/or neurological deficit, spinal cord decompression and stabilization are performed. Kyphoplasty is an effective method in stable fractures of the vertebrae ensuring minimal trauma, short surgical operation time and reduced pain in the early stages. In this study, clinical outcomes of 52 patients who underwent kyphoplasty at the Neurosurgery Clinic of Inonu University due to osteoporosis, vertebral hemangioma and spinal colon metastatic malignancies were discussed and presented along with the literature.

Method: In our study, quantitative data are presented with medians (minimums and maximums) or averages (standard deviations), and qualitative data are presented with counts (percentages). The assumption of normality was checked by using the Shapiro-Wilk test. Because the DEXA variable had a normal distribution ($p > 0.05$), one-way analysis of variance was utilized to analyze the difference between fracture types. The variables of age and Visual Analog Scale (VAS) were not normally distributed ($p < 0.05$), so the Kruskal Wallis H test was utilized to analyze the differences between fracture types. Pearson's chi-squared test was used to investigate how fracture sites were related to age groups and gender. $p < .05$ was considered statistically significant.

Results: A total of 52 patients who did not require surgery at the Neurosurgery Clinic of Inonu University but underwent kyphoplasty between January 1, 2010 and April 1, 2020 were included in the study. Of these patients, 45 underwent kyphoplasty due to osteoporotic vertebral fractures, 3 due to vertebral hemangioma, and 4 due to spinal metastasis. All patients were compared in terms of age, gender, fracture sites, DEXA, preoperative VAS scores and VAS scores on day 20.

Conclusion: Kyphoplasty is an effective method for the treatment of stable vertebral fractures caused by osteoporosis, spinal metastases and vertebral hemangiomata

Key words: Kyphoplasty, Vertebral metastasis, Hemangioma.

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Introduction

Osteoporosis, trauma and spinal malignancies cause vertebral fractures. Osteoporosis causes a decrease in bone mineral density and an increase in a risk of fractures (Siris, Chen and Abbott, Kan et al. 2017). The incidence of osteoporotic vertebral fractures among people over 50 years of age is 307/100,000 (Hernlund et al. 2013). Vertebral colon is the most common site in bone metastases. Metastases can disrupt the integrity of vertebral corpus, make it susceptible to fracture under normal physiological stress, and cause neurological deficits (Uei and Tokuhashi 2018). Treatment of vertebral fractures aims to reduce pain, prevent new fractures and ensure spinal stabilization. In acute vertebral fractures, patients are rested, analgesic anti-inflammatory therapy and kyphoplasty are performed, and if there is an unstable fracture and/or neurological deficit, spinal cord decompression and stabilization are performed. Kyphoplasty ensures minimal trauma, short surgical operation time and reduced pain in the early stages (Zuo et al. 2018). Vertebral hemangiomata make up 2–3% of all spinal tumors. They are generally asymptomatic. In 1% of cases, they cause pain and inflict neurological deficits. Vertebroplasty/kyphoplasty, aggressive decompression stabilization, embolization and/or hybrid surgery can be performed in these patients (Nigro 2017).

In vertebral metastatic spinal tumors, patients complain of nagging pain and weight loss. Conservative treatments such as analgesics, chemotherapy, hormone therapy and radiotherapy may be effective for a short time. It is recommended to perform kyphoplasty in appropriate patients due to short life expectancy, high complications, long surgical time and long postoperative hospital stays in aggressive surgeries. It has been stated that kyphoplasty provides analgesia within 24–48 hours in 73%–92% of such patients. Kyphoplasty allows for biopsy during the procedure and causes little bleeding. It ensures that the height of the vertebral corpus is maintained and therefore provides sagittal and coronal balance and early pain management. Its cost is cheaper in the long term compared to the cost of other forms of treatment (Itagaki et al. 2012, Berenson et al. 2011).

In this study, clinical outcomes of 52 patients who underwent kyphoplasty at the Neurosurgery Clinic of Inonu University due to osteoporosis, vertebral hemangioma and spinal colon metastatic malignancies were discussed and presented along with the related literature.

Methods

Patients

Patients who underwent kyphoplasty at the Neurosurgery Clinic due to osteoporosis, vertebral hemangioma and spinal colon metastatic malignancies were enrolled in the present study. A total of 52 patients who did not require surgery at the Neurosurgery Clinic of Inonu University, Malatya, Turkey; but underwent kyphoplasty between January 1, 2010 and April 1, 2020 were included in the study. The related data of the patients were retrospectively gathered during the study period. About 2–4 cc cement was used during the kyphoplasty procedure. Instable vertebral fractures were not included in the study. Of these patients, 45 underwent kyphoplasty due to osteoporotic vertebral fractures, 3 due to vertebral hemangioma, and 4 due to spinal metastasis. The patients were followed up through radiography of scoliosis. The average duration of hospitalization was 48 hours in 52 patients after kyphoplasty.

Data Analyses

In the current study, quantitative data are presented with medians (minimums and maximums) or arithmetic means (standard deviations), and qualitative data are presented with counts (percentages). The assumption of normality was checked by using the Shapiro-Wilk test. Because the DEXA variable had a normal distribution ($p > 0.05$), one-way analysis of variance was utilized to analyze the difference between fracture types. The variables of age and Visual Analog Scale (VAS) were not normally distributed ($p< 0.05$), so, the Kruskal Wallis H test was utilized to analyze the differences between fracture types. Pearson's chi-squared test was used to investigate how fracture sites were related to age groups and gender. $p < 0.05$ was considered statistically significant. The IBM SPSS 26.0 Statistics program was used to conduct the analyses.

Results

The mean age of 45 patients with osteoporotic vertebral fractures was 64.04 ± 13.20 (ranging from 30 to 87). Of the patients, 24 (53.3%) were female, and 21 (46.27%) were male. The number of patients under 65 years of age was 18 (40.0%), and the number of patients aged 65 and older was 27 (60.0%). Among the patients who were younger than 65 years of age, 7 (38.9%) were women and 11 (61.1%) were men, and of those who were 65 years old or older, 17 (53.3%) were women and 10 (46.7%) were men. The number of patients whose fracture site was T10 and above was 12 (26.7%), the number of those whose

fracture site was T11–L1 was 18 (40.0%), and the number of those whose fracture site was L2 and below was 15 (33.3%). There were statistically significant differences between the fracture sites in terms of age groups (Pearson's Chi-squared test, p = 0.01, Table 1). The significant differences were between T10 and T11–L1 for each age category. There were no statistically significant differences between the fracture sites in terms of gender (Pearson's Chi-squared test, p = 0.268, Table 1).

There were no statistically significant differences between fracture sites in terms of the variables of VAS initial and VAS on day 20 (p > 0.05, Table 2).
DEXA results of 41 (91.11%) of these patients could be obtained, but the results of 4 (8.89%) could not be obtained. The average value of patients undergoing DEXA was between 2.59 ± 0.72 (ranging from 1 to 4.5). There was no statistically significant difference between the fracture sites in terms of the DEXA variable (One-way analysis of variance, p = 0.291, Table 2).
There was no statistically significant difference between the initial VAS scores and the VAS scores after 20 days in all patients who underwent kyphoplasty due to osteoporotic vertebral fractures (Wilcoxon Paired Two-Sample Test, p = 0.0001). Six (13.33%) patients had fractures in two sites, and 39 (86.67%) patients had fractures in one site.

In a one-year follow-up period, there were no features in 40 (88.9%) of the patients, whereas there were vertebral fractures in other sites in 5 (11.1%) of the patients. Of these patients, 4 were found to have fractures (T7, T12, L4, T7) at the first-year follow-up, and one (T7) at the 3-month follow-up at the neighboring segment. No patients had complications after kyphoplasty.

The average age of the patients undergoing kyphoplasty due to vertebral hemangioma was 46.33 for 3 patients, and all patients were female. The fracture sites were L1, L1 and T8, respectively. The average preoperative VAS score was 8, and the follow-up VAS score on day 20 was 3. The DEXA average was -0.87, and there was no osteoporosis. No patients developed complications after kyphoplasty (Table 3).

Of the patients who underwent kyphoplasty due to metastatic vertebral fractures, the average age of 4 patients one of whom had myeloma, 2 prostate cancer and 1 pulmonary cancer metastasis was 59.75. One of them was a woman (25.0%), and the other 3 were men (75.0%). The fracture sites were the levels L4, L3, T7–8 and L3, respectively. The average of preoperative VAS scores was 7, and the follow-up VAS score average on day 20 was 3.5. The patient with myeloma had a fracture in the neighboring vertebrae 3 months later. There were no complications during the operations (Table 3).

Table 1. Fracture sites in osteoporotic vertebral fractures in relation to age and gender

Variable	Variable Classes	Fracture Sites			Total	p*
		T10 and above n (%)	T11–L1 n (%)	L2 and below n (%)		
Age	<65	2^{a} (16.7)	12^{b} (66.7)	$4^{a,b}$ (26.7)	18 (40.0)	0.01
	>=65	10^{a} (83.3)	6^{b} (33.3)	$11^{a,b}$ (73.3)	27 (60.0)	
Gender	Female	8 (66.7)	7 (38.9)	9 (60.0)	24 (53.3)	0.268
	Male	4 (33.3)	11 (61.1)	6 (40.0)	21 (46.7)	

*: Pearson' Chi-squared test. Values in the same row and sub-table that do not have the same superscript differ significantly at p < 0.05 for a two-way test for column ratios (Pearson's Chi-squared test with Bonferroni correction).

Table 2. Table of fracture sites in osteoporotic vertebral fractures in relation to the variables of age, VAS initial and VAS on day 20

Variables	Fracture Sites			p
	T10 and above (n=12)	T11–L1 (n=18)	L2 and below (n=15)	
VAS Initial [Median (Min–Max)]	6 (6–8)	8 (6–8)	8 (6–8)	0.302*
VAS after 20 days [Median (Min–Max)]	2 (2–4)	2 (2–4)	4 (2–4)	0.096*
DEXA (Mean ± Standard Deviation)	2.5 ± 0.6	2.4 ± 0.6	2.8 ± 0.8	0.291**

*: Kruskal Wallis H test, **: One-way analysis of variance.

Table 3. Age, gender, fracture site, VAS scores and DEXA values of patients who had vertebral hemangioma and vertebral metastasis

Variables	Age	Gender	Fracture site	Prior to Operation VAS	Day 20 VAS	DEXA
Hemangioma	65	Female	L1	8	4	0.8
Hemangioma	38	Female	L1	8	3	1.2
Hemangioma	36	Female	T8	8	2	0.6
Myeloma	52	Female	L4	6	4	-
Prostate metastasis	55	Male	L3	8	3	-
Prostate metastasis	72	Male	L3	6	4	-
Lung metastasis	60	Male	T7–8	8	3	-

Discussion

The incidence of vertebral fractures owing to osteoporosis is increasing on a continuous basis. They can lead to consequences with high mortality such as post-fracture pain, kyphosis or scoliosis, inactivity-related stroke, depression, DVT, and pulmonary embolism (Zhang et al. 2017b). Of patients over the age of 50, 30–50% are in the risk group for osteoporotic vertebral fractures (OVFs), and this risk increases over the age of 65. In Europe, the incidence of OVF is 570/100,000 among men and 1070/100,000 among women, and in South Korea, the 5-year OVF incidence is 852/100,000 (Choi et al. 2020). In a study of Peh et al. on 155 patients, 79.97% of people diagnosed with OVF were reported to be female, and the average age was 73.6 (Peh, Gilula and Peck 2002). Age and gender in our study parallel the relevant literature. Research has shown that vertebral fractures are usually seen in the T8–L3 range and most commonly occur in the 12th thoracic and 1st lumbar vertebrae (Peh et al. 2002, Bolat and Mıstık 2019). In our study, vertebral fractures were common in the T12–L1 region in all patient groups, and this is consistent with the literature. Levels at which age-dependent vertebral fractures occur linked to osteoporosis have not been reported in the literature. In our study, vertebral fractures were more frequently detected above T10 and below L2 in patients 65 years of age or older. What draws attention is that these patients were usually kyphotic patients, and this can be explained by the change in the center of gravity on the sagittal plane. However, more biomechanical studies are needed. The incidence of fracture development in the neighboring vertebrae after kyphoplasty increases (Koyuncu et al. 1996). Zhu K et al. (2013) and Movrin I et al. (2012) have reported in their retrospective studies that patients undergoing kyphoplasty have few fractures of the neighboring vertebrae. It has been reported that an intact vertebral corpus and the volume of cement applied are risk factors for cement leakage in patients undergoing kyphoplasty. In balloon kyphoplasty, the incidence of neighboring vertebral fractures increases due to the change of the Cobb's angle (Chen et al. 2020). The rise of incidence of neighboring vertebral fractures is still controversial. In our study, 5 patients were found to have vertebral fractures in another site at the follow-up after kyphoplasty, and none of our patients had complications due to cement leakage. If bone mineral density is above 2.5 based on DEXA, the risk of fractures increases, and density decreases depending on age but increases the risk of fracture with advancing age (Kanis et al. 2004, Cakir et al. 2009). In our study, the DEXA average was less than -2.5 consistent with the literature. There was no statistically significant difference when the DEXA was compared based on fracture levels. There has been a significant decrease in VAS scores after kyphoplasty application in all studies (Liu, Cao and Kong 2019). In our study, there was a significant decrease in patients undergoing kyphoplasty due to osteoporotic vertebral fractures. This shows the effectiveness of kyphoplasty.

In vertebral hemangiomata, 2/3 of all hemangiomata are seen in the cranium and spinal colon. Vertebral hemangiomata constitute 2–3% of all spinal tumors, are usually benign, and 1% of them are symptomatic. Neurological symptoms accompany in 30–40% of symptomatic patients (Acosta Jr et al. 2006, SPINE, Chi, Manley and Chou 2005). The rate of bleeding, surgical duration and the rate of complications are high in vertebral hemangiomata during open surgery. Radiotherapy, vertebroplasty and/or kyphoplasty are an effective method in patients with only pain complaints. Decompression, embolization and aggressive surgery are recommended in patients with neurological deficits (Chi et al. 2005, Saracen and Kotwica 2018). VAS scores were used to determine the level of pain in a series of studies conducted on 110 patients. Complications developed in 3 patients (Saracen and Kotwica 2018). Our study parallels the literature. There were no complications in our patients during the operation.

In metastatic vertebral fractures, tumors that metastasize to the spinal column are most commonly breast, lung, prostate and other tumors. Of metastatic vertebral tumors, 3/4 form osteolytic tumors and 1/10 form osteoblastic tumors (Georgy 2010, Zhang et al. 2017a). Of spinal colon metastases, 7/10 involve the thoracic region, 2/10 involve the lumbar region and 1/10 involve the cervical region, and bone involvement is observed in 3/5 of newly diagnosed multiple myeloma patients (Gerszten and Welch 2000). Kyphoplasty and/or radiotherapy is an effective and alternative method because of short lifespan and for managing pain in metastatic spinal tumors. The risk of damage to the back wall is very high, particularly in metastatic osteolytic lesions when the balloon is inflated (Wang et al. 2016). Leakage of bone cement in up to 38% of cases was reported in some studies (Liu et al. 2017). Pflugmacher et al. (2006) found a significant decrease in VAS scores of 31 patients who underwent multiple myeloma kyphoplasty, after one year of follow-up. Early significant enhancement was observed in VAS scores in metastatic vertebral fractures (Wang et al. 2016, Liu et al. 2017, Zhou et al. 2019). There was a case of lung cancer metastasis in our study, and the cancer had metastasized to the thoracic region. This is consistent with the literature. Two patients with prostate cancer metastases and one patient with multiple myeloma are consistent with the literature, as well. No patients developed complications after kyphoplasty. However, a patient with multiple myeloma was diagnosed with fractures in the neighboring vertebrae three months later. It could not be understood whether the cause of this fractures in neighboring vertebrae was due to myeloma and/or kyphoplasty.

Conclusion

Medical diagnosis and care opportunities are growing in the world every passing day. As a result, the incidence of vertebral fractures due to osteoporosis, hemangioma and spinal metastases has been increasing. Due to long operative time, excessive bleeding, excess complications, long post-operative pain control for all patient groups and long hospital stay in aggressive vertebral surgeries, kyphoplasty is a suitable choice for stable vertebral fractures. Kyphoplasty is performed to control pain, prevent the development of deformity, improve the quality of life by preventing fatal complications due to immobilization, reduce costs and reduce the length of hospital stay. Kyphoplasty is an effective method for the treatment of stable vertebral fractures caused by osteoporosis, spinal metastases and vertebral hemangiomata.

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References

Acosta Jr, F. L., C. F. Dowd, C. Chin, T. Tihan, C. P. Ames & P. R. Weinstein. Current treatment strategies and outcomes in the management of symptomatic vertebral hemangiomas. Neurosurgery; 2006;58(2):287-295.

Berenson, J., R. Pflugmacher, P. Jarzem, J. Zonder, K. Schechtman, J. B. Tillman, L. Bastian, T. Ashraf, F. Vrionis & C. P. F. E. Investigators. Balloon kyphoplasty versus non-surgical fracture management for treatment of painful vertebral body compression fractures in patients with cancer: a multicentre, randomised controlled trial. The lancet oncology; 2011;12(3):225-235.

Bolat, E. S. & S. Mıstık. Yerleşmiş Osteoporozda Teriparatid Tedavisinin Spinal Deformite İndeksi Üzerine Etkisi. Turk J Osteoporos; 2019;25:6-11.

Cakir, B., C. Carazzo, R. Schmidt, T. Mattes, H. Reichel & W. Käfer. Adjacent segment mobility after rigid and semirigid instrumentation of the lumbar spine. Spine; 2009;34(12):1287-1291.

Chen, C., P. Fan, X. Xie & Y. Wang. Risk Factors for Cement Leakage and Adjacent Vertebral Fractures in Kyphoplasty for Osteoporotic Vertebral Fractures. Clinical Spine Surgery; 2020;33(6):E251-E255.

Chi, J. H., G. T. Manley & D. Chou. Pregnancy-related vertebral hemangioma: case report, review of the literature, and management algorithm. Neurosurgical focus; 2005;19(3):1-7.

Choi, S. H., D.-Y. Kim, J. W. Koo, S. G. Lee, S.-Y. Jeong & C.-N. Kang. Incidence and management trends of osteoporotic vertebral compression fractures in South Korea: a nationwide population-based study. Asian Spine Journal; 2020;14(2):220.

Georgy, B. A. Vertebroplasty technique in metastatic disease. Neuroimaging Clinics; 2010;20(2):169-177.

Gerszten, P. C. & W. C. Welch. Current surgical management of metastatic spinal disease. 2000.

Hernlund, E., A. Svedbom, M. Ivergård, J. Compston, C. Cooper, J. Stenmark, E. V. et. al. Osteoporosis in the European Union: medical management, epidemiology and economic burden. Archives of osteoporosis; 2013;8(1-2):136.

Itagaki, M. W., A. D. Talenfeld, S. W. Kwan, J. W. Brunner, K. E. Mortell & M. C. Brunner. Percutaneous vertebroplasty and kyphoplasty for pathologic vertebral fractures in the Medicare population: safer and less expensive than open surgery. Journal of Vascular and Interventional Radiology; 2012;23(11):1423-1429.

Kan, S.-L., Z.-F. Yuan, L.-X. Chen, J.-C. Sun, G.-Z. Ning & S.-Q. Feng. Which is best for osteoporotic vertebral compression fractures: balloon kyphoplasty, percutaneous vertebroplasty or non-surgical treatment? A study protocol for a Bayesian network meta-analysis. BMJ open; 2017;7:e012937.

Kanis, J., O. Johnell, A. Odén, C. De Laet & D. Mellstrom. Epidemiology of osteoporosis and fracture in men. Calcified tissue international; 2004;75(2):90-99.

Koyuncu, H., S. Karamehmetoğlu, C. Bahadır & K. Akgün. Postmenopozal vertebral kompresyon fraktürü sıklığı: Yaş, boy, kilo, boy/kulaç, menopoz süresi ilişkisinin değerlendirilmesi. Osteoporoz Dünyasından; 1996;2:81-84.

Liu, Q., J. Cao & J. Kong. Clinical effect of balloon kyphoplasty in elderly patients with multiple osteoporotic vertebral fracture. Nigerian journal of clinical practice; 2019;22(3):289.

Liu, Y., Y. Wang, L. Zhao, R. Song, H. Tan & L. Wang. Effectiveness and safety of percutaneous vertebroplasty in the treatment of spinal metastatic tumor. Pakistan journal of medical sciences; 2017; 33(3):675.

Movrin, I. Adjacent level fracture after osteoporotic vertebral compression fracture: a nonrandomized prospective study comparing balloon kyphoplasty with conservative therapy. Wiener Klinische Wochenschrift;2012;124(9-10):304-311.

Nigro, L. Algorithm of treatment for extensive vertebral hemangiomas according to Tomita classification of vertebral tumors. Journal of Neurology and Neuroscience;2017;8(02).

Peh, W. C., L. A. Gilula & D. D. Peck. Percutaneous vertebroplasty for severe osteoporotic vertebral body compression fractures. Radiology; 2002; 223(1):121-126.

Pflugmacher, R., F. Kandziora, R.-J. Schroeder, I. Melcher, N. Haas & C. Klostermann. Percutaneous balloon kyphoplasty in the treatment of pathological vertebral body fracture and deformity in multiple myeloma: a one-year follow-up. Acta Radiologica; 2006;47(4):369-376.

Saracen, A. & Z. Kotwica. Vertebroplasty (PVP) is effective in the treatment of painful vertebral hemangiomas. Acta Orthopædica Belgica; 2018;84:105-107.

Siris, E., Y. Chen & T. Abbott a, Barrett-Connor E, Miller PD, Wehren LE, Berger ML. Bone mineral density thresholds for pharmacological intervention to prevent fractures. Arch Intern Med.; 2004;164(10):1108–1112.

Uei, H. & Y. Tokuhashi. Prognostic factors in patients with metastatic spine tumors derived from lung cancer—a novel scoring system for predicting life expectancy. World journal of surgical oncology;2018;16(1):131.

Wang, Y., H. Liu, B. Pi, H. Yang, Z. Qian & X. Zhu. Clinical evaluation of percutaneous kyphoplasty in the treatment of osteolytic and osteoblastic metastatic vertebral lesions. International Journal of Surgery; 2016;30:161-165.

Zhang, H.-T., G.-D. Chen, H.-L. Yang & Z.-P. Luo. Percutaneous kyphoplasty in the treatment of osteoblastic-related spinal metastases. Clinical spine surgery; 2017;30(2):80-84.

Zhang, Y.-L., L.-T. Shi, P.-F. Tang, Z.-J. Sun & Y.-H. Wang. Correlation analysis of osteoporotic vertebral compression fractures and spinal sagittal imbalance. Der Orthopäde; 2017;46(3):249-255.

Zhou, Z., Y. Wang, Z. Sun & Z. Qian. Safety of Cement Distribution Patterns in Metastatic Vertebral Tumors: A Retrospective Study. Medical science monitor: international medical journal of experimental and clinical research; 2019; 25:7228.

Zhu, K., Zhang C. Shao C. Research progress of secondary fracture of adjacent vertebral body after percutaneous vertebroplasty and percutaneous kyphoplasty. Zhongguo xiufu chongjian wai Ke Za Zhi 2013 Mar;27(3):369-73

Zuo, X.-H., X.-P. Zhu, H.-G. Bao, C.-J. Xu, H. Chen, X.-Z. Gao & Q.-X. Zhang. Network meta-analysis of percutaneous vertebroplasty, percutaneous kyphoplasty, nerve block, and conservative treatment for nonsurgery options of acute/subacute and chronic osteoporotic vertebral compression fractures (OVCFs) in short-term and long-term effects. Medicine; 2018;97(29).

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RESEARCH ARTICLE

Association Between Pain during Intracanal Diode Laser Application and Demographic and Preoperative Factors

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Abstract

Objective: The present study aimed to evaluate the association between pain during intracanal diode laser irradiation in mandibular molar teeth have symptomatic apical periodontitis and factors such as demographic and preoperative factors.

Methods: Fourteen patients who have mandibular molar teeth have symptomatic apical periodontitis were enrolled in this clinical study. All endodontic treatments were performed in one-visit. After final irrigation, root canals were irradiated using a 970 ± 15 nm diode laser with a 14 W maximum power. Pain during laser application, postoperative pain levels at day 1, 3, 5, 7 and 30 and postoperative percussion tenderness levels at day 7 on the visual analog scale were marked. Multiple lineer regression was used for constructing a predictive model for intraoperative pain (P = 0.05).

Results: 11 (78 %) patients reported pain during intracanal diode laser application. Age, gender, tooth type (first molar or second molar), side of the tooth (left or right), preoperative palpation, pulp status, preoperative percussion and preoperative spontaneous pain did not predict intraoperative pain during intracanal diode laser application ($F(8, 5) = 2.332$, $p > .05$).

Conclusion: Within the limitations of the present clinical trial, none of the factors predict intraoperative pain during intracanal diode laser application.

Key words: Diode laser, intracanal laser, symptomatic apical periodontitis

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Introduction

Reasons of postoperative pain are complex. There are conflicting results about the effect of age, gender and systemic diseases on postoperative pain (Torabinejad et al., 1988; Glennon et al., 2004). However, it was reported that tooth type, initial root canal treatment or retreatment, anxiety and allergic situations are associated with postoperative pain (Shavit et al., 1984; Soukos et al., 2006). In addition, using medicine, such as corticosteroid, preoperatively or postoperatively affects the postoperative pain (Torabinejad et al., 1988). Preoperative factors such

as swelling, pain, percussion tenderness, sinus tract, periapical lesion have significant effect on postoperative pain (Torabinejad et al., 1988; Walton and Fouad, 1992; Glennon et al., 2004). Missed canals, incomplete root canal preparation, root canal medicaments, over preparation, irrigation solutions, paper points, root canal medicaments, apical debris and microorganism extrusion are operative reasons of postoperative pain (Alves Vde, 2010). Another factor affects the postoperative pain is experience of the clinician (Walton and Fouad, 1992). Although postoperative pain is a common subject in endodontics, intraoperative pain especially during laser application is not frequently studied subject.

One of the methods to control the pain and inflammation related to endodontic treatment procedures is improving of cleaning of the root canal system mechanically and chemically (Soukos et al., 2006; Garcez et al., 2007; Siqueira and Rocas, 2008). One of the methods for decontamination of root canals is using lasers, which aims to enhance the limited effect of traditional techniques caused by the anatomic three-dimensional complex structure of the root canal system. For this aim, various laser systems have been used and one of them is diode laser. Since diode laser does not damage the dental hard tissues, it is effective on microorganisms in dentinal tubules (de Souza et al., 2008). A study showed that diode laser irradiation provides has high bactericidal effect against Enterococcus faecalis, the bacteria that are the most difficult to eliminate, even at the 1000-µm depth of dentine (Schulte-Lunzum et al., 2017).

Although the intracanal diode laser application has antibacterial effects in the root canal, it may have effect on postoperative or intraoperative pain. Thus, the present study aimed to evaluate the association between pain during intracanal diode laser irradiation in mandibular molar teeth have symptomatic apical periodontitis and factors such as demographic and preoperative factors.

Methods

A quasi experimental design was conducted. Ethics committee approval was received from Clinical Research Ethics Committee of Ataturk University (no. 05-2014).

Inclusion criteria were having mandibular molar tooth has symptomatic apical periodontitis, having preoperative pain and preoperative percussion tenderness greater than 60 on a 100 mm - Visual Analog Scale (VAS).

Exclusion criteria were presence of periapical radiolucency, severe periodontal disease, preoperative swelling or sinus tract. Patients who had used analgesics within the last 3 days were also not included.

According to these criteria, 14 patients were included in the present study. All root canal treatments were performed by one operator in one-visit under rubber-dam isolation. Root canal instrumentation was performed using Reciproc instruments (VDW, Munich, Germany). During instrumentation, 1% sodium hypochlorite was used between 3 in-and-out pecking motions. For final irrigation procedure, 5 mL of 1% NaOCl for 1 minute and 5 mL of 5% EDTA for 1 minute was used. After final irrigation, root canals were dried using paper points. For intracanal diode laser application, a 970 ± 15 nm diode laser with a 14 W maximum power (SIROLaser Xtend; Sirona Dental Systems GmbH, Bensheim, Germany) was used. A 200 µm optical tip was placed into the apical third of the root canal. Then, it was activated and up-down motion was applied up to 1 mm from the working length. The laser application was performed at 2 W using the continuous wave mode and distilled water was applied during laser application in this group. Totally, irradiation time was 60 s for each tooth. After this procedure, root canals were dried using paper points, and root canal filling was completed using gutta-percha cones and a resin-based selaer (2 seal; VDW, Munich, Germany). Access cavities were restored using nanohybrid composite resin (3M-ESPE, St. Paul, MN, USA). 400 mg ibuprofen (Brufen; Abbott, Latina, Italy) was prescribed to the patients and the patients were informed to note the analgesic intake.

Patients were marked pain during laser application on VAS. A form was given to the patients in order to record their postoperative pain level at day 1, 3, 5, 7 and 30. Patients were recalled after one week in order to apply percussion test. Patients recorded postoperative percussion tenderness at this visit. The scores of the patients on VAS were measured using a ruler and recorded in millimeters.

Statistical Analysis

For all the statistical analyses, IBM Statistical Package for the Social Sciences version 20 (IBM SPSS Inc, Chicago, IL, USA) for Windows was used. Multiple lineer regression was used for constructing a predictive model for intraoperative pain ($P = 0.05$).

Assumptions for lineer regression test were as follows; a continuous dependent variable, at leaset two or more independent variables, independence of residuals, linearity, homoscedasticity, multicollinearity and absence of outliers.

The primary output variable was intraoperative pain during intracanal diode laser application.

For multiple lineer regression analysis, postoperative pain was recorded as "present" if the patient scored his/her pain more than 30 on VAS on any day; postoperative pain was recorded as "absent" if the patient scored his/her pain less than 30 on VAS on every day postoperatively or the patient used analgesic postoperatively.

The data of gender (male/female), pulpal status (vital or nonvital) and preoperative palpation (absent/present) were recorded as nominal data.

The data of preoperative/postoperative pain and preoperative/postoperative percussion tenderness were used as scale data (0-100 mm) to compare to each other. The highest postoperative pain value was selected as postoperative pain. Kolmogorov-Smirnov test was used as normality test. Since the data was distributed normally and there was no extreme data, paired-samples t test was used compare preoperative and postoperative pain data, preoperative/postoperative percussion data ($P = 0.05$).

Results

14 patients were enrolled in the present study. Their age range was between 18 and 30 years. 7 female (50%) and 7 male (50%) patients were enrolled. 6 teeth were left first molar, 2 teeth were left second molar and 6 teeth were right first molar. Age, gender and tooth number data are summarized in Table 1. 8 (57.1%) of treated teeth were vital and 6 (42.9%) of treated teeth were nonvital.

Table 1. Demographic data of the patients

	Intracanal Diode Laser Application
Age	23.93±3.81
Gender	
Male	7
Female	7
Tooth Number	
Left first molar	6
Left second molar	2
Right first molar	6
Right second molar	0

Pain and percussion tenderness data (preoperative and postoperative) are in Table 2. According to the paired-samples t test, there were significant differences between preoperative postoperative pain, and preoperative and postoperative percussion tenderness ($P < 0.05$).

Table 2. Preoperative and postoperative pain and percussion tenderness data (mean ± standard deviation) (The highest postoperative pain value was selected as postoperative pain)

	Measurements on VAS (in millimetres)	P value
Preoperative Pain	85.64±10.63	0.00
Postoperative Pain	34.64±27.07	
Preoperative Percussion Tenderness	78.50±10.93	0.00
Postoperative Percussion Tenderness	5.14±6.90	

6 patients in intracanal diode laser application group used analgesic postoperatively. 11 (78 %) patients reported pain during intracanal diode laser application.

No patient was referred for an unscheduled appointment. None of the patients had postoperative palpation tenderness, swelling and sinus tract.

Intraoperative pain

R2 for the overall model was 78.9% with an adjusted R2 of 45%, a strong effect size. Age, gender, tooth type (first molar or second molar), side of the tooth (left or right), preoperative palpation, pulp status, preoperative percussion and preoperative spontaneous pain did not predict intraoperative pain. ($F(8, 5) = 2.332$, $p > .05$).

Discussion

Intracanal diode laser application is used for removal of smear layer (Saghiri et al., 2012; Lagemann et al., 2014; Sohrabi et al., 2016), root canal disinfection (Mehrvarzfar et al., 2011; Beer et al., 2012; Bago et al., 2013; Neelakantan et al., 2015; Sohrabi et al., 2016) and increase in bond strength of sealers (Moura-Netto et al., 2012; Das et al., 2013; Maenosono et al., 2015). However, according to our literature search, there are not many in vivo studies about intracanal diode laser application (Morsy et al., 2018; Genc Sen and Kaya, 2019) and there is no study relating to the association between pain during intracanal diode laser application factors such as demographic, preoperative and postoperative factors. Therefore, the present study aimed to evaluate the association between pain during intracanal diode laser application in mandibular molar teeth have symptomatic apical periodontitis and factors such as demographic, preoperative factors. The results of the present clinical study showed that none of the factors predict intraoperative pain.

In a study by Yoo et al. (2014), the influence of a 1440-nm Nd:YAG laser on relieving pain and found that the 1440-nm Nd:YAG laser irradiation provided significantly decrease in pain on percussion. Morsy et al. (2018) reported that diode laser might be a useful in order to reduce of postoperative pain after endodontic treatment in teeth with necrotic pulps and chronic periapical periodontitis. Genc Sen and Kaya (2019) reported that diode laser application provided less postoperative pain than control group and improved postoperative comfort after endodontic retreatment.

Murillo-Benitez et al. (2020) investigated correlation between intraoperative pain and some factors such as age, gender, and anxiety during endodontic treatment. Murillo-Benitez et al. (2020) reported that there was no correlation between intraoperative pain and age; and between intraoperative pain and gender; there was correlation between preoperative pain and intraoperative pain. Murillo-Benitez et al. (2020) did not irradiated root canals using laser. Although a direct comparison is not possible, it can be claimed that the results related to age and gender are in accordance with the results of the present study, but the result related to preoperative pain is not. Yücel et al. (2018) and Kayaoğlu et al. (2016) reported that age is a significant factor for intraoperative pain, but gender is not. While the result related to gender is in accordance with the results of the present study, the result related to age is not, although a direct comparison is not possible, again.

Morsy et al. (2018) used diode laser at 1.2 W power. Genc Sen and Kaya (2019) used diode laser at 1 W power. In the present clinical study, diode laser was used at 2 Was suggested by the manufacturer.

Laser energy can be used with the continuous wave mode or the pulsed mode. The continuous wave mode can cause heat increase in tissues. Therefore, air- or water-cooling is required when irradiation was done using the continuous wave mode (Coluzzi, 2000). In the present clinical trial, the intracanal laser application was performed using the continuous wave mode and distilled water-cooling was applied during irradiation in order to eliminate the risk of thermal damage as much as possible.

Conclusion

During intracanal laser applications, 78 % of the patients reported pain during intracanal laser application. Within the limitations of the present clinical trial, none of the factors predict intraoperative pain during intracanal diode laser application.

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References

Alves Vde O. Endodontic flare-ups: a prospective study. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2010;110(5): e68-72.

Bago I, Plecko V, Gabric Panduric D, Schauperl Z, Baraba A, Anic I. Antimicrobial efficacy of a high-power diode laser, photo-activated disinfection, conventional and sonic activated irrigation during root canal treatment. Int Endod J 2013;46(4): 339-347.

Beer F, Buchmair A, Wernisch J, Georgopoulos A, Moritz A. Comparison of two diode lasers on bactericidity in root canals--an in vitro study. Lasers Med Sci 2012;27(2): 361-364.

Coluzzi DJ. An overview of laser wavelengths used in dentistry. Dent Clin North Am 2000;44(4): 753-765.

Das M, Kumar GA, Ramesh S, Garapati S, Sharma D. An in vitro evaluation of microtensile bond strength of resin-based sealer with dentin treated with diode and Nd:YAG laser. J Contemp Dent Pract 2013;14(2): 183-187.

de Souza EB, Cai S, Simionato MR, Lage-Marques JL. High-power diode laser in the disinfection in depth of the root canal dentin. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2008;106(1): e68-72.

Garcez AS, Ribeiro MS, Tegos GP, Nunez SC, Jorge AO, Hamblin MR. Antimicrobial photodynamic therapy combined with conventional endodontic treatment to eliminate root canal biofilm infection. Lasers Surg Med 2007;39(1): 59-66.

Genc Sen O, Kaya M. Effect of Root Canal Disinfection with a Diode Laser on Postoperative Pain After Endodontic Retreatment. Photobiomodul Photomed Laser Surg 2019;37(2): 85-90.

Glennon JP, Ng YL, Setchell DJ, Gulabivala K. Prevalence of and factors affecting postpreparation pain in patients undergoing two-visit root canal treatment. Int Endod J 2004;37(1): 29-37.

Kayaoglu G, Gurel M, Saricam E, Ilhan MN, Ilk O. Predictive Model of Intraoperative Pain during Endodontic Treatment: Prospective Observational Clinical Study. J Endod 2016;42(1): 36-41.

Lagemann M, George R, Chai L, Walsh LJ. Activation of ethylenediaminetetraacetic acid by a 940 nm diode laser for enhanced removal of smear layer. Aust Endod J 2014;40(2): 72-75.

Maenosono RM, Bim Junior O, Duarte MA, Palma-Dibb RG, Wang L, Ishikiriama SK. Diode laser irradiation increases microtensile bond strength of dentin. Braz Oral Res 2015;29: 1-5.

Mehrvarzfar P, Saghiri MA, Asatourian A et al. Additive effect of a diode laser on the antibacterial activity of 2.5% NaOCl, 2% CHX and MTAD against Enterococcus faecalis contaminating root canals: an in vitro study. J Oral Sci 2011;53(3): 355-360.

Morsy DA, Negm M, Diab A, Ahmed G. Postoperative pain and antibacterial effect of 980 nm diode laser versus conventional endodontic treatment in necrotic teeth with chronic periapical lesions: A randomized control trial. F1000Res 2018;7: 1795.

Moura-Netto C, Palo RM, Camargo SE, Jent C, Leonardo Rde T, Marques MM. Influence of prior 810-nm-diode intracanal laser irradiation on hydrophilic resin-based sealer obturation. Braz Oral Res 2012;26(4): 323-329.

Murillo-Benitez M, Martin-Gonzalez J, Jimenez-Sanchez MC, Cabanillas-Balsera D, Velasco-Ortega E, Segura-Egea JJ. Association between dental anxiety and intraoperative pain during root canal treatment: a cross-sectional study. Int Endod J 2020;53(4): 447-454.

Neelakantan P, Cheng CQ, Mohanraj R, Sriraman P, Subbarao C, Sharma S. Antibiofilm activity of three irrigation protocols activated by ultrasonic, diode laser or Er:YAG laser in vitro. Int Endod J 2015;48(6): 602-610.

Saghiri MA, Asgar K, Gutmann JL et al. Effect of laser irradiation on root canal walls after final irrigation with 17% EDTA or BioPure MTAD: X-ray diffraction and SEM analysis. Quintessence Int 2012;43(10): e127-134.

Schulte-Lunzum R, Gutknecht N, Conrads G, Franzen R. The Impact of a 940 nm Diode Laser with Radial Firing Tip and Bare End Fiber Tip on Enterococcus faecalis in the Root Canal Wall Dentin of Bovine Teeth: An In Vitro Study. Photomed Laser Surg 2017;35(7): 357-363.

Shavit Y, Lewis JW, Terman GW, Gale RP, Liebeskind JC. Opioid peptides mediate the suppressive effect of stress on natural killer cell cytotoxicity. Science 1984;223(4632): 188-190.

Siqueira JF, Jr., Rocas IN. Clinical implications and microbiology of bacterial persistence after treatment procedures. J Endod 2008;34(11): 1291-1301 e1293.

Sohrabi K, Sooratgar A, Zolfagharnasab K, Kharazifard MJ, Afkhami F. Antibacterial Activity of Diode Laser and Sodium Hypochlorite in Enterococcus Faecalis-Contaminated Root Canals. Iran Endod J 2016;11(1): 8-12.

Soukos NS, Chen PS, Morris JT et al. Photodynamic therapy for endodontic disinfection. J Endod 2006;32(10): 979-984.

Torabinejad M, Kettering JD, McGraw JC, Cummings RR, Dwyer TG, Tobias TS. Factors associated with endodontic interappointment emergencies of teeth with necrotic pulps. J Endod 1988;14(5): 261-266.

Walton R, Fouad A. Endodontic interappointment flare-ups: a prospective study of incidence and related factors. J Endod 1992;18(4): 172-177.

Yoo YJ, Shon WJ, Baek SH, Kang MK, Kim HC, Lee W. Effect of 1440-nanometer neodymium:yttrium-aluminum-garnet laser irradiation on pain and neuropeptide reduction: a randomized prospective clinical trial. J Endod 2014;40(1): 28-32.

Yucel O, Ekici MA, Ilk O, Ilhan MN, Kayaoglu G. Predicting intraoperative pain in emergency endodontic patients: clinical study. Braz Oral Res 2018;32: e38.

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RESEARCH ARTICLE

The Effect of Loop Electrosurgical Excision Procedure on Female Sexual Function

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Abstract

Objective: The aim of the study is to objectively evaluate the effects of Loop Electrosurgical Excision Procedure (LEEP) on women's sexual function using a validated questionnaire.

Methods: This pre-post survey design study was conducted at a tertiary referral hospital gynecological oncology clinic. 80 sexually active patients who had undergone LEEP because of abnormal cervical cytology results between October 2018 and December 2018 were included. Participating patients answered the Female Sexual Function Index (FSFI) questionnaire before undergoing LEEP and at 3 and 6 months after the procedure. The FSFI questionnaire consists of 19 multiple choice questions and it evaluates the following six aspects of female sexuality: arousal, lubrication, desire, orgasm, satisfaction, and pain. 9 patients were excluded for not coming to the follow-up appointments. Patients who had any systemic or psychological disease were excluded in order to avoid any additional variables that could affect sexual function.

Results: Arousal, lubrication, desire, orgasm, satisfaction, and pain were evaluated in 71 patients. There was no statistical difference in sexual desire, lubrication, sexual satisfaction, and pain in between follow-up results and the baseline scores. However, there was a significant decrease in patients' orgasm scores and degree of arousal in the follow-up results compared to the baseline scores.

Conclusion: Parameters such as orgasm and the degree of arousal, which are strongly connected with a patient's physical and psychological well-being, are affected by the procedure. We believe detailed information, psychological support, and even psychiatric consultation can have a beneficial effect on patients. Further studies with a larger sample and a control group and a longer follow-up interval should be performed to assess the effect of psychological precautions and to avoid sexual function disorders resulting from LEEP.

Keywords: Cervical dysplasia, conization, Female Sexual Function Index, Loop Electrosurgical Excision Procedure, sexual function, sexuality

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Introduction

World Health Organisation (WHO) defines sexual health as " a state of physical, mental and social well-being in relation to sexuality. It requires a positive and respectful approach to sexuality and sexual relationships, as well as the possibility of having pleasurable and safe sexual experiences, free of coercion, discrimination and violence.("WHO | Sexual Health," 2016)" . It is shown that the prevalence of sexual dysfunction in women varies between 25% and 63% of the population(Hatzichristou et al., 2004). Although there has been many studies conducted to understand and treat male sexual function disorders, there is a lack of abundancy when it comes to studies regarding female sexual function problems, thus Sexual dysfunction among women is still a largely incomprehensible phenomenon. A Consensus Statement from the Fourth International Consultation on Sexual Medicine 2015 has shown that perceived poor health, mood and anxiety disorders can cause dyspareunia, lack of desire, orgasm and arousal. (McCabe et al., 2016)

HPV is a very common sexually transmitted virus and %20 of the infected women has cervical intraepithelian neoplasia (CIN) (Frederiksen et al., 2015)Because of effective screening programs worldwide, there is a significant increase in women who are diagnosed and treated for cervical dysplasia. Loop electrosurgical excision procedure (LEEP) is the preferred treatment for these patients because it is simple and effective (Inna et al., 2010a). Thus, it is important to determine whether it affects women's sexual health.

It is shown that even the diagnosis of CIN can have many psychological effects among patients (Frederiksen et al., 2015) ,so it is presumable that treatment with LEEP can cause patients anxiety and because of the location of the lesion, the treatment may have a significant effect on the patient's sexual function and desire. The few studies that investigated the procedure's effect on sexual well-being had a limited number of patients and most of these studies used non-validated evaluation techniques (Cendejas et al., 2015)

In this study, we aimed to document the impact of LEEP on female sexual function using validated modalities that can lead to identification, precautions, and treatment of the physiological and sexual effects of the procedure on women's sexual function.

Methods

This study was conducted at a tertiary referral center, the Research Hospital Gynecologic Oncology Clinic, and 80 patients who had undergone LEEP because of abnormal cervical cytology results between October 2018 and December 2018 were included. 9 patients were excluded for not coming to the follow-up appointments.A prospective pre-post survey study design was used and questionnaires were administered before the procedure (baseline) and at 3-month and 6-month follow-up appointments. We used the Female Sexual Function Index (FSFI), a widely used questionnaire that has been validated in many languages, including Turkish (Aygin & Eti Aslan, 2005). The questionnaire consists of 19 multiple choice questions and it evaluates the following six aspects of female sexuality: arousal, lubrication, desire, orgasm, satisfaction, and pain.

Patients who were sexually active were asked to participate in our study. We excluded patients who had any systemic or psychological disease to avoid any additional variables that could affect sexual function. The study was approved by the ethics review committee and informed consent was obtained from each patient before participating in the study. The patients were interviewed and the study was explained to them by a gynecologist in an isolated quiet room. Each of the patients' questions were answered. At the 3-month and 6-month follow-ups, the patients were asked to complete the questionnaire again regardless of their previous answers. Demographic information such as age, parity, and education were also recorded for each patient.

Statistical analyses were performed using Statistical Package for Social Sciences (SPSS) Mac version 24 (SPSS Inc., Chicago, IL, USA). Continuous variables are presented as the mean ± standard deviation (SD). Categorical variables are presented as the frequency and percentage. Levene's test was used to evaluate equality of the variance homogeneity and $p > 0.05$ was considered to be homogeneous. The Kolmogorov–Smirnov test was used to analyze homogeneity of the data distribution. In cases of abnormal distribution in binary dependent group comparisons for numerical variables, the Wilcoxon test was used. A p value of <0.05 was considered to be statistically significant.

Results

All of the patients completed the questionnaire before the procedure, and at 3 months and 6 months after the procedure. Participants' demographic characteristics are presented in Table 1. The mean patient age (SD) was 40.59 years, and the age range

was 24 to 63 years. Gravida, parity, and abortus status of the patients ranged from zero to seven with a mean (SD) of 3.18, zero to six with a mean (SD) of 2.51, and one to five with a mean (SD) of 1.76, respectively. Two of the patients could barely read and write while 91% of the participants had graduated from primary school and only four of the patients (5.6%) had graduated from high school. All of our patients were housewives.

Table 1. Demographic characteristics of women participated in the study

	Mean±sd	**Min/max**
Age	40,59±7,95	24/63
Gravidity	3,18±1,65	0/7
Parity	2,51±1,26	0/6
Abortus	1,76±1,16	1/5
Education	**n**	**%**
Literate	2	2.8
Primary school	65	91.5
High school	4	5.6

As shown in Table 2, for desire, patients' baseline, and 3-month and 6-month follow-up scores ranged from 2 to 8, with a mean (SD) score of 5.47, 5.42, and 5.48 respectively. We found no statistical difference in sexual desire during our study (p>0.05).

Regarding the lubrication degree of the patients, the mean score before surgery was 12.3. At the 3-month follow-up, the mean score was 12.1 (4), and at the 6-month follow-up, the mean score was 12.2. Thus, there was no statistical difference in the patients' degree of lubrication during intercourse (p>0.05).

Sexual satisfaction was also assessed and the mean scores before surgery and at 3 and 6 months after the procedure were 10.5, 10.4, and 10.4, respectively. We found no statistically significant difference in sexual satisfaction (p>0.05).

When patients' sense of pain was evaluated, the mean values were 6.2 before the procedure, 6.0 at the 3-month follow-up, and 6.0 at 6-month follow-up. Thus, there was no statistically significant difference in pain during intercourse (p>0.05).

Another evaluation criterion was orgasm. The mean score was 9.6 before the surgery, and the mean score decreased to 9.32 after 3 months and 9.38 after 6 months (p<0.05).

The degree of arousal was also evaluated, and while the mean score was 11.3 before the procedure, the 3-month follow-up degree of arousal mean score was 11.1 and that of the 6-month follow-up was 11.1 (p<0.05).

Table 2. FSFI scores before, three months and six months after LEEP procedures

Sexual function	**Baseline Mean±sd**	**3-month follow-up mean ±sd**	**6-month follow-up mean ±sd**	**P**
Sexual desire	5,478±1,842	5,422±1,909	5,480±1,890	***P1,P2,P3=0,234***
Sexual arousal	11,352±4,908	11,140±5,066	11,145±5,023	***P1=0,010**** ***P2=0,012**** ***P3=0,342***
Lubrication	12,338±3,660	12,197±4,023	12,253±3,905	***P1,P2,P3=0,422***
Orgasm	9,605±4,047	9,323±4,073	9,382±4,062	***P1,=0,002***** ***P2=0,004***** ***P3=0,312***
Sexual satisfaction	10,563±3,812	10,408±3,893	10,452±3,890	***P1,P2,P3=0,102***
Pain	6,253±3,276	6,028±3,229	6,092±3,232	***P1,P2,P3=0,141***

Anova *P<0,05 **P<0,01
P1: significance of difference between baseline and 3-month follow-up values
P2: significance of difference between baseline and 6- month follow-up values
P3: significance of difference between 3-month and 6-month follow-up values

Discussion

Although there are few studies on the effect of LEEP on women's sexual function, our study and most of the other similar studies showed that LEEP can jeopardize the patient's sexual health status.

Sadaun et al. (2016) claimed that among 69 women who underwent LEEP, there was a significant improvement regarding sexual life. They believe psychological impact of HPV infection was higher than the anatomical effects of LEEP.But they used a self-made questionnaire and perform it before and after 3 months of the procedure. Rahman et al. (2016) suggests that LEEP does not affect the sexual function of 46 women at reproductive age whose mean age was 32.32 ±4.44 years at the time of the study. They used a self-made questionnaire which was not validated and they perform the questionnaire only after 6 months after the procedure.

On the other hand, Sparić et al. (2019) also conducted a study regarding women at reproductive age whose mean age was 35.2 ± 5.4 years. Participants underwent excisional cervical treatment, either LEEP or cold knife conization and asked to answer a non-validated questionnaire only after 2 years of the procedure. 1/3 of the women claimed to have lesser sexual interest and higher anxiety and depression scores.

Howells et al. (1999) used a modified psychosexual questionnaire that was also used by Campion et al. to evaluate 210 women who were treated with colposcopy (77 of whom also underwent LEEP). They found a reduction in the spontaneous interest in sex. Hellsten et al.(2008) used the questionnaire that was modified by Howells et al. (1999), and they found that among 45 women who had undergone LEEP, there was an increase in the negative feelings toward sex and a decrease in spontaneous interest, sexual arousal, and the frequency of intercourse.

Inna et al. (2010b) also used a self-designed questionnaire to evaluate 89 patients who had undergone LEEP 3 months before the procedure and after a median interval of 29.3 (12.1–70.9) weeks after the procedure. There were no significant differences in "general sexual function and related symptoms such as frequency of sexual intercourse, dysmenorrhea, dyspareunia, and postcoital bleeding". However, they found that vaginal elasticity, overall satisfaction, and orgasmic satisfaction were decreased slightly, but the results were statistically significant.

Serati et al. (2010) were the first to use a validated questionnaire, the FSFI, to determine the effects of LEEP on sexual function. Fifty-eight patients answered the questionnaire before the procedure and 6 months thereafter. They concluded that undergoing LEEP did not affect sexual function, but that sexual desire was decreased.

Moreover, Campion et al. used a self designed questionnaire to assess the psychosexual impact of a cervical dysplasia diagnosis and subsequent laser treatment of cervical intraepithelial neoplasia (CIN), and they found an increase in negative feelings towards sexuality and dyspareunia as well as a decrease of spontaneous sexual interest, vaginal lubrication, frequency of orgasm, sexual arousal, and frequency of intercourse.

In a systematic review by O'Conner et al.(2015) about the adverse psychological outcomes following colposcopy and related procedures, 23 papers were assessed and they found that a wide spectrum from anxiety, distress-related sexual function problems, and fears about future fertility to depression can occur after those procedures. Thus, LEEP and alternative treatments seem to have an effect on female sexual function and well-being.

Our study group comprised 71 patients who completed a well-known validated questionnaire, unlike most of the other studies, before the procedure and at 3 months and 6 months after the procedure. We found that there was a statistical difference in orgasm and the degree of arousal in patients after the procedure, while lubrication, satisfaction, sexual desire, and pain remained unchanged. Although it was not randomized, the patients' socioeconomic and educational statuses were homogenous. All the procedures were performed at the same hospital and the questionnaires were answered with the assistance of the same gynecologist. However, the colposcopy results differed between patients and this may have caused some changes in the anxiety and pyschological status of the patient.

Conclusion

Healthy sexuality is an important part of a person's well-being, and the treatments that are performed for a patient's physical health deeply affect the patient. Our study showed that parameters such as orgasm and the degree of arousal, which are both strongly connected with a patient's physical and psychological well-being, are affected by the procedure. We believe that anxiety and the inability to fully understand the treatment and risks play crucial roles in this situation. Detailed information, psychological support, and psychiatric consultation, if necessary, can help to overcome this situation. Further studies with a larger and homogenous sample and a control group should be performed to assess the effect of psychological precautions and to avoid sexual function disorders resulting from LEEP.

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References

Aygin D, & Eti Aslan F. The Turkish adaptation of the female sexual function index. Turkiye Klinikleri Journal of Medical Sciences. 2005

Cendejas BR, Smith-Mccune KK, & Khan MJ.. Does treatment for cervical and vulvar dysplasia impact women's sexual health? American Journal of Obstetrics and Gynecology, 2015;212(3):291–297. https://doi.org/10.1016/j.ajog.2014.05.039

Connor MO, Gallagher P, Waller J, Martin CM, Leary J J O, & Sharp, L.. Adverse psychological outcomes following colposcopy and related procedures : a systematic review. 2015;24–38. https://doi.org/10.1111/1471-0528.13462

Frederiksen M E, Njor S, Lynge E, & Rebolj M. Psychological effects of diagnosis and treatment of cervical intraepithelial neoplasia: A systematic review. Sexually Transmitted Infections, 2015;91(4):248–256. https://doi.org/10.1136/sextrans-2014-051754

Hatzichristou D, Rosen RC, Broderick G, Clayton A, Cuzin B, Derogatis L, et al. Dysfunction in Men and Women. Journal Of Sexual Medicine. 2004

Hellsten C, Lindqvist PG, & Sjöström K. A longitudinal study of sexual functioning in women referred for colposcopy: A 2-year follow up. BJOG: An International Journal of Obstetrics and Gynaecology, 2008;115(2):205–211. https://doi.org/10.1111/j.1471-0528.2007.01503.x

Howells REJ, Dunn PDJ, Isasi T, Chenoy R, Calvert E, JonesPW, et al. Is the provision of information leaflets before colposcopy beneficial? A prospective randomised study. BJOG: An International Journal of Obstetrics and Gynaecology, 1999;106(6):528–534. https://doi.org/10.1111/j.1471-0528.1999.tb08319.x

Inna N, Phianmongkhol Y, & Charoenkwan K.. Sexual function after loop electrosurgical excision procedure for cervical dysplasia. Journal of Sexual Medicine, 2010a;7(3):1291–1297. https://doi.org/10.1111/j.1743-6109.2009.01633.x

Inna N, Phianmongkhol Y, & Charoenkwan K.. Sexual function after loop electrosurgical excision procedure for cervical dysplasia. Journal of Sexual Medicine, 2010b;7(3):1291–1297. https://doi.org/10.1111/j.1743-6109.2009.01633.x

McCabe MP, Sharlip ID, Lewis R, Atalla E, Balon R, Fisher AD, et al.Risk Factors for Sexual Dysfunction Among Women and Men: A Consensus Statement From the Fourth International Consultation on Sexual Medicine 2015. The Journal of Sexual Medicine, 2016;13(2):153–167. https://doi.org/10.1016/j.jsxm.2015.12.015

Rahman MM, Jahan R, Ferdous J, Islam F, & Lipi LB.. The impact of loop electrosurgical excision procedure for cervical intraepithelial neoplasia on female sexual function. Bangladesh Journal of Obstetrics and Gynecology, 2016;31(2):81–85. https://doi.org/10.3329/bjog.v31i2.34215

Sadoun C, Ohannessian A, Carcopino X, Mauviel F, Boubli L, & Agostini A.. Impact de la conisation cervicale à l'anse diathermique sur la qualité de vie sexuelle. Journal de Gynecologie Obstetrique et Biologie de La Reproduction, 2016;45(2):120–123. https://doi.org/10.1016/j.jgyn.2015.11.004

Serati M, Salvatore S, Cattoni E, Zanirato M, Mauri S, Siesto G, et al. The Impact of the Loop Electrosurgical Excisional Procedure for Cervical Intraepithelial Lesions on Female Sexual Function. The Journal of Sexual Medicine, 2010;7(6):2267–2272. https://doi.org/10.1111/j.1743-6109.2010.01819.x

Sparić R, Papoutsis D, Kadija S, Stefanović R, Antonakou A, Nejković L, et al. Psychosexual outcomes in women of reproductive age at more than two-years from excisional cervical treatment–a cross-sectional study. Journal of Psychosomatic Obstetrics and Gynecology, 2019;40(2):128–137. https://doi.org/10.1080/0167482X.2018.1445220

WHO | Sexual health. 2016. WHO. https://www.who.int/topics/sexual_health/en/

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RESEARCH ARTICLE

The Involvement of ATP-Sensitive Potassium Channels in the Nebivolol-Induced Relaxation of Endothelium-Intact Aorta Isolated from Rats

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Abstract

Objective: Nebivolol is a highly selective beta-1 adrenergic receptor blocker with additional vasorelaxant properties. The vasorelaxant effect of nebivolol has been mainly attributed to endothelium-dependent mechanisms including beta-adrenergic receptors. However, the involvement of ATP-sensitive potassium (K_{ATP}) channels, another potential mechanism for vasorelaxant effect, in the vasorelaxant response to nebivolol remains unclear. Therefore, this study was aimed to investigate the role of K_{ATP} channels in the nebivolol-induced vasorelaxation in the isolated rat aorta

Methods: The rat thoracic aortic rings isolated from Sprague-Dawley rats were mounted in organ bath chambers containing Krebs-Henseleit solution at 37 ºC continuously bubbled with 95% O2 and 5% CO2. After an equilibration period, the presence of endothelium was confirmed by the response (more than 50%) to acetylcholine (10 µM) in aortic rings precontracted with phenylephrine (1 µM). After washout, in control group, the endothelium-intact aortic rings were contracted by potassium chloride (30 mM) before the cumulative addition of nebivolol (0.0001-100 µM). In some experiments, the relaxant response to nebivolol (0.0001-100 µM) was also obtained in the presence of glibenclamide (K_{ATP} channel blocker, 10 µM) or Nω-Nitro-L-arginine methyl ester (L-NAME: eNOS inhibitor, 100 µM) in the endothelium-intact aortic rings precontracted with potassium chloride (30 mM). Data were presented as means±SEM. Multiple comparisons of groups were performed by using ANOVA followed by post-hoc Bonferroni test.

Results: Nebivolol elicited a concentration dependent vasorelaxant effect in the endothelium-intact aortic rings. Relaxant response to nebivolol was significantly inhibited by the presence of glibenclamide or L-NAME ($p< 0.05$). Although E_{max} values were not found significantly different among groups, pD_2 values of nebivolol were reduced in the endothelium-intact aortic rings incubated with glibenclamide or L-NAME.

Conclusion: These results demonstrate for the first time the involvement of K_{ATP} channels in the nebivolol-induced vasorelaxation in the endothelium-intact aorta precontracted with potassium chloride.

Key words: Nebivolol, vasorelaxation, ATP-sensitive potassium channels, nitric oxide, rat aorta.

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Introduction

Nebivolol is a third-generation, cardioselective beta (β)-blocker with additional antioxidant and vasorelaxant properties. The latter effect of nebivolol is closely associated with nitric oxide (NO) production by endothelium-dependent mechanisms (Cicero et al., 2018; Olawi et al., 2019).

The involvement of the endothelium in the vascular tone has been widely documented (Félétou M and Vanhoutte, 2006). In this regard, there is increasing evidence showing that endothelial beta- 2 (β2)- and/or β3-ARs are primarily responsible for the vasorelaxant response to nebivolol (Broeders et al., 2000; de Groot et al., 2003). These receptors belong to the G-protein coupled receptor family (Biaggioni and Robertson, 2018).

Potassium channels including ATP-sensitive potassium (K_{ATP}) channels play an important role in the vascular tonus due to their effects on membrane potential. The opening of K_{ATP} channels results in membrane hyperpolarization in smooth muscle and hence contributes to vasorelaxation (Sobey, 2001). Recently, K_{ATP} channels are reported to be also present in the vascular endothelium and have a functional role in the vascular reactivity (Aziz et al., 2017). The vasodilatory action of adenosine through its receptors has also been shown to be associated with activation of endothelial K_{ATP} channels (Kuo and Chancellor, 1995). Adenosine receptors are also coupled with stimulatory G-protein like β_2- and β_3-ARs (Biaggioni and Robertson, 2018).

Most studies investigating vascular action of nebivolol have mainly focused on adrenergic receptors linking with NO production to explain the mechanism of vasorelaxation. Experimental evidence regarding the role K_{ATP} channels in the vasoleraxant effect of nebivolol is still limited. Therefore, it would be informative to investigate the role of K_{ATP} channels in the vasorelaxant effect of nebivolol. This study was aimed to investigate whether K_{ATP} channels could involve in the vasorelaxant response to nebivolol in the endothelium-intact aorta isolated from rat.

Methods

Drugs and chemicals

Nebivolol hydrochloride, phenylephrine hydrochloride (PE), acetylcholine hydrochloride (ACh) and Nω-Nitro-L-arginine methyl ester hydrochloride (L-NAME) were obtained from Sigma-Aldrich. In addition, glibenclamide was obtained from Tocris. Nebivolol and glibenclamide was dissolved in dimethylsulphoxide as described previously (Rautureau et al., 2002; Pullen et al., 2014) and the final concentration of the solvent in the organ bath was less than 0.01% (v/v).

Animals

Experimental protocols were approved by Ethical Committee for Experimental Research on Animals. Male Sprague–Dawley rats (250-300g) were used in this study. The rats were housed in cages under 12/12 hours light/dark cycle and were allowed ad libitum access to standard laboratory diet and tap water.

Preparation of Rat Thoracic Aortic Rings

The anesthetized rats were sacrificed by cervical dislocation and the descending thoracic aorta was rapidly dissected out and placed in Krebs-Henseleit solution (KHS) composed of (mM): NaCl, 118; KCl, 4.7; MgSO4·7H2O, 1.2; KH2PO4, 1.2; CaCl2, 2.5; NaHCO3, 25; and glucose, 11). The thorasic aorta was carefully cleaned of surrounding fat and connective tissue and cut into aortic rings approximately 3 mm in length. The aortic rings were mounted between two stainless hooks in 10 ml organ baths containing KHS (at 37 ◦C bubbled with 95% O2 +5% CO2) and attached to force displacement that were connected to a computer for isometric force recording.

Experimental protocol

The aortic ring was held at a resting tension of 2 g and allowed to equilibrate for 1 h with washing fresh KHS every 15 min. After this equilibration period, the integrity of the vascular endothelium was checked by contracting the tissues with PE (1 μM) and adding ACh (10 μM). Only tissues that relaxed by more than 50% to ACh were included in this study.

In order to elucidate the impact of KATP channels in the nebivolol-mediated vasorelaxation, some aortic rings were incubated with the glibenclamide (KATP channel blocker, 10 μM, n=6) for 30 minutes. Additionally, the NO-dependent effect of nebivolol was also evaluated by the incubation of some aortic rings with L-NAME (endothelial nitric oxide synthase inhibitor, 100 μM, n=4) for 20 minutes. Other aortic rings were not incubated and served as controls (n=5). Nebivolol (10-10-10-4 M) was cumulatively added to organ bath to obtain cumulative concentration-relaxation curves (CCRCs) in the aortic rings precontracted with potassium chloride (KCl, 30 mM). The concentrations of antagonists were selected based on preliminary experiments and previous studies (Sobey, 2001; Aziz et al., 2017).

Statistical analysis

Data are expressed as mean ± SEM. Relaxation is expressed as the percentage of the contraction caused by KCl. The analysis was performed using the statistical software package (Graphpad Prism, USA). Statistical significance was tested by ANOVA followed by the Bonferroni Comparison post-test. Efficacy of nebivolol was expressed as maximum relaxation (E_{max}) and determined as a percentage of the KCl precontraction. pD_2 (negative logarithm of the half maximum effective concentration (EC50)) values were calculated for potency of nebivolol. Differences were considered to be statistically significant when $p<0.05$.

Results

Nebivolol produced concentration-dependent relaxation in the rat aorta precontracted with KCl (Fig 1, n=5). The vasorelaxant effect of nebivolol was significantly inhibited after incubation of aortic rings with glibenclamide (10 µM, n=6) or L-NAME (100 µM, n=4). (Fig 1, *$p<0.05$). Additionally, as shown in Figure 1, incubation of aortic rings with glibenclamide (10 µM) or L-NAME (100 µM) caused a rightward shift of the CCRCs.

The Emax values for nebivolol were not significantly different in the aortic rings incubated with glibenclamide (10 µM, n=6) or L-NAME (100 µM, n=4) compared to controls (n=5) (Fig 2, $p>0.05$).

The potency of nebivolol as attested by pD2 values were reduced by the presence of glibenclamide (10 µM, n=6) or L-NAME (100 µM, n=4) (Fig 3).

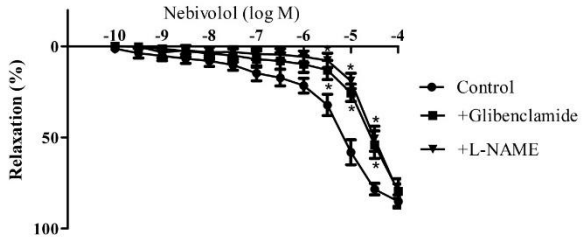

Figure 1. Percentage relaxations of endothelium-intact aortic rings in response to cumulative concentrations of nebivolol in the absence (n=5) or presence of glibenclamide (10 µM, n=6) or L-NAME (100 µM, n=4). *$p<0.05$ vs Control.

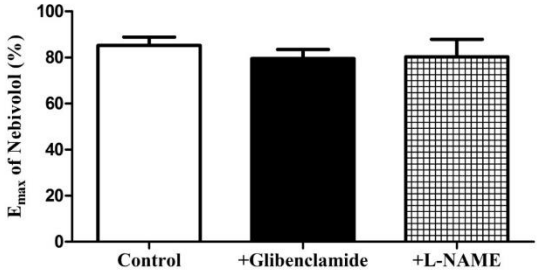

Figure 2. E_{max} of nebivolol in the the absence (n=5) or presence of glibenclamide (10 µM, n=6) or L-NAME (100 µM, n=4) in the endothelium-intact aortas.

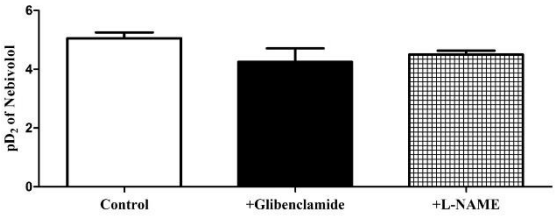

Figure 3. pD_2 of nebivolol in the the absence (n=5) or presence of glibenclamide (10 µM, n=6) or L-NAME (100 µM, n=4) in the endothelium-intact aortas.

Discussion

In the present study, nebivolol produced NO-dependent vasorelaxation in the endothelium-intact aorta precontracted with KCl. In addition, the present findings provide a new mechanism showing the involvement of K_{ATP} channels in the vasorelaxant response to nebivolol in the endothelium-intact aorta.

K_{ATP} channels play an important regulator role in the vascular tonus by their ability to couple cellular metabolism with membrane potential (Aziz et al., 2017). In this regard, membrane hyperpolarization induced by activation of sarcolemmal vascular smooth muscle K_{ATP} channels ($sarcK_{ATP}$ channels) results in the vasorelaxant response (Sobey, 2001). Therefore, most in vitro experiments were focused to clarify that the role of $sarcK_{ATP}$ channels in the vasorelaxant response using the endothelium-denuded aortic preparations (Pantan et al., 2014; Arsyad and Dobson, 2016). However, endothelial K_{ATP} channels also exist (Aziz et al., 2017) and the vasorelaxant effect may be evaluated in the presence of both endothelial K_{ATP} and $sarcK_{ATP}$ channels to obtain whole vascular response. Although the functional role of $sarcK_{ATP}$ channels is well known, there is limited information regarding the involvement of endothelial K_{ATP} channels in vascular function. Indeed, it has been reported that K_{ATP} channels are also present in the vascular endothelium

and contribute to the vascular reactivity in the coronary arteries (Aziz et al., 2017). Structurally, K_{ATP} channels consist of subunits including pore-forming inward rectifier Kir6.x subunits (Kir6.1 or Kir6.2) and regulatory sulfonylurea receptors (SUR1, SUR2A, or SUR2B) (Tinker et al., 2014). The different combinations of these subunits form KATP channels which have distinct pharmacological and electrophysiological properties as in vascular and pancreatic beta cells (Aziz et al., 2015; Ashcroft et al., 2017). Aziz et al. found that Kir6.1 subtype is the relevant subunit in the endothelial KATP channels similar to sarcKATP channels (Aziz et al., 2017). Moreover, endothelial KATP channels are also found to be partly involved in the vasodilatory action of adenosine (Kuo and Chancellor, 1995). This seems to be associated with direct phosphorylation of these channels via protein kinase A which is activated by stimulation of G-protein coupled adenosine receptors by adenosine (Aziz et al., 2017). The activation is also pronounced through distinct stimulatory G-protein coupled receptors such as β-adrenergic receptors (β-ARs) and this mechanism is involved in β-AR-mediated vasorelaxant response (Biaggioni and Robertson, 2018). Nebivolol produces an endothelium-dependent vasorelaxant effect primarily attributed to endothelial β2- and/or β3-ARs stimulation and subsequent activation of eNOS (Broeders et al., 2000; de Groot et al., 2003). NO is an endothelium-derived relaxing factor which increases the production of cyclic guanosine monophosphate (cGMP) by activating of soluble guanylate cyclase in the vascular smooth muscle (Vanhoutte et al., 2017). Alternatively, NO could also induce hyperpolarization in the smooth muscle of different arteries, including the rat aorta (Vanheel et al., 1994).

A critical question is whether K_{ATP} channels play any role in the nebivolol-induced relaxation due to their effects on membrane potential in the aorta precontracted by KCl-mediated membrane depolarization. The vasorelaxant activity of nebivolol seems to be primarily based on increased endothelial NO production by stimulation of endothelial β_2- and/or β_3-ARs, as mentioned before. However, the NO production induced by nebivolol may also be under the modulation of endothelial K_{ATP} channels. This hypothesis is supported by the findings of present study showing a similar inhibition of nebivolol-induced vasorelaxant response in the presence of K_{ATP} channel blocker or endothelial nitric oxide synthase inhibitor. This outcome is also supported by another study which shows that NO-induced changes in membrane potential were inhibited by K_{ATP} channel blocker (Garland and McPherson, 1992). Unfortunately, a limitation of the present study was the lack of measurement of membrane potentials due to the insufficiency of technical resources at the laboratory.

In previous organ bath experiments, nebivolol has been similarly found to induce relaxation in the rat aorta precontracted with KCl (de Groot et al., 2003; Wang et al., 2009). Additionally, they have also shown that this effect is NO-dependent because it could be abrogated by endothelial NO synthase inhibitor (de Groot et al., 2003; Wang et al., 2009). However, Wang et al. (2009) found that glibenclamide failed to inhibit nebivolol-induced relaxation in the rat aorta. This discrepancy may be explained by concentrations of glibenclamide and KCl that differ from the present study. Because, the appropriate concentrations of glibenclamide and KCl were selected based on a preliminary experiments of the present study. For example, the concentration of KCl (30 mM) was tested and selected because it has been found that nebivolol was failed to induce relaxation when higher concentration (60 mM) of KCl was used in the experimental protocol (data not shown). In addition to this, the concentrations of glibenclamide and KCl used in the present study were in line with previous in vitro studies in the rat aorta (Ito et al., 1997; Erdei et al., 2006; Mateus et al., 2019).

Conclusion

In conclusion, the present findings suggest for the first time that activation of K_{ATP} channels is involved in the relaxant response to nebivolol in the rat aorta precontracted with KCl. The vasorelaxant effect of nebivolol is also found to be NO-dependent. Taken together, possible mechanisms by which NO and K_{ATP} channels could involve in the nebivol-induced relaxation in the endothelium-intact aortas were summarized in the Fig 4. However, further studies are needed to clarify the signalling pathways including endothelial and sarcolemmal K_{ATP} channels in the nebivolol-induced vasorelaxation.

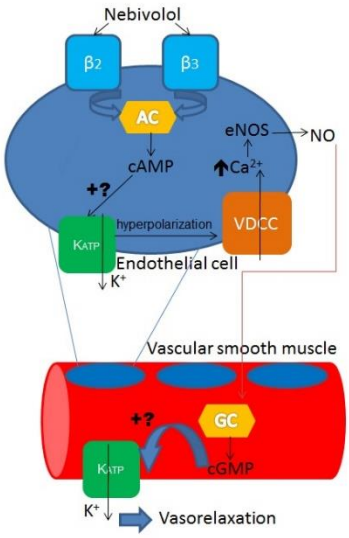

Fig 4. Possible mechanisms leading to nebivolol-induced relaxation in the endothelium-intact aorta.

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References

Arsyad A, Dobson GP. Lidocaine relaxation in isolated rat aortic rings is enhanced by endothelial removal: possible role of Kv, KATP channels and A2a receptor crosstalk. BMC Anesthesiol 2016; 16(1): 121.

Ashcroft FM, Puljung MC, Vedovato N. Neonatal Diabetes and the KATP Channel: From Mutation to Therapy. Trends Endocrinol Metab 2017; 28 (5): 377-387.

Aziz Q, Li Y, Tinker A. ATP-sensitive potassium channels and vascular function. Channels (Austin) 2015; 9(1): 3-4.

Aziz Q, Li Y, Anderson N, Ojake L, Tsisanova E, Tinker A. Molecular and functional characterization of the endothelial ATP-sensitive potassium channel. J Biol Chem 2017; 292(43): 17587-17597.

Biaggioni I, Robertson D. Adrenoceptor Agonists & Sympathomimetic Drugs. Katzung, B.G. (ed). Basic & Clinical Pharmacology. USA: McGraw-Hill Education; 2018, p:137-155.

Broeders MA, Doevendans PA, Bekkers BC, Bronsaer R, van Gorsel E, Heemskerk JW, et al. Nebivolol: a third-generation beta-blocker that augments vascular nitric oxide release: endothelial beta (2)-adrenergic receptor-mediated nitric oxide production. Circulation 2000; 102(6): 677-684.

Cicero AFG, Kuwabara M, Borghi C. A Critical Review of Nebivolol and its Fixed-Dose Combinations in the Treatment of Hypertension. Drugs 2018; 78(17): 1783-1790.

de Groot AA, Mathy MJ, van Zwieten PA, Peters SL. Involvement of the beta3 adrenoceptor in nebivolol-induced vasorelaxation in the rat aorta. J Cardiovasc Pharmacol 2003; 42(2): 232-236.

Erdei N, Papp Z, Pollesello P, Edes I, Bagi Z. The levosimendan metabolite OR-1896 elicits vasodilation by activating the K(ATP) and BK(Ca) channels in rat isolated arterioles. Br J Pharmacol 2006; 148(5): 696-702.

Félétou M, Vanhoutte PM. Endothelial dysfunction: a multifaceted disorder. Am J Physiol Heart Circ Physiol 2006; 91(3): H985-1002

Garland CJ, McPherson GA. Evidence that nitric oxide does not mediate the hyperpolarization and relaxation to acetylcholine in the rat small mesenteric artery. Br J Pharmacol 1992; 105(2): 429-435.

Ito M, Yamamoto I, Naruse A, Suzuki Y, Satake N, Shibata S. Impaired relaxing response to isoprenaline in isolated thoracic aorta of nephrotic rats: decrease in release of EDRF from endothelial cells. J Cardiovasc Pharmacol 1997; 29(2): 232-239.

Kuo L, Chancellor JD. Adenosine potentiates flow-induced dilation of coronary arterioles by activating KATP channels in endothelium. Am J Physiol 1995; 269: H541-H549.

Mateus LS, Albuquerque AAS, Celotto AC, Evora PRB. In vitro evidence that endothelium-dependent vasodilatation induced by clozapine is mediated by an ATP-sensitive potassium channel. Pharmacol Rep 2019; 71(3): 522-527.

Olawi N, Krüger M, Grimm D, Infanger M, Wehland M. Nebivolol in the treatment of arterial hypertension. Basic Clin Pharmacol Toxicol 2019; 125(3): 189-201.

Pantan R, Onsa-Ard A, Tocharus J, Wonganan O, Suksamrarn A, Tocharus C. Endothelium-independent vasorelaxation effects of 16-O-acetyldihydroisosteviol on isolated rat thoracic aorta. Life Sci 2014; 116(1):31-36.

Pullen C, Coulson FR, Fenning A. Effects of Resveratrol and Nebivolol on Isolated Vascular and Cardiac Tissues from Young Rats. Adv Pharmacol Sci 2014; 2014: 720386.

Rautureau Y, Toumaniantz G, Serpillon S, Jourdon P, Trochu JN, Gauthier C. Beta 3-adrenoceptor in Rat Aorta: Molecular and Biochemical Characterization and Signalling Pathway. Br J Pharmacol 2002; 137(2):153-61.

Sobey CG. Potassium channel function in vascular disease. Arterioscler Thromb Vasc Biol 2001; 21(1): 28-38

Tinker A, Aziz Q, Thomas A. The role of ATP-sensitive potassium channels in cellular function and protection in the cardiovascular system. Br J Pharmacol 2014; 171(1): 12-23.

Vanheel B, Van de Voorde J, Leusen I. Contribution of nitric oxide to the endothelium-dependent hyperpolarization in rat aorta. J Physiol. 1994; 475(2): 277-284.

Vanhoutte PM, Shimokawa H, Feletou M, Tang EH. Endothelial dysfunction and vascular disease – a 30th anniversary update. Acta Physiol (Oxf). 2017; 219(1): 22-96.

Wang Y, Zhang M, Liu Y, Li J, Song E, Niu L, Cheng N. Neither K+ channels nor PI3K/Akt mediates the vasodilative effect of nebivolol on different types of rat arteries. J Cardiovasc Pharmacol Ther 2009; 14(4): 332-338.

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RESEARCH ARTICLE

A web-based software developed for permutation tests and an application in medicine

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Abstract

Objective: In this study, it is aimed to develop a new user-friendly web-based software in order to easily carry out the use of permutation tests that can overcome the difficulties of use due to the restrictions in the usage phases of parametric and nonparametric tests and can be used as an alternative to these tests.

Methods: Shiny, an R package, was used to develop the "permutation tests" software. In the developed software, by selecting “the Specify Sample Number” tab, the number of samples presented as “Single”, “Two” and “More than two” options is selected and analyzes are made by selecting the appropriate data set from the file upload menu.

Results: The data set called “dietstudy” was used to examine the work of the developed web-based software and to evaluate its outputs. “Two Independent Sample Permutation Tests” were selected and analyzed to see whether there was a difference between the variables in terms of gender. According to the results, no statistically significant difference was found for the triglyceride levels Triglyceride, 1st interim triglyceride, 2nd interim triglyceride, 3rd interim triglyceride ve Final triglyceride in terms of gender, but a statistically significant difference was obtained in terms of Weight, 1st interim weight, 2nd interim weight, 3rd interim weight ve Final weight variables.

Conclusion: The "permutation tests" software developed is a new user-friendly web-based software that can be used to easily perform permutation tests that can be used as an alternative to the preferred parametric and non-parametric tests.

Key words: Parametric tests, nonparametric tests, permutation tests, Web-based software

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Introduction

Statistical hypothesis tests are used in order to reach the results suitable for the purpose determined by making statistical inferences with the data obtained as a result of the studies. Statistical tests used to analyze the data can be classified as parametric and nonparametric tests according to the structure of the data, the type of scale, the form of the distribution and the hypothesis to be tested. Parametric tests are methods based on certain hypothetical population distribution and some parameters such as mean, a standard deviation that determine this distribution. Nonparametric tests are generally based on more basic estimations such as expected-observed value differences, sequence and sequence differences, independent of population distribution (Buskirk, Willoughby and Tomazic 2013). Statistical power and effect size of parametric tests are higher than nonparametric tests (Kartal 2010). For this reason, researchers tend to choose and apply parametric tests rather than non-parametric tests in the selection of tests (Shapiro and Wilk 1965). Parametric tests contain some assumptions since they are developed according to a known distribution and some parameters. Some of these assumptions show that the universes from which the samples are taken have a normal distribution and the variance of the universe is homogeneous. (Alpar 2013). Neglecting assumptions for these tests can cause test results to be inaccurate and misleading. In such cases, it is ensured that the data set is made to meet the assumptions by making necessary arrangements (for example, using data conversion methods if it is not normally distributed). Use of non-parametric tests is preferred if assumptions are not met in spite of the procedures (Field 2013). In non-parametric tests, operations can generally be performed by considering the ordinal numbers. Therefore, the use of permutation tests which can be used in place of both parametric and nonparametric tests provides different advantages. Because, as in parametric tests, it does not require any assumption about sample distribution. In addition, permutation tests use the actual values of the data, not the ordinal numbers of the data, as in nonparametric tests. When compared in terms of test results, it is reported that permutation tests are close to parametric tests, sometimes they give better results, and often they are better than non-parametric tests (Good 2006).

Although the use of the permutation method was first proposed at the beginning of the twentieth century, it has become more preferred in recent years with the elimination of the difficulty in calculations with the development and use of computer technology (Good 2006). Permutation tests have been preferred nowadays due to the limitations in the use of parametric and nonparametric tests (Ludbrook and Dudley 1998). For this reason, it is aimed to develop a new easy-to-use web-based software to carry out the use of permutation tests that can be used to avoid restrictions.

Methods

In order to examine the working principle of the web-based software and evaluate its outputs, the data set called dietstudy was obtained from the link https://www.ibm.com/support/knowledgecenter/ko/SSLVMB_23.0.0/spss/tutorials/data_files.html. This data set contains the results of a study of the "Stillman diet". In the data set, age, sex variables and weights of individuals before and after the diet were given in weight and triglyceride levels were given in mg / 100 ml.

Permutation test

Although the permutation test method was first introduced and proposed in the early 20th century, it has been used more and more recently with the elimination of the difficulty in calculations due to the development of computer technology (Good 2006). Permutation tests are increasingly common tests to perform certain types of statistical analysis. As with other known parametric and non-parametric tests, permutation tests do not rely on assumptions about the distribution of data and are therefore considered non-parametric tests (Mangiafico 2016).

Permutation tests have certain advantages over parametric and non-parametric tests for ease of use (Ludbrook and Dudley 1998). Permutation tests do not require some assumptions as in parametric tests. For example, the assumption about the distribution of samples which is one of the parametric test assumptions does not exist in the permutation tests. Similarly, non-parametric tests are generally performed with the ordinal numbers of data, and in permutation tests operations are performed using the actual values, not the ordinal numbers of the data. Permutation tests give results that are close to parametric test results, but often give better results when it comes to non-parametric test results. For these reasons, the permutation test method can be used instead of all parametric and non-parametric test methods (Good 2006).

Developed web-based software

To create this web-based application, the Shiny library, which allows the design of interactive web-based applications, is used (Chang et al. 2017). The

main and sub-menus created to use the software are described below.

File upload

In the analysis to be made with this application, the first step is loading the file containing the data set. Data analysis is done by loading MS Excel (.xls / .xlsx) and SPSS (.sav) file types, which have different extensions and are widely used. In addition, this menu contains the Specify the type and role of the variables tab that will allow you to specify the type and role of the variables in the loaded file. In addition, this menu contains the "Specify the Type and Role of Variables" tab, which will allow you to specify the type and role of the variables in the uploaded file. This process is necessary for the analysis and the roles of the variables should be determined.

Permutation tests

In this menu of web-based applications, the number of samples should be selected in order to decide the test to be used. When the permutation tests menu is opened, the number of samples presented with the option “One”, “Two” and " More than Two" is selected from the ” Number of Sample” tab. In this tab, "One Sample Permutation Tests" for "Single" number of sample, "Two Independent Sample Permutation Tests" and "Two Dependent Sample Permutation Tests" for "Two" number of sample and "More Than Two independent Sample Permutation Tests" and "More than Two Dependent Sample Permutation Tests" for "More than Two" number of sample tabs are opened. The number of samples appropriate to the loaded data set is determined and analyzes are performed with appropriate test selections. Figure 1 shows the “Permutation Tests” menu.

Figure 1. “Permutation Tests” menü

Results

In order to examine the working principle of the developed web-based software and evaluate its outputs, the data set called dietstudy was used. A descriptive statistics table related to the data set is given in table 1.

First, the data set is loaded into the software. Images of the data set uploaded to the software are shown in Figure 2.

Table 1. Descriptive statistics table of variables

Variables	Variable Type	Mean±Standart deviation
Triglyceride	Numerical	138,44±29,040
1st interim triglyceride	Numerical	124,56±25,126
2nd interim triglyceride	Numerical	124,38±21,854
3rd interim triglyceride	Numerical	118,81±33,255
Final triglyceride	Numerical	124,38±29,412
Weight	Numerical	198,38±33,472
1st interim weight	Numerical	196,13±33,669
2nd interim weight	Numerical	194,13±33,498
3rd interim weight	Numerical	192,13±33,915
Final weight	Numerical	190,31±33,508
Age in years	Numerical	54,69±6,916

Then, with the “Permutation Tests” tab, the appropriate test selection is made according to the purpose of the study and the data set. “Two Independent Sample Permutation Tests” were selected in order to see whether there was a difference between the variables in terms of gender and the analyzes were performed. Figure 3 shows the images for a variable belonging to the results of “Two Independent Samples Permutation Tests”.

According to these results, no statistically significant difference was found for Triglyceride, 1st interim triglyceride, 2nd interim triglyceride, 3rd interim triglyceride and Final triglyceride variables. A significant difference was obtained in terms of weight, 1st interim weight, 2nd interim weight, 3rd interim weight, and Final weight variables.

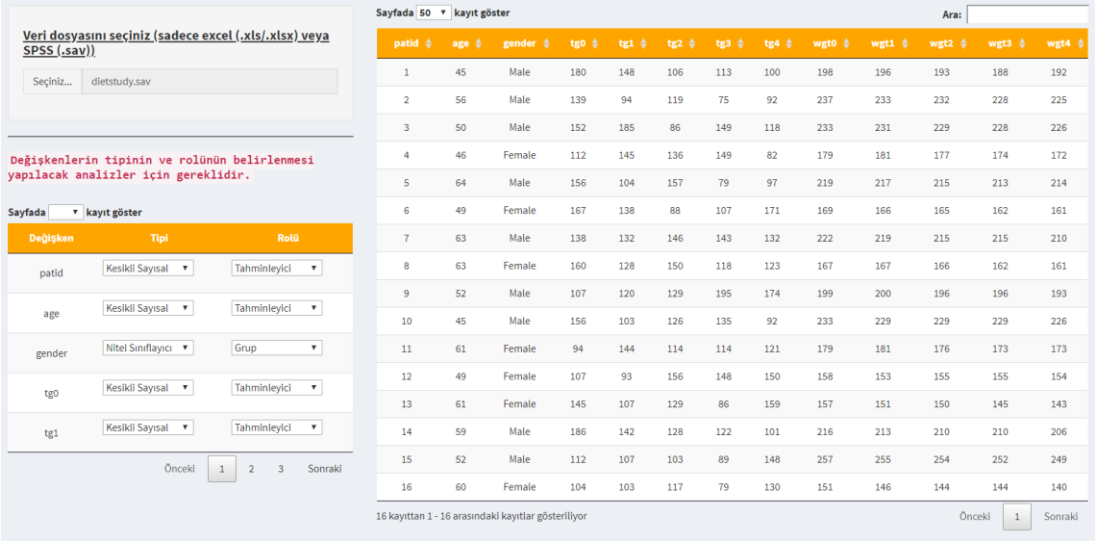

Figure 2. The images of the uploaded file.

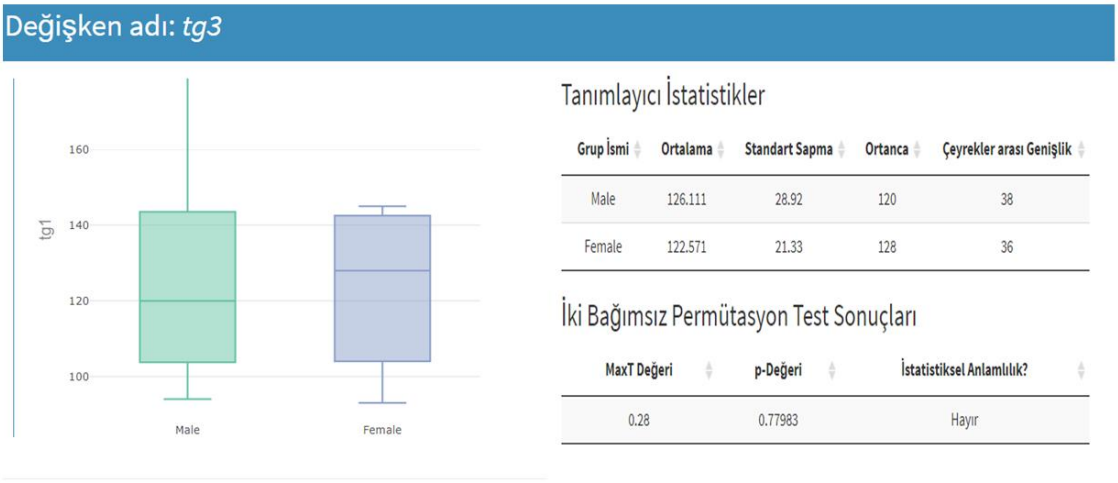

Figure 3. "Two Independent Sample Permutation Tests" result

Discussion

In this study, it is aimed to develop a user-friendly web-based software to easily carry out the use of permutation tests in order to overcome the usage difficulties due to the restrictions in the use of parametric and non-parametric tests which are generally preferred tests. Parametric tests are methods based on a certain hypothetical population distribution and some parameters such as mean, standard deviation that determine this distribution. Nonparametric tests are generally based on more basic estimations such as expected-observed value differences, sequence and sequence differences, provided that they are independent of population distribution (Buskirk et al. 2013). Since parametric tests are developed based on a certain distribution and parameters, they contain some assumptions that are defined based on these limitations (Alpar 2013). The use of parametric tests depends on the fulfillment of these assumptions. Nonparametric tests perform operations by using sequence numbers of data (Good 2006). Due to such similar restrictions and conditions, it is advantageous to use permutation tests that can be used in place of the proposed parametric and nonparametric tests at the beginning of the 20th century. (Ludbrook and Dudley 1998). Because it does not require any assumption about sample distribution which is one of the parametric test assumptions. In addition, as in non-parametric tests, the data is processed using real values, not sequence numbers (Good 2006). Therefore, a user-friendly web software has been developed in which researchers can easily access permutation tests and interpret their results easily.

IBM SPSS Statistics (Corp 2017), Minitab (Minitab 2000), MedCalc (Schoonjans et al. 1995),

Stata (StataCorp 2007), which are known package programs, do not have a module to allow the application of permutation tests. Using web-based software developed in this study, comparisons of permutation tests can be done easily by loading the data set and interpretation can be obtained for statistical significance.

The developed software in accordance with the number and structure of the sample includes Single Sample Permutation Tests, Two Independent Sample Permutation Tests, Two Dependent Sample Permutation Tests, More Than Two Independent Sample Permutation Tests, and More than Two Dependent Sample Permutation Tests. The software provides test results, descriptive statistics of variables and graphs of variables.

In addition, the data set called diet study was used in order to examine the working principle of the web-based software developed in this study and to evaluate its outputs. According to the results obtained by using "Two Independent Sample Permutation Tests in order to see whether there is a difference between the variables in terms of gender, no statistically significant difference was found for Triglyceride, 1st interim triglyceride, 2nd interim triglyceride, 3rd interim triglyceride and Final triglyceride variables in terms of gender. However, a significant difference was obtained in terms of Weight, 1st interim weight, 2nd interim weight, 3rd interim weight and Final weight

Conclusion

Permutation tests have been preferred nowadays due to the limitations in the use of parametric and nonparametric tests (Ludbrook and Dudley 1998). For this reason, a new user-friendly web-based software has been presented to users in order to realize the use of permutation tests that are used as an alternative to parametric and nonparametric tests.

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References

Alpar R. Applied multivariate statistical methods. Detay Publishing, 2013.
Buskirk T D, Willoughby L M, Tomazic T J. Nonparametric statistical techniques. The Oxford handbook of quantitative methods. Statistical analysis. 2013;2:106-141.
Chang W, Cheng J, Allaire J, Xie Y, McPherson J. Shiny: web application framework for R. R package version 1. 2017.
Corp, I. IBM SPSS statistics for windows, version 25.0. Armonk, NY: IBM Corp. 2017.
Field A. Discovering statistics using IBM SPSS statistics. Sage. 2013.
Good P I. Resampling methods. Springer. 2006.
Hothorn T, Hornik K, Van De Wiel M A, Zeileis A. Implementing a class of permutation pests: the coin package. 2008.
Kartal M. Hypothesis Tests in Scientific Research. Nobel publishing. Ankara. 2010.
Ludbrook J, Dudley H. Why permutation tests are superior to t and F tests in biomedical research. The American Statistician. 1998;52:127-132.
Mangiafico S S. Summary and analysis of extension program evaluation in R. Rutgers Cooperative Extension: New Brunswick. NJ, USA. 2016.
Minitab I MINITAB statistical software. Minitab Release. 2000.
Schoonjans F, Zalata A, Depuydt C, Comhaire F. MedCalc: a new computer program for medical statistics. Computer methods and programs in biomedicine. 1995;48:257-262.
Shapiro S S, Wilk, M B. An analysis of variance test for normality (complete samples). Biometrika. 1965;52:591-611.
StataCorp L. Stata data analysis and statistical Software. Special Edition Release. 2007;10:733.

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RESEARCH ARTICLE

A Web-Based Software Developed for Bayesian Tests and an Application in Medicine

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Abstract

Objective: In this study, it is aimed to develop a new user-friendly web-based software to easily carry out Bayesian tests, which are becoming more and more common, instead of using the classical approach, which is generally preferred in analysis from statistical modeling.

Method: Shiny, an open-source R package, is used to develop the recommended web software. In the developed software, by selecting "the Specify Sample Number" tab, the number of samples presented as "Single", "Two" options is selected, and analyzes are made by selecting the appropriate data set from the file upload menu.

Results: The data set "ulcer recurrence" was used to examine the way the developed web-based software works and to evaluate its output. To test whether there is a difference in age variable in terms of result variable, "Two Independent Sample Bayes Tests" were selected and analyzes were performed. According to the results obtained, statistically "little evidence for Ho" was found for the age variable in terms of the result variable. With the evidence obtained, it is said that no statistically significant difference was obtained for the dependent variable according to the independent variable.

Conclusion: The developed software is a new user-friendly web-based software that can be used to easily use Bayesian tests used as an alternative to the classical approach.

Key words: Bayesian approach, Bayesian tests, Classical approach, Web-based software

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Introduction

It is known that in the development process of statistical science from the past to the present, it was influenced by two approaches known as the "Classic Approach" and the "Bayesian Approach". The bases of the Bayes approach are based on Bayes' theorem, and this approach was introduced by Thomas Bayes. This approach has been left behind by the intensity of classical approach studies and the effect of those who support the classical approach. However, in addition to F.P. Ramsey's experiment called Reality and Probability in the early 20th century, it has been brought to the agenda again in recent years as it responded to the results that some researchers could

not achieve in their studies with a classical approach (Demirci, 2006).

There are some situations where the Bayesian approach is more useful and superior to the classical approach. Some of these situations are as follows. While the classical approach is based on many theorems, the Bayesian approach is based only on the Bayesian theorem. Therefore, the Bayesian approach makes making inferences easier. In the classical approach, the presence of prior information is neglected for the prediction of the parameters of the statistical models, while the prediction of the Bayesian approach is made using the presence of the prior information. The Bayesian approach at this point provides superiority. In the classical approach, range estimation is obtained for the parameter prediction, while in the Bayesian approach, the probability of the parameter prediction is obtained by benefiting the posterior distribution. Therefore, in the Bayesian approach direct calculation of the estimate provides an advantage in practice (Press 1989, Demirhan 2004). Estimating the parameters of models that are complicated in the classical approach is rather difficult. Since the marginal posterior distribution is used in the Bayesian approach, estimation of parameters of models is easier. In the classical approach, when the parameters are estimated with small samples, the reliability of the predictions may be lost. However, more reliable results can be obtained with small samples in the Bayesian approach. While making the parameter estimation with the classical approach, the assumptions such as unbiased and consistency must be fulfilled, whereas in the Bayesian approach, the parameter estimation is a possibility, so there is no need to provide these assumptions. Also, since the variance obtained in the Bayesian approach is found using a priori distributions, it is smaller than the variance obtained with the classical approach, so that the interval estimates are obtained narrower. Thus, more accurate predictions can be achieved with the Bayesian approach. For these reasons, Bayesian analysis is preferred over the classical approach (Press 1989, Demirhan 2004). The purpose of this research is to develop a new user-friendly web-based software that uses the Bayesian approach as an alternative to the Classic approach to enable users to obtain more accurate results in their studies.

Methods

Data set

The data set “ulcer_recurrence” has been obtained from the link https://www.ibm.com/support/knowledgecenter/SSLVMB_24.0.0/spss/tutorials/data_files.html to be able to analyze how the web-based software developed in this study works and evaluate its output. This data set contains partial information from a study designed to compare the effectiveness of the two therapies to prevent relapse of ulcers. Age, duration, treatment, time, and result variables are given in the data set. The descriptive properties of the variables used in the data set are given in Table 1.

Table 1. Descriptive property table of variables

Variables	Variable Type	The Role of the Variable	Explanation
Age	Numerical	Independent/Predictive	Patient's age at the time of diagnosis
Duration	Categorical	Independent/Predictive	Duration of the disease (Less than five years / Five years and more)
Treatment	Categorical	Independent/Predictive	Treatment group (A / B)
Time	Numerical	Independent/Predictive	Duration of the last visit to the hospital in months
Result	Categorical	Dependent / Target	Result (Ulcer detected - No ulcer detected)

Bayesian Approach

Bayes theorem is one of the important theorems of statistics. This theorem: When modeling any situation, it aims to produce results using universal lines and observations. The use of observations and subjective opinions for the prediction of noninformative information is seen as the most important feature that distinguishes this approach from classical statistical methods (Akar and Gundogdu 2014). In the classical approach, the parameters of statistical models are defined as fixed, while in the Bayesian approach, these parameters are defined depending on probability. Therefore, there is a distribution of each parameter. These possibilities are defined as the degrees of belief. In other words, parameters are accepted as random variables in the Bayesian approach (Bolstad 2007, Ibrahim et al, 2014).

The Bayesian approach is very advantageous compared to the classical approach, as it uses previously acquired knowledge (prior knowledge) in the modeling of complex data (Yin and Ibrahim 2006). Obtaining prior information plays an important role in the Bayesian inference. Prior knowledge is derived from past experiences and is based on a subjective interpretation of information

from previously conducted studies. By combining the results obtained from this prior information, the posterior distribution is formed (Congdon 2007, Wong, Lam and Lo 2005). The most important problem in obtaining posterior information is the difficulty of the calculation in the distribution. The difficulty of analytic solutions in complex distributions accelerated the development of computer software and thus facilitated finding solutions (Bolstad 2007).

Prior and Posterior Distribution

The preliminary distribution of a parameter is the probability distribution that enables us to obtain noninformative information for the parameter before starting the analysis of the data. Prior distribution: are the distributions obtained from the researcher's opinions, expert opinions, and similar studies. The posterior distribution of the parameter is obtained by multiplying the prior distribution with the likelihood function. All inferences of the parameter can be made by making use of the posterior distribution. Bayesian inference or modeling cannot be done without using a prior distribution. The Bayesian probability is considered to be the measure of the degree of belief of a random event. Based on this definition, the probability mentioned is quite subjective (informative). Therefore, all prior distributions are classified as subjective a prior and objective prior (Cengiz et al. 2012, Berger 2006). Objective averages have a minimal effect on the posterior distribution and are called uncertain or flat a prior. These prior distributions are used by most researchers because they seem more objective. However, it is not always appropriate to give the total uncertainty for the parameter with an objective a priori distribution. Therefore, objective prior distributions cause the researchers to obtain the posterior distribution incorrectly (Kass and Wasserman 1996).

Subjective prior distributions are the most preferred and used prior distributions in practice. Among the subjective prior distributions, conjugate a prior and Jeffreys' prior are the most preferred and known preliminary distributions. Conjugate a prior distribution is preferred because the posterior distribution is easily obtained and provides convenience in subsequent calculations. The preliminary distribution of Jeffreys was proposed by Jeffreys in 1961 and can be easily calculated. This a prior has uniform distribution properties and does not include large values outside the range in which the parameters are defined (Jeffreys 1998, Ashby and Smith 2000).

In practice, one of the difficulties encountered for posterior distributions in the Bayesian approach is that the integrals required for statistical inferences are difficult to solve and even there are no analytical solutions for these integrals. Some models are used to make the truth understandable in science, technology, management, and many other fields. With simulation studies, comments can be made using models to create specific situations and to examine the reaction against these situations. Some simulation methods have been developed to overcome the difficulties in the Bayesian approach and these methods are used in the solution of integrals (Altuntas 2011).

Markov Chain Monte Carlo Method

Solutions of integrals to be used in the calculation of posterior distributions in the Bayesian approach are either too difficult or impossible. In these cases, approaches are given to derive the Markov chain and achieve convergence properties and posterior distribution (Berg 2005). Thus, using the Markov chain derivation and simulation techniques, approaches called chain data replication were developed. In general, these approaches are examined through the Markov chain Monte Carlo (MCMC). With the help of the Monte Carlo method, a set of simulation values is generated from the desired probability distribution independent of each other. In other words, many values are drawn randomly from the posterior distribution. The MCMC method, on the other hand, generates a chain value where each simulation value will depend on the previous value. The purpose of the MCMC approach is to converge to the target posterior distribution randomly in the θ parameter space. That is, the θ^(j+1) random variable derived to converge to the posterior distribution in MCMC approaches depends on the random variable θ^j. For this purpose, sampling is done from q(〖 θ,θ 〗 ^j) Markov transition distribution (Cengiz et al. 2009).

Metropolis Algorithm and Gibbs sampling are the most used algorithms in MCMC. With these methods, it is possible to draw samples from complex posterior distributions and obtain posterior statistics.

Metropolis Algorithm

This algorithm was discovered by the American physicist and computer scientist C. Metropolis. The algorithm is very practical and easy to use. Estimates are made to obtain random samples from arbitrary complex target distribution of any size known as the normalization constant. Samples are to be created from a univariate distribution, with probability density function f(θ⁄y). Suppose the tth sample obtained with f is θt. To start using the Metropolis algorithm, θ^0 is taken as the initial value. Also, there is a need for a symmetrical q(〖 θ〗 ^(t+1)| 〖 θ〗 ^t) target density function. The application of the algorithm is the process of deriving a sample from the q(.|.) density function for the 〖 θ〗 ^t the parameter in the case of (t + 1) iteration and deciding whether to accept or reject the new sample. If the new sample is accepted, the algorithm starts with the new sample and repeats itself. If the new sample is to be rejected, the algorithm remains at the current point and starts repeating. The algorithm repeats itself until necessary. In practice, the user has the advantage of stopping sampling and deciding the total number of samples after sufficient iteration has been completed.

We can summarize this algorithm as follows.

1) With f((θ^0)⁄y)>0, t = 0 and the starting point θ^0 are selected.

2) With the help of the proposed q(.| 〖 θ〗 ^t) distribution, θ_new is produced.

3) r=min{(f(θ_yeni|y))/(f(θ^t|y)),1} value is calculated.

4) U is generated from U(0,1).

5) If u<r, it becomes 〖 θ〗 ^(t+1)=θ_new. Otherwise, t=t+1 is taken. Return to Step 2 if T is the desired sample number and t <T. Otherwise, the process is completed (Gilks, Richardson and Spiegelhalter).

Gibbs Sampling:

Gibbs sampling is a special case of the Metropolis algorithm. For the solution to the problems encountered in the Bayesian approach, Gibbs sampling was first used by Gelfand et al (1990) (Gelfand et al. 1990). The main purpose of Gibbs sampling is to run the prediction process periodically through conditional relationships and to reach the compound distributions of the parameters. The expression π(θ_i 〖|θ〗 _j,i≠j,y) for the θ=(θ_1 〖,θ 〗 _2,…,θ_k) parameter vector, p(y|θ) likelihood function, and π(θ) a priori distribution can be written as follows.

π(θ_i 〖|θ〗 _j,i≠j,y)∞p(y|θ)π(θ) (1)

The algorithm of Gibbs sampling under the above explanations is as follows.

1) t=0 is taken and chosen to be an arbitrary initial value θ^((0))={θ_1^((0)),θ_2^((0)),…,θ_k^((0)) }.

2) Each component of θ

From π(θ_1|θ_2^((t)),…,θ_k^((t)),y) to θ_1^((t+1))

From π(θ_1|θ_2^((t)),…,θ_k^((t)),y) to θ_1^((t+1))

……..

From π(θ_k|θ_1^((t+1)),…,θ_(k-1)^((t+1)),y) to θ_k^((t+1))

is obtained.

t=t+1 is taken. Return to Step 2 if T is the desired sample number and t <T. Otherwise, the process is completed.

When Gibbs sampling is run with long enough iteration, all loops in the algorithm will be able to derive a sampling for all components of θ using conditional distributions. However, this sampling does not work when conditional distributions of x parameters are not easily available (Gelfand et al. 1990).

Developed Web-Based Software:

To create this web-based application, the Shiny library is used, which allows the design of interactive web-based applications based on the R programming language (Chang et al. 2016). The main and submenus of the software are described below.

Upload a File:

In the first stage of this web-based application, the file containing the data set is loaded. In data analysis, loading is done with MS Excel (.xls / .xlsx) and SPSS (.sav) file types, which are the most widely used file types with different extensions. Besides, this menu includes the 'Determine the type and role of the variables' tab, which will enable determining the type and role of the variables in the uploaded file. The process of determining the roles of variables is required for analysis.

Bayesian Analysis:

In this menu, the variable type must first be determined to decide on the test to be used in the web-based application. After deciding on the type of variable, the sample size must be determined. When the Bayesian analysis menu is opened, two options are offered, namely "Quantitative Variables" and "Qualitative Variables" from the "Determine Variable Type" tab. After the variable type is decided, the sample size is selected from the options presented

as "One" and "Two" from the "Determine Sample Size" tab.

Here, "One Sample Bayes Tests" for "One" sample size, "Two Independent Sample Bayes Tests" and "Two Dependent Sample Bayes Tests" tabs for "Two" sample size are opened. After loading the data set from the file upload menu, the sample size suitable for the loaded data set is selected. Then, analysis is made by making test selections by the sample size. Figure 1 shows the Bayesian Analysis menu.

Accessibility and citation of the improved interactive web application:

The developed interactive web-based software can be accessed free of charge at http://biostatapps.inonu.edu.tr/BTY/. Information on how to show the software as a source in scientific studies is available in the "Citation" menu. Figure 2 shows the "Citation" menu."Shiny" (Chang et al. 2016), "BayesFactor" (Morey et al. 2015) package was used in the development of this software.

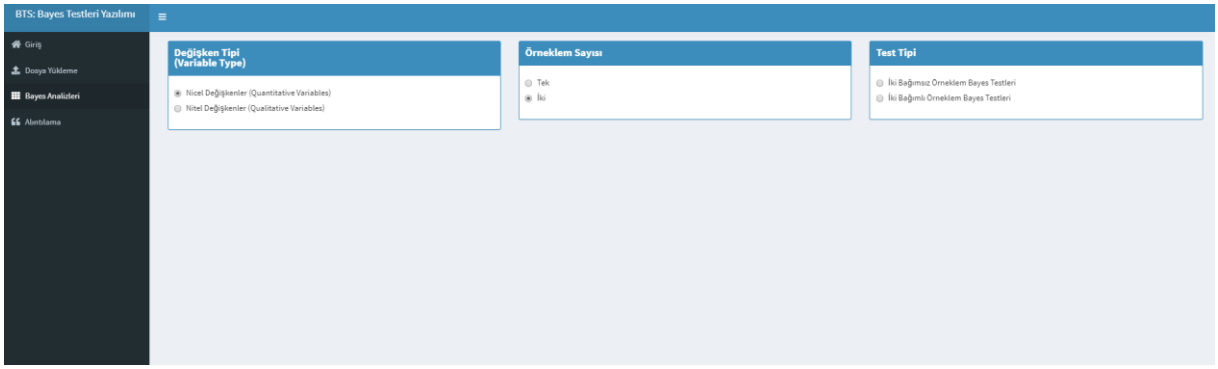

Figure 1. Bayesian Analysis menu

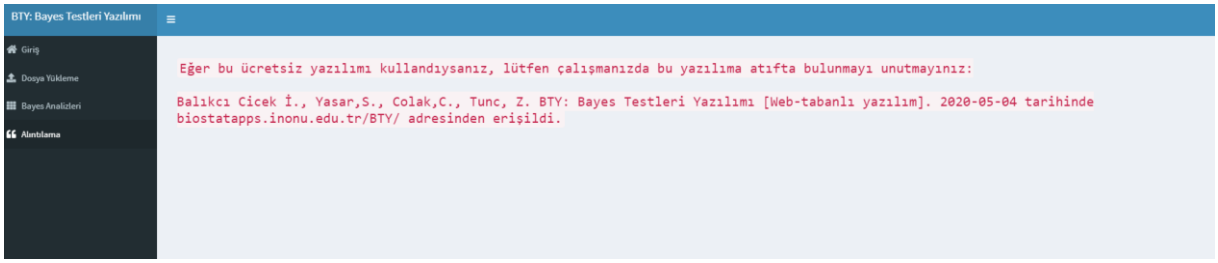

Figure 2. Citation Menu

Results

In this study, the “ulcer recurrence” dataset was used to analyze how this web-based software works and evaluate its output. The user interface of the software is shown in Figure 3.

The descriptive statistics table for age and time variables in the data set are given in Table 2.

The distribution table for the target variable in the data set is given in Table 3.

Firstly, the data set is loaded to the file upload menu in the software. Figure 4 shows the images of the uploaded file.

After the file is uploaded, the test selection is made from the "Bayesian Analysis" tab by the purpose of the study and the data set. To determine whether there is a difference in age variable in terms of result variable, “Two Independent Sample Bayes Tests” were selected and analyzes were performed. Figure 5 shows the images of the results of “Two Independent Sample Bayes Tests” for the variables selected.

According to this output, statistically “little evidence for Ho” was found in the age variable in terms of the result variable. According to the result obtained, it is said that there is no statistically significant difference in terms of the dependent variable compared to the independent variable.

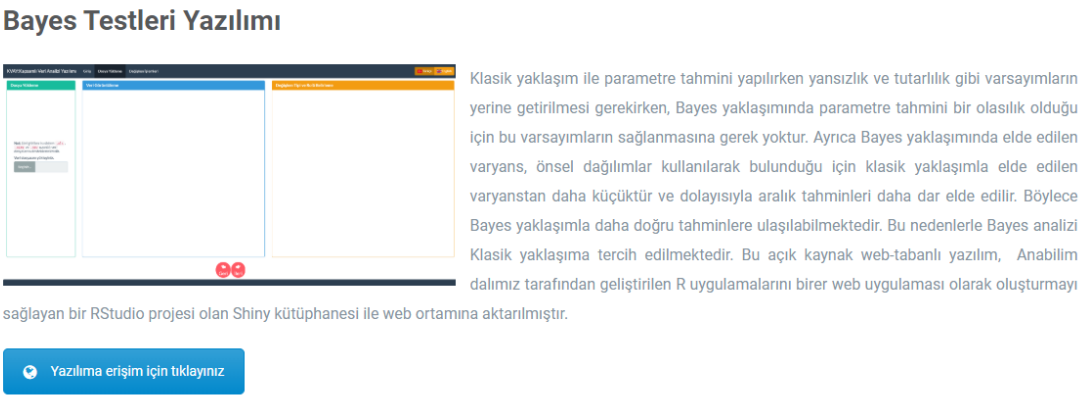

Figure 3: Software Interface

Table 2. Descriptive Statistics table for Age and Time variables

Variables	Mean	Standard deviation	Median	Minimum	Maximum
Age	50.98	16.42	52	23	76
Time	10.42	2.91	12	2	12

Table 3. Distribution table of the variable Result

Ulcer detected		No ulcer detected	
Count	Percentage	Count	Percentage
11	25.6	32	74.4

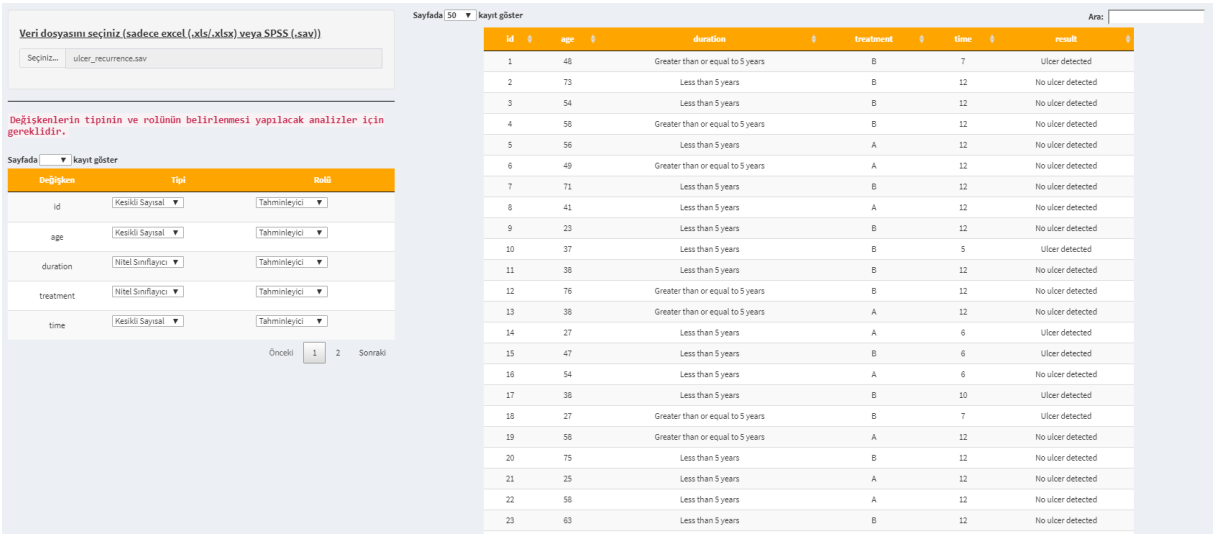

Figure 4. Image of the uploaded file

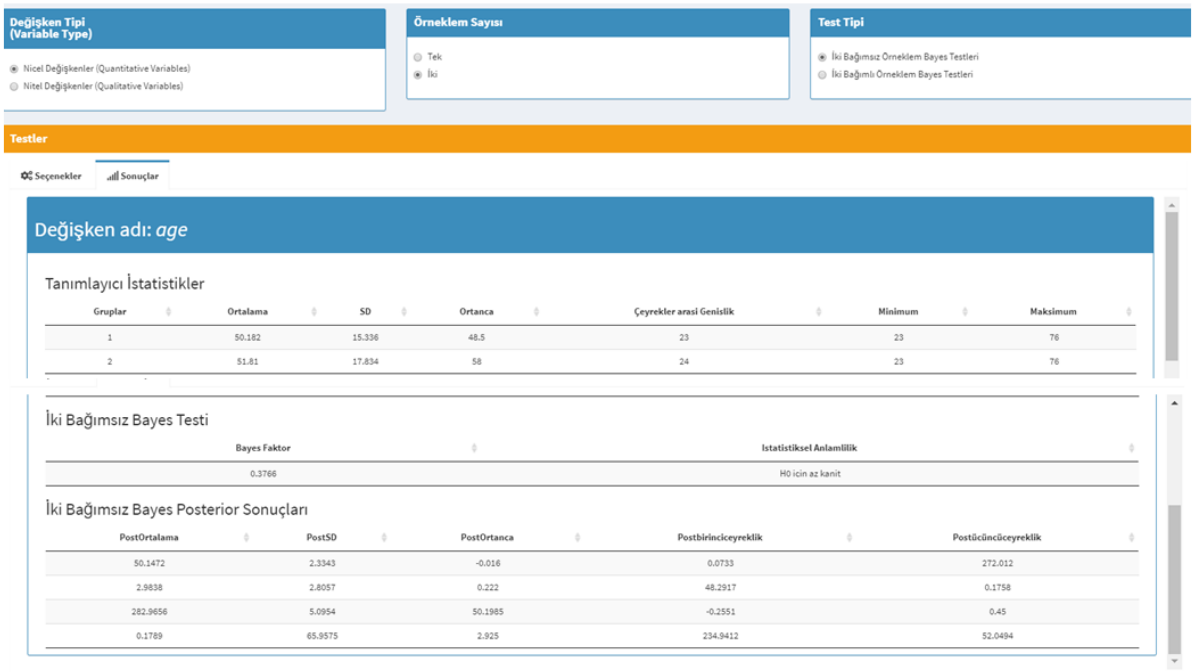

Figure 5. Two Independent Sample Bayes Test Results

Discussion

The foundations of the Bayesian approach emerged in the 18th century based on the "Bayesian Theorem". With the changes made since its occurrence until now, it has advanced considerably today and has been an approach used in almost all branches of science. The most important difference between the Bayesian approach and the classical approach is that the parameters are taken as a random variable for analysis in the Bayesian approach. Researchers supporting the classical approach did not accept the Bayesian approach since the prior distributions selected for the parameters were subjective (Press 1989, Demirhan 2004). Although it has sometimes been left behind by the advocates of the classical approach since its development, it has always been compared with the classical approach. In the working principle of classical statistical methods, unknown parameters are assumed to be fixed and probabilities related to these parameters are determined by using relative frequencies. According to these assumptions, since the parameters are fixed, probability inferences about them cannot be made. For this situation, Bayesian methods, which accept the probability as a " degrees of belief"(that is, the degree of belief in the accuracy of an event) and the trial parameter as a random variable, offer an alternative approach to the classical approach. In other words, parameters are accepted as random variables in the Bayesian approach (Bolstad 2007, Ibrahim et al. 2014).

For the studies, this developed web-based software has “One Sample Bayes Tests” for “One” sample size, “Two Independent Sample Bayes Tests” and “Two Dependent Sample Bayes Tests” and tabs for “Two” sample size. In the software, descriptive statistics of variables, outputs related to the test, comments about the outputs, and posterior results of the variable are presented to users. Some package programs such as IBM SPSS Statistics (Spss 2013), Minitab (Minitab 2000), and Stata (StataCorp 2007) and JASP (Team 2018), which are among the known package programs, carry out Bayesian analysis but there is no interpretation of the analysis output in these programs. Also, the software we developed offers free access.

Besides, it is planned to add “More Than Two Independent Sample Bayes Tests” and “More Than Two Dependent Sample Bayes Tests” tabs for the “More than Two” sample size. Codes that cannot be found in the R programming language for more than two samples codes in the Python programming language will be interoperable by adding a Python session to the R session with the Reticulate package. As a result, the developed software is a user-friendly web-based software that allows users to perform Bayesian tests that can be used as an alternative to single and two-sample tests in the classical approach.

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References

Akar, M. & S. Gundogdu. Use of Bayes theory in seafood. Journal of FisheriesSciences. com, 2014; 8: 8-16.

Altuntas, M. Bayesian Approaches in Statistical Model Selection and Bayes Factor. Master Thesis. TC Sinop University Institute of Science, Sinop, 2011

Ashby, D. & A. F. Smith Evidence-based medicine as Bayesian decision-making. Statistics in medicine, 2000; 19: 3291-3305.

Berg, B. A. Introduction to Markov chain Monte Carlo simulations and their statistical analysis. Markov Chain Monte Carlo Lect Notes Ser Inst Math Sci Natl Univ Singap, 2005; 7: 1-52.

Berger, J. The case for objective Bayesian analysis. Bayesian analysis, 2006; 1: 385-402.

Bolstad, W. Introduction to Bayesian Statistics Second Edition, A John Wiley & Sons. Inc., New York, 2007

Cengiz, M., Y. Terzi & B. Yuksel A Bayesian approach in detecting vascular occlusion. Journal of Experimental and Clinical Medicine, 2009; 21.

Cengiz, M. A., E. Terzi, T. Senel & N. Murat A bayesian approach to parameter estimation in logistic regression. Afyon Kocatepe University Journal of Science and Engineering Sciences, 2012; 12: 15-22.

Chang, W., J. Cheng, J. Allaire, Y. Xie & J. McPherson shiny: Web Application Framework for R; 2016. R package version 0.13. 2. URL: http://CRAN. R-project. org/package= shiny.

Congdon, P. Bayesian statistical modelling. John Wiley & Sons, 2007

Demirci, M. Bayes Theorem and its applications in business administration. The Journal of Academic Social Science Studies, 2016; 43: 439-462.

Demirhan, H. Bayesian estimation of parameters and expected cell frequencies in logarithmic linear models.Master of Science Thesis. Hacettepe University, 2004

Gelfand, A. E., S. E. Hills, A. Racine-Poon & A. F. Smith Illustration of Bayesian inference in normal data models using Gibbs sampling. Journal of the American Statistical Association, 1990; 85: 972-985.

Gilks, W., S. Richardson & D. Spiegelhalter. Markov chain Monte Carlo in practice. 1995. Chapman and Hall/CRC.

Ibrahim, J. G., M. H. Chen & D. Sinha Bayesian Survival Analysis. Wiley StatsRef: Statistics Reference Online, 2014

Jeffreys, H. The theory of probability. OUP Oxford, 1998

Kass, R. E. & L. Wasserman Formal rules for selecting prior distributions: A review and annotated bibliography. Journal of the American Statistical Association, 1996; 435: 1343-1370.

Minitab, I. MINITAB statistical software. Minitab Release, 13, 0., 2000

Morey, R. D., J. N. Rouder, T. Jamil & M. R. D. Morey Package 'bayesfactor'; 2015. URLh http://cran/r-projectorg/web/packages/BayesFactor/BayesFactor pdf i (accessed 1006 15).

Press, S. J. Bayesian statistics: principles, models, and applications. John Wiley & Sons Inc., 1989.

Spss, I. IBM SPSS statistics 22. New York: IBM Corp., 2013

StataCorp, L. Stata data analysis and statistical Software. Special Edition Release, 2007;10: 733.

Team, J. JASP (Version 0.9)., 2018; Computer software. https://jasp-stats. org.

Wong, M., K. Lam & E. Lo Bayesian analysis of clustered interval-censored data. Journal of dental research, 2005;84: 817-821.

Yin, G. & J. G. Ibrahim. Bayesian transformation hazard models. In Optimality, 2006; 170-182. Institute of Mathematical Statistics.

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RESEARCH ARTICLE

Assessment of Dentists' Referral Patterns to Endodontist in Turkey

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Abstract

Objective: To determine the factors of endodontic referral from general dental practitioners in Turkey.

Methods: A questionnaire containing 39 questions was designed to determine the need for referral to endodontists and the factors that influenced the decision to refer a patient to the endodontist. The survey was sent by e-mail to be registered dentists in a database of the Turkish Dental Association, and only unequivocal responses were included in calculating the percentage data. The categorical data were analyzed with a chi-square test, and the results were presented as frequency and percentage. The significance threshold for all tests was set at $p<0.05$.

Results: The response rate was 5.5% (655). The majority (96.8%) of the respondents performed root canal treatment by themselves, and they refer the patient to an endodontist (92.3%) when they encounter a challenging case. Statistical analyses revealed that female general dentists referred more patients to endodontists than males ($p<0.05$). "Limitations in mouth opening" was the most common referral reason in the patient related factors. "Difficult diagnosis" was the most common referral reason in the teeth and diagnosis-related factors. A statistically negative correlation was found between the professional experience and patient referral ($p<0.05$).

Conclusion: We concluded that many patient- and tooth-related factors influence the endodontic referral of patients. For a successful treatment, a general dentist should make a proper diagnosis and refer to a specialist if necessary.

Keywords: Case management, Endodontics, Referral, Questionnaires

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Introduction

There is a significant need for root canal treatment in the population. General dental practitioners (GDPs) have performed the vast majority of root canal treatments worldwide (deMoor et al, 2000; Kirkevang et al, 2000). Studies have shown that the success rate of root canal treatment in general dental practice is 60-85%, and the success rate of root canal treatment by endodontist is 98% (Friedman et al., 2003; Alley et al., 2004). Studies have shown that teeth with inadequate root canal filling and coronal restoration were significantly more likely to have apical periodontitis (deMoor et al, 2000; Kirkevang et al., 2001). Previous studies reported that high

retreatment requirements due to the recurrent apical periodontitis among Turkish population (Gencoglu et al., 2010; Ozbas et al., 2011; Kalender et al., 2013). To avoid this complication, the GDP should become more proficient at root canal treatment or refer the patient to an endodontist.

Referral of difficult cases to the endodontist who has advanced knowledge and skill is increases the success of root canal treatment (deMoor et al, 2000; de Cleen et al., 1993). The decision to refer to an endodontist is influenced by many patient- and dentist-related factors (Maupome and Sheiham, 2000; Elderton and Nuttal, 1983; Bader and Shugars, 1993) including clinical experience, confidence, training, working environment, etc (Bader and Shugars, 1993). However, there is little information about when and why dental practitioners refer to an endodontist. There are some published guidelines in endodontic practice which were prepared by specialists to help the practitioners determine the difficulty of a root canal treatment (Rosenberg and Goodis, 1992; Falcon et al., 2001; Ree et al., 2003). The first questionnaire was prepared at the University of California for selection undergraduate student patients in the endodontic department (Rosenberg and Goodis, 1992). Later, Falcon et al. submitted a different form to determine the difficulty of endodontic cases (Falcon et al., 2001). The latest form was published by the American Association of Endodontics (AAE) "endodontic case difficulty assessment form" and was created in 1999 with updates in 2006 (available at https://www.aae.org/uploadedfiles/dental_professionals/endodontic_case_assessment/2006casedifficultyassessmentformb_edited2010.pdf). The aim of these guidelines is to make a standardized protocol that provides a systematic approach for patient evaluation and provide more objective decisions. The main advantage of this guides is to help the dental practitioners decide whether to treat or refer the patient (Messer, 1999).

To improve the quality of endodontic therapy performed by dentists, it is important to determine the need and reasons for referral to endodontists. There have been no previous studies on the factors that may influence the decision to refer a patient to endodontists in a Turkish population. The purpose of this study was to analyze the need for referral to an endodontist and to determine the factors influencing referral among Turkish dental practitioners.

Methods

The local university clinical research ethics committee approved the protocol of this study (Decision date: 15.04.2015, Decision no: 2015/125). A questionnaire containing 39 questions was given to GDPs to identify the factors that influence the referral decision. A short explanation containing the purpose of the questionnaire was added. The name and other information concerning the identity of the participants were not requested.

The questionnaire was modified from the "endodontic case difficulty assessment form" created by AAE. A pilot study including 50 dentists was performed to understand whether the questions were easy to understand. Based on these responses, necessary revisions were performed in the questionnaire.

In the first part of the questionnaire, the demographic information of the participants including clinical experience and gender of GDP were evaluated. According to the clinical experience, the dentists were divided into four groups: group A (one years in practice), group B (2–10 years), group C (11–19 years), and group D (more than 20 years). In the second part of questionnaire, the "endodontic case difficulty assessment form" was applied and the endodontic referral needs were analyzed. Here, the question about patient-related factors, diagnostic and treatment considerations and additional considerations were asked, and the results were evaluated for each participant. The survey was sent by e-mail to the each dentist registered in the database of Turkish Dental Association. Blank or twice answered surveys were excluded from the study. Only unequivocal responses were included in calculating the percentages.

Data analysis

95% confidence to participate in the survey, 655 people were selected ± 3.7% with acceptable error. The data were analyzed with the statistical software IBM SPSS V21 (Chicago, USA). Categorical data were analyzed with chi-square test, and the results were presented as a frequency and a percentage. The significance threshold for all tests was set at $p<0.05$. We used a binary comparison of categorical data held in Minitab Statistical Software 15 software package to compare to Fisher's Exact (Two Tailed) test.

Results

The response rate was 5.5% (655). The ratio of female-to-male respondents was 298(45.5%):356(54.4%). Statistical studies showed that female GDPs referred (97.3%) more patients to endodontist than males (89.9%) ($p<0.05$) (Table 1).

Table 1. The effect of gender to patient referral

Referral Rate	% of total	p value
Female	97.3%	0,0001
Male	89.9%	

The majority of the respondents (37.7%) were group B dentists; 27.5% were group C, 26.1% were group D, and the minority were group A (8.5%). A statistically negative correlation was found between the professional experience and patient referral ($p<0.05$). Responses from group A dentists were more likely than group D. Group B dentists more often referred patients to endodontist than Group D dentists (Table 2).

Table 2. Experience in the profession and patient referral

Year of graduation	Referral rate	p value
Group A	100% (56)[c]	
Group B	94.7% (234)[e]	0.008
Group C	93.9% (169)	
Group D	88.3% (151)	

In the column; a: Comparison between group A and Group B, b: Comparison between group A and Group C, c: Comparison between group A and Group D, d: Comparison between group B and Group C, e: Comparison between group B and Group D, f: Comparison between group C and Group D

3.2% of dentists had never performed a root canal treatment. In any given week 57.4% of dentists treated between 1-10 root canals, and 32.5% of dentists treated between 10-25; 6.4% treated more than 25. In terms of referral, 6.7% did this never, 69.5% rarely, 17.4% occasionally, 4.9% often, and 0.6% usually (Table 3).

Table 3. Frequency of referral

Frequency	% of total
Never	6.7
Rarely	69.5
Occasionally	17.4
Often	4.9
Usually	0.6

Situations in which the GDP refers are shown in Table 4. The most common patient-based reasons were significant limitations in mouth opening (73.3%) and extreme gag reflex (66.4%). The most common diagnostic and treatment considerations were difficult diagnosis (60.6%) and non-visible canals on the radiograph (55.4%). When additional considerations were evaluated, the most common referral reasons were alveolar fracture (56.7%) and external resorption (54.8%).

Discussion

The dentist's undergraduate and post-graduate education is one of the most important factors that affect the success of root canal treatment (deMoor et al, 2000). The decision to perform an endodontic treatment or refer to an endodontist depends on the GDP's evaluation of their knowledge and skills (Peciuliene et al., 2010). Previous studies have suggested various assessment forms to determine the difficulty of root canal treatment (Rosenberg and Goodis, 1992; Falcon et al., 2001; Ree et al., 2003). In this study an "endodontic case difficulty assessment form" was utilized because it is the most recent and comprehensive assessment form.

Questionnaire surveys can be applied by face-to-face, telephone, mail and via the Internet. Questionnaires performed via the Internet are preferable because of ease, speed, and access (Schonlau et al., 2002). Thus, this survey was distributed in Turkey via the Internet. However, internet-based surveys have a low response rate. Information about the topic was added to the survey, and it was also sent to GDPs with a corporate extension to improve reliability as recommended by other studies (Avcıoglu, 2014).

There are currently 11,749 dentists registered with the Turkish Dental Association. 655 questionnaires were received for a response rate of 5.5%. According to Ree et al. (20) 5858 GDPs maintain their own practice in the Netherlands, and 283 GDP (5%) participated in their survey. Our response rate was similar to Ree at al (2003).

Barnes et al. (2011) reported that 94% of GDPs referred patients to endodontists for challenging endodontic cases whereas Abott et al. (2011) and Wolcott and Terlap (2014) reported 46% and 43% referral rates, respectively, in serial endodontic referral rate studies. The referral rates of this study (92.3%) were similar to the referral rates of Barnes et al. (21). Otherwise Abott et al. (2011) and Wolcott and Terlap (2014) reported lower referral rates than this study. In these studies, the authors showed that one-third of the GDPs performed root canal treatment even though they think that they should have referred to an endodontist.

The results of this study showed that female GDPs were likely to refer than males. This concurs with previous surveys (Zemanovich et al., 2006; Cottrell et al., 2007). According to Abott et al. (2011) the reason for the high referral rate of female GDPs is their preference for less risky treatment choices and more positive perception of the endodontist and their work versus male GDPs. Peciuliene et al. (2010) investigated the reasons for referral to a specialist for

Table 4. Factors effect on decision to refer

Factors influence referral behavior		Referral rate (%)
Patient Considerations		
Medical history	Complex medical history	63.7
Anesthesia	Difficulty achieving anesthesia	28.5
Patient disposition	Uncooperative patient	49.3
Ability to open mouth	Significant limitation mouth opening	73.2
Gag reflex	Extreme gag reflex	66.4
Emergency condition	Severe pain or swelling	38.7
Diagnostic and treatment considerations		
Diagnosis	Difficult diagnosis	60.6
Radiographic difficulties	Extreme difficulty obtaining/interpreting radiographs	54.3
Position in the arch	2^{nd} and 3^{rd} molar	25.4
	Extreme inclination and extreme rotation (>30)	43.9
Morphologic aberrations of crown	Fusion	43.6
	Dens in dente	38.7
Canal and root morphology	Extreme curvature (>30^0) or S- shaped curvature	42.5
	Mandibular premolar or anterior with 2 roots	6.4
	Maxillar premolar with 3 roots	14.5
	Canal divides in the middle or apical third	32.3
	Very long tooth (>25mm)	14.6
	Open apex	40
Radiographic appearance of root canals	Canal(s) not visible	55.4
Additional considerations		
Resorption	Extensive apical resorption	30
	Internal resorption	49.9
	External resorption	54.8
Trauma history	Complicated crown fracture of immature teeth	34.8
	Horizontal root fracture	55.2
	Alveolar fracture	56.7
	Intrusive, extrusive, lateral luxation	38.3
	Avulsion	38.9
Endodontic treatment history	Perforation	26.4
	Ledge	23
	Separated instrument	38.7
Periodontal endodontic condition	Concurrent severe periodontal disease	28.3
	Cracked teeth with periodontal complications	34.1
	Combined endodontic/periodontic lesion	45.8
	Root amputation prior to endodontic treatment	44.2

endodontic therapy among GDPs. The results revealed that the referral rates of less experienced GDPs were higher than experienced GDPs. In contrast, Caplan et al. (1999) reported that GDPs with 10 years or more experience were more likely to refer. Ree et al. (2003) found no significant relationship between years of experience and referral rate. Here, a statically negative correlation was found between the professional experience and patient referral. This agrees with Peciuliene et al. (2010) and disagrees with Caplan et al. (1999) and Ree et al. (2003). The difference between these studies might be the

educational differences and/or the number of endodontics specialists in these countries. The cost and insurance coverage of endodontic treatment in these countries might be also having effect on the difference between the studies.

Here, the factors that influenced referral were examined with three main categories: "patient considerations", "diagnostic and treatment consideration" and "additional considerations". Patient consideration consisted of medical history, anesthesia, patients' disposition, ability to open the mouth, gag reflex, and emergency conditions. The diagnosis, radiographic difficulties, position in the arc, morphologic aberrations of crown, canal and root morphology, and radiographic appearance of root canals were investigated under diagnostic and treatment considerations. Finally, resorption, trauma history, endodontic treatment history and periodontal/endodontic condition were investigated under additional considerations. A significant limitation in mouth opening (73.2%) and extreme gag reflex (66.4%) were the most effective factors influencing endodontic referral related to patient considerations. Difficult diagnosis (60.6%) and non-visible canals on the radiograph (55.4%) had highest referral rates in terms of diagnostic and treatment consideration. Alveolar fracture (56.7%) was most common reason for endodontic referral related to additional considerations. The "patient-related factors" were the most effective category of endodontic referral.

Several studies on endodontic referral have been published. Harty reported that most common reasons for endodontic referral were previous root fillings (19.8%), inability to control pain or swelling (13.7%) and diagnostic problems (12.8%) (Harty, 1992). Management of pain (%24), blocked canals (17%) and endodontic retreatment (%15) were the most common reasons of endodontic referral reported by Abbott in Australia (Abbott, 1994). Hommez et al. (2003) found that the most common reasons for endodontic referral were silver point retreatment (56.7%) and perforation (47.6%) in Belgium. Apicoectomy/retrofill (84-95%) and external root resorption were the top reasons for endodontic referral in the Pacific Northwest (Caplan et al., 1999). Obstruction in canals (54%) and the presence of post, crown, and bridge restoration of teeth (37%) were common reasons for endodontic referral in Holland (Ree et al., 2003). Peciuliene et al. (2010) found that the persistent symptoms (82.4%) and difficulty in diagnosis (74.2%) were common reasons for endodontic referral in Lithuania. Persistent pain (29.5%), gingival swelling and sinus tract (24.1%) were the most common reasons in Korea (Kim, 2014). In this study the most referral reasons were significant limitations in mouth opening (73.3%) and extreme gag reflex (66.4%). Different reasons and proportions of endodontic referral are due to educational differences of dental faculties between different countries. The endodontist availability could also affect the results. One limitationof this study is the low response rate (5.5%). However, low response rates are a common issue for Internet-based questionnaires (Avcıoglu, 2014). Face-to-face surveys could solve this problem in further studies.

Conclusion

The major factors underlying endodontic referral were the complex medical history and significant limitations in mouth opening. Referral to an endodontist depends on many reasons like patients and tooth-related factors that were investigated here. The resources of the dental establishment for patients and financial issues including insurance coverage might also influence referral. Further studies regarding the relationship between referral behavior and dental establishments' opportunities as well as financial issues like insurance coverage should be performed. The GDP should confirm endodontic referral for challenging cases, and dental schools should give training about endodontic referral.

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References

Abbott JA, Wolcott JF, Gordon G, Terlap HT. Survey of general dentists to identify characteristics associated with increased referrals to endodontists. J Endod. 2011;37(9):1191-6.

Abbott PV. Analysis of a referral-based endodontic practice: Part 1. Demographic data and reasons for referral. J Endod. 1994;20(2):93-6.

Alley BS, Kitchens G, Alley L, Eleazer P. A comparison of survival of teeth following endodontic treatment performed by general dentists or by specialists. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2004;98(1):115-8.

Avcıoglu GŞ. Internet survey applications in social sciences: response rate, data quality, sample problems and solutions. International Journal of Human Sciences 2014;11:89-113.

Bader JD, Shugars DA. Agreement among dentists' decisions for restorative treatment. J Dent Res. 1993;72(5):891-6.

Barnes, S. Patel & F. Mannocci. Why do general dental practitioners refer to a specific specialist endodontist in practice? Int Endod J. 2011;44(1):21-32.

Caplan DJ, Reams G, Weintraub JA (1999). Recommendations for Endodontic Referral among Practitioners in a Dental HMO. J Endod. 1999;25(5):369-75.

Cottrell DA, Reebye UN, Blyer SM. Referral patterns of general dental practitioners for oral surgical procedures. J Oral Maxillofac Surg. 2007;65(4):686-90.

de Cleen MJH, Schuurs AHB, Wesselink PR, Wu MK. Periapical status and prevalence of endodontic treatment in an adult Dutch population. Int Endod J. 1993;26(2):112-9.

deMoor RJG, Hommez GMG, De Boever JG, Delme KIM, Martens GEI. Periapical health related to the quality of root canal treatment in a Belgian population. Int Endod J. 2000;33(2):113-20.

Elderton RJ, Nuttal NM. Variation among dentists in planning treatment. Br Dent J. 1983;154(7):201-6.

Falcon HC, Richardson P, Shaw MJ, Bulman JS, Smith BGN. Developing an index of restorative treatment need. Br Dent J. 2001;190(9):479-86.

Friedman S, Abitbol S, Lawrence HP. Treatment outcomes in endodontics: The Toronto Study. Phase 1: Initial Treatment. J Endod. 2003;29(12):787-93.

Gencoğlu N, Pekiner FN, Gumru B, Helvacıoğlu D. Periapical status and quality of root fillings and coronal restorations in an adult Turkish subpopulation. Eur J Dent. 2010;4(1):17-22.

Harty FJ. A survey of endodontic procedures performed by practitioners in limited practice. Int Endod J. 1992 Jan;25(1):25-8.

Hommez GM, De Moor RJ, Braem M. Endodontic treatment performed by Flemish dentists. Part 2. Canal filling and decision making for referrals and treatment of apical periodontitis. Int Endod J. 2003;36(5):344-51.

Kalender A, Orhan K, Aksoy U, Basmaci F, Er F, Alankus. A Influence of the quality of endodontic treatment and coronal restorations on the prevalence of apical periodontitis in a Turkish Cypriot population. Med Princ Pract. 2013;22(2):173-7.

Kim S. Prevalence of referral reasons and clinical symptoms for endodontic referrals. Restor Dent Endod. 2014;39(3):210-4.

Kirkevang LL, Orstavik D, Ho Orsted-Bindslev P, Wenzel A. Frequency and distribution of endodontically treated teeth and periapical periodontitis in an urban Danish population. Int Endod J. 2001;34(3):198-205.

Kirkevang LL, Orstavik D, Ho Orsted-Bindslev P, Wenzel A. Periapical status and quality of root fillings and coronal restorations in a Danish population. Int Endod J. 2000;33(6):509-15.

Maupome G, Sheiham A. Clinical decision-making in restorative dentistry. Content-analysis of diagnostic thinking processes and concurrent concepts used in an educational environment. Eur J Dent Educ. 2000;4(4):143-52.

Messer HH. Clinical Judgement And Decision Making In Endodontics. Aust Endod J. 1999;25(3):124-32.

Ozbas H, Aşcı S, Aydın Y. Examination of the prevalence of periapical lesions and technical quality of endodontic treatment in a Turkish subpopulation. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2011;112(1):136-42.

Peciuliene V, Rimkuviene J, Maneliene R, Drukteinis S. The need and reasons for referrals to specialists among Lithuanian general dentists. Medicina (Kaunas). 2010;46(9):611-5.

Ree MH, Timmerman MF, Wesselink PR. An evaluation of the usefulness of two endodontic case assessment forms by general dentists. Int Endod J. 2003;36(8):545-55.

Ree MH, Timmerman MF, Wesselink PR. Factors influencing referral for expert endodontic treatment among a group of Dutch general practitioners. Int Endod J 2003;36: 129-34.

Rosenberg RJ, Goodis HE. Endodontic case selection: to treat or to refer. J Am Dent Assoc. 1992;123(12):57-63.

Schonlau M, Fricker, RD, Elliott MN. Conducting research surveys via e-mail and the web. Santa Monica: Rand; 2002.

Wolcott JF, Terlap HT. Follow-up Survey of General Dentists to Identify Characteristics Associated with Increased Referrals to Endodontists. J Endod. 2014;40(2):204-10.

Zemanovich MR, Russell EB, Abbott DM, Maynard GJ Jr, Lanning SK. Demographic variables affecting patient referrals from general practice dentists to periodontists. J Periodontol. 2006;77(3):341-9.

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RESEARCH ARTICLE

A Developed Interactive Web Application for Statistical Analysis: Statistical Analysis Software

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Abstract

Objective: Hypothesis testing, correlation, and regression analysis are statistical methods developed to be used in the statistical inference process which is the main purpose of all scientific studies. The purpose of this study is to develop a web-based application using the Shiny package in R software, which allows the evaluation of the results of scientific research to be made in a simpler, easier and understandable way.

Methods: In this study, the tests and techniques developed in the software were applied to the data derived from the simulation. This web tool will be updated upon the updated R software packages, including ggplot2, shiny, reshape, plotly, shinydashboard, dplyr, plyr, tinytex, DT, rhandsontable, shinyjs, tools, readxl, foreign, shinyWidgets, shinyLP, shinyjqui, stringr, olsrr, perturb, mctest, relaimpo, MASS, MKmisc, aod, caret, shinydashboardPlus, rmarkdown. Scripts were written for calculations that could not be done by these packages.

Results: In the web-based software developed to perform statistical analyses, the results and outputs of the derived dataset were interpreted.

Conclusion: The developed interactive user-friendly web application is freely accessible through http://biostatapps.inonu.edu.tr/IAY. In future studies, it is aimed to strengthen the software by adding modules that perform different multivariate statistical analyzes.

Key words: Statistical analysis software; hypothesis testing; correlation analysis; regression analysis; web-based software

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Introduction

Scientific researches are the studies carried out in order to contribute to science through the systematic and planned collection, interpretation and evaluation of the data (Caparlar and Donmez 2016). In scientific research, the statistic has a significant place. The science of statistics enables the planning of the study, the collection of data, the evaluation, and the inference of a study in order to examine any subject from a scientific point of view. In scientific research, estimation of the populations parameters with the help of the statistics obtained from the samples and in order to generalize the findings to the universe of the research, each stage of the research plan must be made correctly. One of the important stages in research planning is the evaluation of the data collected from the individuals in the sample with the correct statistical methods. The approaches such as basic hypothesis tests, correlation, regression analysis, and data science methods are frequently used in data analysis within this context (Ozdamar, 2013).

The purpose of the hypothesis tests is to examine whether the hypotheses are realized statistically and to make a decision. For this purpose, there are many hypothesis testing methods used depending on the type of data collected (nominal/ordinal/scale), the design of the experiment (dependent/independent), whether it is independent of distribution (parametric/nonparametric) and the number of samples (one/two/more than two) (Alpar, 2010). It is very important to control whether distribution assumptions, one of the hypothesis testing assumptions, are provided. Parametric hypothesis tests used under the assumption that distribution assumptions are provided are considered to be stronger than nonparametric tests (Pituch and Stevens, 2015). Therefore, ignoring the assumption of normality may cause false tests to be applied to the data. Therefore, the results obtained can be misinterpreted (Yazici and Yolacan, 2007).

The correlation analysis is tested whether the relationship between two or more variables is statistically significant. With the correlation coefficient, information is obtained about the direction and strength of the relationship which is statistically significant. Correlation coefficients also vary depending on the type and distribution of data, as in hypothesis testing (Orhunbilge, 2017).

Regression analysis is based on the principle of determining the relationships between the dependent variable and the independent variable (s) and expressing the relationship between them with the help of a mathematical model. The main purpose of the regression analysis is to predict the dependent variable with the help of the independent variable(s). If the number of the independent variable is more than one, regression analysis is done to find the answer to the question, "Which argument is affected more by the dependent variable?" (Alpar 2013).

The aim of this study is to develop a web-based software with open source access that is independent of the operating system and user-friendly that performs basic statistical methods which are hypothesis testing, correlation analysis and regression analysis (linear /binary logistics).

Methods

In order to introduce the working principles of the developed web-based software, the data set, in which quantitative variables consisting of five variables, three quantitative and two qualitative, have the standard normal distribution ($\mu=0,\sigma=1$) and the variables contain 1000 observations, is derived from the simulation tab of IBM SPSS Statistics version 25.0 (Corp. 2017). The basic features and descriptive statistics for the data set are given in Table 1.

Table 1. The basic features and descriptive statistics for the data set

Variables	Variable Type	Descriptive Statistics	
y	Categorical	0	589 (58,9)
		1	411 (41,1)
x_1	Categorical	0	279 (27,9)
		1	402 (40,2)
		2	319 (31,9)
x_2	Continual	197,7 ± 18,5	
x_3	Continual	182,7 ± 18,6	
x_4	Continual	175,2 ± 22,3	

Developed Web-Based Software

In the development of the web-based application, the Shiny (Chang et al. 2017) package was used on the basis of the R programming language. With web-based software, normality, hypothesis testing, correlation analysis, linear regression, and logistic regression analysis are performed. The description of the main and sub-menus of the web-based application is detailed below.

Introduction Menu

The "Introduction" menu, the first menu of this web-based software, contains information about the software. The screenshot of this menu is shown in Figure 1.

Upload File Menu

In the "Upload File" menu of the developed web-based software, MS Excel (.xls / .xlsx) and SPSS (.sav) extensions are loaded with file types containing the data set. It is possible to change the values of the loaded dataset, delete rows and add variables. In addition, in this menu, there is a sub-menu where the type and role of the variables in the loaded data are determined. The screenshot of this menu is depicted in Figure 2.

Normality Menu

In this menu of the developed web-based software, Shapiro-Wilk and Kolmogorov Smirnov tests are used to test the compliance of the variable (s) to normal distribution. Shapiro-Wilk normality test is a test used when the number of subjects for each group in independent measurement and sample size in dependent measurement is less than or equal to 50. However, in other cases, the test used for normality tests is usually the Kolmogorov-Smirnov normality test (Alpar, 2010). The image of this menu is depicted in Figure 3.

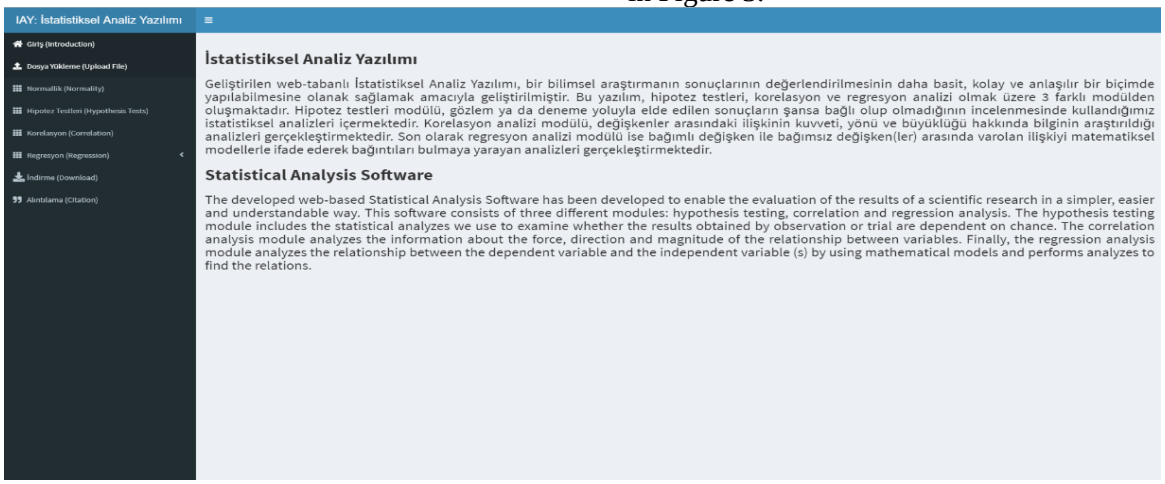

Figure 1. "Introduction" Menu

Figure 2. "Upload File" Menu

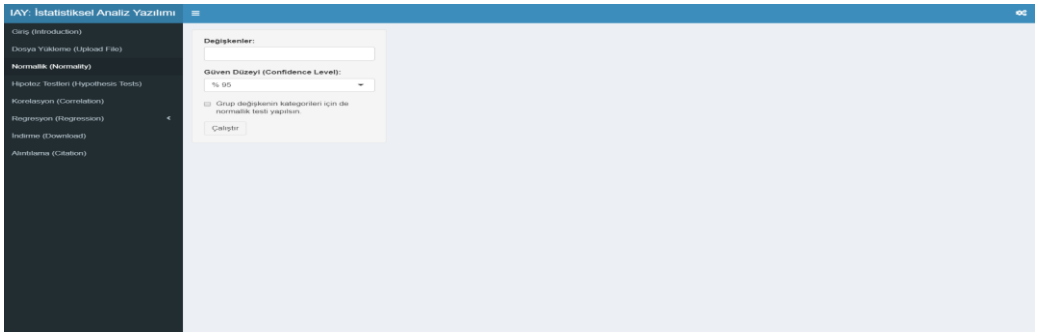

Figure 3. "Normality" Menu

Hypothesis Tests Menu

In the related menu of the developed web-based software, there are basic hypothesis tests that can be used depending on the measurement format of the variables, the structure, and the number of groups. The hypothesis testing menu consists of two submenus, “Quantitative Variables” and “Qualitative Variables”, where the measurement method of variables is determined. There are 3 options: "One", "Two" and "More than Two" in the "Quantitative Variables" sub-menu. In these sections, sample/group numbers are determined. In the "One" menu, there is the "One-Sample t-Test" option, which is used when the sample/group number is one. In the “Two” sub-menu, there are tabs that can be used depending on the sample/group structure. If the sample/group structure is independent, the "Two Independent Sample t-Tests" button is selected. However, if the sample/group structure is dependent, the "Two Paired Sample t-Test" button can be preferred. The "Two Independent Sample t-Tests" submenu includes the "Two Independent Sample t-Tests" used when the variables provide normal distribution assumptions and the "Mann-Whitney U Test" that can be applied when the normal distribution assumption is not realized. On the other hand, the “Two Dependent Sample t-Test” menu consists of the “Paired Sample t-Test” button that can be used when the normal distribution assumption of dependent measurements is provided and the “Wilcoxon Test” button that can be used when normal distribution assumptions are not provided. In the sub-menu where the number of groups is "More than 2", there are "More Than Two Independent Sample Tests" and "More than Two Dependent Sample Tests" which are preferred depending on whether the group structure is dependent and independent. The "More Than Two Independent Sample Tests" sub-menu includes the "One-Way Analysis of Variance (One-way ANOVA)" that can be applied under the normal distribution assumption of groups and the "Kruskal-Wallis Test" that can be realized when the normal distribution assumption of groups is not provided. Similarly, in "More than Two Dependent Sample Tests" submenu, there is a "Friedman Test" button that can be used in cases where normality assumptions do not occur with "One Way Analysis of Variance with Repeated Measures" button, which can be used under normality assumptions. With the "Automatic Test Selection Mode" in the hypothesis testing menu, the test to be used is performed automatically according to the normality assumption regarding the quantitative variables. In order to set an example for the developed web-based software, the image of the " One Way Analysis of Variance with Repeated Measures" menu is given in Figure 4.

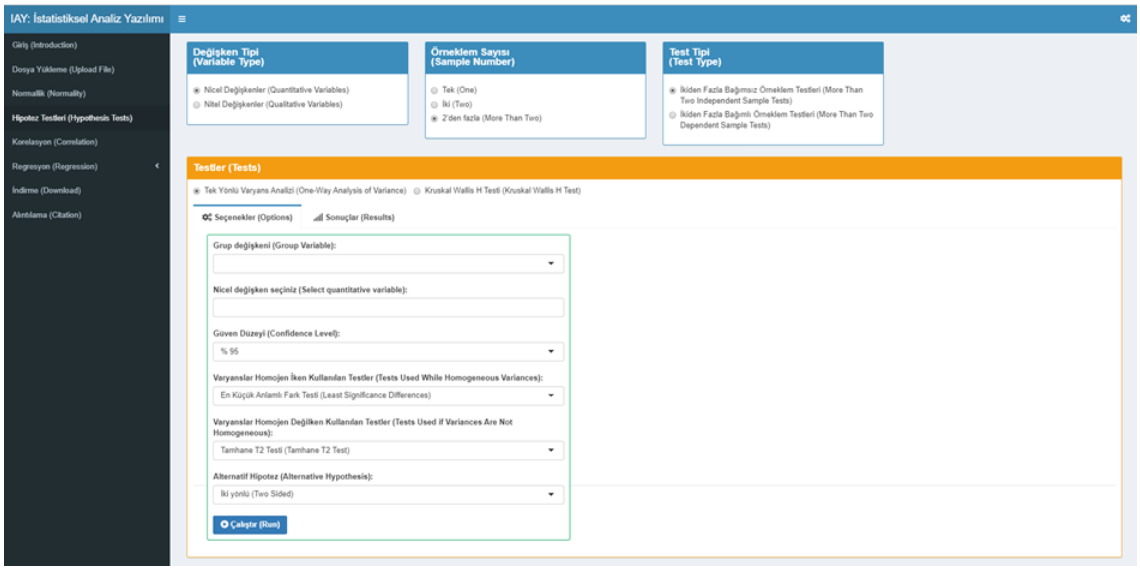

Figure 4. “One Way Analysis of Variance with Repeated Measures” Menu

In the "Qualitative Variables" sub-menu, there are 2 options, namely "One" and "Two", where the sample/group numbers are specified. There is a “Chi-Square Goodness of Fit Test” in the “Single” submenus, where the distribution of a single qualitative variable is tested for the compatibility of any theoretical distribution. On the other hand, in the "two" sub-menu, there is a "Chi-Square Independence Test", which examines whether there is a relationship between two qualitative variables with two or more groups.

Correlation Menu

Pearson Correlation, Spearman Correlation, and Kendall Tau Correlation coefficient were used in this module, where the correlation analysis used to investigate the size, direction, and significance of the relationship between variables was performed, depending on the variables' normal distribution assumptions. If two variables determined by measurement have a normal distribution, the relationship between these two variables can be determined by the Pearson correlation coefficient. On the other hand, the Spearman correlation coefficient or the Kendall Tau correlation coefficient can be used if two variables are qualitative, or if at least one of these two variables do not have a normal distribution. The value of the correlation coefficient ranges from -1 to +1. The sign for these values indicates the direction of the relationship. The strength of the relationship increases as the coefficient approaches -1 and +1. On the other hand, as the coefficient approaches 0, the strength of the relationship decreases (Alpar, 2010).

The correlation menu consists of two submenus, “Which Correlation Coefficient Should I Use?” And “Analysis Outputs”. In the "Which Correlation Coefficient Should I Use?" menu, it is aimed to determine the appropriate correlation coefficient before correlation analysis. To determine the appropriate coefficient, all possible variable pairs are tested by the Shapiro-Wilk normality test. Then, the relevant p-value for each variable and the correlation coefficient suitable for use in the study of the relationship between the variable pair are suggested to the researchers. In the "Analysis Outputs" menu, the correlation coefficient value, p-value and statistical significance selected between the variable pairs are summarized with a table. As an example, the image of the "Analysis Outputs" sub-menu under the correlation menu is given in Figure 5.

Regression Menu

The “Regression” analysis, which is used to determine the relationship between two or more variables with a cause and effect relationship, may vary depending on the measurement type of the dependent variable. Similarly, when the dependent variable is a qualitative two-category variable, Binary Logistic Regression Analysis is used in studies in which the cause-effect relationship between the independent variables and the dependent variable is investigated (Orhunbilge, 2017).

The regression menu consists of two submenus: "Linear Regression" and "Logistic Regression". As an example, the image of the “Linear Regression” menu is given in Figure 6.

Download Menu

The "Download" menu in the developed web-based software allows the researchers to download and store all analysis outputs related to their work with the extension "PDF", "Word" and "HTML". The image of this menu is given in Figure 7.

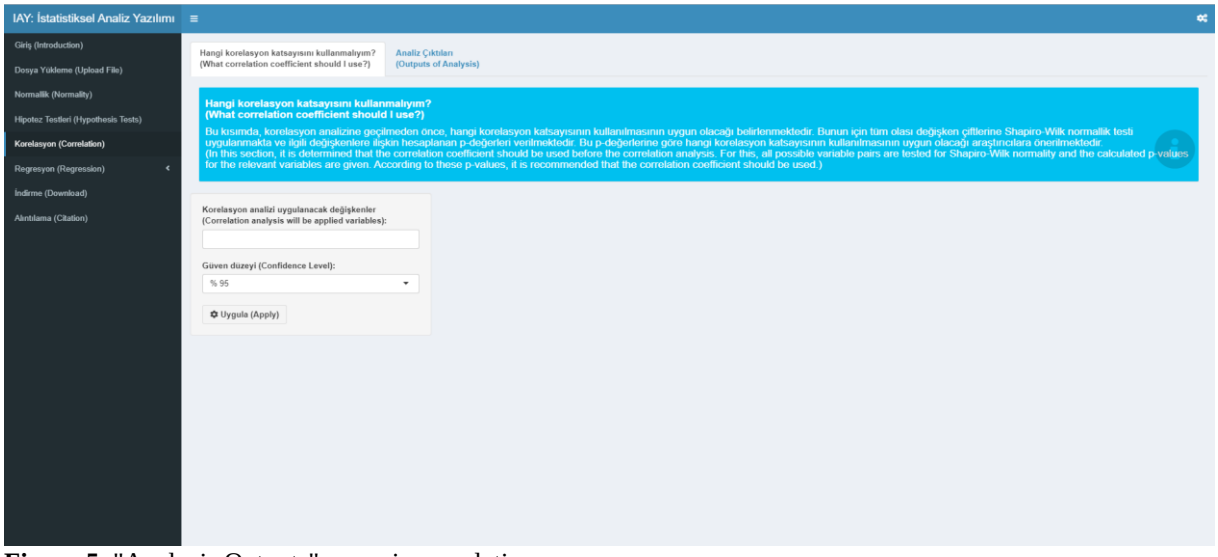

Figure 5. "Analysis Outputs" menu in correlation menu

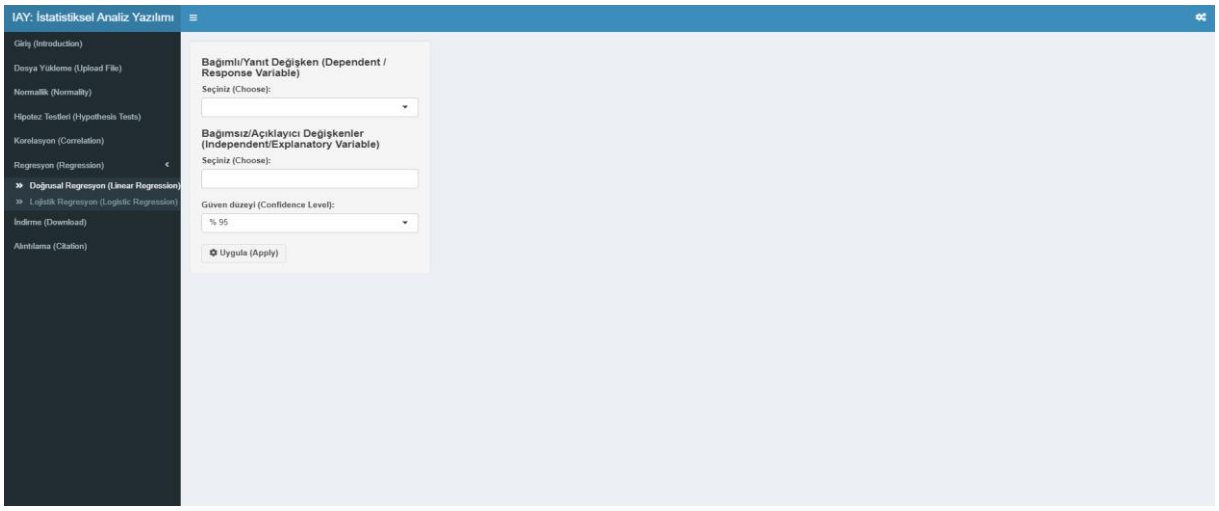

Figure 6. "Linear Regression" Menu

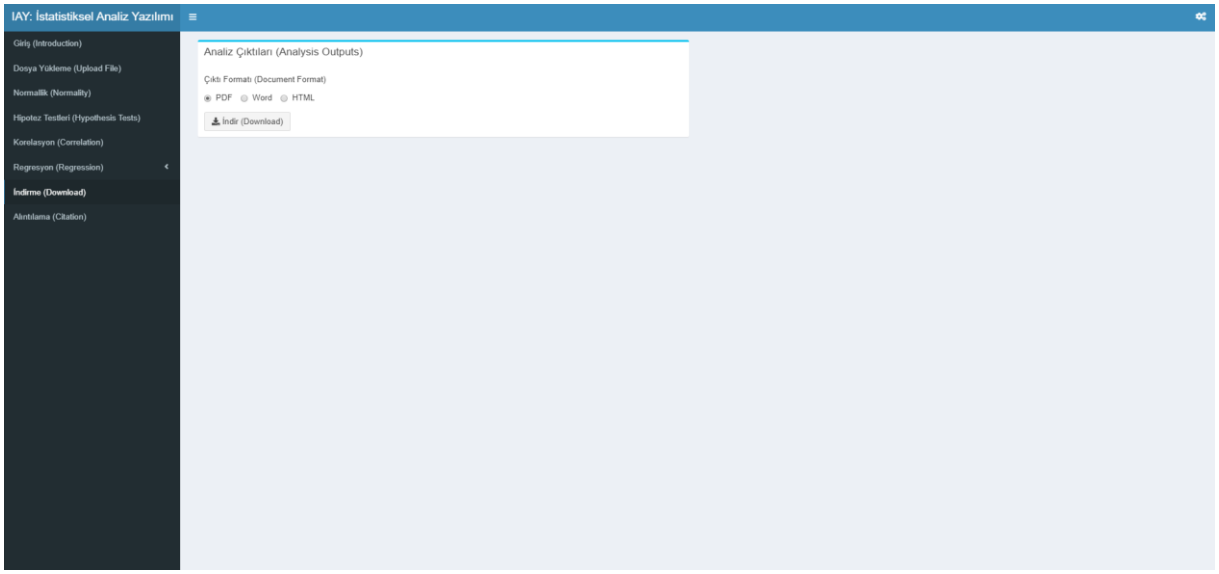

Figure 7. "Download" Menu"

Access to Developed Interactive Web Application

The developed interactive web application can be accessed free of charge at http://biostatapps.inonu.edu.tr/IAY/. This web-based software has been developed on updated R software packages including ggplot2 (Wickham, 2011), shiny (Chang et al. 2017), reshape (Wickham and Wickham 2017), plotly (Sievert et al. 2018), shinydashboard (Chang and Borges Ribeiro 2017), dplyr (Wickham 2018), plyr (Wickham and Wickham, 2016), tinytex (Yihui Xie et al. 2019), DT (Xie et al. 2015), rhandsontable (Jonathan Owen et al. 2018), shinyjs (Attali, 2016), tools (Hadley Wickham, 2018), readxl (Wickham and Bryan, 2017), foreign (Team et al. 2019), shinyWidgets (Perrier, 2019), shinyLP (Dumas, 2019), shinyjqui (Tang, 2018), stringr (Wickham, 2010), olsrr (Hebbali, 2018), perturb (Hendrickx and Hendrickx, 2019), mctest (Imdadullah et al. 2016), relaimpo (Groemping and Matthias, 2018), MASS (Brian Ripley et al. 2019), MKmisc (Kohl and Kohl, 2016), aod (Lesnoff et al. 2010), caret (Kuhn, 2012), shinydashboardPlus (David Granjon et al. 2019), rmarkdown (Baumer et al. 2014).

Results

The image of the "Upload File" menu formed as a result of loading the derived data set into the software to show the operating principles of the menus of the web-based software is given in Figure 8.

Normality Analysis

It is aimed to investigate the normality of the x2 variable in the derived dataset both in terms of the variable and in terms of the categories of the y variable. The image of the outputs regarding the

normality analysis that takes place when the "Run" button is pressed is given in Figure 9. Considering the results, the variable x2 showed a normal distribution according to the Kolmogorov Smirnov normality analysis. In addition, according to the subgroup analysis using the variable y, the variable x2 shows a normal distribution on the basis of each group.

Hypothesis Tests

To demonstrate the working principle of the hypothesis testing menu, consider the x4 quantitative variable and x1 categorical variable in the derived data set. Whether there is a statistically significant difference between subcategories of x1 variable in terms of x4 variable is wanted to be examined by one-way analysis of variance. The image of the one-way analysis of variance to be performed is given in Figure 10. When the assumption of homogeneity variances is provided in Table 8, it is preferred to use the “Least Significance Differences Test”, and if the homogeneity assumptions are not provided, the “Tamhane T2 Test” is preferred. When the "Run" button is pressed, the table containing the descriptive statistics related to the variable on the basis of the group, the table containing the statistics obtained as a result of testing the homogeneity of the variances, table with one-way analysis of variance test statistics, a window where the statistical significance of the results is interpreted, a table with statistics on the "Least Significance Difference Test" results in which binary comparisons are made and finally, mean standard deviation graph are obtained. An image of these results is given in Figure 11.

As a result, there is a statistically significant difference between the categories of the x1 variable in terms of the x4 variable (p=0.0454). According to Levene test results, variances show homogeneous distribution. Therefore, there is a statistically significant difference between “0-2” and between “1-2” according to the binary comparisons made using the “Least Significant Difference Test”.

Correlation Analysis

In order to determine the relationship between x2, x3 and x4 variables in the derived data set, it is necessary to determine the appropriate correlation coefficient to be used first. In the developed web-based software, the image of the menu where this coefficient is determined is given in Figure 12.

Since each of the variable pairs showed normal distribution, the appropriate correlation coefficient to be used in the correlation analysis was determined as “Pearson Correlation Coefficient”. The image of the menu with the outputs of the correlation analysis applied according to the determined Pearson correlation coefficient is given in Figure 13.

According to the results obtained, the relationship between the x2 variable and x3 variable and x2 variable and x4 variable is statistically significant, whereas the relationship between x3 variable and x4 variable is not statistically significant.

Logistic Regression Analysis

In the derived data set, an image of the logistic regression analysis performed to model the relationship between the dependent categorical y variable and the independent x3 variable specified by continuous measurement and the categorical x1 variable is given in Figure 14. In the logistic regression analysis carried out as an example, “Entry” was selected, in which all variables were included in the model from the model selection methods. In the image of Figure 14.

In the logistic regression analysis carried out as an example, “Entry” was selected, in which all variables were included in the model from the model selection methods. In the image of Figure 14, a table of Hosmer-Lemeshow test statistics, which is a measure of the effectiveness of the best model created to explain the dependent variable of the model, table of statistics for different explanatory coefficients used as an indicator of fit to the model, table of variables coefficient in the model, classification matrix and table of statistics on classification performances are given.

Download

If it is desired to download with the .html extension of all samples made in order to explain the working principle of the developed web-based software, the resulting image is given in Figure15

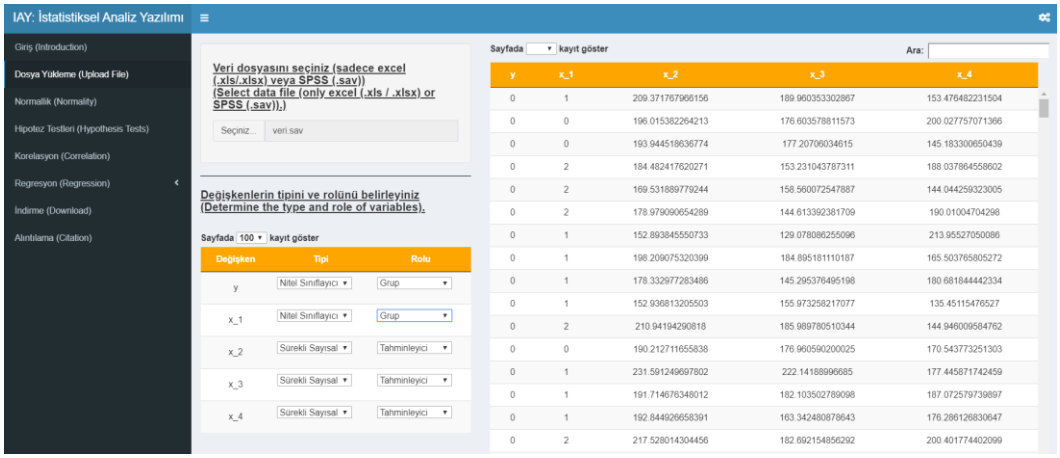

Figure 8. Uploading Data to the Software

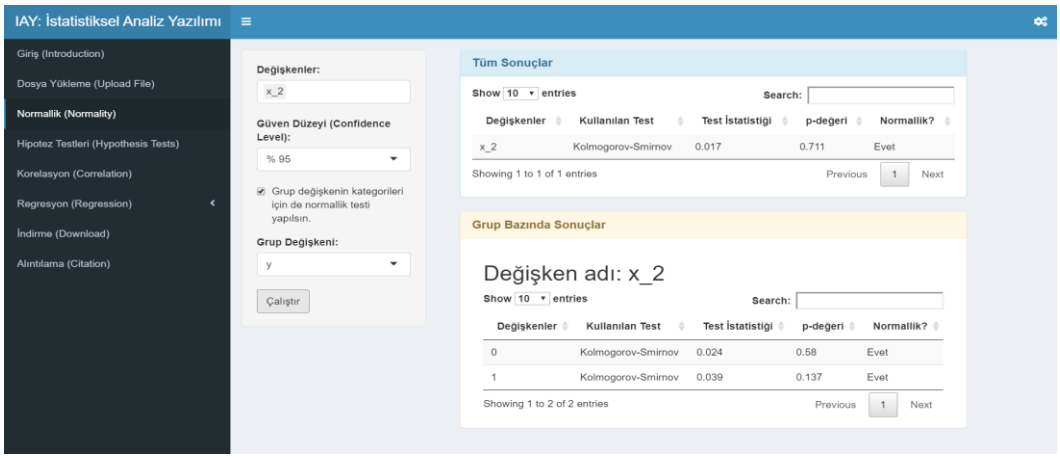

Figure 9. Normality Test Results Regarding x_2 variable

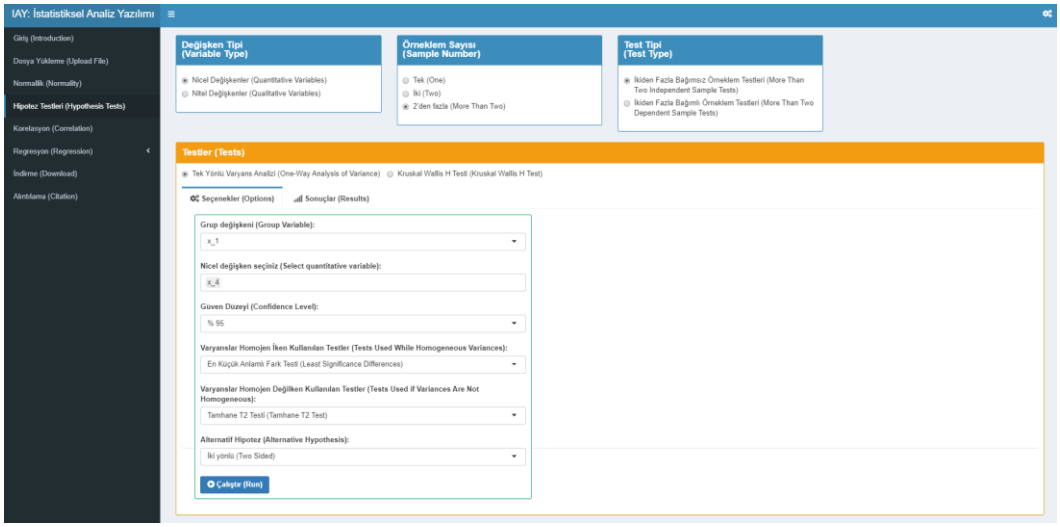

Figure 10. "One-way Analysis of Variance" Hypothesis Testing

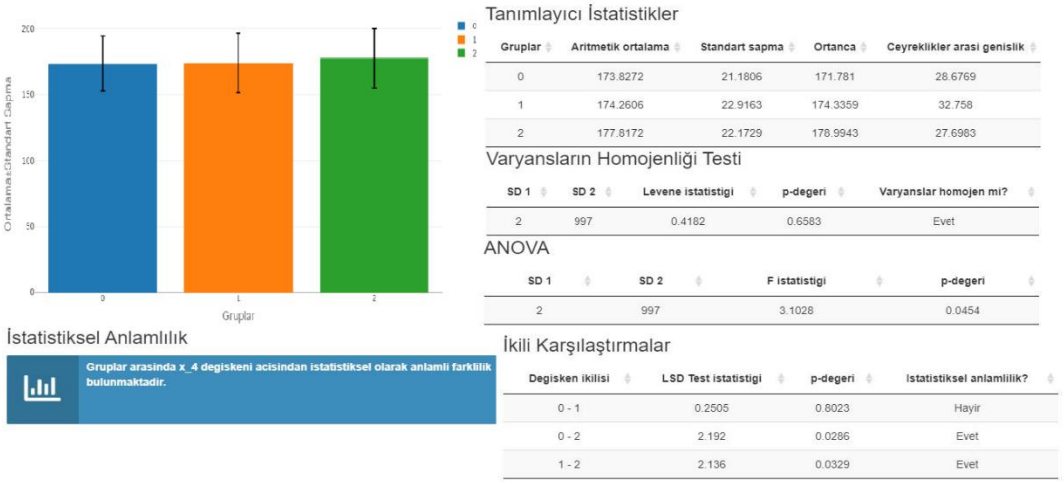

Figure 11. Image of Results Regarding One-Way Analysis of Variance

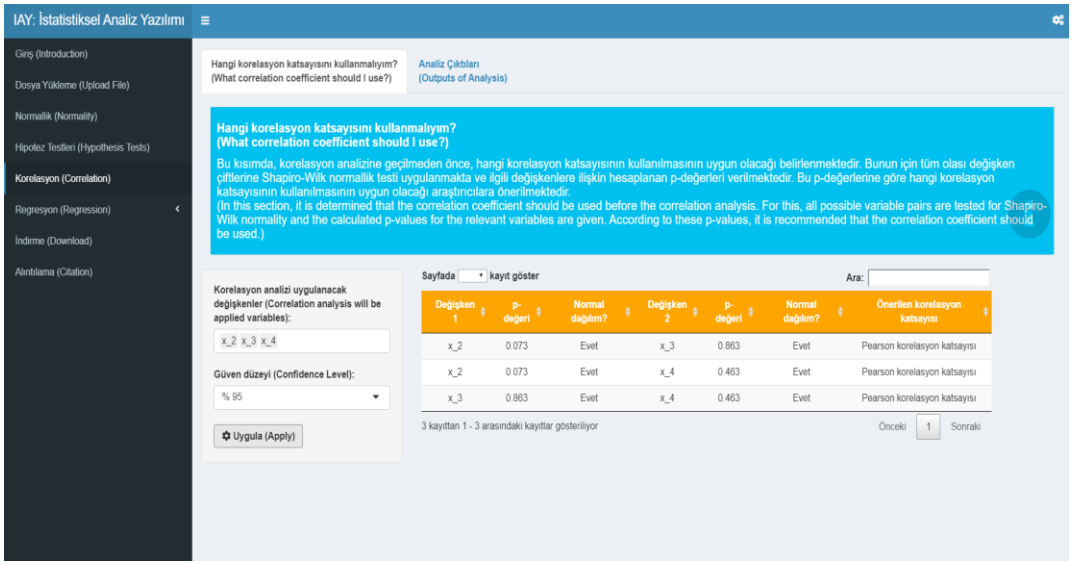

Figure 12. Determining the Appropriate Correlation Coefficient

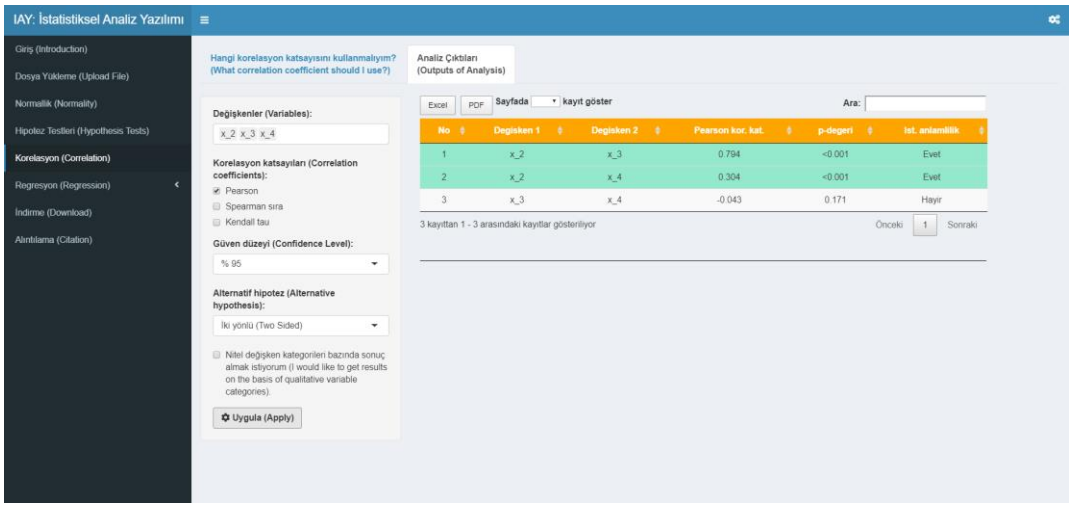

Figure 13. Image of Correlation Analysis Statistics

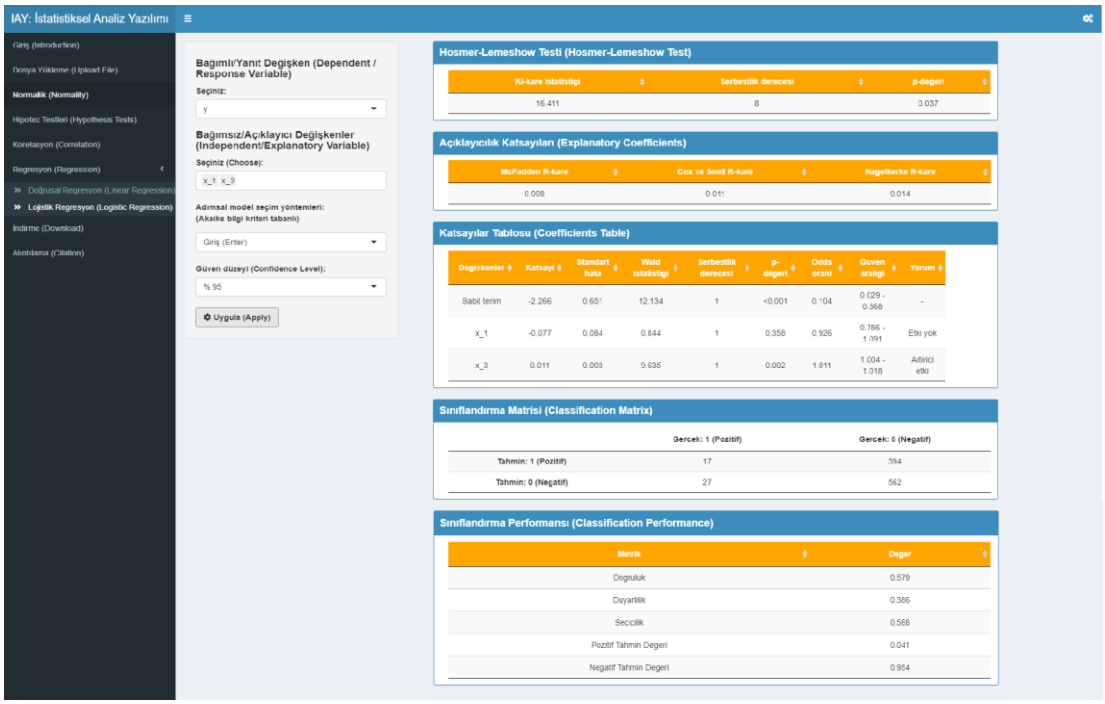

Figure 14. Image of statistics obtained from logistic regression analysis

IAY:Istatistiksel Analiz Yazilimi

Biyoistatistik ve Tip Bilisimi AD

2019-10-29

```
[[1]]


Table: x_4 Degiskenine Iliskin Tek Yonlu Varyans Analizi Tanimlayici Istatistikler

Gruplar   Aritmetik ortalama   Standart sapma   Ortanca    Ceyreklikler arasi genislik
--------  -------------------  ---------------  ---------  ----------------------------
0         173.8272             21.1806          171.781    28.6769
1         174.2606             22.9163          174.3359   32.758
2         177.8172             22.1729          178.9943   27.6983



[[1]]


Table: x_4 Degiskenine Iliskin Tek Yonlu Varyans Analizi Varyanslarin Homojenligi Testi

SD 1   SD 2   Levene istatistigi   p-degeri   Varyanslar homojen mi?
-----  -----  -------------------  ---------  ----------------------
2      997    0.4182               0.6583     Evet



[[1]]


Table: x_4 Degiskenine Iliskin ANOVA Tablosu

 SD 1   SD 2   F istatistigi   p-degeri
-----  -----  --------------  ---------
    2    997             3.1       0.05
```

Figure 15. Downloading the analysis results

Discussion

The analysis of the data collected for scientific research can be carried out by many methods. It is very important to check the assumptions of the analyses to be applied and to interpret the results correctly. At this stage, choosing the wrong statistical analysis method may cause errors in terms of the generalization of the study to the universe (external validity) (Yazici and Yolacan 2007).

Hypothesis testing varies according to the type of data used (nominal/ordinal/continuous), whether the distribution provides normality assumptions (parametric/non-parametric), the structure (dependent/independent), the number of groups (one/two/more than two) handled, etc.. There is much software used and developed to perform statistical analysis. Package programs, which are frequently used in scientific research, are; IBM SPSS Statistics (Corp. 2017), MedCalc (Schoonjans 2009), Minitab (Minitab 2000), Statistica (StatSoft 2001), etc. can be listed as. The difference of the developed web-based software from this aforementioned software is that it directs the researchers to the appropriate test that will be used according to the type of data, structure, and number of groups through consecutive menus. At the same time, the "Automatic Test Selection Mode" available in the software enables the appropriate test to be performed automatically depending on whether or not the assumption of normality on the basis of the variable is achieved. The interpretation of the results of a scientific study is done with various statistical criteria obtained as a result of the analysis. Therefore, the correct interpretation of these criteria is of great importance for the quality of the study. While none of the known statistical analysis programs have an information section that includes the interpretation of statistical criteria/values, this developed web-based software also provides the researchers with comments on the statistical criteria/values obtained. In addition, in the multi-class chi-square analysis menu, the software makes binary comparisons for two variables that have a relationship and interpret the results of the obtained statistics.

In the correlation analysis applications, the coefficient used to determine the direction and strength of the relationship between the two variables varies according to the measurement type of the variables and the assumption of normal distribution (Orhunbilge 2017). Researchers can ignore these assumptions and often choose to use the Pearson correlation coefficient. Statistics obtained by using the wrong correlation coefficient in the analysis phase may cause the results of the research to be evaluated incorrectly. The developed web-based software controls the normal distribution on a variable basis and reports the appropriate correlation coefficient to be used in the analysis. There is also an interpretation of the statistics obtained from the analysis in the correlation analysis menu.

Many assumptions must be fulfilled in order to apply the multivariate regression analysis. One of these assumptions is the multivariate normal distribution for independent variables. There are no modules in this program that control this assumption. Thanks to the developed web-based software, researchers can test the multivariate normal distribution assumption regarding the independent variables used in regression analysis with Mardia's distortion-kurtosis, Henze-Zirkler and Doornik-Hansen test and they can reach the interpretation of the statistical significance related to the obtained test statistics. The multicollinearity problem is another assumption of multivariate regression analysis. In the mentioned programs, statistics such as condition index, variance inflation factor, and tolerance value are used to detect this problem. On the other hand, in addition to these statistical values, Farrar and Glauber Chi-square hypothesis testing is used in the developed software and the test statistics are interpreted.

The significance of the odds ratio statistics obtained as a result of logistic regression analysis and the correct interpretation of the results are of great importance for the correct evaluation of the study. Therefore, in the logistic regression analysis menu of the developed web-based software, it assists the researchers in this regard as it includes the comments on the odds ratio statistics (increasing effect, reducing effect).

Conclusion

The developed web-based software controls hypothesis tests, correlation analysis and simple/multiple linear regression analysis and logistic regression analysis assumptions that will be applied to the data obtained from scientific studies and presents the results obtained in a table. It also provides support for researchers on data analysis and interpretation, as it includes statistical comments on these values.

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References

Alpar R. Applied statistics and validity and reliability with examples from sports, health and education sciences. Ankara: Detay Publishing; 2010.

Alpar R. Applied multivariate statistical methods. Ankara: Detay Publishing; 2013.

Attali D. shinyjs: easily improve the user experience of your shiny apps in seconds; 2016. R package version 0.8 https://CRAN.R-project.org/package=shinyjs.

Baumer B, Cetinkaya-Rundel M, Bray A, Loi L, Horton N. J. R Markdown: Integrating a reproducible analysis tool into introductory statistics. arXiv preprint arXiv:1402.1894, 2014.

Ripley B, Venables B, Bates D M, Hornik K, Gebhardt A, Firth D, Ripley M B. MASS: support functions and datasets for Venables and Ripley's MASS. R package version, 2011, 7: 3-29.

Chang W, Ribeiro B B. shinydashboard: create dashboards with 'Shiny'; 2017. R package version 0.6.1 https://CRAN.R-project.org/package=shinydashboard.

Chang W, Cheng J, Allaire J, Xie Y, McPherson J. Shiny: web application framework for R; 2016. R Package version 0.14.2. https://CRAN.R-project.org/package=shiny.

IBM C. R. IBM SPSS Statistics for Windows, Version Q3 25.0. Armonk, NY: IBM Corporation, 2017.

Caparlar C. Ö, Dönmez A. What is Scientific Research and How Is It Done? Turk J Anaesthesiol Reanim, 2016 44: 212-8.

Granjon D. shinydashboardPlus: Add More 'AdminLTE2' Components to 'shinydashboard'; 2019. R Package Version 0.7.0. https://CRAN.R-project.org/package=shinydashboardPlus.

DUMAS J. shinyLP: Bootstrap Landing Home Pages for Shiny Applications; 2019. R package version. https://CRAN.R-project.org/package=shinyLP.

Groemping U, Matthias L. Package 'relaimpo'; (2018). R package https://cran.r-project.org/web/packages/relaimpo/relaimpo.

Wickham H, Chang W. devtools: tools to make developing R packages easier; 2018. R package version 1.13. 4. https://CRAN.R-project.org/package=devtools.

Hebbali A. olsrr: Tools for building OLS Regression Models; 2018. R version 0.5. 1. https://cran.r-project.org/web/packages/olsrr/olsrr.pdf.

Hendrickx J, Hendrickx M J. Package 'perturb'; 2019. http://cran.r-project.org/web/packages/perturb/perturb.pdf .

Imdadullah M, Aslam M, Imdadullah M. M, LazyData T. R. U. E. Package 'mctest'; 2016. https://CRAN.R-project.org/package=mctest .

Owen J. rhandsontable: Interface to the 'Handsontable. js' library; 2018. R package version 0.3, 7. https://CRAN.R-project.org/package=rhandsontable.

Kohl M, Kohl M. M. Package 'MKmisc'; 2019. R package version 0.3. https://CRAN.R-project.org/package=MKmisc.

Kuhn M. The caret package; 2012. R Foundation for Statistical Computing, Vienna, Austria. https://cran.r-project.org/package=caret.

Lesnoff M, Lancelot R, Lancelot M R, Suggests M. Package 'aod'; 2010. R package version 1.3.1. https://CRAN.R-project.org/package=aod.

Minitab, I (2000) MINITAB statistical software. Minitab Release, 13.

Orhunbilge N, Applied regression and correlation analysis. Ankara: NOBEL Academic Publishing; 2017.

Ozdamar, K. 2013. Biostatistics with SPSS. Eskişehir: Nisan Bookstore Publications; 2013.

Perrier V, shinyWidgets: Custom Inputs Widgets for Shiny; 2019. R package version, 0.4.8. https://CRAN.R-project.org/package=shinyWidgets.

Pituch K A, Stevens J P. Applied multivariate statistics for the social sciences: Analyses with SAS and IBM's SPSS. Routledge: NewYork; 2016.

MedCalc Statistical Software. Version 10.1.6.0, bvba, Ostend, Belgium.

Sievert C, Parmer C, Hocking T, Chamberlain S, Ram K, Corvellec M, Despouy P. plotly: Create Interactive Web Graphics via'plotly. js'; 2016. R package version 3.6. 0. ed. https://CRAN.R-project.org/package=plotly.

StatSoft I, (2001) STATISTICA (data analysis software system), version 6. Tulsa, USA, 150, 91-94.

Tang Y. shinyjqui: 'jQuery UI' Interactions and Effects for Shiny; 2018. https://CRAN.R-project.org/package=shinyjqui.

Team R C, Bivand R, Carey V J, DebRoy S, Eglen S, Guha R, Herbrandt S, et al. Package 'foreign'; 2019. https://CRAN.R-project.org/package=foreign.

Wickham, H. Stringr: modern, consistent string processing. The R Journal 2010; 2(2), 38-40.

Wickham H. ggplot2. Wiley Interdisciplinary Reviews: Computational Statistics 2011; 3(2), 180-185.

Wickham H, Francois R. dplyr: A Grammar of Data Manipulation; 2015.. R package version 0.4. 3. https://CRAN.R-project.org/package=dplyr.

Wickham H, Bryan J. readxl: Read Excel Files; 2017. R package version 1.0. 0. URL https://CRAN. R-project. org/package= readxl.

Wickham H, Wickham M. H. Package 'plyr'; 2016. Obtenido de. https://CRAN.R-project.org/package=plyr.

Wickham H, Wickham M H, Rcpp L. Package 'reshape'; 2018. R package version 0.8.8. https://CRAN.R-project.org/package=reshape.

Xie Y, Cheng J, Allaire J, Reavis B, Gersen L, Szopka B. DT: a wrapper of the JavaScript library 'DataTables; 2015. R package version 0.1. http://CRAN.R-project.org/package=DT.

Yazici, B & Yolacan, S (2007) A comparison of various tests of normality. J Stat Comput Simul., 77, 175-183.

XIE Y. tinytex: Helper Functions to Install and Maintain TeX Live, and Compile LaTeX Documents; 2018. R package version 5.8. https://CRAN.R-project.org/package=tinytex.

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RESEARCH ARTICLE

Impact of The Covid-19 Pandemic on Anxiety and Depression Levels of The Dialysis Center Employees

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Abstract

Objective: Coronavirus (COVID-19), an acute respiratory tract disease caused by a new coronavirus (SARS-CoV-2, formerly known as 2019-nCoV), first emerged in China and then drew attention spreading worldwide. In our study we aimed to determine the impact of the Covid-19 pandemic on the dialysis center employees.

Methods: The healthcare professionals to take part in the study were limited to the dialysis center employees. The study used a questionnaire comprising the participants' socio-demographic characteristics, Beck Anxiety Inventory and Beck Depression Inventory, asdata collection tool. The participants completed the questionnaire on voluntary basis in their own environment. As the Beck Anxiety Inventory and Beck Depression Inventory are grading inventories, their validity was confirmed via factor analyses. In addition their reliability analyses were conducted. In order to test the purposes of the study, the SPSS statistics software was used. The analyses were carried out at 95% (p=0.05) confidence interval. The study used descriptive statistical methods, t and ANOVA tests and correlation analysis.

Results: Among the participants;54.4% are female and 79.4% are aged 26 to 49 years. 51% of the participants have encountered patients with covid, 41.2% have served patients with covid, 22.1% had covid test and tested negative. 55.9% of the participants have developed no anxiety symptoms, while 24% havedeveloped mild symptoms, 11.8% moderate symptoms and 8.3% severe symptoms. 59.3% of the participants have developed no depression symptoms, while 27.5% have developed mild symptoms, 11.3% moderate symptoms and 2% severe symptoms. It was determined that the participants' gender, occupation (title), type of their hospital, state of encountering patients with covid and serving these patients, affected their anxiety and depression levels.

Conclusion: A significant rate of anxiety and depression was determined in the healthcare professionals providing service in hemodialysis units during the Covid-19 pandemic. In all pandemics, it is necessary to carefully evaluate not only patients, but also healthcare professionals providing service to chronic patients and to take measures. Otherwise healthcare professionals who do not feel well, will not be able to provide effective service.

Key words: Covid-19, Anxiety, Depression, Dialysis Center Employees

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Introduction

COVID-19 represents the seventh member of the coronavirus family which infects people and is categorized under the orthocoronavirus subfamily. COVID-19 forms a clot in the sarcocovirus subgenus. Covid-19 which is a new type of coronavirus, first emerged as an etiologic agent in indefinite pneumonia cases in the Wuhan city of China. An acute respiratory tract disease caused by a new coronavirus (SARS-CoV-2, formerly known as 2019-nCoV), coronavirus (COVID-19) first emerged in China and then drew attention spreading worldwide. SARS-CoV-2 is a β-coronavirus which is anenveloped RNA virus with a positive sensitivity to non-segment (Zhu et al;2019). In China a total of 79.968 COVID-19 cases and 2873 deaths have been determined since 1 March 2020 (WHO Corona virus disease situation reports ;2020).

Contagiousness of the COVID-19 infection from person to person has led to the isolation of the patients receiving various treatments. Comprehensive measures have been taken to reduce contagiousness of COVID-19 from person to person, in order to control the present pandemic. It is necessary to apply a particular effort and attention in order to protect or reduce infection among sensitive populations, including children, healthcare service providers and the elderly (Hussin et al, 2020). Just as the general population is under the risk of a psychological distress during the COVID-19 pandemic, the experiences gained from the SARS and H1N1 pandemics stress the importance of the psychological pressure on healthcare professionals who come to the forefront in interventions aimed at suppressing the pandemic (Chong et al; 2004, Goulia et al, 2010).

The study showed that there was a significant correlation between anxiety and depression levels of the hemodialysis patients and caregivers (Wang; 2012; Sajadi et al, 2017). It is necessary to individually evaluate the dialysis patients and professional caregivers administering treatment to these patients and to apply special interventions in order to reduce anxiety and depression levels among them (Gerogianni et al, 2019). Assistant health personnel working in the dialysis unit should pay attention to personal hygiene and should be ensured to work with protective equipment (mask, gloves, protective gown, disinfectant). This awareness can reduce the level of anxiety. Hospital management should provide all the necessary support for the provision of protective equipment, otherwise an important health service such as dialysis service will be interrupted.(Naicker et al, 2020) Interestingly enough, healthcare professionals tend to focus on biological aspect of the disease or other technical issues related to hemodialysis machine. They usually underestimate the symptoms in the mental area (Vasilopoulou et al, 2016). It might be a necessary measure to encourage patients to express their feelings and meet their psychological needs, in order to face this enervating disease. Inadequately treated or untreated anxiety and depression may reduce the quality of life among patients and caregivers (Pereira et al;2017).

In this study we investigated the impacts of the Covid-19 pandemic on anxiety and depression of the hemodialysis employees.

Methods

Purpose of the Research

The study aims to determine the impact of the Covid-19 pandemic on the dialysis center employees. Thus, the healthcare professionals to take part in the study were limited to the dialysis center employees.

Research Questions

In the research, how are

a) anxiety levels b) depression levels of healthcare workers working in dialysis centers serving during the covid-19 pandemic process?

c) What is the relationship between anxiety levels and depression levels? Answers to their questions were sought.

Research Design and Study Poulation

The population of the study was limited to healthcare workers in seven dialysis centers operating in Ordu. In order to carry out the study, first of all, the researchers made observations in dialysis centers and interviewed working people and experts. First of all, ethics committee and research permissions were obtained. The questionnaire, consisting of research scales, was distributed by hand to healthcare

professionals working in seven dialysis centers, who volunteered to participate in the study. The sample was not determined because it was desired to reach the entire study population. 194 research forms were collected back in a day or two. Approximately 70% of the healthcare professionals working in seven dialysis centers participated in the study. The data were encoded and uploaded to the computer environment. Analysis of data was done in computer environment.

Data Collection Scales, Process and Scale Analyses

In the study, a questionnaire consisting of socio-demographic characteristics, back anxiety scale and back depression scale was used as data collection tool. Back anxiety (Back at all; 1988) and back depression (Back; 1961) scales are scales that determine the anxiety and depression level of the individual by detecting the symptoms that have arisen in the individual in the last week due to stress or mental problems. In each statement of the scales, the absence of the queried symptom was scored as 1, the presence degree as 2, 3, and 4. The anxiety or depression levels defined by the total score are given in the tables.

The study used a questionnaire comprising the participants' socio-demographic characteristics, Beck Anxiety Inventory and Beck Depression Inventory, as data collection tool. Ethics committee decision to apply the questionnaire was made with an approval number dated 16.04.2020, numbered 2020/70. The questionnaire was applied to the hemodialysis unit employees in seven public hospitals, four private hospitals and one university hospital by hand. The participants completed the questionnaire on voluntary basis in their own environment. The questionnaire was applied between 17-30 April 2020.

As the Beck Anxiety Inventory and Beck Depression Inventory are grading inventories, their validity was confirmed via factor analyses. Validity is a degree of a test or an inventory to measure things (Coskun et al., 2017). In addition, their reliability analyses were conducted. Table 1 shows the results of the factor analyses of the inventories.

Examining Table 1; it is seen that the KMO sample coefficient of both inventories is above 0.80. It is accepted that as the KMO value approaches one, the sample size used in a study reaches excellence. This value is accepted to be very good when it is 0.80 and excellent when 0.90 (Karagoz, 2017). The Bartlett's Test of Sphericity which was used for assessing the convenience of the inventory for the factor analysis, was found to be significant ($p<0.001$). Accordingly, the inventories were found to be convenient for the factor analysis. It was determined that both inventories had higher factor loads in general and had adequate power to explain the total variance. As the inventories' Cronbach's alpha coefficient for the reliability analysis was above 0,80, they were found to be highly reliable.

In order to test the purposes of the study, the SPSS 26 statistics software (Ordu University demo version) was used. The analyses were carried out at 95% ($p=0.05$) confidence interval. The study used descriptive statistical methods, t and ANOVA tests and correlation analysis**.**

Table 1. Validity and Reliability Analyses of the Inventories

Factor Analysis		Beck Anxiety	Beck Depression
Kaiser-Meyer-OlkinMeasure of Sampling Adequacy.		0.893	0.876
Bartlett's Test of Sphericity	Approx. Chi-Square	2736.241	1931.365
	Df	210	210
	Sig.	0.000	0.000
Factor load range		350-771	419-784
Total variance explained	%	43.422	34.955
Cronbach'salpha		0.933	0.897

Results

Table 2 shows descriptive data of the dialysis center employees who took part in the study.

Examining Table 2; 54.4% of the participants are female, 72.1% are married, 41.7% have kids, 79.4% are aged 26 to 49 years and 44.6% have been working in the dialysis center for 1-5 year(s). 14.7% of the participants comprise doctors, 27.9% nurses, 17.2% dialysis technicians, 6.4% secretaries and 33.8% auxiliary medical personnel. Occupational distribution of the participants is appropriate for the personnel structure of dialysis centers. Among the participants; 49.5% work in dialysis centers affiliated with the Ministry of Health, 39.7% in private hospitals and 10.8% in university hospitals. 53.9% of the participants work in a hospital which has been declared a pandemic hospital. 17.2% of the participants have a chronic disease.

51% of the participants have encountered patients with covid, 41.2% have served patients with covid, 22.1% had covid test and tested negative. 44.6% of the participants stated that there was a decrease in the number of patients during the pandemic.

Table 3 shows anxiety level of the participants during the pandemic process. Examining the table; it

was determined that 55.9% of the participants developed no anxiety symptoms, while 24% developed mild symptoms, 11.8% moderate symptoms and 8.3% severe symptoms.

Table 2. Frequency Table Related to Descriptive Variables of the Participants

Variable	N	%	Variable	N	%
Gender			Title		
Female	111	54.4	Doctor	30	14.7
Male	93	45.6	Nurse	57	27.9
Marital Status			Dialysis Technician	35	17.2
The married	147	72.1	Secretary	13	6.4
Single	57	27.9	Assistant Medical Staff	69	33.8
Child Status			Hospital Type		
Yes	85	41.7	Ministry of Health	101	49.5
No	119	58.3	University	22	10.8
Age			Private Dialysis Center	81	39.7
25 years and under	25	12.3	Hospital Pandemic Hospital?		
26-49	162	79.4	Yes	110	53.9
50 years and over	17	8.3	No	94	46.1
Working Year at the Dialysis Center			Do you have any chronic diseases?		
1-5	91	44.6	No	169	82.8
6-10	54	26.5	Yes	35	17.2
11-15	36	17.3	Did you meet the Covıd patient?		
16+	23	11.3	Yes	104	51.0
Did you get a Covid Test?			No	100	49.0
Yes	45	22.1	Did you serve the Covid Patient?		
No	158	77.9	Yes	84	41.2
Test result			No	120	58.8
Negative	43	21.2	Is there a decrease in the number of patients?		
			Yes	91	44.6
			No	113	55.4

Table 3. An Assessment of the Participants' Beck Anxiety Inventory

Beck Anxiety Inventory Report	N	%
No (0-7)	114	55.9
Low lewels (8-15)	49	24.0
Modereta Lewels (16-25)	24	11.8
High Lewels (26-63)	17	8.3

Table 4. An Assessment of the Participants' Beck Depression Inventory

Beck Anxiety Inventory Report	N	%
No (0-7)	114	55.9
Low lewels (8-15)	49	24.0
Modereta Lewels (16-25)	24	11.8
High Lewels (26-63)	17	8.3

Table 4 shows depression level of the participants during the pandemic process. Examining the table; it was determined that 55.3% of the participants developed no depression symptoms, while 27.5% developed mild symptoms, 11.3% moderate symptoms and 2% severe symptoms.

The t and ANOVA tests investigated whether the participants' independent variables had a distinctive impact on their anxiety and depression levels or not. It was determined that the participants' age, marital status, state of having kids, working year, presence of a chronic disease, state of working in a pandemic hospital and havinga covid test, did not affect their

anxiety and depression levels. On the other hand, it was determined that the participants' gender, occupation (title), type of their hospital, state of encountering patients with covid and serving these patients, affected their anxiety and depression levels.

The female employees were affected by the covid pandemic more than men, in terms of anxiety level (at the error level of p=0.002) and depression level (at the error level of p=0.014). Among the employees working in dialysis units, the nurses were affected by the covid pandemic more than the doctors and auxiliary medical personnel, in terms of anxiety level (at the error level of p=0.002) and depression level (at the error level of p=0.005). It was seen that the participants working in hospitals affiliated with the Ministry of Health had a higher depression level than those working in university hospitals at the error level of p=0.018.

Encountering patients with covid increases anxiety level of the dialysis unit employees at the error level of p=0.001 and serving patients with covid increases their depression level at the error level of p=0.001. Anxiety level of the participants who stated that there was a decrease in the number of patients during the pandemic, was found to be higher than others at the error level of p=0.002.

In the study, a correlation analysis was conducted to describe the correlation of the inventories with encountering patients with covid and serving patients with covid. Table 5 shows the results of the correlation analysis.

Examining Table 5; it was determined that there was a linear high correlation between anxiety and depression levels of the participants at the error level of p=0.001. On the other hand, there was a reversely weak correlation between anxiety level and encountering patients with covid and having a patient relative with covid. Accordingly, it was found that as anxiety level of the individuals increased, their depression level increased. Also, anxiety level was found to be higher when encountering patients with covid or serving patients with covid. It was determined that there was no correlation between encountering patients with covid or serving patients with covid, in terms of depression level of the participants. A linear high correlation was also observed between encountering patients with covid or serving patients with covid.

Table 5. Results of the Correlation Analysis

	Beck Anxiety	Beck Depression	Serving the patient with Covid
Beck anxiety	1		
Beck depression	,707(**)	1	
Serving the patient with Covid	-,225(**)	-,105	1
Meeting the patient with Covid	-,238(**)	-,134	,781(**)

Discussion

According to the results of our study, it was determined that gender, occupation (title), type of hospital, state of encountering patients with covid and serving these patients, affected anxiety and depression levels of the personnel providing care service in hemodialysis units during the Covid-19 pandemic.

Anxiety disorders are common in the general population and affect nearly 40 million American adults (WHO Geneva ;2010).

The studies have shown a lower quality of life and sleep quality among patients with chronic renal disease, compared to the general population (Kusek et al, 2002; Perlman et al, 2005; Karatas et al, 2018). However, the studies investigating mental state of medical personnel who provide care to hemodialysis patients, are not adequate in number.

Psychological distress among medical personnel affects not only their health, but also the health and safety of patients (Hall et al, 2016). In their study, Lwia et al. (2017) investigated the role of caregiver mental health in neurodegenerative patient mortality. In a caregiver group of 176, they found that worse caregiver mental health predicted more patient mortality, considering the key risk factors in patients (recent diagnosis, age, gender, dementia severity and patient's mental health). Mahoney.et al. (2005) determined anxiety (25.3%) and depression (10.5%) in family caregivers providing care to Alzheimer's patients. They claimed that Alzheimer's patient caregivers with caregiver anxiety have a lower quality of patient service.

In the study by Panagiota et al. investigating the impacts of the A/H1N1 influenzapandemic on healthcare professionals, it was found that 46.9% of the healthcare professionals had concerns about contagious pandemics (Goulia et al; 2010). In the study by Arechabala. et al., (2011) it was found that individuals providing care to hemodialysis patients had caregiver burden symptoms. According to the National Comorbidity Study Replication (NCS-R) data, 19.1% of adults suffer from anxiety disorder. Prevalence of anxiety disorder is higher in women

(23.4%) than men (14.3%) (Anxiety Disorders; anxiety-disorders / index .shtml).

In our study, anxiety level of the cases was similar with the study by Panagiota G. et al. However, it was higher than the National Comorbidity Study Replication (NCS-R) data. It was found that 55.9% of the cases in our study had no anxiety, while 44.1% had anxiety at different levels (mild, moderate, severe).We believe that the Covid-19 pandemic affecting the whole world, has a greater negative impact especially on medical teams struggling with this disease in the field. Our study shows that care of hemodialysis patients negatively affects emotional state of caregivers. In this respect our study is in agreement with other similar studies investigating anxiety and depression of caregivers of hemodialysis patients.

Depression is the most frequent psychiatric disorder encountered in general society (Kessler et al, 2011). Also, it is the most frequent mental health condition encountered in primary patients (Ansseau et al, 2004). It is estimated that only 50% of patients with major depression are identified without screening (Mitchellet al, 2011). In their study, Yan Wang et al. stressed the necessity of developing interventions and appropriate coping styles in order to reduce the stress of Chinese doctors in the future (Wang et al;2019).

The DEPRES study assessing depressive disorder ratio in six European countries, found the prevalence to be at the rate of 17%. It was determined that 13.359 of the 78.463 adults who took part in the study had suffered from any type of depression or experienced depression in the last six months. Thus, the six-month prevalence of any type of depression in society was found to be 17% (Arbabzadeh-Bouchez et al, 2002). In a metaanalysis conducted by Alex J. Mitchell et al., it was determined that depression prevalence varied according to nations, which was expected. While Italy (27.4%) and Netherlands (22.7%) had the highest rates of depression, England (15.6%) and the United States (12.5%) had lower rates. The lowest rate was observed in Australia (10.9%) (Mitchell et al;2009).

Chong et al. (2004) conducted a study assessing SARS-related stress and its psychological impacts among healthcare professionals. In the study, the psychiatric morbidity was three times higher in the healthcare professionals (75.3%) than the normal population in Taiwan (24%). The same study found depression in 74.4% of the cases. In our study, we observed depression at different levels at the rate of 40.7% in total. Depression was found to be higher in our study than the DEPRES study showing depression rate in thenormal population. However, it was found to be lower than the study by Chong MY. et al. which has similar characteristics to our study (the impact of SARS on healthcare professionals). It is possible to state that although healthcare professionals have higher rates of depression than the normal population concerning pandemics, these rates have dropped in individuals providing healthcare service in the course of time.

In the study by Ansseau et al., (2004) anxiety was found to be higher in women than men. In their study investigating common anxiety prevalence in society, Wittchen et al. (1994) claimed that the prevalence was two times greater in women than men. Similarly, our study found anxiety level to be higher in women. Our study results are in agreement with the literature findings.

In their study, Ferrari et al. (2013) found the 12-month prevalence of global major depressive disorder to be 5.8% in women and 3.5% in men. Similarly, Bebbington et al. (1998) suggested that depression and depression episode were higher in women than men. Also, our study found depression level to be higher in women. Our study results are in agreement with the literature findings.

In their study, Chong et al. (2004), stated that healthcare professionals had an increased psychiatric morbidity such as feeling defenseless, unsafe and threatened due to the SARS pandemic. Also, in our study we observed that hemodialysis personnel who had close contact with the Covid-19 patients in the field, had a higher prevalence of psychiatric disorders such as anxiety and depression compared to the normal population. In this respect our study is in agreement with the study conducted by Chong. et al. (2004).

In a study investigating the impact of healthcare staff on the psychological stress of the H1N1 pandemic, Gaulia and colleagues claimed that nurses were more psychologically affected in pandemics than other healthcare professionals (Goulia et al, 2010). In the studies of Seale H et al. Showing the psychological effects of influenza pandemic on health personnel, pandemic was claimed to have more psychological effects on auxiliary healthcare staff compared to doctors and nurses (Seale et al;2009). In our study, we found that, similar to the work of Goulia et al (2010), The Covid-19 pandemic affects nurses the most. Our study is partially compatible with the literature in this aspect.

According to the National Comorbidity Survey (NCS) data, it is reported that depression comorbidity has increased in individuals with general anxiety disorder. Similarly, common anxiety disorder comorbidity is higher in individuals with major

depression (Huppert, 2008). A number of studies have shown that major depressive disorder (MDD) and common anxiety disorder (CAD) have the highest comorbidity rates among all mood and anxiety disorders (Brown, 2001; Huppert, 2008). Also, in our study, it was found that there was a linear high correlation between anxiety and depression levels of the participants and as their anxiety level increased, their depression level increased. Our study in this respect is in agreement with the literature.

The limitations of our study are as follows; cases are limited to the region we live in, has a limited number. In addition, the use of self-report scales recorded by patients rather than diagnostic interviews in psychiatric morbidity assessment is another limitation of our study.

Conclusion

As a consequence, our study determined a significant rate of anxiety and depression symptoms in the healthcare professionals providing service in hemodialysis units during the Covid-19 pandemic. In all pandemics, it is necessary to carefully evaluate not only patients, but also healthcare professionals providing service to chronic patients and to take measures. Otherwise healthcare professionals who do not feel well, will not be able to provide effective service.

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References

Anxiety Disorders. National Institute of Mental Health. Available at: http://www. nimh. nih. Gov / health / topics / anxiety-disorders / index .shtml.

Ansseau M, Dierick M, Buntinkx F, Cnockaert P, Smedt JD, Van Den Haute M, et. al. High Prevalence of Mental Disorders in Primary Care. J Affect Disord. 2004;78(1): 49-55.

Arechabala MC, Catoni MI, Palma E, Barrios S. Depression and Self-Perceived Burden of Care by Hemodialysis Patients and Their Caregivers. Rev Panam Salud Publica. 2011;30(1):74-9.

Arbabzadeh-Bouchez S, Tylee A, Lepine JP. A European Perspective on Depression in the Community: The DEPRES Study. CNS Spectrums. 2002 Vol 7, No 2;120-126.

Bebbington PE, Dunn G, Jenkins R, Lewis G, Brugha T, Farrell M, et al. The İnfluence of Age and Sex on the Prevalence of Depressive Conditions: Report from the National Survey of Psychiatric Morbidity. Psychological Medicine. 1998;28 (1):9–19.

Beck AT. An Inventory formeasuringdepression. Arch Gen Psychiatry 1961;4:561–71.

Beck AT, Epstein N, Brown G, Steer RA. An inventoryformeasuringclinicalanxiety: Psychometricproperties. J Consult Clin Psychol 1988;56:893–7.

Brown TA, Campbell LA, Lehman CL, Grisham, JR, Mancill RB. Current and Lifetime Comorbidity of the DSM-IV Anxiety and Mood Disorders in a Large Clinical Sample. J. Abnorm. Psychol. 2001 Nov;110 (4):585-599.

Chong MY, Wang WC, Hsieh WC, Lee CY, Chiu NM, Yeh WC, et. al. Psychological impact of severe acute respiratory syndrome on health workers in a tertiary hospital. Br J Psychiatry. 2004;185:127–133.

Coskun R, Altunısık R, Yıldırım E. (2017). Research methods in social sciences (SPSS Applied). Adapazarı: Sakarya Bookstore.

Ferrari AJ, Somerville AJ, Baxter AJ, Norman R, Patten SB, Vos T et. al. Global variation in the prevalence and incidence of major depressive disorder: a systematic review of the epidemiological literature. Psychological Medicine. 2013;43(3):471–481.

Gerogianni G, Polikandrioti M, Babatsikou F, Zyga S, Alikari V, Vasilopoulos G, et al. Anxiety–Depression of Dialysis Patients and Their Caregivers, Medicina (Kauras) 2019 May; 55(5):168.1-9.

Goulia P, Mantas C, Dimitroula D, Mantis D, Hyphantis T. General hospital staff worries, perceived sufficiency of information and associated psychological distress during the A/H1N1 influenza pandemic. BMC Infect Dis. 2010;10(322).

Hall LH, Johnson J, Watt I, Tsipa A, O'Connor DB. Healthcare Staff Wellbeing, Burnout, and Patient Safety: A Systematic Review. PLoSOne. 2016; 11(7): e0159015.

Huppert JD. Anxiety Disorders and Depression Comorbidity. Oxford handbook of anxiety and related disorders. Oxford University Press, New York 2008. pp.576-586.

Hussin A. Rothana, Siddappa N. Byrareddy, The Epidemiology and Pathogenesis of Coronavirüs Disease (COVID-19) Outbreak, J Autoimmun. 2020;109:102433.

Karagoz, Y. SPSS and AMOS Applied Scientific Research Methods and Publication Ethics. Ankara: Nobel Publishing. 2007.

Karatas A, Canakci E, Turkmen E. Comparison of Sleep Quality of Life İndexes with Sociodemographic Characteristics in Patients with Chronic Kidney Disease. Niger J Clin Pract 2018;21:1461-1467.

Kusek JW, Greene P, Wang SR, Beck G, West D, Jamerson K, et. al. Cross-sectional Study of Health-Related Quality of Life in African Americans with Chronic Renal İnsufficiency: the African

American Study of Kidney Disease and Hypertension. Trial. Am J Kidney Dis 2002;39(3):513–524.

Kessler RC, Ormel J, Petukhova M, McLaughlin KA, Green JG, Russo LJ, et al. Development of Lifetime Comorbidity in the World Health Organization World Mental Health Surveys. Arch Gen Psychiatry. 2011;68(1):90-100.

Lwia SJ, Ford BQ, Casey JJ,Miller BL, Levenson RW. Poor Caregiver Mental Health Predicts Mortality of Patients with Neurodegenerative Disease. Proc Natl Acad Sci U S A. 2017;114(28):7319-7324.

Mahoney R, Regan C, Katona C, Livingston G. Anxiety and Depression in Family Caregivers of People with Alzheimer Disease: the LASER-AD Study. Am J Geriatr Psychiatry. 2005;13(9):795-801.

Mitchell AJ, Vaze A, Rao S. Clinical Diagnosis of Depression in Primary Care: A Meta-Analysis. Lancet. 2009;374 (9690):609-19.

Mitchell AJ, Rao S, Vaze A. International Comparison of Clinicians' ability to identify depression in primary care: meta-analysis and meta-regression of predictors. Br J Gen Pract. 2011; 61(583): e72–e80.

Naicker S, Yang CW, Hwang SJ, Liu BC, Chen JH, Jha V, The Novel Coronavirus 2019 Epidemic and Kidneys, Kidney International (2020), doi: https://doi.org/10.1016/ j.kint.2020.03.001.

Pereira BDS, Fernandes NDS, Melo NPD, Abrita R, Grincenkov FRDS, Fernandes NMDS. Beyond Quality of Life:A Cross Sectional Study on the Mental Health of Patients with Chronic Kidney Disease Under Going Dialysis and Their Caregivers. Health Qual Life Outcomes 2017;15(1):74.

Perlman RL, Finkelstein FO, Liu L, Roys E, Kiser M, Eisele G, et al. Quality of Life in Chronic Kidney Disease (CKD): a Cross-Sectional Analysis in the Renal Research Institute-CKD Study. Am J Kidney Dis 2005;45:658–666.

Sajadi, S. Ebadi, A, Moradian, S. Quality of Life among Family Caregivers of Patients on Hemodialysis and its Relevant Factors. A Systematic Review. IJCBNM 2017;5: 206–218.

Seale H, Leask J, Po K, MacIntyre CR: "Will they just pack up and leave?" attitudes and intended behaviour of hospital health care workers during an influenza pandemic. BMC Health Services Research 2009;9:30.

Vasilopoulou C, Bourtsi E, Giaple S, Koutelekos I, Theofilou P, Polikandrioti M. The Impact of Anxiety and Depression on the Quality of Life of Hemodialysis Patients. Glob. J.Health Sci. 2016;8(1):45-55.

Wang LJ, Chen CK. The Psychological Impact of Hemodialysis on Patients with Chronic Renal Failure, Renal Failure Diagnosis and Treatment - The Facts, Dr. Momir Polenakovic (Ed.) 2012, 217-36. ISBN: 978-953-51-0630-2.

Wang Y, PingWang. Perceived Stres and Psychological Distress Among Chinese Physicians the Mediating Role of Coping Style. Medicine 2019;98(23):e15950.

Wittchen HU, Zhao S, Kessler RC, EatonWW. DSM-III-R Generalized Anxiety Disorder in the National Comorbidity Survey. Arch Gen Psychiatry. 1994;51(5): 355-64.

World Health Organization (WHO): New Understanding, New Hope: Burden of Mental and Behavioural Disorders. In: The World Health Report-MentalHealth, Geneva, WHO Press, 2010, pp 1–65.

World Health Organization Corona virüs disease (COVID-2019) situation reports. 2020. https:// www.who.int / emergencies / diseases / novel-coronavirus-2019/ situation reports. Accessed 5 Mar 2020.

Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al. A Novel Coronavirüs From Patients with Pneumonia in China, 2019. N Engl J Med. 2020;382(8):727–33.

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RESEARCH ARTICLE

Neurocognitive Functions in Soacial Anxiety Disorder

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Abstract

Objective: The purpose of this study was to assess the neurocognitive functions of patients with social phobia and to examine the relation between these functions and the severity of the disease.

Methods: The study was performed with 30 patients under monitoring with a diagnosis of social phobia at the Ondokuz Mayıs University Psychiatry Clinic and 30 age- and sex-matched healthy controls. Patients were assessed using the Hamilton Anxiety Rating Scale (HARS), the State-Trait Anxiety Inventory (STAI), and the Liebowitz Social Anxiety Scale (LSAS). Both groups were administered the Wisconsin Card Sorting Test (WCST), the Stroop Test, the Auditory-Verbal Learning Test (AVLT), and the Trail Making Test (TMT) forms A and B, and the two groups' neurocognitive performances were compared.

Results: Social phobia patients exhibited significantly poorer performance than the control group in terms of total number of errors, number of perseverative errors and number of categories completed on the WCST, time taken to complete TMT forms A and B, time taken to complete the first, third, fourth and fifth parts of the Stroop test, and AVLT immediate recall scores. Positive correlation was determined in the patient group between LSAS subscores and time taken to complete the first, third and fourth parts of the Stroop test. Positive correlation was also determined between patients' time taken to complete the fifth part of the Stroop test and LSAS avoidance and total scores.

Conclusion: Greater impairment was observed in the attention, executive function and immediate recall performances of social phobia patients compared to the healthy controls.

Key words: Social phobia, Neurocognitive functions, memory

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Introduction

Social anxiety disorder is a pronounced and constant fear of one or more social performance situations that may cause embarrassment (APA, 2000). Individuals with social anxiety disorder experience problems in working life, education, and social and emotional relations. Patients who fear and avoid one or only a few social situations are defined as having 'specific type' social phobia, while those who fear and avoid several social situations are defined as having 'generalized type' social phobia (APA, 1994). In DSM-V generalized specifier deleted (APA, 2013). In terms of studies investigating neurocognitive functions in anxiety

disorders, few have investigated cognitive functions in patients with social phobia, although this is a mental disease that is frequently seen and that causes severe disability.

Studies investigating the neurobiological aspect of social phobia concentrate on neurotransmitter systems and functioning problems in these systems. The relation between the neurotransmitter's serotonin and dopamine and social anxiety has been examined (Marcin and Nemeroff 2003; Kim and Gorman, 2005). Tiihonen et al. (1997) concluded that since dopamine reuptake site densities in the striata of patients with social phobia were significantly lower compared to those in healthy individuals, social phobia is related to dopamine function disturbance. In their magnetic resonance spectroscopy study, Davidson et al. determined an increase in central nervous system activity in the zones of the basal ganglia, white matter, and other cortical or non-cortical gray matter (Davidson, 1993a). In contrast, Potts et al. observed no significant difference between social phobia patients and age- and sex-matched healthy controls in terms of caudate, putamen, thalamus and cerebral volume (Potts et al., 2003). Another study employing cerebral imaging of subjects with social phobia observed increased blood flow in the right dorsolateral prefrontal cortex, the left inferior temporal cortex and the left amygdaloidal-hippocampal region (Tillfors et al., 2001). One study which evaluated social phobia and control group cortex thicknesses using magnetic resonance determined thinning in the frontal, temporal, parietal and insular cortexes, which play important roles in executive, social and emotional functions, in patients with social phobia (Syal, 2012). This study evaluated neurocognitive functions in patients with generalized social phobia and examined various factors that might be associated with cognitive functions.

Methods

Volunteers meeting the study criteria were enrolled from among patients diagnosed with generalized social phobia and receiving treatment for at least one month at the Ondokuz Mayıs University Medical Faculty Psychiatric Clinic. We anticipated that patients with generalized type social phobia, who experience greater loss of function than patients with specific type social phobia, would also have greater impairment of neurocognitive functions. Patients meeting a diagnosis of generalized type social phobia were therefore enrolled in order to produce a homogeneous group. We aimed to enroll 30 patients and 30 healthy controls, by calculating power analysis, and enrolment was stopped when these numbers were achieved. The patients have no psychiatric comorbidity. Healthy volunteers matched to the patient group in terms of age and sex and consisting of hospital personnel and university students were included as the control group. In the first session, the patients were administered SCID-V, a structured clinical interview, in order to determines Axis-I psychiatric disorders according to DSM-V. Additional diagnoses were excluded, and patients with Liebowitz Social Anxiety Scale (LSAS) scores over 60 were asked to complete a sociodemographic data form, and these patients were assessed in the second session. In the second session, the patients were administered the Hamilton Anxiety Rating Scale (HAM-A), the State-Trait Anxiety Inventory (STAI) and the LSAS. Once the tests were completed, neuropsychological test battery was applied consisting of the Wisconsin Card Sorting Test (WCST), the Stroop Test, the Auditory-Verbal Learning Test (AVLT), and the Trail Making Test (TMT) forms A and B. The neuropsychological tests applied to the patient group were also administered to the control group to compare the findings obtained. The aim and methodology of the study were explained to all participants, and verbal and written consents were obtained. The study protocol was approved by the Ethic Committee for Clinical Research Ondokuz Mayıs Medical Faculty (Date: 24.10.2011). This article is derived from the Republic of Turkey, our thesis registered with expertice in the national thesis center number 340551.

Data collection tools

Sociodemographic and Clinical Assessment Form: Separate forms for the patient and control groups were prepared by the authors to record information concerning sociodemographic and clinical characteristics.

The Structured Clinical Interview for DSM-V Axis I Disorders (SCID-V): A clinical interview developed for the diagnosis of major disorders according to DSM-V (First, 2015). The validity and reliability of the Turkish language version have been confirmed (Elbir, 2019).

Hamilton Anxiety Rating Scale: The validity and reliability of the Turkish language version were confirmed by Yazıcı et al. (1998).

The State-Trait Anxiety Inventory: The validity and reliability in Turkey were confirmed

by Öner and Le Compte in 1985 (Oner and Le Compte, 1985).

Liebowitz Social Anxiety Scale: The validity and reliability of the Turkish language version have been confirmed (Dilbaz and Guz, 2001).

The Stroop test: The Stroop test TBAG (Basic Sciences Research Group) form was used in this study. The Stroop test is regarded as being particularly related to orbitofrontal cortex functions (Karakas, 2006).

Wisconsin Card Sorting Test (WCST): Originally developed by Berg in 1948, modifications were made by Heaton et al. in 1981 and 1993, and a test handbook was produced (Heaton, 1993). Our study used the total number of correct scores, total number of errors, number of categories completed, number of perseverative errors and number of non-perseverative errors, which have been frequently employed in previous studies.

Auditory-Verbal Learning Test (AVLT): The AVLT is easy to apply and score and permits examination of memory from various perspectives (Karakas and Kafadar, 1999).

Trail Making Test Forms A and B (TMT-A, TMT-B): The TMT was developed by Reitan (1958). This test provides information concerning mental flexibility, visual scanning, processing speed and cognitive functions.

Statistical Analysis

The data obtained from the study groups were transferred onto SPSS for Windows 15.0 software for statistical analysis. Whether the relation between dependent variable and other independent variables was normally distributed was evaluated according to Kolmogorov-Simirnov histogram and Q-Q Plots graph. Student's t test was used to compare age, length of education and neurocognitive test scores between the groups, and the chi square test, and Fisher's exact chi square test when required, in the comparison of grouped data. $p<0.05$ was regarded as statistically significant. In the patient group neurocognitive test and LSA scale scores analysis was done using Pearson Correlation.

Results

Sociodemographic characteristics of the patient and control groups

No statistically significant difference was determined between the patient and control groups in terms of sex, age, length of education, marital status or place of residence (Table 1).

Clinical characteristics of the patient group

Age at onset of disease in the patient group was 15.70±3.42 years, total duration of disease was 9.40±5.23 years, untreated duration of disease was 5.53±3.62 years and duration of most recent treatment was 6.33±5.70 months. Mean LSAS anxiety score was 42.43±9.08, mean LSAS avoidance score was 37.63±7.74, and mean total LSAS score was 80.06±15.98. Mean HARS score was 10.30±3.65, mean STAI score was 40.27±13.24, and mean Trait Anxiety Inventory score was 51.80 ±11.09. In addition, 10 patients (33.3%) in the patient group were diagnosed with avoidant personality disorder in addition to social phobia.

Comparison of Patient and Control group Neurocognitive Test Scores

Evaluation of WCST subscores revealed significant differences between the groups in terms of mean scores for total number of errors ($t=3.62$, $p=0.001$), numbers of perseverative errors ($t=3.19$, $p=0.002$) and non-perseverative errors ($t=3.32$, $p=0.002$) and number of completed categories ($t=-2.75$, $p=0.008$). Mean total error, perseverative error and non-perseverative error numbers were high in the patient group, while the mean number of categories completed was low. Differences were observed between the two groups in terms of time taken to complete the TMT forms A ($t=3.20$, $p=0.002$) and B ($t=4.26$, $p=0.000$). Patient group forms A and B were completed in a longer time than in the control group. Differences were also observed between the groups in terms of time taken to complete the first ($t=2.96$, $p=0.004$), third ($t=2.78$, $p=0.007$), fourth ($t=3.46$, $p=0.001$) and fifth ($t=3.23$, $p=0.002$) parts of the Stroop test, all being longer in the patient group. The only difference between the groups at comparison of AVLT scores was in immediate recall scores ($t=-2.36$, $p=0.022$), which were lower in the patient group (Table 2).

Relations between LSAS Scores and Neurocognitive Test Scores in the Patient Group

LSAS scores in the patient group were not correlated with WCST scores or time taken to complete TMT forms A and B. A weak-moderate positive correlation was observed between mean LSAS anxiety ($r=0.451$, $p=0.012$), avoidance ($r=0.440$, $p=0.015$) and total scores ($r=0.469$, $p=0.009$) and time taken to complete the first part of the Stroop test. Weak-moderate positive correlation was observed between time taken to complete the third part of the Stroop test and mean LSAS anxiety ($r=0.479$, $p=0.007$) score, while

good positive correlation was determined with mean LSAS avoidance and (r=0.615, p=0.000) total LSAS scores (r=0.570, p=0.001). In addition, good positive correlation was observed between mean LSAS anxiety (r=0.578, p=0.001), avoidance (r=0.735, p=0.000) and total scores (r=0.684, p=0.000) and time taken to complete the fourth part of the Stroop test. Time taken to complete the fifth part of the Stroop test exhibited good positive correlation with mean LSAS avoidance scores (r=0.522, p=0.003), and weak-moderate positive correlation with mean total LSAS scores (r=0.424, p=0.020). Analysis of correlation between mean AVLT subscores and mean LSAS scores revealed only a weak-moderate inverse correlation between mean verbal learning scores and mean LSAS anxiety (r= 0.438, p=0.016), avoidance (r= -0.453, p=0.012) and total scores (r= -0.468, p=0.009) (Table 3).

Table 1. A Comparison of the Patient and Control Groups in Terms of Sociodemographic Characteristics

		Patient (n=30)	Control (n=30)	Analysis	p
Sex	Female	15 (50%)	15 (50%)	X^2=0.000*	1.000
	Male	15 (50%)	15 (50%)		
Age (years)	Mean ± SD	25.10±6.43	25.70±5.23	t= -0.397 **	0.693
Length of education (years)	Mean ± SD	12.30±1.99	12.97±2.87	t= -1.046	0.300
Marital status	Married	8 (26.7%)	14 (46.7$)	X^2=1.794	0.180
	Unmarried	22 (73.3%)	16 (53.3%)		
Place of residence	Urban	27 (90%)	28 (92.3%)	***	1.000
	Rural	3 (10%)	2 (7.7%)		

*Chi square test, ** Student t test, *** Using Fisher's exact chi square test.

Table 2. A Comparison of patient and Control Group Neurocognitive Test Scores

			Patient (n=30) (Mean ± SD)	Control (n30) (Mean ± SD	t	p
W C S T	Total number correct answers		69.67±12.18	72.43±9.28	-0.99	0.327
	Total number of errors		39.50±23.87	21.23±13.96	3.62	**0.001**
	Number of perseverative errors		18.60±11.02	11.00±7.03	3.19	**0.002**
	Total number of non-perseverative errors		20.90±15.50	10.23±8.29	3.32	**0.002**
	Number of categories completed		4.40±1.99	5.57±1.19	-2.75	**0.008**
T M T	A Form	Time (sec)	35.03±15.87	24.70±7.88	3.20	**0.002**
	B Form	Time (sec)	76.98±33.11	48.78±14.70	4.26	**<0.001**
A V L T	Immediate recall		6.23±1.63	7.23±1.65	-2.36	**0.022**
	Verbal leaning		48.37±7.39	51.77±6.13	-1.94	0.057
	Retention		10.57±2.08	10.97±1.45	-0.86	0.391
	Delayed recall		10.27±1.89	10.73±1.68	-1.01	0.317

Student t test

Table 3. Correlation between LSAS and Neurocognitive Test Scores in the Patient Group *

			Liebowitz Social Anxiety Scale		
			LSAS Anxiety	LSAS Avoidance	LSAS Total
W C S T	Total number of correct answers	r	-0.049	-0.215	-0.132
		p	0.795	0.253	0.485
	Total number of errors	r	0.172	0.256	0.222
		p	0.362	0.172	0.238
	Number of perseverative errors	r	0.248	0.322	0.297
		p	0.187	0.082	0.111
	Number of non-perseverative errors	r	0.089	0.166	0.131
		p	0.638	0.381	0.490
	Number of categories completed	r	-0.294	-0.355	-0.339
		p	0.115	0.055	0.067
T M T	A Form	r	0.096	0.118	0.112
		p	0.613	0.534	0.556
	B Form	r	0.118	0.245	0.186
		p	0.535	0.193	0.326
S T R O O P	Part 1 Time (sec)	r	**0.451**	**0.440**	**0.469**
		p	**0.012**	**0.015**	**0.009**
	Part 2 Time (sec)	r	0.229	0.320	0.286
		p	0.223	0.084	0.126
	Part 3 Time (sec)	r	**0.479**	**0.615**	**0.570**
		p	**0.007**	**<0.001**	**0.001**
	Part 4 Time (sec)	r	**0.578**	**0.735**	**0.684**
		p	**0.001**	**<0.001**	**<0.001**
	Part 5 Time (sec)	r	0.301	**0.522**	**0.424**
		p	0.106	**0.003**	**0.020**
A V L T	Immediate recall	r	-0.342	-0.288	-0.334
		p	0.064	0.123	0.072
	Verbal learning	r	**-0.438**	**-0.453**	**-0.468**
		p	**0.016**	**0.012**	**0.009**
	Retention	r	-0.320	-0.342	-0.348
		p	0.084	0.064	0.060
	Delayed recall	r	-0.312	-0.356	-0.350
		p	0.093	0.054	0.058

*Pearson Corelation Test

Discussion

Our study compared patients with social anxiety disorder and healthy controls in terms of neurocognitive test performances. It also examined whether severity of disease was correlated with neurocognitive test performances in patients with social anxiety disorder.

The AVLT was used to assess memory functions. Memory scores such as immediate recall, verbal learning, retention and delayed recall were evaluated using the AVLT. Mean immediate recall scores were lower in the patient group than in the control group. No statistically significant difference was determined between the two groups in terms of verbal learning, retention and delayed recalled subscores. Asmundson et al. (1994) compared age-, sex- and education-level-matched patients, 18 with generalized social phobia, and 18 with panic disorder, and 16 healthy controls. Untreated patients were selected in that study, and the groups' verbal learning and recall performances were assessed using the California Verbal Learning Test. Immediate and long-term memory performances were lower in both the panic disorder and social phobia patients compared with the control group.

Airaksinen et al. (2004) compared cognitive functions in 33 patients diagnosed with social phobia, seven with generalized anxiety disorder, 16 with obsessive compulsive disorder (OCD), 33 with panic

disorder (with/without agoraphobia) and 24 with specific phobia with those of healthy controls. They determined impairment in recall performance of patients with social phobia, with or without cues. Other studies have reported no memory impairment in patients with social anxiety disorder. Wenzel and Holt (2002) showed that when social phobia patients were read paragraphs with neutral content they exhibited the same level of recall as a healthy control group. Sachs et al. (2004) assessed verbal and non-verbal memory functions in social phobia patients and a healthy control group and showed no compromise of memory function in the social phobia patients. Another study evaluated memory functions in untreated patients with generalized type social phobia and a healthy control group using the Wechsler Memory Test and determined no difference between the two groups (Sutterby and Bedwell, 2012). Another study of memory function in patients with generalized type social phobia using the AVLT also determined no impairment of verbal memory functions in the social phobia patients (Fujii et al., 2013). Differences in the measurement tools used and sampling in studies can affect the findings and lead to inconsistent results being obtained. Williams et al. (1997) reported that individuals with anxiety directed their attention toward threat containing information and that this led them to prioritize such information. Since patients with social anxiety disorder direct their attention to threat containing stimuli when they enter a new environment, they may find it difficult to learn new information. This may also explain the impaired immediate recall in our study. The existence of conflicting findings concerning memory functions in social anxiety disorder shows that further studies are now needed to determine whether a problem exists in memory functions in these patients.

When we compared WCST subscores between the patients with social anxiety disorder and the controls, we observed differences in terms of mean total number of errors, number of perseverative errors, and numbers of categories completed. The WCST performances of the patients in our study were more impaired than those of the control group. We used the TMT in addition to the WCST to assess executive functions in our study. One previous study showed that TMT form B determined cognitive flexibility better than the WCST (Kortte et al., 2002). According to our findings, patients took longer to complete form B and exhibited a poorer performance on this test than the control group. Topçuoglu et al. (2009) compared the executive functions of social phobia patients with a healthy control group and concluded the executive functions by WCST. Our findings are compatible with that study. Cohen et al. used TMT form B to evaluate executive functions in 65 patients with OCD, 17 with social phobia and 32 healthy controls. They reported longer TMT form B completion times in the social phobia patients compared to the OCD and control groups. These findings are compatible with our study showing impairment in executive functions in patients with social anxiety disorder using TMT form B and the WCST. Another study that evaluated executive functions in social phobia patients using TMT form B enrolled 25 patients with generalized type social phobia and 25 healthy controls. Comorbid psychiatric diseases, with the exception of specific phobia, were excluded. No difference was determined between the groups in terms of TMT form B performances in that study (Sachs et al., 2004). Finally, Fujii et al. (2013) assessed the executive functions of 30 generalized type social phobia patients with no comorbid psychiatric disease using TMT-B and the WCST and reported no impairment of executive functions in the social phobia patients. Cognitive functions involved in social skills include planning, suppression of inappropriate alternatives among different response options, and deciding on the correct option. This shows that executive functions are necessary for an effective social performance. The fact that social phobia patients experience difficulties in establishing socıal relations may derive from impairment of executive functions. Our findings also support the idea of compromise of executive functions in these patients.

An inverse correlation was determined in this study between LSAS anxiety, avoidance and total scores and verbal learning scores. Patients with higher LSAS anxiety, avoidance and total scores taking longer to complete parts 1, 3, 4 and 5 of the Stroop test no correlation being observed between LSAS scores and time to complete form A, which measures attention, may be interpreted as meaning that severity of the disease is related to selective attention in particular. The absence of any relation between patients' social anxiety levels and time taken to complete TMT-B and the WCST suggests that severity of disease is not related to executive functions. However, the results of our study also showed that social phobia patients who took longer to complete part 5 of the Stroop test also had higher LSAS avoidance and total anxiety scores. In contrast to our study, TopçuoGlu et al. (2009) reported an inverse correlation between social anxiety and WCST results. Similarly, in a recent study, Topçuoğlu et al. determined a decrease in WCST performance and LSAS total scores and reported an inverse correlation

between disease severity and executive functions (Sutterby and Bedwell, 2012).

All the patients in our study were using drugs from the selective serotonin reuptake inhibitor (SSRI) group. Since the patients in our study were not all using the same SSRIs, the differences between them may have had different effects on neurocognitive tests. Another limitation of our study is that the effect of patients' performance anxiety on neurocognitive test performance could not be entirely excluded.

Conclusion

In our study greater impairment was observed in the attention, executive function and immediate recall performances of social phobia patients compared to the healthy controls. Further studies are needed to show whether there is any association between neurocognitive test performance and drug effects

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References

Airaksinen E, Larsson M, Forsel Y. Neuropsychological functions in anxiety disorders in population-based samples: Evidence of episodic memory dysfunction. Journal of Psychiatric Research 2004; 39: 207–214.

American Psychiatric Association, Diagnostic and Statistical Manual of Mental Disorders. 4th ed. Text Revision. (DSM-IV-TR). Washington DC: APA, 2000.

American Psychiatric Association, Diagnostic and Statistical Manual of Mental Disorders. 4th ed. (DSM-IV). Washington DC: APA, 1994.

American Psychiatric Association, Diagnostic and Statistical Manual for Mental Disorders. 5th edition (DSM-5). Washington DC: APA, 2013.

Asmundson GJ, Stein MB, Larsen DK, Walker JR. Neurocognitive function in panic disorder and social phobia patients. Anxiety. 1994; 1(5):201-7.

Cohen LJ, Hollander E, DeCaria CM, Stein DJ, Simeon D, Liebowitz MR. Specificity of neuropsychological impairment in obsessive-compulsive disorder: A comparison with social phobic and control subjects. Journal of Neuropsychiatry and Clinical Neuroscience. 1996; 8: 82–85.

Davidson JR, Krishnan KR, Charles HC, Boyko O, Potts NL, Ford SM, Patterson L. Magnetic resonance spectroscopy in social phobia: preliminary findings. J Clin Psychiatry 1993a; 54:19-25.

Dilbaz N., Guz H Liebowitz Social Anxiety Scale: The validity and reliability of the Turkish language version.37. National Psychiatry Congress, Istanbul, 2-6 October 2001.

Elbir M, Alp Topbas O, Bayad S, Kocabas T, Topak OZ, Cetin S, Ozdel O, Atesci F, Aydemir O. Adaptation and Reliability of the Structured Clinical Interview for DSM-5-Disorders - Clinician Version (SCID-5/CV) to the Turkish Language. Turk Psikiyatri Derg. 2019 Spring;30(1):51-56.

First MB, Williams JBW, Karg, RS, Spitzer, RL. Structured Clinical Interview for DSM-5: Research Version. Arlington, VA: American Psychiatric Association; 2015.

Fujii Y, Kitagawa N, Shimizu Y, Mitsui N, Toyomaki A, Hashimoto N, Kako Y, Tanaka T, Asakura S, Koyama T, Kusumi I. Severity of generalized social anxiety disorder correlates with low executive functioning. Neurosci Lett. 2013; 543:42-6.

Heaton RK, Chelune GJ, Talley JL, Kay GG, Curttis CG. Wisconsin card sorting test manual: Revised and expanded. Psycological Assesment Resources. Florida. 1993.

Karakas S, Kafadar H. Neuropsychological Tests in the Assessment of Cognitive Processes in Schizophrenia: Measuring Memory and Attention. Turkish Psychiatry Index 1999; 2(4):132-52.

Karakas S. BİLNOT Bataryası El Kitabı: Research and Development Studies for Neuropsychological Tests. 2nd Edition. Eryilmaz Offset. Ankara. 2006.

Kim J, Gorman J. The psychobiology of anxiety. Clinical Neuroscience Research, 2005, Volume 4, 335-347.

Kortte KB, Horner MD, Windham WK. The trail making test, part B: cognitive flexibility or ability to maintain set? Appl Neuropsychol, 2002; 9(2):106-9.

Marcin MS, Nemeroff CB. The neurobiology of social anxiety disorder: The relevance of fear and anxiety, Acta Psychiatry Scand, 2003; 108 (Suppl. 417), 51-64.

Oner N, Le Compte A. State Trait Anxiety Inventory Handbook, Second Edition, Bogazici University Press.İstanbul.1985.

Potts NL, Davidson JR, Krishnan KR, Doraiswamy PM. Magnetic resonance imaging in social phobia. Psychiatry Res. 1994; 52(1):35-42.

Reitan RM. Validity of the trail making test as an indication of organic brain damage. Percept Mot Skills. 1958; 8:271-276.

Sachs G, Anderer P, Margreiter N. P300 event-related potentials and cognitive function in social phobia. Psychiatry Res. 2004; 131(3):249-61.

Sutterby SR, Bedwell JS. Lack of neuropsychological deficits in generalized social phobia. PLoS One 2012; 7(8):e42675.

Syal S, Hattingh CJ, Fouche JP, Spottiswoode B, Carey PD, Lochner C, Stein DJ. Grey matter abnormalities in social anxiety disorder: a pilot study. Metab Brain Dis 2012; 27:299–309.

Tiihonen J, Kuikka J, Bergstrom K, Lepola U, Koponen H, Leinonen E.Dopamine reuptake site densities in patients with social phobia. Am J Psychiatry. 1997;154(2):239-42.

Tillfors M, Furmark T, Marteinsdottir I, Fischer H, Pissiota A, Långstrom B, Fredrikson M. Cerebral blood flow in subjects with social phobia during stressful speaking tasks: a PET study. Am J Psychiatry 2001;158(8):1220-6.

Topcuoğlu V, Fıstıkcı N, Ekinci O, Gonentur A, Comert B, Agouridas BC. Assessment of Executive Functions in Social Phobia Patients Using the Wisconsin Card Sorting Test. Turkish Journal of Psychiatry 2009; 20(4):322-331.

Wenzel A, Holt CS. Memory bias against threat in social phobia. Br J Clin Psychol. 2002; 41(1):73-79.

Williams JMG, Watts FN, MacLeod C, Mathews A. Cognitive Psychology and Emotional Disorders. İkinci baskı, Chicester, Wiley, 1997.

Yazıcı MK, Demir B, Tanrıverdi N, Karaagaoglu E, Yolac P. Hamilton Anxiety Rating Scale: Interrater reliability and validity study. Turkish Journal of Psychiatry,1998; 9(2):114-120.

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RESEARCH ARTICLE

Traditional Practices in Infant Care a Province in Eastern Region of Turkey

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Abstract

Objective: This study was conducted to find out the traditional methods applied in infant care in Turkish culture.

Methods: This study is a descriptive study in a city in the east of Turkey between February and August 2017. Women who participated in the study were chosen with improbable random sampling method. The data were collected with questionnaire form by using face-to- face interview method. Descriptive statistics were used in data analysis

Results: The most common postnatal practices were reciting the azan to the infant's ear (66.2%) and swaddling (44.4%). In addition, it was found that before the first feeding of the infant, azan was recited (16.2%) and honey was placed on the infant's mouth (21.4%). The most common practice for the health care of the infant was to cover with a yellow cloth/muslin/blanket to prevent jaundice (47.6%), while the most common spiritual care practices were evil eye bead (37.1%) and to put a Koran on the cradle to prevent the infant from getting sick in the first 40 days (33.6%).

Conclusion: It was found that the puerperal women conducted traditional practices such as for umbilical stump to fall off, to prevent jaundice, to recover from jaundice, for moniliasis, for diaper rash, for cough, for diarrhea, for constipation, for fever, for gas for infants who cry and who are uneasy all the time, before the first feeding religious ritual in the infants care.

Key words: Home care, Infant, Traditional

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Introduction

In addition to having significance in terms of monitoring and assessing health programs and determining future policies, neonatal, post-neonatal infant and child deaths are also indicators of the society's development levels (Toruner ve Buyukgonenc, 2012). While infant death rate has been reported as 31.7 per thousand globally, as 9.8 per thousand in WHO Europe and as 5.8 per thousand in high-income group families, it is reported to reach 7.3 per thousand in 2016 from 52.6 per thousand in 1993 (Mollahaliloglu et al., 2011; Health Staistics Yearbook, 2016). It can be seen that the decrease in the last 23 years still did

not reach the level of developed country. The fact that prenatal and natal reasons rank first are among reasons for infant and child deaths shows that problems about newborn and mother are still on the forefront in our country. There are various postnatal beliefs and practices in the world and in our country such as cutting the umbilical cord, placental practices, breastfeeding, practices for the umbilical stump's falling off and practices after the stump falls off, naming the baby, incubus, practices on the 40th day of the baby, bathing, baby's talking a lot and beautifully, choice of profession, evil eye, jaundice, fever, moniliasis, diaper rash, rash, cough, diarrhea, phlegm and tapeworm. Economic reasons, lack of information and service about maternal and infant health are determinants in preferring such traditional practices (Bozkaya et al., 2008; Kesterton and Cleland, 2009; Boer and Lamxay, 2009; Bulbul et al., 2009; Gokduman and Balkaya, 2010; Titaley et al., 2010; Amin et al., 2010).

Since infants' immune, central nervous and gastrointestinal systems are not completely developed, alternative methods are more important. For this reason, it is important to determine which of these practices are useful and which are harmful to prevent harmful ones from being used by the society and to encourage useful ones for being used. In addition, health professionals should inform mothers on the subject, support mothers for making the right choice and make sure that mothers are aware of the consequences and side effects of traditional practices (Sevig and Tanriverdi, 2014).

The purpose of this study is to find out the traditional infant care practices in puerperas in the puerperal service of the Training and Research Hospital in a city in the east of Turkey.

Methods

Study Design and Setting

This study, which was designed as a descriptive study to find out traditional practices in infant care, was conducted in the puerperal service of the Training and Research Hospital in a city in the east of Turkey. The universe of the study consists of puerperas who gave birth in the aforementioned hospital between February and August 2017. The number of women who gave birth in the aforementioned hospital between January 2016 and December 2016 is 4425. In the calculation of sample size, OpenEpi, version 3 general use statistical software was used (http://www.openepi.com) sample size was determined as at least 426 puerperas with a 0.05 level of significance, 97% confidence interval and 80% ability of representing the universe. Until the determined sample size was reached, women who gave birth in the aforementioned hospital and who met the inclusion criteria were chosen through improbable random sampling method. The inclusion criteria were participants' being literate, not having any psychiatric diagnosis and absence of postnatal complications in the mother and the infant. In the collection of data, the most suitable time for the mother and the infant was taken into consideration and the data were collected by the researchers through face to face interview method.

Ethical issues

Before starting the study, written permission from the institution the research was conducted in and approval from University Non-Invasive Clinical Researches Ethical Board (decision number: 08/06.01.2017) were taken. In addition, the participants were informed about the research and told that their individual information would be protected and volunteers were included in the study.

Instruments

For data collection, "Introductory Information Form" which was prepared to find out the socio-demographic characteristics of the puerperas (age, level of education, state of working, level of income, etc) and "Traditional Practices Information Form" which was prepared in line with the literature (Celasin et al., 2008; Vurur et al., 2009; Kesterton and Cleland, 2009; Gokduman and Balkaya, 2010) to find out the traditional practices used in infant care were used. Traditional Practices Information Form includes questions about traditional practices conducted in the hospital or at home after the baby is born (first feeding/breastfeeding of the baby, bathing the baby, belly button care, swaddling, jaundice, diaper rash, rash, fever, gas problems and spiritual care (baby's not being scared, not getting ill in the first forty days).

Data analysis

The data were assessed with SPSS 16.0 for Windows software (SPSS Inc., Chicago, IL, USA). In the study, descriptive statistics (numbers, percentages, averages, Standard deviation) were used to find out the traditional methods used in

infant care and the participants' introductory characteristics.

Results

When the distribution of participants' socio-demographic characteristics was examined, it was found that their average age was 27.08±5.66, 44.1% were high school graduates, 39.9% did not have a job and 72.8% had nuclear family. 66.9% of the participants stated that they lived in city center and 88.5% stated that they had social security. 63.6% of the participants stated that their income was equal to their expenditure. 94.8% of the participants stated that their spouses had a job and 41.8% stated that their spouses' level of education was high school (Table 1).

Table 1. Distribution of participants' socio-demographic characteristics (n=426)

Variable	Mean ±SD	
Age	27.08 ± 5.66	
Level of Education	**n**	**%**
Literate/Primary	62	14.6
Secondary	57	13.4
High school	188	44.1
University	119	27.9
State of being employed		
Yes	170	39.9
No	256	60.1
Spouse's level of education		
Literate/Primary	45	10.6
Secondary	45	10.6
High school	178	41.8
University	158	37.0
Spouse's state of being employed		
Yes	404	94.8
No	22	5.2
Family structure		
Nuclear	310	72.8
Traditional	116	27.2
State of income		
Less than expenditure	78	18.3
Equal to expenditure	271	63.6
More than expenditure	77	18.1
Place of residence		
City	285	66.9
Town	90	21.1
Village	51	12.0
Social Security		
Yes	377	88.5
No	49	11.5
Total	**426**	**100.0**

Table 2 shows the traditional practices used by the participants in terms of the newborn's health care. It was found that the first place participants referred to when the infant got sick was health institutions with a rate of 73.7%. It was found that 19.5% of the participants did not bathe the infant for the stump to fall off, 47.7% covered with a yellow cloth/muslin/blanket to prevent jaundice, 41.1% took the infant to doctor for jaundice. The most used two practices were "taking to doctor/getting medicine (32.3%)", "cleaning with carbonated water, throwing cotton cleaned with carbonated water on the ceiling and believing that the infant gets well when it falls down, making the infant drink water, cleaning with starch, cleaning the mouth with water from the container dogs drink water, putting on ring (24.6 %)" for moniliasis, "taking to doctor/applying cream (33.0%)", "using powder (14.6%)" for diaper rash, " taking to doctor/using medicine (38.2%)", "using herbal products (26.7%)" for cough, " taking to doctor/using medicine (41.3%)", "making the infant drink water frequently, breastfeeding often, making the infant eat banana (24.9%) for diarrhea, " taking to doctor/using medicine (27.6%)", "massaging the abdomen, making the infant drink olive oil, making the infant drink water frequently, making the infant eat fruit puree, soap from the anus as suppository, making the infant drink compost, making the infant drink fish oil (37.9%)" for constipation, "applying cold compress (37.1%)", " taking to doctor/using medicine (19.9%)" for fever and "massaging, rubbing the back, making the infant drink herbal tea/tea, putting on apple oil (61.4%)"for gas, praying for the infant that got uneasy (15.0%) and waiting for reciting of azan, making the infant drink zam-zam applying date on the infant's mouth and making the infant drink blessed water as a religious ritual (14.1%), before the first feeding .

When the cultural beliefs used by the participants in term o the newborn's were examined, it was found that 37.1% put evil eye bead on the infant to protect the infant from evil eye. Other cultural practices are "reading prayer, putting on amulet, pouring lead for evil eye, putting sour apple in swaddle (32.6%). In addition, it was found that 30.8% put mother's milk on the infant face so that the infant would be beautiful, swaddled the infant (44.4%) for the infant's body to be smooth, 27% put salt in the bathing water of the infant so that the infant would not smell, 33.6 % put Quran on the cradle to prevent the baby from getting ill in the first 40 days, 31.9% talked to the infant so that the infant would be talkative, putting honey in the infant's mouth before the first feeding (21.4%) for infants to be sweet talker.

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Table 2. Distribution of traditional practices conducted on health care of the newborn by the participants

*Variable	n	%
The persons to contact first when the infant gets sick		
Family elders	112	26.3
Health institutions	314	73.7
For umbilical stump to fall off		
No practices	268	62.9
Not bathing the infant	83	19.5
†Other	75	17.6
†Cleaning with alcohol, putting on powder, putting on batticon, bathing the infant with salted water, putting cinder on the stump		
To prevent jaundice		
No practices	128	30.0
Covering with yellow cloth/muslin/blanket	203	47.7
Breastfeeding often	70	16.4
‡Other	28	5.9
‡Bathing the infant in water with gold, making the infant sleep under white lamp		
To recover from jaundice		
No practices	146	34.3
Taking to doctor	175	41.1
§Other	105	24.6
§Covering with yellow muslin/blanket, breastfeeding often, taking to hodja		
For moniliasis		
No practices	184	43.1
Taking to doctor/drug	138	32.3
¶Other	104	24.6
¶Cleaning with carbonated water, throwing cotton cleaned with carbonated water on the ceiling and believing that the infant gets well when it falls down, making the infant drink water, cleaning with starch, cleaning the mouth with water from the container dogs drink water, putting on ring		
For diaper rash		
No practices	145	34.1
Taking to doctor/applying cream	141	33.0
Using powder	62	14.6
††Other	78	18.3
†† Putting on olive oil, changing diapers frequently, bathing the infant frequently, washing the infant's bottom with salted water		
For cough		
No practices	149	34.9
Taking to doctor/using drug	163	38.4
Using herbal products**	114	26.7
‡‡Using herbal products(linden, ginger, cinnamon, rose hip, cumin), making the infant drink olive oil, making the infant drink honey lemon tea		
For diarrhea		
No practices	145	33.8
Taking to doctor/using drug	176	41.3
§§Other	105	24.9
§§Making the infant drink water frequently, breastfeeding often, making the infant eat banana		
For constipation		
No practices	147	34.5
Taking to doctor/using drug	118	27.6
¶¶Other	161	37.9
¶¶ Massaging the abdomen, making the infant drink olive oil, making the infant drink water frequently, making the infant eat fruit puree, soap from the anus as suppository, making the infant drink compost, making the infant drink fish oil		
For fever		
No practices	134	31.5
Cold compress	158	37.1
Taking to doctor/using drug	85	19.9
†††Other	49	11.5
†††Taking off clothes, putting on water with vinegar, putting on water with raki		
For gas		
No practices	145	33.0
Taking to doctor/using drug	24	5.6
‡‡‡ Other	247	61.4
‡‡‡Massaging, rubbing the back, making the infant drink herbal tea/tea, putting on apple oil		
For infants who cry and who are uneasy all the time		
No practices	138	31.8
Taking to doctor	47	11.0
¶Other	241	57.2
¶Reciting prayer, holding the infant in the lap, making the infant let out gas after breastfeeding, breastfeeding, rocking the baby, giving pacifier, collecting rope from seven neighbors		
Before the first feeding religious ritual		
No practices	366	85.9
††Other	60	14.1
†† Waiting for reciting of azan, ,Making the infant drink zam-zam before first feeding, Putting date on the infant's mouth before first feeding , Making the infant drink blessed water before first feeding		
Total	**426**	**100.0**

*Since the answers were more than one, the percentages were taken over "n".

Table 3. Distribution of cultural beliefs conducted of infants by the participants (n=426)

*Variable	n	%
To protect the infant from evil eye		
No practices	129	30.3
Putting on evil eye bead	158	37.1
†Other	139	32.6
†Reading prayer, putting on amulet, pouring lead for evil eye, putting sour apple in swaddle		
For the infant to be beautiful		
No practices	234	54.9
Putting mother's milk on the infant's face	131	30.8
Tinging the eyes	61	14.3
For the infant's body to be smooth,		
No practices	237	55.6
Swaddling	189	44.4
For the infant not to smell bad		
No practices	168	39.4
Adding salt in the bathing water	115	27.0
Bathing the infant frequently	65	15.3
‡ Other	78	18.3
‡Salting the infant, putting on rose water, baby lotion, reciting Quran		
To prevent the infant from getting sick in the first forty days		
No practices	171	40.0
Putting Quran on the cradle	143	33.6
§Other	112	26.4
§Putting Quran on the cradle, putting knife under the cradle, reciting Quran, not showing to women who are in their periods, tying red, hanging the father's clothes in the infant's room		
For the infant to be talkative		
No practices	276	64.8
Talking to the infant	136	31.9
Making the infant kiss bird beak	14	3.3
For infants to be a sweet talker		
No practices	335	78.6
Putting honey on the infant's mouth before first feeding	91	21.4
For the infant to be a person in the future		
No practices	163	37.2
‡‡Other	263	62.8
‡‡Burying in the garden of an educational institution, burying in the mosque, burying in the house or garden, throwing the stump on the ceiling, keeping in the bag, tying to the cradle		

* Since the answers were more than one, the percentages were taken over "n".

The practices for the umbilical stump that fell off were "burying in the garden of an educational institution, burying in the mosque, burying in the house or garden, throwing the stump on the ceiling, keeping in the bag, tying to the cradle" (62.8%) for the infant to be a person in the future

Discussion

The findings of the study to determine the traditional methods puerperal women apply for baby-care in the Eastern region of Turkey were discussed in this section. It is stated that traditional practices of baby care are observed especially in families who live in rural areas far away from health centers and who have a low level of education, many family members, poor socioeconomic status, no social security, and no job and in immigrant families (Cetinkaya et al., 2008; Bozkus et al., 2011). In this study, some traditional practices were determined because it was conducted in a region regarded as rural.

In the study, it was found that the first place referred to is health institutions with a rate of 73.7% when the infant gets sick. In studies conducted, it has been stated that the rate of taking the infant to doctor immediately when the infant gets sick is about 53%. The number of people who referred to primary,

secondary and tertiary health institutions within the last 14 years went up to 8.6 from 3.2 and the rate of referring to especially secondary and tertiary health institutions reached 70%. The rate of infant death which is 31.7 globally is 9.7 in Turkey and this can be considered as a result of the fact that health institutions are mostly preferred when infants get sick (Health Statistics Yearbook, 2016).

In the study, it was found that the participants conducted practices such as not making the infant bathe, cleaning with alcohol, putting powder on, putting on batticon, bathing the infant in salty water and putting ash on the stump to help the stump fall off. In a comparative study between Turkey and Iran in literature, it was reported that alcohol and iodize tincture were mostly applied for the umbilical stump to fall off (Ozsay and Katabi, 2008), olive oil and powder were used in Turkey (Turkey Demographic and Health Survey, 2013), butter was used in Ethiopia(Amare, 2014), while cow's manure was used in Uganda (Beinempaka et al., 2014) In the present study, it was found that women used alcohol, powder and batticon for the stump to fall off, even though low in number, in addition to traditional practices such as bathing the infant in salty water and putting ash on the stump. World Health Organization recommends waiting for the umbilical stump to fall off and to use antiseptic solution only in developing countries such as Africa and Afghanistan (Toruner and Buyukgonenc, 2012).

It was found that women who participated in the study mostly conducted unharmful practices such as covering with yellow cloth/muslin/blanket for the infant not to get jaundice or to recover. In addition, bathing the infant with water containing gold, making the infant sleep under white lamp and taking the infant to a hodja were also conducted in low rates. Studies conducted show that practices such as making the infant wear yellow things, putting gold on the infant (Isık et al., 2010; Calıskan and Bayat, 2011; Yigitalp and Gumus, 2017), putting on yellow cloth (Isık et al., 2010) and making the infant drink mineral water (Bilgen Sivri, 2012) are conducted for the infant not to get jaundice or to recover. Jaundice is a condition that is accepted as pathological within the first 24 hours of infants and it should be monitored (Toruner ve Buyukgonenc, 2012). Mothers are advised to breastfeed infants frequently to prevent jaundice. In addition, it is not harmful to conduct unharmful practices such as those found in this study (covering with yellow things, putting on gold).

It was found that the participants in the study generally used sodium bicarbonate for moniliasis; however, although low in number, there were also participants who conducted harmful practices such as using starch or cleaning the infant's mouth with water from a container from which dogs drank things. Studies in literature show that in case of moniliasis, practices were conducted such as putting mineral water on the infant's mouth (Bolukbas et al., 2009; Caliskan and Bayat, 2011; Demirbag et al., 2012; Bilgen Sivri, 2012; Yigitalp and Gumus, 2017;), cleaning with sodium bicarbonate, sugar, mother's hair and dry cloth (Caliskan and Bayat, 2011; Bilgen Sivri, 2012; Demirbag et al., 2012). In study, the result that most of the mothers used sodium bicarbonate for moniliasis is in accordance with modern medicine. However, it is thought that traditional practices such as cleaning the infant's mouth with water from a container from which dogs drank things, cleaning with hair, and putting on starch can cause moniliasis to increase, recovery to be delayed and even the infant to get other infections (Demirbag et al., 2012).

In the present study, it was found that the participants used olive oil and powder to prevent diaper rash and washed the infant's bottom with salty water. Studies conducted show that powder, olive oil (Arisoy et al., 2014), salt (Yigitalp and Gumus, 2017) and drugs are used to prevent diaper rash (Caliskan ve Bayat, 2011). Using olive oil for diaper rash is a recommended practice since it prevents the scratchiness which occurs on the skin due to ammoniac. However, using powder is not recommended since it can cause scratchiness by accumulating on the inguinal area and since it can cause aspiration in respiratory tract (Toruner and Buyukgonenc, 2012).

In the study, it was found that the participants used herbal products, olive oil and honey lemon tea for cough. Other studies conducted showed that various mixtures (honey, grape molasses, aspirin, olive oil, cologne, paraffin oil, ethyl alcohol) were put on the infant's back or chest to heal the infant's cough and also hot towel, angora wool gloves and newspaper were put on the infant's chest. In another study, it was reported that the infant was made to drink grape molasses, honey, mint-lemon, olive oil, ginger-honey (Bilgen Sivri, 2012). Other practices were making the infant drink black pepper added boiled milk or tea, making the infant eat paraffin oil after dropping sugar, jumping on trash by putting key on the infant's throat, putting hot milk, cologne, vicks on the infant's back, making the infant drink grape molasses with milk or butter, or boiled parsley (Toruner and Buyukgonenc, 2012). The results of this study are similar to the results in literature.

In study, it was found that the participants took their infants to doctor in case of diarrhea and they conducted correct practices such as making the infant drink water, breastfeeding often and making the infant eat banana. Infants are often taken to doctor in case of diarrhea (Memona et al., 2013; Ugurlu et al., 2013). When studies on the subject are examined, it has been found that instead of traditional practices, most of the mothers take their infants to doctor in case of diarrhea. This is a significant result for infant health (Ugurlu et al., 2013). In addition, women were found to conduct practices such as giving ORS and solid food (Memona et al., 2013; Ugurlu et al., 2013), making the infant drink dark tea, mint-lemon and decreasing greasy food (Wang et al., 2008). It can be said that taking infants to doctor most of the time in case of diarrhea is a positive behavior in case of health.

In the present study, it was found that the participants massaged the abdomen, made the infant drink olive oil, eat fruit puree, gave soap from anus for suppository, made the infant drink stewed fruits or fish oil for constipation. Studies conducted showed that mothers conducted practices such as making the infant drink olive oil (Bilgen Sivri, 2012), placing olive oil or soap in the anus and used drugs for constipation (Yalcin, 2012; Arisoy et al., 2014). Placing soap in the anus can harm the anus mucosa; however, making the infant drink olive oil can be accepted to be an effective practice.

In the present study, it was found that the participants conducted practices such as cold compress, taking to doctor/using drug, taking off clothes, putting on water with vinegar and raki in case of fever. In literature, the first practice to be referred to has been giving an antipyretic, applying cold water and water with vinegar (Arisoy et al., 2014) and warm water application. The results of this study are similar to the results in literature.

In the present study, it was found that the participants conducted practices such as massage, rubbing the back, taking to doctor/using drug, making the infant drink herbal tea/tea and putting on apple oil for gas. Studies in literature on gas pains revealed practices such as burning a cloth and putting the cinder on abdomen (Isik et al., 2010), giving antiflatulent, making the infant drink fennel tea, aniseed tea and chamomile tea (Caliskan and Bayat,2011). Similar results were obtained in the present study.

In this study, it was found that the participants conducted practices such as reciting prayer, holding the infant in the lap, making the infant let out gas after breastfeeding, breastfeeding, rocking the baby, giving a pacifier, collecting rope from seven neighbors for infants who cry and who are uneasy all the time. In literature, it has been reported that methods such as carrying the infant, bathing the infant frequently, warm towel compression, praying, putting evil eye bead and putting on amulet were used by families to calm infants who cried and got uneasy all the time (Cetinkaya et al., 2008; Isik et al., 2010; Yalcin, 2012; Bilgen Sivri, 2012). The results of this study are similar to the results in literature.

In this study, it was found that the practices of putting honey in the newborn's mouth, making the infant drink zam-zam, putting date on the infant's mouth and waiting for reciting the Quran before the first feeding of the infant are still practiced even if these practices are applied by a minority. Breastfeeding the infant within the first 30 minutes after birth is important both the breastfeeding reflex of the infant and for stimulating the infant's lactation (Toruner and Buyukgonenc, 2012). Studies conducted in Turkey show that in the past infants were breastfed every half an hour or every hour (Isik et al., 2010; Caliskan and Bayat, 2011; Arisoy et al., 2014), while there were also mothers who waited for three azans to feed the infant. Studies show that infants are first fed with sugared water (Yigitalp and Gumus, 2017). Similarly, it was found that 71% of the mothers in Pakistan breastfed their infants within the first hour and before they gave the colostrum, they gave salty water (44%), cow's milk (26%), and zam-zam (14%) to their infants (Memona et al., 2013). In literature, it has been stated that it is very important for the infant to get colostrum in the first 5 days due to its effect of regulating gastrointestinal system functions and protecting the infant from infections in addition to having high bioefficacy for the infant to grow up and develop (Samur, 2008). According to TNSA 2013 data, it has been reported that within the first hour of birth, one out of two children is breastfed, the rate of early breastfeeding is higher in mothers with a high level of welfare, infants are fed with other nutrients at a rate of 26% before mother's milk and that this situation does not differ in terms of level of education and welfare (Turkey Demographic and Health Survey, 2013). In the present study, the results that practices are applied such as putting honey and date on the newborn's mouth before first feeding, making the infant drink zam-zam or blessed water and waiting for the azan to be recited before first feeding, although practiced in low numbers, show that some social practices are transferred from generation to generation.

In the present study, it was found that the participants conducted practices such as reading

prayer, putting on amulet, pouring lead for evil eye, putting sour apple in swaddle to protect the infant from evil eye. Such practices may not be harmful in terms of infants' health. However, infants' health may be negatively influenced when the search for healthy behavior is influenced by thinking that the infants' illness can be resulting from evil eye.

In the study, it was found that the baby was put on their face for the baby to be beautiful and riding in the eyes. Similarly, in the studies conducted in different regions, it is stated that the baby's face is taken from breast milk, lemon and almond oil is applied to eyebrows and eyes (Isik et al., 2010; Bilgen Sivri, 2012; Arisoy et al., 2014) in order to make the baby beautiful. In the study, breastfeeding is harmless for babies to be beautiful but harmful for conjunctivitis.

It was found that about half of the participants continued swaddling. In literature, it is stated that one of the traditional practices which can negatively influence infant health is swaddling, which is considered to be among developmental hip dysplasia risk factors (Toruner and Buyukgonenc, 2012; Sevig and Tanriverdi, 2014). It has also been stated in studies conducted in Turkey that the tradition of swaddling is quite common and swaddling is conducted for the infant to have shapely arms, legs and body (Cetinkaya et al., 2008; Isik et al., 2010; Yigit and Gumus, 2017), to sleep comfortably, for the infant not to have the waist hurt and not to feel cold (Gokduman and Akdolun Balkaya, 2013). However, the fact that infants cannot feel comfortably when their arms and legs are covered is considered to be among risk factors for developmental hip dysplasia and this is considered to be risky in terms of health.

In order to prevent the baby from smelling, it was determined that practices such as salting the baby, riding the rose water, using baby lotion and reading the Quran were carried out in this study. It has also been stated in the studies conducted in Turkey that the tradition of salting is quite common (Cetinkaya et al., 2008). The application of salting to newborns is harmful to health because it can cause dehydration and loss of fluid from the body. The study is carried out in harmless applications (rose water and baby lotion riding and reading) in order not to smell the baby.

In the present study, it was found that the participants conducted practices such as putting Quran on the cradle, putting knife under the cradle, reciting Quran, not showing the baby to women who are in their periods, tying red, hanging the father's clothes in the infant's room to prevent the baby from getting ill in the first 40 days. It is the belief in the existence of the soul that the gin, fairy and devil affects the woman and the newborn. There are examples of similar applications in Turkey (Bozkus Egri and Konak, 2011). Preventing the baby from getting ill in the first 40 days is a cultural belief.

In the study, it was found that after the infant's umbilical stump falls off, the participants conducted practices such as burying in the garden of an educational institution or mosque, burying in the house or garden, throwing on the ceiling, keeping it in a bag and tying on the cradle. In Turkish tradition, the stump is not thrown away after it falls off and it is kept according to what kind of a person the family wants the infant to become (Ozsoy and Katabi, 2008; Bilgen Sivri, 2012). It is stated that the stump is buried to the mosque courtyard if the family wants the infant to be a religious person, in the courtyard of the faculty of medicine if the family wants the infant to become a doctor and in the garden of the house if the family wants the infant to be domestic (Bilgen Sivri, 2012). As a similar practice, the infant's umbilical stump is buried under a specially chosen tree in Nigeria so that the child can have a long life (Okpomeshine, 2011). In our study, it was found that the practices related with umbilical stump that falls off have been found to be practices which are not harmful for the infant's health.

Limitations of the Study

The fact that the study was conducted on puerperas who gave birth in the puerperal service of the Training and Research Hospital in a city in the east of Turkey is a limitation in terms of the generalizability of the results. Conducting similar studies in each region of the country is important in terms of finding out traditional practices.

Conclusion

In this study, it was found that the puerperal women conducted traditional practices such as for umbilical stump to fall off, to prevent jaundice, to recover from jaundice, for moniliasis, for diaper rash, for cough, for diarrhea, for constipation, for fever, for gas for infants who cry and who are uneasy all the time, before the first feeding religious ritual in the infants care. In addition, it was determined that puerperal women have some cultural beliefs for the evil eye, the baby to be beautiful, the body to be smooth, not to smell, to be talkative, to be sweet, forty not to stop in the future. Some of the traditional methods used by puerperal women are detrimental to health. Nurses, who have an active role in protecting and developing individuals' health are expected to conduct such studies so that they can provide more effective and qualified care. The fact that nurses are aware of the

traditional practices for the cultural structure and infant care of societies they are serving will be guidance in shaping training programs for the society and mothers. In addition, detailed anamnesis taken by nurses in postnatal periods, planned trainings about traditional methods are significant in terms of preventing the possible results of traditional practices.

Ethics Committee Approval: Before starting the study, written permission from the institution the research was conducted in and approval from Recep Tayyip Erdoğan University Non-Invasive Clinical Researches Ethical Board (decision number: 08/06.01.2017) were taken.
Peer-review: Externally peer-reviewed.
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References

Amare Y. Umbilical cord care in Ethiopia and implications for behavioral change: A qualitative study. BMC Int Health Hum Rights 2014; 14: 12. doi: 10.1186/1472-698X-14-12.

Amin R, Shah MN, Becker S. Socioeconomic factors differentiating maternal and child health-seeking behavior in rural Bangladesh: A cross-sectional analysis. International Journal for Equity in Health 2010; 9 (9): 1-11. doi:10.1186/1475-9276-9-9

Arisoy A, Canbulat N, Ayhan F. Traditional methods applied in caring for ınfants of mothers in Karaman. Journal of Anatolian Nursing and Health Sciences. 2014; 17: 23-31.

Beinempaka F, Tibanyendera B, Atwine F, Kyomuhangi T, Macdonald NE. The practice of traditional rituals and customs in newborns by mothers in selected villages in southwest Uganda. Paediatr Child Health 2014; 19: 72.

Bilgen Sivri B. Traditional practices about child and mother care of the mothers who owner 0-12 month baby. Erciyes Üniversity. Master Thesis. 2012.

Birdee SG, Phillips SR, Davis BR, Gardiner P. Factors associated with pediatric use of Complementary and Alternative Medicine. Pediatrics 2009; 125 (2): 248-257.

Boer H, Lamxay V. Plants used during pregnancy, childbirth, and postpartum healthcare in Lao PDR: A comparative study of the Brou, Saek and Kry ethnic groups. Journal of Ethnobiology and Ethnomedicine 2009; 5 (25). doi:10.1186/1746-4269-5-25.

Bozkaya GO, Akgün I, Birgi E, Cinkoglu A, Gog K, Karadeniz D. Practice of alternative medıcıne in chıldhood by parents. Journal of Dokuz Eylul University Medical Faculty. 2008; 22 (3): 129-135.

Bozkus Egri G, Konak A. Traditional belief related to postpartum period and samples for practises from Turkey and the World. ZfWT 2011; 3(1): 143-155.

Bolukbas N, Erbil N, Altunbas H, Arslan Z. Traditional practices about childcare of the mothers who owner 0-12 month baby. Journal of Human Sciences. 2009; 1: 165-8.

Bulbul HS, Turgut M, Koyluoglu S. Parents' views about alternative practices in children. Journal of Child Health and Diseases. 2009; 52: 195-202.

Celasin SN, Ergin D, Atman U. Attitudes and knowledge concerning high temperature of mothers have 0-6 age group ınfants who are hospitalized due to high temperature ailments. Fırat University Journal of Health Sciences. 2008; 22 (6): 315-322.

Calıskan Z, Bayat M. Infant care practices and influencing factors: An example of Cappadocia. Journal of Anatolian Nursing and Health Sciences. 2011; 14: 23-30.

Cetinkaya A, Ozmen D, Cambaz S. Traditional practices associated with ınfant health among the 15-49 aged women who have children in Manisa. Journal of Cumhuriyet University School of Nursing. 2008; 12: 39- 46.

Demirbag CB, Tanir KM, Kuguoglu S. Oral thrush ınfectıon ın ınfants between 1-12 months and approaches the traditional used by mothers for treatment. Electronic Journal of Vocational Colleges 2012; 136-44.

Gokduman M, Akdolun Balkaya N. The traditional practices of increasing the quantity of mothers of 0-6 month. Journal of Adnan Menderes University Health Sciences Faculty. 2013; 14: 31-1.

Gokduman M, Balkaya AN. The use of herbal tea to ıncrease breast milk and ınfluencing factors. Dokuz Eylul University E-Journal of Nursing Faculty. 2010; 3(4): 187-194.

Health Statistics Yearbook, 2016. Ankara.

Isik T, Akcinar M, Kadioglu S. Traditional practices applied to mother and newborn during pregnancy, labor and postpartum periods in Mersin. International Journal of Human Sciences. 2010; 7: 63-4.

Kesterton JA, Cleland J. Neonatal care in rural Karnataka: Healthy and harmful practices, the potential for change. BMC Pregnancy and Childbirth 2009; 9 (20): 1-13.

Memona ZA, Khanb MI, Soofic S, Muhammad S, Bhuttac ZA. A cross sectional survey of newborn care practices in rural Sindh, Pakistan: Implications for research and policy. J Neonatal Perinatal Med 2013; 6: 137-44.

Mollahaliloglu S, Kosdak M, Eryilmaz Z. The Ministry of Health of Turkey Health Statistics Yearbook, 2008. Ankara. 2011.

Okpomeshine C. Traditional birthing practices in Igbo Land, Nigeria. Int J Interdisciplinary Social Sciences 2011; 6: 93-8.

OpenEpi Version 3.01. (http://www.openepi.com)

Ozsoy SA, Katabi VA. Comparison of traditional practices used in pregnancy, labour and the postpartum period among women in Turkey and Iran. Midwifery 2008; 24: 291-300.

Samur G. Mother's milk. Ministry of Health Publication Number: 726, Klasmat Press (in Turkish). 2008.

Sevig U, Tanriverdi G. Interculturel Nursing. 1st press. Akademi Press and Publishing (in Turkish). İstanbul. 2014.

Titaley RC, Hunter LC, Heywood P, Dibley JM. Why don't some women attend antenatal and postnatal care services? a qualitative study of community members'perspectives in Garut, Sukabumi and Ciamis districts Of West Java Province, Indonesia. BMC Pregnancy and Childbirth 2010; 10 (61): 2-12.

Toruner KE, Buyukgonenc L. The Basic Nursing Approaches in Child Health. Göktuğ Publishing, Amasya. 2012.

Turkey Demographic and Health Survey Hacettepe University Institute of Population Studies 2013. Ankara.

Ugurlu SE, Basbakkal Z, Dayilar H, Coban V, Ada V. Examination of the traditional practicies about child care of the mothers in Odemiş. Gümüşhane University Journal of Health Sciences 2013; 2 (3).

Vurur S, Vurur G, Kocak B, Satılmisoglu O. Determination of traditional practices for breastfeeding. Intercultural Approach Symposium in Nursing and Midwifery 2009; 100.

Wang X, Wang Y, Zanzhou S, Wang J, Wang J. A population based survey of women's traditional postpartum behaviors in Northern China. Midwifery 2008; 19: 238-45.

Yalcin H. Traditional practice related to pregnancy, the natal and postnatal period and baby care (Karaman sample). Journal of Child Health and Diseases. 2010; 55 19-31.

Yigitalp G, Gumus F. Traditional infant care practices of women aged 15-49 in Diyarbakır. Turkish Journal of Pediatric Disease 2017; 3: 188-196.

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CASE REPORT

The Narrow Internal Auditory Canal with Triplication on the Left Side and with Duplication on the Right Side: Radiological Findings

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Abstract

The constricted internal auditory canal with duplication or triplication of the temporal bone is a very rare anomaly with only 23 cases in 16 reports in the literature, and only one of them is a constricted triplicated internal auditory canal (IAC) in which contralateral IAC is normal. We present the case with the right-sided constricted duplicated IAC and the left-sided narrow triplicated internal auditory canal. Computerized tomography (CT) revealed that the internal auditory canals separated by a bony septum into two canals on the right lateral and into three canals on the left lateral. Magnetic resonance (MR) imaging showed bilateral aplasia of cochlear nerve.

Key words: Narrow duplicated, triplicated internal auditory canal, computed tomography, magnetic resonance imaging, congenital hearing loss

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Introduction

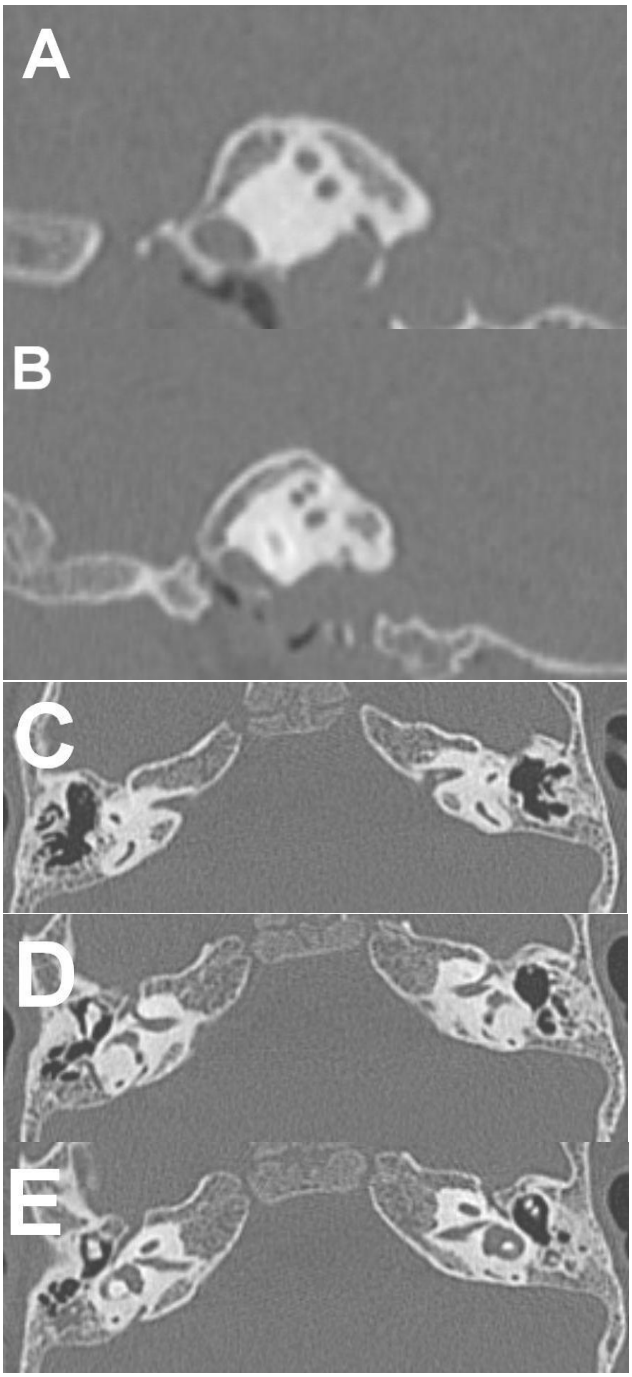
In children with sensorineural hearing loss (SNHL), thanks to improvements of imaging technology and awareness in ear anomalies, the ratio of visible bony inner anomalies including abnormalities in the size and configuration of the cochlear and vestibular structure and in the size and shape of the internal auditory canal (IAC) and the vestibular aqueduct have increased to 30% (McClay et al., 2002). One of these anomalies, narrow duplicated or triplicated IAC, is a very rare anomaly. We found 23 cases in 16 reports in Med-line search using the following terms: internal auditory canal, double, duplication, duplicated, triplication, triplicated (Curtin et al., 1986; Coelho et al., 2010). Only one of 24 cases were triplicated internal auditory canal in which contralateral IAC was normal (Lee at al., 2009).

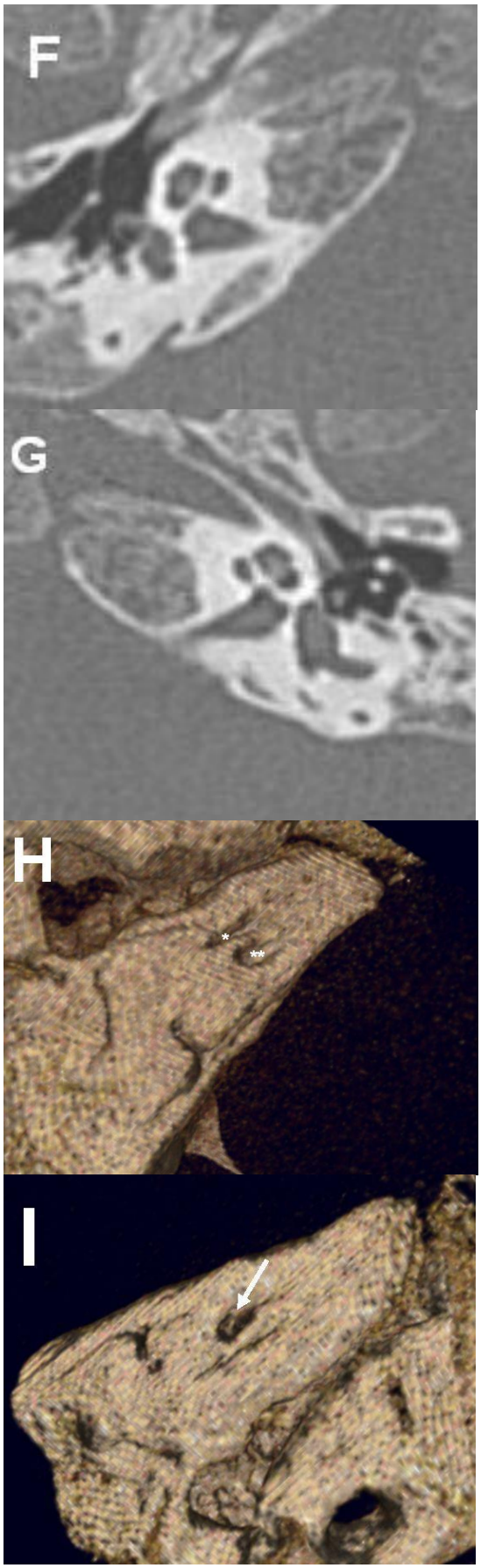
Although high resolution computed tomography (HRCT) is used to evaluate separated, accessory bony canals in duplicated or triplicated narrow IAC, it has little place in the evaluate of ICA's neural elements.

Magnetic resonance (MR) imaging gives detailed anatomical information about vestibulocochlear and facial nerves of the internal auditory canal. Herein, HRCT and MR imaging findings in a child who had the left-sided narrow triplicated IAC and the right-sided narrow duplicated IAC.

Case

A 5-year-old girl with complaint of hearing loss was followed by ear, nose, and throat department. Her complaint was recognized when she was baby. Her perinatal history was normal. Her ear, nose and throat examination were normal. An audiogram revealed bilateral profound SNHL. She had normal facial function. Sensorineural hearing loss information was not detected in her family. She referred to radiology department for temporal computed tomography (CT) imaging. CT examination was performed with a 64-dedector CT scanner (Aquilion 64, Toshiba, Tokyo Japan) and three-dimensional reformatted CT images was obtained. CT images revealed that the internal auditory canals separated by a bony septum into three narrow canals (anterosuperior, posterosuperior and inferior canal) on the left side and two narrow canals (superior and inferior canal) on the right side. Due to the bony septa between two canals was incomplete, the anterosuperior and the posterosuperior canals fused at origin and at lateral end on the left side. The anterosuperior canal on the left lateral and the superior canal on the right lateral continued with a wide connection in the facial canal. The posterosuperior canal, the inferior canal on the left lateral and inferior canal on the right lateral ended a connection to the vestibule. There were a very narrow connections between the inferior canals and the cochlea's (Figure.1). Bilateral vestibules were larger than normal. The facial nerve pathways (labyrinthine segment, geniculate ganglion, tympanic and mastoid segments) were normal on both sides. Additional middle or external inner ear anomalies were not found. MRI examination performed by a 1.5 T MRI scanner (Vision plus, Siemens, Germany)included following protocols: T1-weighted SE axial sequence (TR/TE: 400/25, 3 mm slice thickness), T2-weighted SE axial sequence (TR/TE: 2000/635, 3 mm slice thickness), a three dimensional constructive interference in the steady state (3D FT-CISS) (TR/TE: 12.25/5.9, 1mm slice thickness). Sagittal, parasagittal and coronal reformatted MR images were obtained. MRI showed two nerve in both cerebellopontine angles. The anterosuperior canal and posterosuperior canal on the left lateral and the superior canal on the right lateral contained nerve fibers thought to be facial nerve and vestibular nerve. No nerve fibers were delineated in the inferior canals ending to cochlea (Figure 2).





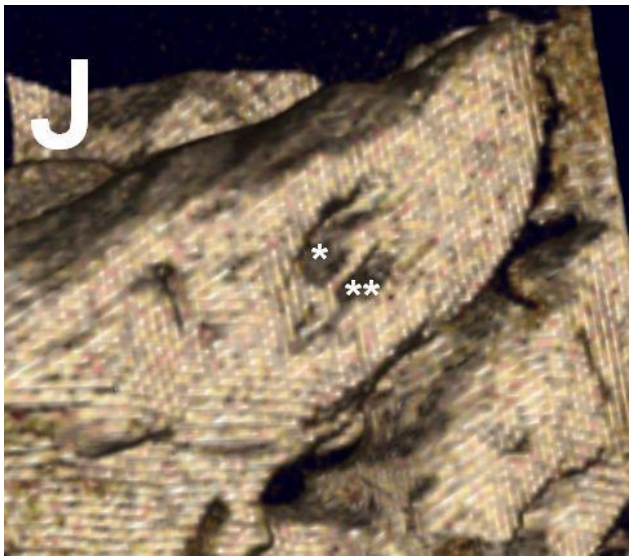


Figure 1. Sagittal oblique reformatted CT images show the IACs divided to two parts (superior and inferior) on the right side (A) and three parts (anterosuperior, posterosuperior, and inferior) on the left side (B) by bony septas. Consecutive axial HRCT images show the superior part of the duplicated IAC on the right lateral and the anterosuperior and the posterosuperior canals of the triplicated IAC on the left lateral. On the right lateral, the superior canal ends in a connection both in labyrinthine segment of the facial nerve canal and in vestibule. On the left side, the anterosuperior canal continues as facial nerve canal while the posterosuperior canal ends connection in vestibule. Bilateral vestibules are larger than normal, which is more prominent on the right lateral (C-E). The inferior canals coursing to the cochlea's are seen (F, G). 3 D reformatted image of lateral aspect of the right temporal bone displays two separate orifices belong to superior canal (single asterisks) and inferior canal (double asterisks) (H). Anterosuperior and posterosuperior canals which have common orifice are divided by bony septa (arrow) at a few millimeters from the orifice (I). The common orifice of the superior canals (single asterisks) and the orifice of inferior canal (double asterisks) are seen (J).

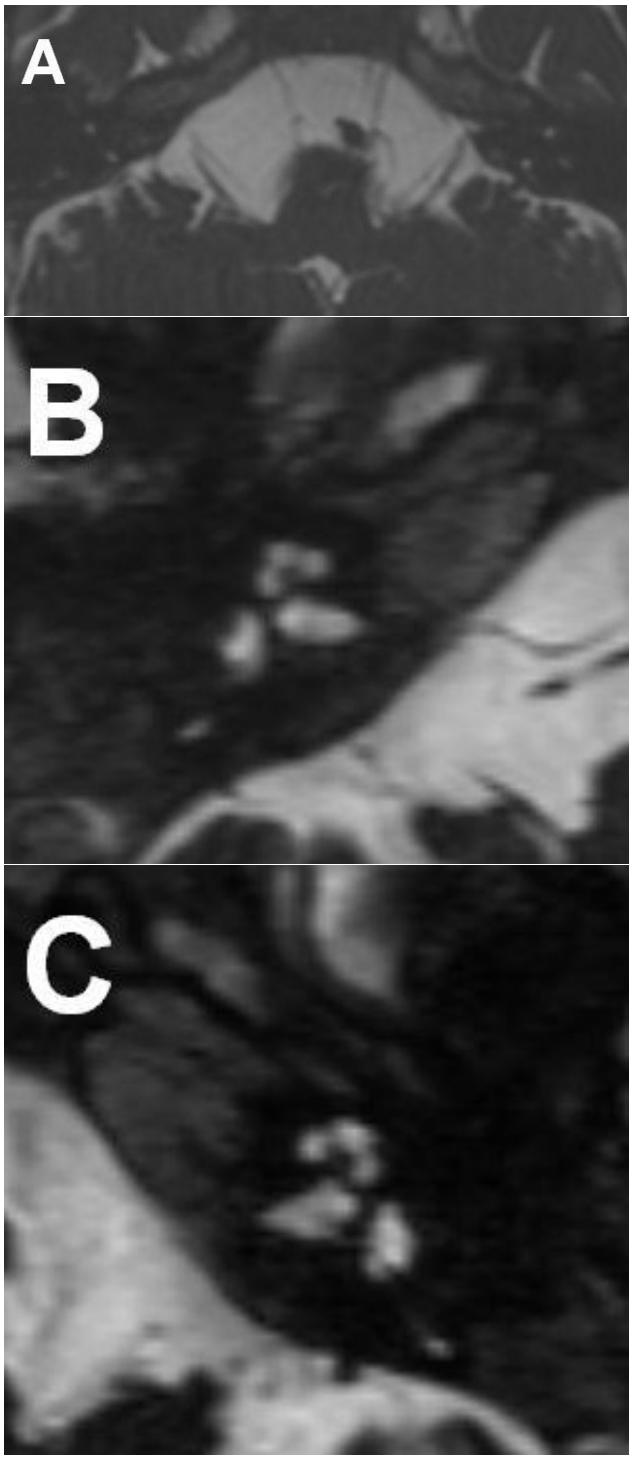


Figure 2. Axial 3D CISS MR image two nerve, which may be a facial nerve and a vestibular nerve are seen at the both cerebellopontine angle (A). The inferior canals in both sides are empty without nerve fibers (B, C).

Discussion

If the diameter of IAC, which is normally between 2 to 8 mm (mean 4mm), is less than 2 mm, this condition is referred as "narrow IAC" (Demir et al., 2005; Lee et al., 2009). This anomaly has high association with the temporal bone's some other abnormalities of and various systemic congenital anomalies, cardiac, renal, skeletal, and intestinal malformations. (Demir et al., 2005; Wang et al., 2010). Internal auditory canal anomalies can be components of some syndromes as seen unilateral narrow duplicated case with Klippeil-Feil presented by Demir et al (Demir et al., 2005). In case presented by Goktas et al, this malformation was associated walking and balance disturbances, and ocular hypertelorism. However, this malformation may exist without other systemic anomalies (Vilain et al., 1999; Cho et al., 2000). The associated inner ear anomalies including Mondini dysplasia, vestibulocochlear dysplasia, semicircular canal dysplasia and enlarged vestibular aqueduct were previously reported (Ferreira et al., 2003; Baik et al., 2008; Coelho., 2010). In the literature were three cases in that narrow-duplicated IAC were associated with external ear anomaly (Casselman et al.,1997; Demir et al., 2005; Kono et al., 2009).

Embryologically, the labyrinthine is derived from the otic placode that later transforms the otic vesicle from which the audio vestibular structures originate. On the 29th days of gestation, the vestibulocochlear nerve begins to develop, and its growth is thought to be induced by the embryonic labyrinth by chemotactic mechanism. During fifth and sixth months of gestation, the mesoderm surrounding seventh and eighth nerves forms bony IAC by chondrification and by ossification (Ferreira et al., 2003). Two hypotheses have been suggested to explain the relation between narrow IAC and SNHL: either primary aplasia-hypoplasia of the vestibulocochlear nerve negatively influencing normal development of the IAC or primary bone defect causing growth failure of the vestibulocochlear nerve (Ferreira et al., 2003; Demir et al., 2005; Baik et al., 2008; Goktas et al., 2008; Lee et al., 2009). Although facial weakness associated with duplicated IAC was only reported in report by Curtin et al (Curtin et al., 1986) , given the fact that normal function of facial nerve in most cases with duplicated or triplicated narrow IAC cannot be explained by second theory, the possibility of this theory is low (Ferreira et al., 2003; Lee et al., 2009). If there is a separate canal for the intracanalicular segment of the facial nerve when the IAC is atretic or stenotic, may it be defined as duplication of the IAC? In the literature, such cases were not named as duplication, as occurred in the report by Westerhof et al. (2001).

While there were only 7 cases about narrow duplicated IAC in the literature until 2000, after then

17 cases (with adding our case) has been reported (Curtin et al., 1986; Coelho et al., 2010). This may attributable to developments in imaging technology during the past decade. The HRCT is the best choice to evaluate the bony structures of the IAC and temporal bone with high sensitivity and spasticity (Linsheng et al., 2019) but It has little place in the evaluate of ICA's neural elements. Evaluation of the cochlear nerve is critical for selecting patients for cochlear implantation in patient with narrow IAC, because the patients who don't have cochlear nerves may not respond to the electric stimulation of cochlear implantation (Kono et al., 2009). Therefore, the HRCT imaging is not appropriate for rule out the risk of aplasia or hypoplasia of the vestibulocochlear nerve and MR imaging should be performed to detect of presence or absence of that neural structures in IAC (Vilain et al., 1999). The extensive anatomical data on vestibulocochlear and facial nerve have been gathered by using high-resolution gradient-echo imaging consisting of 3D Fourier transformation-constructive interference in the steady state (3D FT-CISS), 3D magnetization prepared rapid gradient echo (MP-RAGE), 3D balanced fast field echo (B-FFE), and 3D DRIVE sequences (Goktas et al., 2008). The data are collected via these sequences which are three-dimensional and submillimeter at spatial resolution, besides they are optimal to evaluate the neural structures like vestibulocochlear and facial nerves which are less than 1mm in diameter (Goktas et al., 2008). By using sagittal and parasagittal reconstruction for evaluating neural structures in IAC's, a 3D Fourier transformation-constructive interference in the steady state (3D FT-CISS) was used in this case.

Conclusion

In conclusion, the constricted internal auditory canal with duplication or triplication, usually associated with sensorineural hearing loss should be examined radiologically with both HRCT and MR imaging. Exhibition of absence or presence of cochlear nerve in narrow IAC by MR imaging is essential because it may affect the planning of treatment in cochlear implant candidates.

Ethics Committee Approval: The consent form was taken for the case report.
Peer-review: Externally peer-reviewed.
Author Contributions: Concept - A.K.; Design- A.K.; Supervision- A.K.; Materials- A.K.; Data Collection and/or Processing- A.K.; Analysis and/or Interpretation-A.K.; Literature Review- A.K.; Writing- A.K.; Critical Review- A.K.
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References

Baik HW, Yu H, Kim KS, Kim GH. A narrow internal auditory canal with duplication in a patient with congenital sensorineural hearing loss. Korean J Radiol. 2008; 9(suppl):S22-25.

Casselman JW, Offeciers FE, Govaerts PJ, Kuhweide R, Geldof H, Somers T, D'Hont G. Aplasia and hypoplasia of the vestibulocochlear nerve: diagnosis with MR imaging. Radiology. 1997; 202:773-781.

Cho YS, Na DG, Jung JY, Hong SH. J Narrow internal auditory canal syndrome: parasaggital reconstruction. Laryngol Otol. 2000; 114:392-394.

Coelho LO, Ono SE, Neto AC, Polanski JF, Buschle M. Bilateral narrow duplication of the internal auditory canal. J Laryngol Otol. 2010; 4:1003-1006.

Curtin H, May M. Double internal auditory canal associated with progressive facial weakness. Am J Otol. 1986; 7:275-281.

Demir OI, Cakmakci H, Erdag TK, Men S. Narrow duplicated internal auditory canal: radiological findings and review of the literature. Pediatr Radiol. 2005; 35:1220-1223.

Ferreira T, Shayestehfar B, Lufkin R. Narrow, duplicated internal auditory canal. Neuroradiology. 2003; 45:308-310.

Goktas Bakar T, Karadag D, Calisir C, Adapinar B. Bilateral narrow duplicated internal auditory canal. Eur Arch Otorhinolaryngol. 2008; 265:999-1001.

Guirado CR. Malformations of the inner auditory canal. Rev Laryngol Otol Rhinol 1992; 113:419-421.

Kesser BW, Raghavan P, Mukherjee S, Carfrae M, Essig G, Hashisaki GT. Duplication of the internal auditory canal: radiographic imaging case of the month. Otol Neurotol. 2010; 31:1352-1353.

Kono T, Kuwashima S, Arakawa H, Yamazaki E, Kitajima K, Ejima Y, Ishikawa T, Hashimoto T, Kaji Y. Narrow duplicated internal auditory canal: a rare inner ear malformation with sensorineural hearing loss. Arch Otolaryngol Head Neck Surg. 2009; 135:1048-1051.

Lee SY, Cha SH, Jeon MH, Bae IH, Han GS, Kim SJ, Park KS. Narrow duplicated or triplicated internal auditory canal (3 cases and review of literature): can we regard the separated narrow internal auditory canal as the presence of vestibulocochlear nerve fibers? J Comput Assist Tomogr. 2009; 33:565-570.

Linsheng W, Lihong Z, Xian L, Xiang G. Duplicated internal auditory canal: High-Resolition CT and MRI findings. K J Radiology. 2019; 823-829

McClay JE, Tandy R, Grundfast K, Choi S, Vezina G, Zalzal G, Willner A. Major and minor temporal bone abnormalities in children with and without congenital sensorineural hearing loss. Arch Otolaryngol Head Neck Surg. 2002; 128:664-671.

Vilain J, Pigeolet Y, Casselman JW. Narrow and vacant internal auditory canal. Acta Otorhinolaryngol Belg. 1999; 53:67-71.

Wang LS, Zhang LH, Sun XH, Yang YY, Chen YQ, Li X, Sheng HQ, Sun ZG. [Imaging features of duplication of the internal auditory canal]. Zhonghua Er Bi Yan Hou Tou Jing Wai Ke Za Zhi. 2010; 45:481-485.

Weisman JL, Arriaga M, Curtin HD, Hirsch B. Duplication anomaly of the internal auditory canal. Am J Neuroradiol 1991; 12:867-869.

Weon YC, Kim JH, Choi SK, Koo JW. Bilateral duplication of the internal auditory canal.Pediatr Radiol. 2007; 37:1047-1049.

Westerhof JP, Rademaker J, Weber BP, Becker H.J Congenital malformations of the inner ear and the vestibulocochlear nerve in children with sensorineural hearing loss: evaluation with CT and MRI. Comput Assist Tomogr. 2001; 25:719-726.

Middle Black Sea Journal of Health Science August 2020; 6(2):273-275

CASE REPORT

Is Surgery Really Necessary in Blood Cysts?

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Abstract
Blood cysts are rare cardiac tumors. Although it is considered a benign pathology, it can also be associated with embolic events. We report 42-year-old woman who admitted to our clinic with the palpitation and dyspnea on exertion. Apical diastolic murmur was present in physical examination. On echocardiography mitral valve posterior leaflet had a typical 'domed' appearance in diastole while anterior leaflet was restricted in motion with a fibrocystic formation on the ventricular side, causing mild to moderate mitral stenosis. We decided medical follow-up with the patient choice and we have been following for two years without any complications.
Key words: Mitral, blood cyst, rheumatic valve

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Introduction

The most common masses in the heart are metastases, but the majority of primary cardiac masses are benign. Most of the benign intracardiac masses are myxoma (Thiene et al. 2009). Rarely, benign blood cysts can be found in the heart. Blood cysts are diagnosed especially in the infantile period and uncommon in adulthood (Yilmaz et al. 2013). Although most of the cases are congenital, acquired cases have also been reported (Halim et al. 2015). Blood cysts adhere to cardiac chambers and heart valves. As blood cysts are rare, there is no consensus on treatment and patient management.

Case Presentation

A 42-year-old woman admitted to our clinic with the complaints of palpitation and dyspnea on exertion. Apical 2/6 diastolic murmur was present in physical examination. Blood pressure and heart rate were 120/80 mm Hg and 92 bpm respectively. Electrocardiography revealed sinus rhythm. She had a functional capacity of NYHA Class II. Medical history revealed that she was diagnosed as rheumatic mitral valve disease 2 years ago and she had been given penicillin G prophylaxis since then. Left ventricular ejection fraction was measured to be 60% in transthoracic echocardiography. Left atrium diameter, LVEDD and LVESD were 4.1 cm, 4.5 cm and 2.9 cm respectively. Aortic, tricuspid and pulmonary valves were detected to be normal.

Mitral valve posterior leaflet had a typical 'domed' appearance in diastole while anterior leaflet was restricted in motion with a 1,7x1,4 cm fibrocystic formation on the ventricular side (Video 1-2). Maximum and mean gradient were measured to be 13 mmHg and 7.6 mmHg on the mitral valve. Valve area was calculated as 1.23 cm2 via pressure half time (PHT) method. Transesophageal echocardiography (TEE) and cardiac magnetic resonance imaging was performed for detailed evaluation of the mitral valve structure (Figure 1-4).

Considering the clinical status of the patient, we made a medical follow-up decision with the patient choice. There was no change in the size and structure of the cyst at the 6th, 12th month and 2nd year controls.

Figure 1. Transtorasic echocardiography apical 4 chamber view

LV: Left ventricle, LA: Left atrium

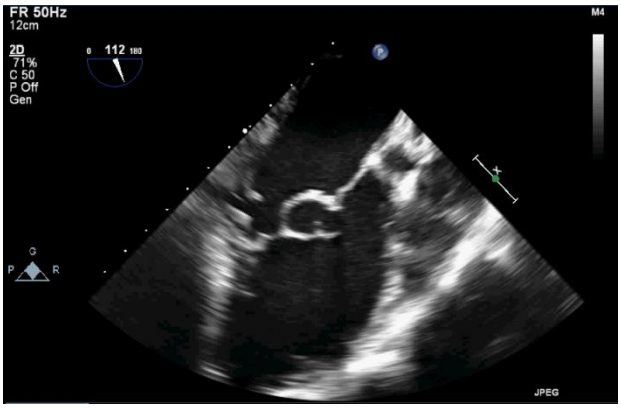

Figure 2. Transoesophageal echocardiography LV: Left ventricle, LA: Left atrium

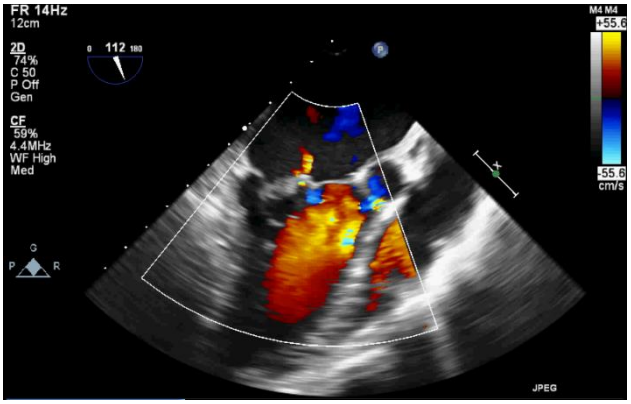

Figure 3. Transoesophageal echocardiography Colour Doppler assessment

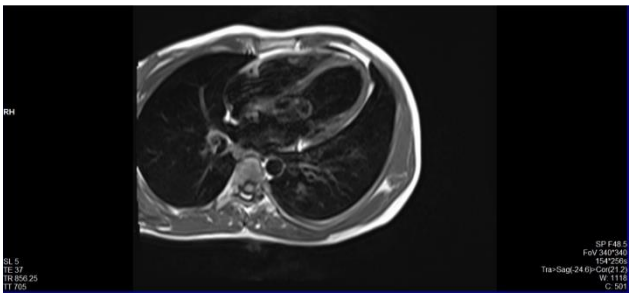

Figure 4. Cardiac magnetic resonance image shows blood cyst

Discussion

Blood cysts are benign intracardiac tumors that have been identified in infancy, mostly asymptomatic and detected incidentally. It is rarely seen in adulthood due to its congenital origin and regression with aging (Donndorf et al. 2013). Blood cysts usually attach to the tricuspid and mitral valve (Zimmerman et al. 1983). Although there are various hypotheses, its physiopathology could not be determined. Blood cysts are generally known as congenital, but an acquired case was detected after

cardiac surgery (Halim et al. 2013). The relationship between blood cyst development and cardiac surgery is not clear.

Despite being considered benign, there have been cases where it is associated with embolic events. There are case reports on embolic stroke and coronary embolism (Jacob et al. 2007; Pavsic et al. 2017). Large blood cysts can occur with valve dysfunction and associated symptoms such as dyspnea on exertion, fatigue. When attached to the mitral valve, it can cause obstruction in left ventricle outflow tract (Bagheri et al. 2018). Also, there are case reports indicating that blood cysts cause severe tricuspid insufficiency (Aydın et al. 2019). As in our patient, a blood cyst in the rheumatic valve is a very rare condition. There is only one similar case in the literature. However, that patient was not followed up medically, valve surgery and blood cyst resection were performed.

Because of the small number of patients and long-term follow-up results are unknown. There is no consensus on treatment and patient management. All information can be obtained from case reports. While some authors recommend medical follow-up for mildly symptomatic and asymptomatic patients, some authors prioritize surgical treatment. However, it is incidental to detect blood cysts, and the complications we see together can be incidental. Since our patient did not want surgical treatment and had mild symptoms that responded to medical treatment, we decided to clinical follow-up. We have been following for two years without complications.

Conclusion

We reported a 42-year-old female patient who was followed up for 2 years with a blood cyst on mitral valve. We think that blood cysts that do not because serious symptoms can be safely followed with medical treatment.

Ethics Committee Approval: The study was performed following the aid of the ethical standards down in the 1964 Declaration of Helsinki and its later amendments.
Peer-review: Externally peer-reviewed.
Author Contributions: Concept- I.B.C; Design- O.B, Z.Y.G; Materials- Z.Y.G, O.B; Data Collection and Processing- A.K; Literature Review- S.D; Writing- I.B.C; Critical Review- A.K.
Conflict of Interest: No conflict of interest was declared by the authors.
Financial Disclosure: The authors declared that this study hasn't received no financial support.

References

Aydin C, Engin M., Kul S. Tricuspid regurgitation due to blood cyst. Echocardiography. 2019;36:2108–2109. https://doi.org/10.1111/echo.14510

Bagheri A, Ansariaval Z, Khani M, Shekarkhar S, Baghayi R, Sharifi T. Two adherent blood cysts in subvalvular apparatus of the mitral valve causing severe left ventricular outflow tract obstruction. Journal of Cardiology Cases. 2018;18:78–80

Donndorf P, Bermaouli B, Westphal B, Steinhoff G. Asymptomatic blood cyst of the papillary muscle in an adult undergoing coronary bypass surgery. Interact Cardiovasc Thorac Surg 2013;16:402–4.

Halim J, van Schaagen F.R.N., Riezebos R.K., Lalezari S. Giant intracardiac blood cyst: assessing the relationship between its formation and previous cardiac surgery. Neth Heart J 2015;23:392–394 DOI 10.1007/s12471-015-0707-4

Jacob JJ, Jose J, John B. Intracardiac blood-filled cysts of the heart: a rare cause of embolic stroke. Singapore Med J. 2007 May;48(5):e125-6.

Pavsic N, Dolenc-Strazar Z, Cerne Cercek A, Klokocovnik T, Prokselj K. Coronary Artery Embolism from a Blood Cyst of the Mitral Valve. Heart Lung and Circulation. 2017;26: e118–e120

Thiene G, Valente M, Lombardi M, Basso C. Tumours of the heart. In: Camm AJ, Lu¨ scher TF, Serruys PW, editors. The ESC textbook of cardiovascular medicine. New York: Oxford University Press; 2009. p. S735–61.

Yilmaz S, M. Gul M, S. Unal, U. Canpolat, Z. Golbasi . Blood cyst of the mitral valve in an adult Herz 2013, DOI 10.1007/s00059-013-4006-9

Zimmerman KG, Paplanus SH, Dong S et al (1983) Congenital blood cysts of the heart valves. Hum Pathol 14:699–703

Middle Black Sea Journal of Health Science August 2020; 6(2):276-279

CASE REPORT

Rare Skin Localization of the Mite: Can it be a house dust mite?

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Abstract
The word "allergy" has been used to describe unexpected reactions occurring in human body at the beginning of the 20thcentury. House dust mites are known as an important source of allergens that are found in house dust. Different studies on patients with positive skin test, who were monitored for allergic complaints have shown 35% to 99% mite positivity in house dust. This study evaluated a case of patient with long term (six months) severe itching and mite identified in standard skin biopsy sample. So, it was thought that it might be a house dust mite.
Key words: Dust mite, Allergy, Ectoparasites

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Note: A part of this study was presented as "Poster Presentation" at the "16th International Eastern Mediterranean Family Medicine Congress (11-14 May 2017)".

Introduction

The word "allergy", derived from the Greek word "allos" meaning "other", has been used to describe unexpected reactions occurring in human body at the beginning of the 20thcentury. Allergens have antigenic structure along with protein or glycoprotein structure and create reactions via IgE in the organism. The mechanism of allergic reactions is complicated, and many factors play a role in formation of the allergic reactions and determining the severity. These include factors like genetic tendency, exposure route, allergen dose and structural characteristics of the person (Cekic and Sapan, 2015; Reithofer and Jahn-Schmid, 2017). Additionally, common allergen sources include feces of dust mites and cockroaches, hair from cats and dogs and mould spores (Reithofer and Jahn-Schmid, 2017; Sokol et al., 2017; Raap et al., 2011; Pravettoni et al.,2014).

With the determination of house dust mites as an important source of allergens found in dust, studies have focused on their distribution in a variety of places around the world, determination of species, allergic complaints, and correlation with various

diseases. Several studies have found that patients with positive skin test monitored for allergic complaints have 35% to 99% mite positivity in their house dust (Atambay et al., 2006) This study evaluated a case of a patient with long term (six months) severe itching and house dust mite identified in standard skin biopsy sample.

Case

A 67-year-old female patient was brought directly to the Ordu University Parasitology laboratory with a complaint of widespread itching on the body by a relative of her (medical faculty student). The anamnesis of the patient included submission to various clinics due to widespread and severe itching on the abdomen, groin, hip, shoulder and chest regions beginning 6 months previously, with blood, urine and stool analysis completed and no pathology was found to explain itching. In light of this, the patient was given oral steroids and scabies treatment for her complaints, but the symptoms were not resolved. When questioned about food and medications that may cause allergies, we learned that the patient's itching was not related to food, and she did not use any medication other than given drugs for itching and the patient had no any chronic disease. When the itchy regions on the patient's body were investigated, no other pathology was identified, except for excoriation lesions linked to scratching.

When the patient was admitted to the laboratory, the standard skin biopsy method was used to obtain samples from the calf and abdominal region, and these were investigated under a light microscope. Investigation of the samples revealed encountered adult mites and mite eggs. The mite was identified and photographed in the light of the relevant literature (Hart and Fain, 1988; Gülkan, 2004). Besides, it was determined that there were no *Sarcoptes scabies* according to the morphological structure of the mite. (Figures 1-3).

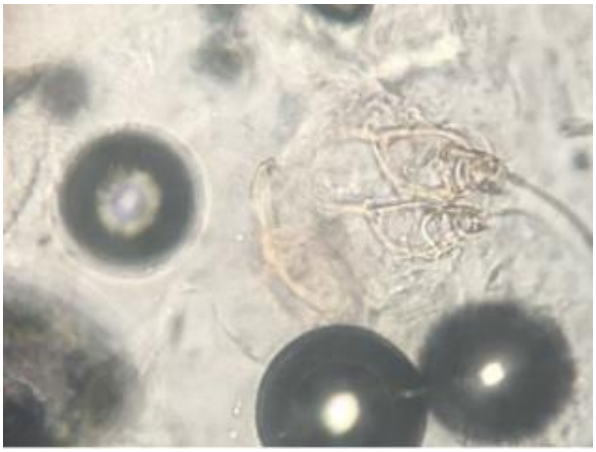

Figure 1. A Part of Adult Mite (20X)

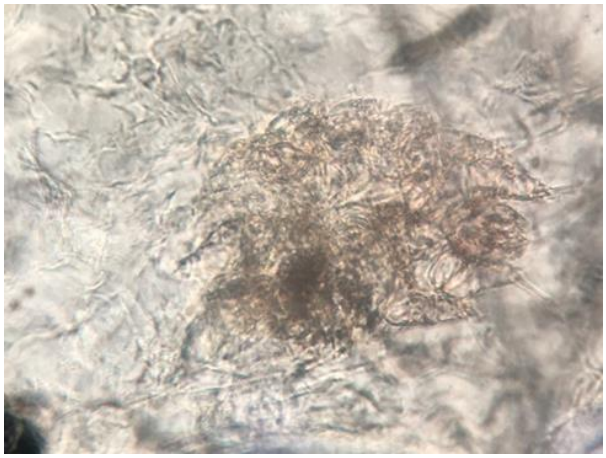

Figure 2. Adult Mite (20X

Figure 3. Mite Eggs (20X)

With large amounts of mites identified on the body, the patient was asked to bring dust samples from 4 different areas of her house. The patient was told to place all dust obtained in a closed large container after vacuuming the living room, bedroom, hall and kitchen with an electric vacuum cleaner, and to bring it to the parasitology laboratory immediately.

The dust samples were investigated with the lactic acid precipitation method and the mites were identified. To begin treatment, the patient was sent to the internal medicine clinic. The patient was administered 5% permethrin treatment for one month. She was called for check-up at the end of the treatment, and the patient's complaints had resolved and no more mites were identified on the skin.

Discussion

Mites are found in all locations from the polar regions to deserts, and in all types of living environments, and they can live as parasites on a variety of plants and animals just as they can live free in nature (Demirsoy, 1998; Unat et al., 1995). In this presented case, they were determined as ectoparasites on the human body.

The density and variety of mite species in a given region are linked to several factors like humidity, elevation, socioeconomic level, and seasons. At a humidity level ≤ 50%, the life cycle of house dust mites is shortened. In regions with elevation ≥ 1000 m, the density decreases and the incidence falls. Living conditions due to socioeconomic situation affect the incidence of mites on a household basis. Additionally, they are observed more commonly in houses in rural areas, with old furniture, without ventilation or exposure to sunlight. It is known that house dust mites are common in the fall season due to the variations in humidity and temperature (Arlian, 1992; Aygan and Ozcelik, 2002). Dust samples obtained from the house of our patient were found to contain *Dermatophagoides pteronyssinus.*

Studies of different venues like houses, hotels, student dormitories, hospitals and libraries have shown that house dust mites are most observed in houses. The rate of mites observed in libraries was close to that of houses; however, in places like hospitals and hotels, the house dust mite incidence has been found to be nearly half of those found in houses (Budak, 1984). In studies about identification of species, genus, and family levels of mites in Turkey, unidentified species have been mentioned. Studies have found that *Dermatophagoides pteronyssinus* is the dominant species followed by Lepidoglyphus destructor. In order of incidence, Cheyletus and Tarsonemus genera and families without species identification from Glycyphagidae, Polyaspidae and Histiostomatidae have been found (Kalyoncu, 1995; Ozcelik, 1997).

House dust mites have been correlated to allergies since 1960 and reported to cause diseases related to the respiratory tract (Arachnida and Kgv Ed, 1973). Feces, secretions, and body parts of mites have been reported to rank the first place for allergens, and not only living mites but also dead ones to be allergic. Each mite defecates 20-25 times per day. These contact the body through the respiratory tract or skin and have been reported to cause allergic reactions (Varma, 1996). The most important allergen found on *D. Pteronyssinus* is a glycoprotein called Der p I, and Der p II for *D. Farinae*. These antigens are used in skin tests; however, it should be noted that positivity on skin tests does not identify species found in dust, while negativity does not mean that there is no allergic reactions due to house dust mites. Mite allergens are found in secretions, mite fragments and especially in feces, with emphasis that more than 95% of allergens are due to mite feces (Schnyder, 2000). In our present case, the patient presented with severe itching complaint on the abdomen, groin, hip, shoulder, and chest regions, beginning 6 months ago and the vector was identified as house dust mites on skin. With treatment, the patient's complaints were resolved.

For treatment, the use of antihistamine medications is recommended, although preventive methods are more important. In this way, preventing the ideal environment for mites is recommended to protect against mites and to reduce complaints of allergic diseases due to house dust mites (Bernhard, 1986). In this case, we used creams containing antihistamines and 5% permethrin.

Conclusion

This study was presented with the aim of attracting attention to the fact that, contrary to the general literature, mites may live on the human body, thus causing allergic reactions

Ethics Committee Approval: Ethics committee approval was not received. Verbal and written consent was obtained from the patient.
Peer-review: Externally peer-reviewed.
Author Contributions: Concept- Y.K.; Design- Y.K., O. E, U.K.; Materials- Y.K, U.K.; Data Collection and Processing- Y.K., O.E, U.K.; Literature Review- O.E.; Writing- Y.K, O.E., U.K.; Critical Review- Y.K, O.E., U.K
Conflict of Interest: No conflict of interest was declared by the authors.
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References

Arachnida S.J, Kgv Ed S. Insects and Another Arthropods of Medical Importance. London: The Trustees of The British Museum (Natural History).1973; 17-462.

Arlian Lg. Water Balance and Humidity Requirements of House Dust MitesExp Appl Acarol. 1992;16(1-2):15-35

Atambay M, Aycan OM, Yologlu S, Karaman U, Daldal N. The Relationship between the Skin Allergy Test and House Dust Mites. Acta Parasitologica Turcica, 30 (4): 327-329, 2006

Aygan C, Ozcelik S. The Prevalence of House Dust Mites in Sivas Region and Its Role in Atopic Allergy.Acta Parasitologica Turcica, 2002; 26(2):186-191

Bernhard K, Karg W, Steinbrink H. House Dust Mites İn Bed Dust and On the Body. Angewandte Parasitologie, 1986; 27(1):49-52

Budak S. The Distribution of Dermatophagoides Pteronyssinus with Medicinal Importance in the Aegean Region. Acta Parasitologica Turcica,1984; 8(12):145-152

Demirsoy A. Basic Rules of Life (Invertebrates = Invertebrae) Volume-II / Part pp:772-781, 1998.

Hart BJ, Fain A. Morphological and biological studies of medically important house-dust mites. Acarologia 1988;29:284-95.

Gülkan B. Hatay ilinde ev tozu akarları. Cumhuriyet Üniv. Sağ. Bil. Enst. Yüksek Lisans Tezi. Sivas, 2004.

Kalyoncu AF, Coplu L, Selcuk ZT, Emri AS, Kolacan B, Kocabas A,Akkoclu A, Erkan L, Sahin A, Baris YI. Survey of The Allergic Status of Patients with Bronchial Asthma In Turkey: A Multicenter Study. Allergy 1995: 50; 451–455

Ozcelik S. Mites That May Cause Allergy and Dermatitis. Arthropod Diseases in Parasitology Vectors (Ozcel Ma, Daldal N Ed.). Acta Parasitologica Turcica Association, 1997; 13: 355-361

Pravettoni V, Primavesi L, Piantanida M. Shiitake Mushroom (Lentinusedodes): A Poorly Known Allergen in Western Countries Responsible for Severe Work-Related Asthma.Int J Occup Med Environ Health, 2014; 27(5):871-4.

Raap U, Wagenmann M, Pfaar O. Allergen-Specific Immunotherapy In Pet Allergy - An Update. Hautarzt., 2011; 62(9):657-62.

Reithofer M, Jahn-Schmid B. Allergens with Protease Activity from House Dustmites. Int. J. Mol. Sci, 2017; 18: 1368

Schnyder B, Schweri T, Thomann B,Pichler C. Allergy To House Dust Mite. Schweiz Med Wochenschr, 2000; 130(12):443-7

Sokol Wn, Wunschmann S, Agah S. Grasshopper Anaphylaxis In Patient Sallergic To Dust Mite, Cockroach, And Crustaceans: Is Tropomyos In The Cause?Ann Allergy Asthma Immunol., 2017; 119(1):91-92.

Sukru Cekic, Nihat Sapan. Alerjen Spesifik İmmunoterapi (Allergen Specific Immunotherapy). J Curr Pediatr, 2015;13:46-55

Unat EK, Yucel A, Altas K, Samastı M. Medicine Parasitology 5th Edition, İ.U. Cerr. Faculty of Medicine. Pub. No:15 S:193-197, 1995. İstanbul.

Varma M. Ticks and Mites. Manson's Tropical Diseases (Ed. Manson-Bahr P.E.C) 20 Th. Ed. W.B. Saunders Com. 1996; 1649-1659

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