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Yakın Dogu University Faculty of Nursing, Department of Nursing, Fundamentals of Nursing and Teaching in Nursing / Management, hatice.sen@neu.edu.tr
Lecturer Dr. Burcin ISIK,
Yakın Dogu University Faculty of Nursing, Department of Nursing, Fundamentals of Nursing and Nursing Education / Management, burcin.isik@neu.edu.tr
Lecturer Dr. Nurcan AKGUL GUNDOGDU

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Sivas Cumhuriyet University Faculty of Health Sciences, Department of Nursing, Department of Nursing Management, necmettinisci@cumhuriyet.edu.tr
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Adnan Menderes University, Faculty of Health Sciences, Department of Midwifery, keziban.amanak@adu.edu.tr
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The relationship between the work-related strain, psychological flexibility and psychological resilience levels of nurses in the COVID-19 pandemic process

İlksen Orhan [1]*, Erman Yıldız [2], Aylin Can [1], Özlem Doğan Yüksekol [3]*

[1]Munzur University Faculty of Health Sciences, Tunceli, Türkiye
[2]İnönü University Faculty of Health Sciences, Malatya, Türkiye
[3]Munzur University Faculty of Health Sciences, Department of Midwifery, Tunceli, Türkiye

ABSTRACT:
Purpose: This research was conducted to define relationship between the work-related strain, psychological flexibility, psychological resilience levels of nurses in COVID-19 pandemic.
Material and Methods: This cross-sectional, correlational research was carried out with 359 nurses. The data were collected using a Personal Information Form, the Work-Related Strain Inventory, Acceptance and Action Questionnaire II and Brief Resilience Scale.
Results: The mean work-related strain score of the participants was 41.45±6.51 (min:18, max: 72), while their mean psychological resilience score was 18.57±4.72.
Conclusion: As a result of this study, it was determined that, as psychological resilience levels of nurses increased, their psychological flexibility levels also increased.
Keywords: *COVID-19 pandemic; nurse; work-related strain; psychological resilience*

**Corresponding author: Özlem Doğan Yüksekol, email: ozlem193523@gmail.com*

INTRODUCTION

Emerging in the city of Wuhan in China in late 2019, COVID-19 has shown a rapid spread and taken the entire world under its effect (Lai et al., 2020). The novel coronavirus that hadn't been detected in humans before has affected millions of people around the world and led to the emergence of the COVID-19 pandemic and the deaths of millions of people. By 31 January 2021, 2,205,515 people had died in the world, and 101,917,147 cases had been detected (WHO, 2021). In Turkey, according to the data of the Turkish Ministry of Health, 25,993 people lost their lives, and 2,447,463 cases were determined (T.C. Ministry of Health, 2021). The rapid spreading rate and high risk of COVID-19 pandemic have led the workload of healthcare workers to increase by causing many people to get infected and hospitals to be filled up in a short time (Uyurdağ et al., 2021). In parallel with the increase in workloads, the risk of healthcare workers to get infected with COVID-19 has increased, and individuals in this professional group are considered as a high-risk group in terms of infection (Yurtseven and Arslan, 2020). It is estimated that, in 44 countries around the world, more than 1,500 nurses have lost their lives, and the COVID-19-related healthcare worker deaths may be higher than 20,000 (International Council of Nursing, 2020).

Nurses who are in the frontlines in the fight against COVID-19 have to struggle with several problems in addition to the risk of spreading infection and death. In this process, as a result of long and shift-style

working hours of nurses, their fears of getting infected with COVID-19 and transmitting it to their families, work overload, long durations of using personal protective equipment and lack of sufficient personal protective equipment, increased numbers of patients, higher workload of nurses working in high-risk units, increased demand for nurses as infected nurses take a break from work and increased circulation of nurses in specialized units that require experience, nurses may experience difficulty in adaptation, burnout, fatigue and stress (Greenberg et al.; 2020, Fernandez et al., 2020). Because of nurses are working an intense and risky environment in the COVID-19 process may lead them to experience work-related stress, and by affecting their health negatively, it may cause psychological problems (Mo et al., 2020; Purabdollah and Ghasempour, 2020).

It is valuable to protect the mental health and psychological adaptation of nurses who take on the treatment and care of COVID-19 patients, and concerns about this situation may develop (Purabdollah and Ghasempour, 2020; Santarone, McKenney and Elkbuli, 2020). Studies have reported that 50.4% of healthcare professionals treating COVID-19 patients in China experienced depressive symptoms, 44.6% experienced anxiety, and 71.5% experienced psychological distress, Aksoy and Koçak, (2020) stated that more than half of 758 nurses and midwives in their study had high levels of uncertainty-related anxiety and needed psychological support, Liu et al. identified psychological distress (15.9%), anxiety (16%) and depressive symptoms (34.6%) among 4679 doctors and nurses at 348 hospitals in China, and Kang et al. (2020) determined that, among 994 physicians and nurses working in Wuhan in the coronavirus pandemic process, the mental health of 36.9% was under the threshold levels, 34.4% had mild levels and 22.4% had moderate levels of mental problems (Aksoy and Koçak, 2020; Liu et al., 2020; Kang et al., 2020). Besides all these issues, it is considered that high psychological resilience and psychological flexibility levels are important in nurses' effective fight against COVİD infection and their protection of own mental health (Bahar et al.,2020). Psychological resilience and psychological flexibility refer to the ability of a person to have adaptation to healthy compliance and coping mechanisms in stressful, distressing and difficult conditions (Salande and Hawkins, 2017; Buz and Genç, 2019). Both concepts may become effective in reducing the negative effects of strain and stress that influence mental health and improving mental health the positive direction in such a difficult process as this pandemic. Arslan et al., (2020) determined that, in the COVID-19 pandemic process, psychological resilience reduced the effects of a negative mental state and increased the effects of a positive mental state on psychological health. In this context, investigating the effect of this concept on the psychological health of nurses who are fighting in the frontlines in the COVID-19 pandemic process has become an important and prominent topic to study in this period (Yıldırım, Arslan and Worg, 2021).

In this pandemic process that has influenced Turkey and the entire world, development of arrangements and interventions to protect the mental health of nurses has become prominent. Accordingly, our study aims to investigate the relationship between the work-related strain, psychological resilience and psychological flexibility levels of nurses.

MATERIAL and METHODS

Type of the Study

This study is a cross-sectional and correlational research

Study design and participants

The population of this cross-sectional and correlational study consisted of nurses working at the Firat University Faculty of Medicine Hospital. The research was carried out between July 2020 and September 2020. The sample size the study was determined as 359 with a 95% confidence interval and a 5% error rate by G*Power 3.1.3 (Heinrich Heine Universitat, Dusseldorf, Germany) analysis. The inclusion criteria were as: a) being voluntary to participate in the study, b) being employed as a nurse at the Fırat University Hospital, and c) being actively working during the COVID-19 pandemic process. Exclusion criteria wee as: a) not being voluntary to participate in the study, b) being employed outside the Fırat University Hospital or in

a position other than nursing, and c) not working actively during the COVID-19 pandemic process due to any reason (e.g., being on leave without payment).

Data Collection

The data of this research were collected by using a Personal Information Form, the Work-Related Strain Inventory (WRSI), the Brief Resilience Scale (BRS) and the Acceptance and Action Questionnaire-II (AAQ-II) and face-to-face by researchers.

Data Collection Instrument

Personal Information Form

Personal Information Form**,** consist of 16 questions sociodemographic, occupational COVID-19 pandemic -related characteristics of the participants.

The Work-Related Strain Inventory

Work-Related Strain Inventory developed by Revicki, May and Whitley (1991) was adapted into Turkish by Aslan et al. (1998). The scale is an 18-item, 4-point Likert-type self-report scale that was developed for the purpose of determining work-related strain and stress in individuals working in the field of health. Scoring is in the form of 4=completely applied to me; 3=almost completely applies to me; 2=somewhat applies to me, and 1=does not apply to me. Items 2, 4, 8, 9, 11 and 15 are inversely scored. The minimum and maximum possible scores are 18 and 72. Higher total scores indicate increased levels of work-related strain (Revicki, May and Whitley, 1991; Aslan, et al.,2020).

The Brief Resilience Scale (BRS)

The Brief Resilience Scale (BRS) was developed to measure the potential of individuals to bounce back and their psychological resilience. The scale was developed by Smith et al. (2008) and adapted into Turkish by Doğan (2015). It is a 6-item, 5-point Likert-type self-report scale. It is scored in the form of 1=not suitable at all; 2=somewhat suitable; 3=suitable, and 4=completely suitable. Among these 6 items, items 2, 4 and 6 are inversely scored, but they need to be firstly reversed in the scoring scheme. After this process, higher scores indicate higher levels of psychological resilience, while lower scores indicate lower levels (Smith et al., ; Doğan, 2015).

Acceptance and Action Questionnaire-II (AAQ-II)

Acceptance and Action Questionnaire-II (AAQ-II) scale that aims to assess psychological flexibility levels in individuals was developed as a result of problems experienced in terms of reliability and significance in its first form, the Acceptance and Action Questionnaire-I. It is a 7-item, 7-point Likert-type scale, where high scores indicate psychological inflexibility, and low scores indicate psychological flexibility (Bond et al., 2011). The Turkish adaptation and testing of the validity and reliability of AAQ-II were performed by Yavuz et al. (2017). Higher scores in AAQ-II have been associated with depressive, obsessive-compulsive and anxiety symptoms, lower scores have been associated with quality of life, and it has been shown to be a valid measurement instrument in both clinical and non-clinical samples. Internal consistency and time-invariance analyses for reliability and exploratory and confirmatory factor analyses for construct validity have been carried out. Convergent validity, concurrent validity and predictive validity analyses have been additionally conducted. With the mean Alpha coefficient of 0.84, the internal validity of the scale was found as good (Yavuz et al., 2016).

Statistical Analyses

Data analysis was done through the SPSS 23.In the study, descriptive statistical methods as frequencies, percentages, means, standard deviations, medians, minima and maxima were used in analysis of sociodemographic data. Compliance of the data with normal distribution was examined based on the skewness and kurtosis values. The parametric tests of “independent-samples t-test and one-way analysis of variance (ANOVA)” were used for the analysis of the normally distributed data, and the non-parametric tests of “Kruskal Wallis test, Mann-Whitney U test and Tamhane’s T2 test” were used for non-normally distributed data. The relationship between the scores obtained from the scales was determined by Pearson’s correlation analysis. Results were interpreted in a 95% confidence interval, on a significance level of $p<0.05$.

Ethical Considerations

Before the study was conducted, ethics approval was obtained from Ethics Committee (dated 17/03/2020-E.1821), and written permission was obtained from the related units. Before the data were collected, the participants were informed about the study and that participation was based on voluntariness.

RESULTS

The mean age of the 359 nurses who participated the study was 31.20±7.67 (years). Among the nurses, 79.9% were female, 53.2% were married, the vast majority (79.4%) had undergraduate or higher degrees, 77.7% did not work at Covid units, 76.6% worked in shifts, and almost all (86.3%) considered their working conditions to be negative and in need of improvement. Among all nurses, the duration of work of 72.1% was 10 years or shorter, the weekly work duration of 62.4% was 40 hours, and 76.6% worked in shifts (Table 1). According to the comparison of the descriptive characteristics of the nurses and their scale scores, there was a significant relationship between their gender (Z=-2.576; p=0.010) and education level (χ2=17.242; p=0.001) and their mean BRS scores. Accordingly, it was determined that the psychological resilience levels of the male nurses were higher than those of the female nurses, while the psychological resilience levels of the nurses who had degrees from vocational high schools of health and those who had postgraduate degrees were also higher (Table 1). There was a significant relationship between the working style of the nurses and their mean AAQ-II scores (χ2=13.802; p=0.001). Accordingly, it was determined that the nurses who were working at night showed higher levels of depressive, obsessive-compulsive and anxiety symptoms, and their psychological inflexibility levels were higher in comparison to those working in daytime and those working in shifts (Table 1). There was a significant relationship between the nurses' statuses of assessing their working conditions and their mean WRSI scores (χ2=14.770; p = 0.001). The work-related strain levels of those who considered their working conditions to be negative and in need of improvement were higher. There were no significant differences in the scale scores of the participants based on age, marital status, weekly working hours or total work duration (p> 0.05; Table 1).

It was found that 61% of the nurses who participated in the study had received training about the pandemic, 84.1% had provided care for suspected or diagnosed patients, and more than half (57.7%) lived separately from their families due to the pandemic. Additionally, it was found that almost all nurses (94.2%) experienced concerns of transmitting the disease to another person, 82.7% followed the posts of health institutions and associations, and the vast majority (87.5%) experienced concern/stress/strain in relation to the pandemic (Table 2). There was a significant relationship between the status of the nurses' of living separately from their families due to the pandemic and their mean AAQ-II scores (Z=-.2.990; p=0.003). Accordingly, the nurses who lived separately from their family members displayed more depressive, obsessive-compulsive and anxiety symptoms, and their psychological inflexibility was higher in comparison to those who did not live separately from their family members. There was a significant relationship between the nurses' status of having concerns about transmitting the disease to another person and their mean BRS (Z=-2.707; p=0.007) and AAQ-II (Z=-3.231; p=0.001) scores (p<0.05; Table 2). Those who did not have such a concern had higher psychological resilience levels, and they were psychologically more flexible. There was a significant relationship between the nurses' status of thinking that they had enough and accurate information about COVID-19 and their mean scale scores. Accordingly, the nurses who thought they had sufficient and accurate information had lower work-related strain levels and higher psychological resilience and flexibility levels (p<0.05; Table 2). There was a significant relationship between the nurses' status of experiencing stress, concern and strain in relation to the pandemic and their mean BRS (Z=-2.546; p=0.011) and AAQ-II (Z=-2.357; p=0.018) scores. Those who experienced stress had lower psychological resilience and higher psychological inflexibility levels.

The participants' mean WRSI score was 41.45±6.51, their mean BRS score was 18.57±4.72, and their mean AAQ-II score was 20.61±8.82.

Table 1. Comparison of the Descriptive Characteristics and Mean Scale Scores of the Nurses (N=359)

		WRSI		BRS		AAQ-II	
Variable	**n (%)**	**X±SD Median**	**Statistical analysis**	**X±SD Median**	**Statistical analysis**	**X±SD Median**	**Statistical analysis**
Gender							
Female	287(79.9)	41.00	Z=-0.003	18.00	Z=-2.576	20.00	Z=-0.607
Male	72(20.1)	42.00	p=0.998[a]	20.00	**p=0.010[a]**	20.00	p=0.544[a]
			U=10330.00		**U**=8310.00		U=51182.50
Marital status							
Married	191(53.2)	41.00	Z=-1.123	18.00	Z=-1.316	19.00	Z=-1.437
Single	168(46.8)	40.00	p=0.262[a]	19.00	p=0.188[a]	21.00	p=0.151[a]
			U=14944.00		U=14557.00		U=14635.50
Education level							
Vocational high school of health(1)	28(7.8)	42.00	χ2=1.618	20.00	χ2=17.242	17.50	χ2=7.752
Associate's(2)	46(12.8)	40.00	p=0.655[b]	18.00	**p=0.001[b]**	17.00	p=0.051[b]
Undergraduate(3)	261(72.7)	41.00	SD=3	18.00	SD=3	21.00	SD=3
Postgraduate(4)	24(6.7)	40.00		21.00	[1-2,3]* [4-2,3]*	16.50	
Weekly working duration(hours)							
40	224(62.4)	41.20±6.63	t=-0.904	17.75±4.73	t=0.970	20.08±9.76	t=-1.720
Over 40	135(37.6)	41.85±6.32	p=0.366[c]	18.25±4.70	p=0.333[c]	21.85±8.77	p=0.086[c]
Total work duration (years)							
1 or shorter	134(37.3)	40.00	χ2=4.547	19.00	χ2=1.152	21.00	χ2=5.361
2-10	125(34.8)	41.00	p=0.103[b]	18.00	p=0.562[b]	20.00	p=0.069[b]
11 or longer	100(27.9)	41.00	SD=2	18.00	SD=2	18.50	SD=2
Unit of work							
Internal medicine clinic	49(13.6)	42.38±6.84		17.93±4.88		22.97±8.59	
Surgicalclinic	54(15.0)	40.35±6.38	F=0.886	18.11±4.85	F=0.867	21.98±8.85	F=2.277
COVID unit	80(22.3)	41.15±7.28	p=0.472[d]	19.20±4.81	p=0.484[d]	21.68±11.24	p=0.061[d]
Intensive care	101(28.1)	41.32±5.86		18.85±4.40		18.88±8.20	
Other	75(20.9)	42.12±6.37		18.26±4.87		19.93±9.46	
Style of work							
Daytime(1)	60(16.7)	42.00	χ2=0.029	18.00	χ2=0.033	15.00	χ2=13.802
Night(2)	24(6.7)	39.50	p=0.986[b]	19.50	p=0.983[b]	24.00	**p=0.001[b]**
Shift(3)	275(76.6)	41.00	SD=2	18.00	SD=2	20.00	SD=2 [1-2]*
Assessment of working conditions							
Positive(1)	49(13.6)	38.00	χ2=14.770	19.00	χ2=3.460	16.00	χ2=4.555
Negative(2)	68(18.9)	42.00	**p=0.001[b]**	18.00	p=0.177[b]	21.00	p=0.103[b]
Needs Improvement(3)	242(67.4)	41.00	SD=2 [1-2,3]*	19.00	SD=2	20.00	SD=2
Age (years)		31.20±7.67	r=0.042 p=0.425**	31.20±7.67	r=-0.009 p=0.862**	31.20±7.67	r=-0.094 p=0.074**

Note: Bold values are statistically significant. n: frequency; %: percentageX±SD: Mean±standard deviation. [a]Mann Whitney U test; [b]Kruskal Wallis test; [c]Independent-samples t-test; [d]One-Way Analysis of Variance; *Tamhane's T2 test; ** Pearson'scorrelation coefficient

According to the correlation analysis results on the WRSI, BRS and AAQ-II scores of the nurses, there was a moderate negative relationship between the WRSI and BRS total scores of the participants, while there was a moderate positive relationship between their total WRSI and AAQ-II scores (p<0.01). Based on these results, as the psychological resilience levels of the nurses decreased, their work-related strain levels increased. Likewise, as their psychological flexibility decreased, their work-related strain levels increased.

Moreover, there was a moderate negative relationship between the nurses' total BRS and AAQ-II scores (p<0.01). Accordingly, as the psychological resilience of the nurses increased, their psychological flexibility levels also increased (Table 3).

Table 2. Comparison of the Scale Scores of the Nurses Based on Their Occupational and COVID-19 Pandemic-Related Characteristics (N=359)

		WRSI		BRS		AAQ-II	
Variable	**n(%)**	**Median**	**Statistical analysis**	**Median**	**Statistical analysis**	**Median**	**Statistical analysis**
Status of having received training on the pandemic			Z=-1.062		Z=-1.021		Z=-0.079
Yes	219(61.0)	40.00	p=0.288[a]	19.00	p=0.307[a]	20.00	p=0.937[a]
No	140(39.0)	41.00	U=14313.00	18.00	U=14354.00	19.00	U=15254.50
Status of having provided care to a suspected/diagnosed patient			Z=-0.253		Z=-1.478		Z=-0.606
Yes	302(84.1)	41.00	p=0.800[a]	19.00	p=0.139[a]	20.00	p=0.545[a]
No	57(15.9)	41.00	U=8425.50	18.00	U=7548.50	17.00	U=8172.00
Status of living separately from family members due to the pandemic			Z=-0.722		Z=-0.206		Z=-.2.990
Yes	152(42.3)	41.00	p=0.470[a]	19.00	p=0.837[a]	22.00	**p=0.003[a]**
No	207(57.7)	41.00	U=15031.50	18.00	U=15532.50	19.00	U=12829.00
Status of having concerns about transmitting the disease to family/friends/other employees			Z=-1.534		Z=-2.707		Z=-3.231
Yes	338(94.2)	41.00	p=0.125[a]	18.00	**p=0.007[a]**	20.00	**p=0.001[a]**
No	21(5.8)	40.00	U=2842.00	22.00	U=2304.00	15.00	U=2059.00
Status of thinking of having sufficient and accurate information about COVID-19			Z=-3.363		Z=-2.213		Z=-2.709
Yes	205(57.1)	40.00	**p=0.001[a]**	19.00	**p=0.027[a]**	19.00	**p=0.007[a]**
No	154(42.9)	42.00	U=12516.50	18.00	U=13638.00	22.00	U=13150.50
Status of following the posts of health institutions and associations about the pandemic			Z=-0.537		Z=-0.744		Z=-1.915
Yes	297(82.7)	41.00	p=0.591[a]	19.00	p=0.457[a]	19.00	p=0.056[a]
No	62(17.3)	40.00	U=8808.00	18.00	U=8656.00	22.00	U=7785.00
Status of experiencing stress, concern, strain about the pandemic			Z=-1.440		Z=-2.546		Z=-2.357
Yes	314(87.5)	41.00	p=0.150[a]	18.00	**p=0.011[a]**	20.00	**p=0.018[a]**
No	45(12.5)	40.00	U=6128.50	20.00	U=5413.00	16.00	U=5531.50

Note: Bold values are statistically significant. n: frequency; %: percentage; [a]Mann Whitney U test

Table 3. Distribution of the Nurses' Scores in the "Work-Related Strain Inventory (WRSI)", "Brief Resilience Scale (BRS)" and "Acceptance and Action Questionnaire-II (AAQ-II)"(n=359)

	Min-Max Possible in the Scale	**Min-Max Received by the Participants**	**Median**	**Mean Scores X±SD**	**Cronbach's alpha value**
Work-Related Strain Inventory	18-72	23-63	41	41.45±6.51	0.681
Brief Resilience Scale	6-30	6-30	18	18.57±4.72	0.818
Acceptance and Action Questionnaire-II	7-49	7-49	20	20.61±8.82	0.902

The results of the regression analysis of psychological flexibility as a factor related to psychological resilience presented that psychological flexibility was a negative factor for psychological resilience which explained 20.4% of the total variance observed in psychological resilience (F = 91.611; p <0.05; Adjusted R^2=0.204) (Tablo 4).

The results of the hierarchical linear regression analysis that was conducted to determine the variables related to work-related strain are shown in Table 5. In the first model, BRS and AAQ-II were included as the independent variables, and their level of explaining work-related strain was tested. It was determined that BRS and AAQ-II explained work-related strain by 21.1% (F = 47.616; p <0.05; Adjusted R^2=0.211). The second model included four variables including BRS and AAQ-II, as well as the perceptions of the nurses regarding their working conditions and information status about COVID-19.

Table 4. Correlation Values Between the Nurses' Mean WRSI, BRS and AAQ-II scores (n=359)

Scales*		BriefResilienceScale (BRS)	Acceptance and Action Questionnaire-II (AAQ-II)
Work-Related Strain Inventory (WRSI)	r**	-0.389	0.357
	p	**0.000**	**0.000**
Brief Resilience Scale (BRS)	r**	-	-0.429
	p	-	**0,000**

* Pearson's correlation analysis; ** Correlation coefficient (r=0.00-0.30 weak, r=0.31-0.70 moderate, r=0.71-1.00 strong)

Table 5. Hierarchical Regression Analysis Results on Factors Related to Work-Related Strain (N=359)

		Variables	ß	t	p	VIF	F	Model (p)	Adjusted R2	DW
WRSI	Model 1	Constant	46.150	24.971	0.001		47.616	0.001	0.211	
		BRS	-0.428	-5.880	0.001	1.257				
		KEF	0.156	4.291	0.001	1.257				
	Model 2	Constant	42.119	19.173	0.001		27.133	0.001	0.235	1.885
		BRS	-0.426	-5.832	0.001	1.297				
		KEF	0.141	3.869	0.001	1.286				
		Perceptions on working conditions	0.870	2.039	0.042	1.038				
		Perceptions on COVID-19-related information status	1.474	2.365	0.019	1.040				

DISCUSSION

The COVID-19 pandemic has been and is providing unmatched contributions in terms of revealing the importance of the profession of nursing. Understanding the psychological change process of nurses during the care of COVID-19 patients is important in terms of the sustainability of health services. This study presented the relationship between the work-related strain, psychological flexibility and psychological resilience levels of nurses in COVID-19 pandemic process.

As nurses are individuals who are in intense and continuous communication with people due to the nature of their field of work, they experience work-related strain (Avcı et al., 2018; Koşucu, Göktaş and Yıldız, 2017). As it has exposed nurses to a working environment with high work demand and low resources, COVID-19 pandemic has led them to experience higher levels of work stress and more symptoms of physical and psychological stress (Mo et al., 2020; Nie et al.,2020). A study conducted on Chinese nurses in the COVID-19 process determined the mean stress load score of nurses was 39.91±12.92 (Mo et al., 2020). In a study conducted on nurses from the Philippines, it was found that nurses who experienced fear of COVID-19 and

psychological distress also experienced lower job satisfaction and higher levels of intention to leave job (Labrague et al., 2020). A study conducted in Spain stated that nurses showed moderate levels of negative psychological distress symptoms in the pandemic process (Lorente, Vera and Peiro, 2021). In this study, the mean work-related strain score of the nurses was 41.45±6.51 (min:18, max: 72). Although this study is not directly comparable to other studies due to the lack of another study using a similar measurement instrument, it was revealed that, in this study, the nurses experienced moderate and high levels of work-related strain. This finding may be explained by the intense experience of regular stressors that have been experienced by the nurses throughout COVID-19 process. Additionally, in this process, high demand for health services and the insufficiency of existing resources may have predicted the higher work-related strain levels of the nurses (Mo et al., 2020).While psychological resilience is conceptualized as the capacity to successfully respond to excessive stress, trauma or negative experiences, studies conducted in the current pandemic period on the relationship between psychological resilience and mental health appear to be highly limited (Blanc, et al., 2021; Ran et al., 2020). Investigation of the psychological resilience of nurses who are in the frontlines in the fight against the COVID-19 pandemic is highly important in terms of understanding whether or not they successfully respond to this traumatic experience. In this research, mean psychological resilience score of nurses was determined as 18.57±4.72. Although the measurement instrument used in this study for psychological resilience does not have a cutoff point, considering that the score range of the scale is 6 to 30, it may be stated that the nurses had moderate levels of psychological resilience. This finding was compatible with studies conducted before the pandemic and those conducted in the pandemic process (Guo et al., 2017; Kutluturkan et al., 2016). As psychological resilience is considered as a characteristic or capacity that allows individuals to cope with distress against traumatic experiences and adapt positively, it is important for individuals to remain in a positive psychological stage (Bonannon and Mancini, 2008; Weiss and Berger, 2010). The moderate level of psychological resilience obtained in this study showed that the nurses who fought against COVID-19 could display their capacity to successfully overcome the experienced psychological pressure and adapt to new situation (Doğan, 2015). In terms of comparative roles of psychological resilience and psychological flexibility on work-related strain in this study, psychological resilience explained the largest part of total explained variance in the work-related strain levels of the nurses. In other words, as the psychological resilience levels of the nurses decreased, their work-related strain levels increased. This finding appeared to be compatible with the literature demonstrating that psychological resilience is a main variable in reducing the negative psychological effects of the pandemic and preventing these effects (Blanc et al., 2021; Ran et al., 2020). Accordingly, the probability of nurses who have high psychological resilience to experience work-related strain is lower, while the probability of those who have low psychological resilience to experience work-related strain is higher. Especially the witnessing of the difficulties experienced by patients in breathing in the COVID-19 by the nurses may have led them to analyze the existing situation and potential problems in a rational way. This, in turn, may have created positive emotions in the rational reactions they gave to the experience and led them to become more resilient in the face of such situations in the future. Psychological flexibility is seen as a resilience factor that alleviates effects of COVID-19 (McCracken et al., 2021). Researchers have stated that targeting psychological flexibility following trauma may provide recovery by increasing resilience (Meyer, et al., 2019). In chaotic processes like a pandemic, the understanding of the importance of psychological flexibility as one of resources of psychological resilience is increasing daily (Daks, Peltz and Regge, 2020) . A study in Italy reported that psychological flexibility increased resilience during COVID-19, and psychological flexibility interventions improved mental health (Pakenham et al., 2020). In this study, psychological flexibility was a factor associated with psychological resilience, and it explained 20.4% of variance observed in psychological resilience. In this sense,

the findings of similar studies in the literature about COVID-19 supported the positive relationship between psychological resilience and psychological flexibility that was determined in this study (McCracken et al., 2021; Pakenham et al., 2020). In another study, it was seen that psychological flexibility was positively associated with a state of wellbeing, whereas it was negatively related to anxiety, depression and COVID-19-related distress (Dawson and Golijani-Moghaddam, 2020). It was also determined that psychological flexibility reduced suicide risk in the context of COVID-19 stress factors, and it supported mental health in the context of social isolation during COVID-19 (Smith et al., 2020). Although it is not possible to make a direct comparison to other studies, in this study, it was revealed that, as the psychological flexibility levels of nurses decreased, their work-related strain levels increased. This finding of the study was compatible with findings in other studies conducted in the COVID-19 process which have revealed the negative relationship between psychological flexibility and psychological distress-related factors. Although the participants of this study did not receive any intervention supporting psychological flexibility, accordingly, the nurses seemed to have spent time and cognitive resources to try to control and organize their negative psychological experiences by getting in touch with their intrinsic experiences. As a result, it may be considered as a pleasing development that the nurses had more resources to notice opportunities regarding the goals that are present in their existing situations and emergency-focused opportunities in relation to their psychological flexibility levels.

Limitations

This study had some limitations. First of all, as participation was voluntary, there may have been a selection bias. The probability of nurses with extremely positive or negative experiences to participate may have been higher, and more neutral perceptions may have been excluded. Second of all, these data were cross-sectional, and the analyses revealed correlations. Therefore, causality cannot be inferred directly. Future studies may be carried out with a longitudinal design to achieve the analysis of the long-term development of the variables.

Conclusions

The findings of this study showed that the nurses who were fighting the disease in the frontlines in the COVID-19 pandemic process experienced significant levels of psychological flexibility, psychological resilience and work-related strain. This study showed that psychological flexibility is important for supporting the psychological resilience of nurses going through a chaotic process. It was also revealed that psychological resilience and psychological flexibility were determinant factors in terms of supporting a decrease in the work-related strain of the nurses. In summary, the nurses who had high psychological resilience and psychological flexibility levels had a lower probability of experiencing work-related strain, while those who had low psychological resilience and psychological flexibility levels had a higher probability.

Conflict of Interest

There is no conflict of interest between the authors.

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Factors Influencing Spiritual Well-Being among People with Chronic Obstructive Pulmonary Disease

Şeyma Demir Erbaş [1]*, Saadet Can Çiçek [1], Dilek Yılmaz [2]

[1]Department of Nursing, Faculty of Health Sciences, Bolu Abant Izzet Baysal University, Bolu, Türkiye
[2]Department of Neurology, Izzet Baysal Training and Research Hospital, Bolu Abant Izzet Baysal University, Bolu, Türkiye

ABSTRACT:
Purpose: Chronic Obstructive Pulmonary Disease has a progressive nature that limits daily living activities. It is important that the patient's spiritual needs are not overlooked and are appropriately integrated into the daily clinical routine. This study was conducted to identify factors that affect the spiritual well-being among people with chronic obstructive pulmonary disease.
Material and Methods: In the cross-sectional analysis, participants were recruited from two pulmonary clinics between April 2018 and December 2018. The study's power was 83% with 144 participants. Comparative and relational analyses of spiritual well-being were calculated based on demographic-clinical characteristics, sleep quality, quality of life, and anxiety. Data collection tools were the Spiritual Well-Being Scale, Pittsburgh Sleep Quality Index, St. George Respiratory Questionnaire, and Spielberger State-Trait Anxiety Inventory. Further analysis was performed with multiple linear regression analysis.
Results: Those who did not take the recommended dosag of medication and did not use devices at home were associated with higher spiritual well-being. Sleep quality, quality of life, and trait anxiety had an explanatory value of 24% for spiritual well-being. The best predictive variable was found to be trait anxiety.
Conclusion: Identifying factors associated with spiritual well-being can help define health requirements for comprehensive health management in clinical practice. In-depth analyses of spiritual well-being, which should be be conducted with more variables, may reveal underlying mechanisms of health outcomes in people with chronic obstructive pulmonary disease.
Keywords: *Anxiety; chronic obstructive pulmonary disease; quality of life; sleep; spirituality*

**Corresponding author: Şeyma Demir Erbaş, email: seymademir@ibu.edu.tr*

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a common and preventable disease in which abnormalities of the small airways of the lungs leading to airflow (World Health Organization, 2021). With a global incidence of 212 million in 2019, the disease is responsible for 3.23 million deaths worldwide and is the third leading cause of death (Global Health Metrics, 2019; World Health Organization, 2021). COPD is also a major public health problem in Turkey. Not only has its incidence increased by 18.2% over the past ten years, but the fact that it is the fourth most common cause of death suggests that it imposes a high burden of morbidity and mortality (Köktürk et al., 2021). One of the most impacted areas of health that should not be overlooked in people with chronic illness is spirituality and the spiritual well-being (SWB) It is associated with two fundamental elements that remain relevant from the past to the present: (a) a belief system that reflects God or a religious vision, (b) the meaning attached to life or purpose existential (Ellison, 1983; Ekşi and Kardaş, 2017). Because current medicine focuseson the biological

or mechanical aspect of the human body in today's medicine, spiritual needs do not receive enough attention by healthcare professionals (Gergianaki et al, 2019). Participants with advanced COPD have been shown to have SWB levels similar to those with inoperable lung cancer. (Hasegawa et al., 2017). A qualitative interview found that participants were dissatisfied with the impact of COPD on their way of being and thinking (Sigurgeirsdottir et al., 2019). On the other hand, there is another that illustrates the ways in which COPD patients express their spiritual/religious beliefs and experiences (Tzounis et al., 2016). Because COPD is a progressive disease that affects activities of daily living in many aspects, the patient's' spiritual need to be properly integrated into daily clinical routine. In this way, not only are patients' comfort, adherence to treatment, and QoL improved their fear and anxiety can also be reduced (Gergianaki et al., 2019). In addition, it can contributeto the psychosocial adaptation of people with diseases with a poor prognosis (Unantenne et al., 2013). The World Health Organization (2018) also emphasizes the need to identify spiritual needs as well as physical and psychosocial needs as part of supportive care in people with serious illness. The limited number of studies evaluating the role of spirituality/SWB in patients with chronic lung disease have focused on its relationship with quality of life (QoL) (Silva et al., 2009; Zimermann Teixeira et al., 2017; Duarte et al., 2020), medical, physical, and psychosocial factors (Hasegawa et al., 2017; Mendes et al., 2021), symptom burden (Strada et al., 2013), and religious coping (Mesquita et al., 2021). Although COPD has been shown to be strongly associated with impaired sleep quality and mental health problems (Aldabayan, 2023, Barrueco-Otero et al., 2022), SWB studies there is no tendency to focus onthese variables. However, the primary endpoint in SBW-based measures for COPD patients is often QoL (Silva et al., 2009; Zimermann Teixeira et al., 2017; Duarte et al., 2020). In fact, examining COPD patients' SWB levels and related factors within a broader framework aimed at eliminatingtheir physiological and psychosocial problems could be a resource for research next intervention. In this way, symptom control as well as the patient's general health can be positively improved.. Therefore, this study aimed to identify factors that affect SWB in people with COPD.

MATERIAL and METHODS

Purpose and Type of the Study

This cross-sectional study aimed to identify factors that affect SWB in people with COPD. It includes a linear analysis of the relationship between SWB and several variables. This study may suggest focusing on care issues that are of less concern toSWB in health service delivery. Therefore, the following research question was posed: Do sleep, anxiety, and QoL as well as demographic characteristics have a predictive influence on SWB in COPD patients?

Sampling and participant

The study was conducted on COPD patients who were hospitalized from April 2018 to December 2018. Participants were recruited from two pulmonary clinics of a tertiary hospital. Inclusion criteria were being over 18 years old, being diagnosed with COPD, and speaking and understanding Turkish. Participants with severe physical and cognitive impairments that could affect responsesto the questions were excluded. In studies on the adaptation of measurement tools, a sample size 5 to 10 times larger than the number of scale items is sufficient (Tavşancıl, 2014). Therefore, a minimum sample size of 145 wase sufficient for the analysis of the 29-item SWBS in this study. After data collection, confirmatory factor analysis (CFA) was conducted to verify whether the sample confirmed the theoretical structure of SWBS. Additionally, power analysis was performed on the data obtained using G*Power 3.1 Data were collected through face-to-face interviews, in the interview room of the hospital, lasting an average of 20 minutes.

Data Collection Tools

Spiritual Well-Being Scale (SWBS)

The SWBS includes 29 items and three factors: transcendence, harmony with nature, and anomie. A total score is calculated by summing responsesto the items using a five-point Likert scale. Items collected in the anomie sub-dimension will be scored in reverse.. A total score of 29 to 145 can be obtained from the scale. High scores indicate high SWB (Ekşi

and Kardaş, 2017). The Cronbach's alpha coefficient for the SWBS was found to be 0.88, which demonstrated sufficient reliability. In this study, the alpha coefficient to be 0.90.

Pittsburgh Sleep Quality Index (PSQI)

Sleep quality was measured using Pittsburgh Sleep Quality Index (PSQI), which includes 24 questions, including 19 self-report questions. The 19th question of the scale is not taken into account when scoring. The first 18 questions include seven items assessing subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, sleep medication use, and dysfunction daytime ability. The scale's components range from 0 to 3, and the total score ranges from 0 to 21. A high score means poor sleep quality. PSQI scores ≥ 5 indicate poor sleep quality (Buysse et al., 1989). In the Turkish reliability and validity study conducted by Ağargün et al. (1996), the Cronbach's alpha coefficient was found to be 0.80 while in this study it was 0.73.

St. George Respiratory Questionnaire (SGRQ)

Quality of life was measured using the St. George Respiratory Questionnaire (SGRQ). The SGRQ consists of 50 items witha three-factor structure: symptoms, activity, and impacts. The three sub-dimensions are scored separately and the total score is calculated. Scores range from 0 to100. A score of 0 represents normal, while a score of 100 represents the maximum level of disability. A four-unit change in the SGRQ due to treatment was considered significant (Jones et al., 1991). The Cronbach's alphacoefficient of the Turkish version of the SGRQ was 0.88 (Polatlı et al., 2013), while in this study it was0.84.

Spielberger State-Trait Anxiety Inventory (STAI)

Anxiety was measured using the Spielberger State-Trait Anxiety Inventory (STAI). The 40-item STAI consists of two parts of 20 items each: state anxiety (S-anxiety) and trait anxiety (T-anxiety) (Spielberger et al., 1970). While S-anxiety aims to measure how a person feels at that moment, T-anxiety often determines how a person feels. In this study, only T-anxiety was measured. In T-anxiety, which is a 4-point Likert scale, there are seven reverse-coded items. 35 points are added to the score obtained and the total score ranging from 20 to 80 is retained.. A score of 0 to30 indicates low anxiety, a score of 31 to49 indicates moderate anxiety, and a score of 50 or higher indicates high anxiety.. The Kuder Richardson coefficient 20 of the Turkish version ranges from 0.94 to 0.96 (Öner and Le Compte, 1985). In this study, the Cronbach's alpha coefficient was calculated as 0.77.

Statistical Analysis

Data were analyzed using SPSS Statistic 26 and Lisrel 8.7. Descriptive statistics were calculated using counts, percentages, mean, standard deviation, and normality tests as skewness and kurtosis values (reference ±2). Comparisons between groups were performed using t test, Mann Whitney U test, and one-way analysis of variance (one-way ANOVA). Bivariate analyzes were performed with the Pearson's correlation and the Spearman's correlation test. The relationship between SWBS and independent variables was examined using multivariate linear regression analysis. Two regression analysis models were established. First, the predictive ability of the three independent variables was evaluated using the enter method. Second, we attempted to find the strongest predictor(s) of the dependent variable using a stepwise method.. Additionally, a CFA was performed. The theoretical structure is fully measured if the following fit indices are met: ratio of chi-square ($\chi 2$) to degrees of freedom (df)≤3, root mean-square error of approximation (RMSEA) 0.05-0.08, standardized root mean-square residual (SRMR)≤0.05, normed fit index (NFI)>0.90, non-NFI (NNFI)>0.90, goodness-of-fit index (GFI)>0.90 and adjusted GFI (AGFI)>0.90 (Byrne, 2016; Çelik and Yılmaz, 2016). The level of significance is taken as $p<0.05$.

Ethical Approval

Approval for the study was obtained from the Institutional Ethics Review Board (registration number 2017/212). This study was voluntary and the participants were informed in advance about the procedure and their written informed consent was

obtained. This study was conducted in accordance with the principles of the Declaration of Helsinki.

RESULTS

Finally, 144 participants were included. According to SWBS gender score, a power value of 83% was obtained with an effect size of 0.51, a pooled standard deviation of 8.72, and a power analysis calculated with a confidence interval of 95%.CFA performed to SWBS had an acceptable model fit (Figure 1). The CFA fit indices are: χ2/df ratio1.83, RMSEA=0.076, SRMR=0.05, NFI=0.95, NNFI=0.97, GFI=0.91, and AGFI=0.90.

Factor-1: transcendence, Factor-2: harmony with nature, Factor-3: anomie.

Characteristics of the population aresummarized in Table 1. The mean age was 71.99±10.83 years and most of them were over 65 years old (75.7%). While the majority are men (76.4%) and the diagnosis time is over 5 years (42.4%). The SWBS scores of the participants not taking COPD medications at the recommended doses (Mean Rank=109.67, p=0.006) and not using any COPD-related devices at home (130.56±17.97, p=0.008) was found to be statisticalsignificant and high.

The SWBS total score was 125.36±16.88. There was a low significant negative correlation between SWBS and both the PSQI overall score (r= -0.25, p<0.001) and the PSQI subscales; subjective sleep quality, sleep latency (r= -0.38, p<0.001), sleep disturbances (r= -0.19, p<0.05), and daytime dysfunction (r= -0.34, p<0.001). A low significant negative correlation was determined between SWBS and SGRQ overall score (r= -0.17, p<0.05) together with its subscale impacts (r= -0.19, p<0.001). Furthermore, a moderately significant negative correlation was observed between SWBS and T-anxiety score (r= -0.49, p<0.001) (Table 2).

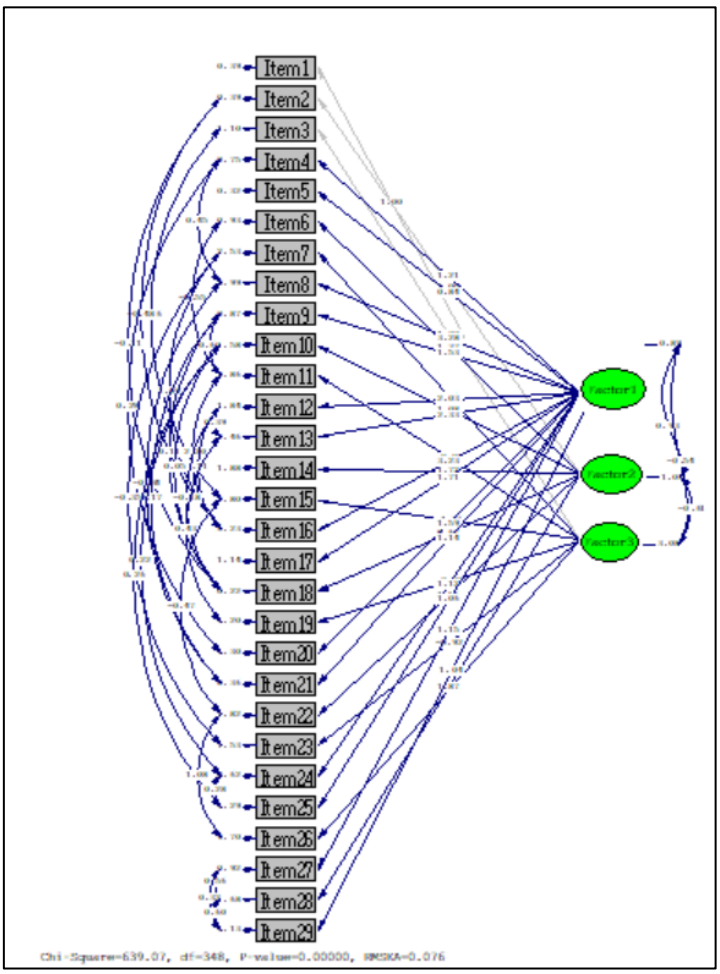

Figure 1. Confirmatory factor analysis of the 3-factor SWBS structural model

Table 1. Population characteristics (n=144)

Characteristics	n (%)	SWBS Mean (SD)	F/t	*p value*
Age (yrs)[a]	71.99±10.83 (min-max: 34-95)			
Age				
≤65 years	35 (24.3)	128.34±16.75	1.20	0.232
>65 years	109 (75.7)	124.41±16.89		
Gender				
Female	34 (23.6)	122.23±13.96	-1.24	0.217
Male	110 (76.4)	126.33±10.50		
Duration of diagnosis				
Less than a year	24 (16.6)	122.33±19.39	1.55	0.216
1-5 years	59 (41.0)	123.67±17.80		
Over 5 years	61 (42.4)	128.19±14.63		
Hospital admissions in the past year				
Once	55 (38.2)	124.89±18.64	2.99	0.053
Twice	61 (42.6)	122.75±15.36		
Three times and more	28 (19.4)	132.00±15.14		
Taking the medications at the recommended dose[b]				
Yes	130 (90.3)	70.02	-2.77	***0.006***
No	14 (9.7)	109.67		
Device use at home[c]				
None	48 (33.3)	130.56±17.97[1]	4.12	***0.008***[1>2]
Nebulizer	70 (48.6)	123.95±15.22		
Oxygen cylinder	8 (5.6)	110.25±22.48[2]		
Nebulizer+Oxygen cylinder	18 (12.5)	123.72±12.74		
Smoking status				
Non smoker	28 (19.4)	120.03±16.00	1.87	0.158
Smoker	28 (19.4)	128.00±17.21		
Smoking cessation	88 (61.2)	126.22±16.88		

[a] Mean±Standard Deviation (SD), [b] Mann-Whitney U Test (Mean Rank), [c] Tukey HSD (Post-Hoc test)
Abbreviations: SWBS, Spiritual Well-Being Scale

Table 2: SWBS, PSQI, SGRQ, T-Anxiety mean scores and bivariate results (n=144)

Variables	Mean±SD	Min.-Max. value	r
SWBS[a]	125.36±16.88	86-145	1
Transcendence	65.04±9.75	39-75	0.918**
Harmony with nature	30.18±4.59	16-35	0.853**
Anomie	30.14±6.67	7-35	0.603**
PSQI[a]	5.91±3.27	1-17	-0.25**
Subjective sleep quality	1.26±0.67	0-3	-0.16
Sleep latency	1.15±1.04	0-3	-0.38**
Sleep duration	0.65±0.83	0-3	0.07
Habitual sleep efficiency[b]	92.52±10.94	50-100	0.12
Sleep disturbances	1.43±0.51	0-2	-0.19*
Use of sleeping medications[b]	0.20±0.64	0-3	-0.16
Daytime dysfunction	0.92±0.78	0-3	-0.34**
SGRQ[a]	54.91±17.95	15.50-83.70	-0.17*
Symptoms	53.53±15.87	0-97.60	-0.12
Activity	74.61±27.88	13.14-100	-0.10
Impacts	43.62±18.69	6.17-81.83	-0.19*
T-anxiety[a]	38.52±9.07	24-62	-0.49**

[a] Total scale score, [b] Spearman correlation coefficient
Abbreviations: PSQI, Pittsburgh Sleep Quality Index; SGRQ, St. George Respiratory Questionnaire; SWBS, Spiritual Well-Being Scale; T-anxiety, Trait Anxiety Inventory; Mean±SD, Mean±Standard Deviation
**Correlation is significant at the 0.01 level (2-tailed), *Correlation is significant at the 0.05 level (2-tailed).

Table 3. The multiple linear regression model of the relationship between the SWBS and PSQI, SGRQ, and T-Anxiety

Model	Variables	SWBS				Correlations			Multiple Linearity Findings	
		Adjusted R-Square	Beta	t	p	Zero-Order	Partial	Part	Tolerance	VIF
1	Constant	0.236[a]	162.273	27.127	0.000					
	PSQI		-0.213	-0.487	0.627	-0.251	-0.041	-0.036	0.741	1.349
	SGRQ		-0.032	-0.421	0.674	-0.174	-0.036	-0.031	0.834	1.198
	T-anxiety		-0.880	-5.838	**0.000**	-0.499	-0.442	-0.427	0.815	1.227
2	Constant	0.249[b]	161.140	30.075	0.000					
	T-anxiety		-0.928	-6.858	**0.000**	-0.499	-0.499	-0.499	1.000	1.000

[a] Enter method, [b] Stepwise method, *Abbreviations:* PSQI, Pittsburgh Sleep Quality Index; SGRQ, St. George Respiratory Questionnaire; SWBS, SWB Scale; T-anxiety, Trait Anxiety Inventory

The multivariate linear regression model of the relationship between SWBS and PSQI, SGRQ, and T-anxiety was summarized in Table 3. In MODEL 1 calculate using the Enter method, it is found that three independent variables explain get 24% SWBS. T-anxiety was found to be an independent predictor of SWBS, and it was observed that as the anxiety levels increased, SWB levels decreased. Furthermore,, in MODEL2 generated using the stepwise method, it was found that T-anxiety was the variable that best explained SWBS and that it alone explained 25% of SWBS.

DISCUSSION

The research content requires a focus on two questions, regardless of the results.First, to our knowledge, this is the first study to provide insight into the combined effects of sleep quality, QoL, and anxiety levels on the SWB of COPD patients. While this may pave the way forwardresearchers in future field studies, it is important for clinicians to pay attention to areas neglected in spiritual health care process. Second, SWB can be influenced by the belief system and sociocultural structuresin which a person grows up. For this reason, the appropriateness of the measurement instrument applied to the spiritual awareness of the studied sample can contribute to the effective identification of spiritual needs. In this study, data were collected using the SWBS, which was developed for individuals raised in Turkish culture and in a society composed primarily of Muslims. On the other hand, the research results arediscussed under separate headings corresponding to each research question.

Spiritual well-being levels

The SWBS was developed as a means of assessing the fit between adults' life goals and their understanding of fundamental meaning in personal, environmental, social, and transcendental dimensions. The authors did not calculate the cut-off point when developing the SWBS. (Ekşi and Kardaş, 2017). However, since higher scores indicate the higher levels of SWB, as stated in the original article, this could be interpreted as the presence of a higher perception of SWB in the patients participating in the study. In accordance these results, it can be concluded that the patient believes in a transcendent being, feels the comforting effect of the feeling of protection and trust in it, that all negative experiences have a reason do or that everything is fine, and that their belief is a troubleshooting guide. On the other hand, it could be argued that the patients see themselves as a part of nature, respect every creature that is created, and adopt the view of solving problems and acting in line with the purpose of life, rather than unhappiness.

In previous studies in patients with chronic lung disease, it was found that the Functional Assessment of Chronic Illness Therapy-Spiritual Well-Being Scale (FACIT-Sp-12), which measures the domains peace, meaning, and faith of SWB, are frequently used (Strada et al., 2013; Hasegawa et al., 2017; Duarte et al., 2020; Mendes et al., 2021). Similarly, there is no cut-off score in the FACIT-Sp-12 for COPD patients to be classified asSWB. Results of studies examining SWB levels in predominantly Catholic cases reported values that could be considered high (Silva et al., 2009; Duarte et al., 2020; Mendes et al., 2021). Considering the cultural context of SWB, religious beliefs and religious coping were found to be higher

in patients from Brazil, which is known to be one of the most religious in the world, compared to the Dutch population (Mesquita et al., 2021). It has been reported that people with advanced COPD have SWB similar to those with inoperable lung cancer (Hasegawa et al., 2017). Therefore, this aspect of care should also be addressed regularly for COPD patients as well, as in the case of cancer patients whose care needs are complex with their aggressive treatments and spiritual needs often mentioned in the context of palliative care.

In this study, patients who did not take COPD drugs at the prescribed dosageand did not utilize any COPD-related devices at home had a better level of SWB. This contrasted marginally from past studies.. Duarte et al. (2020) established a relationship between SWB and vital and functional capacity when compared with clinical parameters. It has been shown that the burden of symptoms related with dyspnea decreases levels of SWB (Strada et al., 2013; Hasegawa et al., 2017; Mendes et al., 2021). In addition, psychosocial distress, including anxiety and depression, has been related with negative SWB (Mendes et al., 2021). Mesquita et al. (2021), in their study conducted with people from two different cultures, showed that age and functional capacity were essentially related to religiosity and religious coping. It can be seen that physical and psychosocial wellbeing parameters essentially influence the SWB levels of COPD patients. In specific, spirituality may lose its defensive affect within the confront of expanding illnessburden with respiratory distress, which is the primary symptom of the illness (Strada et al., 2013). Hence, a person suffering from COPD may lose the drive and will to cope with the illness, and their value and commitment to the significance and purpose of life may be reduced. On the other hand, considering the findings of this study, insufficient medication adherence or the absence of the require for an extra device may be related with a better perception of physical health or less presentation to the symptom burden of COPD. To demonstrate, those who required an oxygen supplement within the home environment had the most reduced level of SWB. In further studies, questioning patients' medication adherence and use of devices may reveal the relationship between SWB and self-management. However, more frequent study of individual and clinical characteristics associated with COPD should be encouraged.

Spiritul well-being, sleep quality, anxiety and quality of life

The SWBS was related with sleep quality, anxiety, and QoL scores ranging from low to moderate. Whereas it was especially related with the sleep latency, sleep disturbances, and daytime dysfunction subscale of PSQI, it had a negative correlation with the impacts subscale of QoL. On the other hand, regression analysis revealed the joint impact of three factors on SWB, and it was concluded that anxiety alone was a stronger predictor. Increased anxiety was related with lower SWB in the study. This was consistent with the findings of a limited number of quantitative studies (Mendes et al., 2021; Mesquita et al., 2021). Mendes et al. (2021) reported that intrinsic religiosity is related to mental health and that strong religious beliefs may act as a protective factor against emotional distress caused by illness. Although Mesquita et al. (2021) did not show a correlation between spirituality and anxiety symptoms in people from two different cultures, they reported a significant correlation with negative religious coping. This is based on the notion that increased anxiety can lead to the existence of spiritual tensions within oneself or with the divine, while illness-related experiences can be a form of punishment from God. Qualitative research reveals several aspects of the nature of psychosocial stress in COPD patients, one of which is related to the inability to lead a normal life due to limitations in activities of daily living, fear of death and being a burden to the family. Second is guilt due to the impact of lifestyle choices, especially smoking, on the development of COPD, as well as feelings of shame and isolation associated with experiencing symptoms (Chang et al., 2016; Ali et al., 2018). Chang et al. (2016) found that this situation was associated with feelings of powerlessness and imprisonment. Therefore, our study shows that limitations in activities of daily living and the experience of symptoms may lead to an inability to cope with difficulties and behaviors such as avoidance, fear, panic, anxiety, and feelings of weakness and

powerlessness. Patients may tend to act with less confidence in themselves and their environment. They may also seek forgiveness from guilt and want to feel loved and cared for by taking refuge in God's power. Increased levels of anxiety in this study may have led to a person's sense of emptiness in their inner world, confusion of meaning, flight to divine power, and a loss of resilience and ability to cope. These results may suggest that attention should be paid to the effects of spiritual care in reducing anxiety.

Quality of life is a universal phenomenon, and the negative impact of COPD on QoL is well documented. It is used as the primary endpoint in most studies on SWB (Hasegawa et al., 2017; Zimermann Teixeira et al., 2017; Duarte et al., 2020; Mendes et al., 2021). Although a wealth of evidence has been presented regarding spirituality and QoL, information regarding people with chronic respiratory disease is still limited. A comparative study of patients with advanced COPD showed a correlation between the meaning and peace subscales of SWB and mental health (Duarte et al., 2020). Another study showed an association between higher meaning and improved emotional and mental health (Zimermann Teixeira et al., 2017). Mendes et al. (2021) correlated increased spirituality with improved QoL in the subscales of emotional functioning and mastery. Nevertheless, another study that showed a significant association between QoL and SWB reported that the SWB levels in advanced COPD patients were similar to those in lung cancer patients (Hasegawa et al., 2017). These were also consistent with previous research findings on their SWB in different populations (Pilger et al., 2017; Lee and Salman, 2018). These results can be explained by the fact that the mental health is a good predictor of SWB. A recent review discusses possible mechanisms of the association between mental health and SWB as social support, religious affiliation, meaning-making, and beliefs as cultural aspects of self-regulation that control thoughts and behaviors (Garssen et al., 2021). People with high levels of religiosity and spirituality reportedly develop internal and external mechanisms to cope with the negative things they encounter throughout their lives.. It also helps you deal with stressful situations, fear, suffering, sadness, anger and rage (Vitorino et al., 2018). Although mental health is not directly measured, given the meanings given to the items, it is possible that mental health is affected by experiencing symptoms behaviors such as loss of control, embarrassment, weakness, panic, and avoidance of activity. Additionally, patients' potentially negative attitudes toward treatment may have increased their sense of uncertainty and hopelessness about the future. In such environments, an individuals' perception of spirituality may be negatively affected, which may influence their attitudes and behaviors such as holding on to life more willingly, managing life, belonging to a religion and performing personal religious rituals.

To our knowledge, this study was the first to examine the relationship between SWB and sleep quality in patients with COPD. It was determined that COPD patients with poor sleep quality were found to have lower SWB awareness. Additionally, patients who experienced difficulty falling asleep, difficulty sleep problems due to symptoms, and difficulty maintaining daily living activities had lower SWB scores when considering the components. Currently, there is a lack of information regarding the association between SWB and sleep quality, making it difficult to explain and interpret the underlying mechanisms. However, the results were consistent with samples tested in different populations (Yang et al., 2008; Saiz et al., 2020; Miller et al., 2021). Patients with heart failure who were highly spiritual were associated with better sleep quality, less discomfort during sleep, less time to fall asleep, better performance, less trouble staying awake during daily activities, and duration (Saiz et al., 2020). A Taiwanese study of hemodialysis patients found that strong spiritual beliefs were associated with sleep problems, and stronger religious beliefs were associated with fewer problems with daily functioning. This study found that the relationship between spirituality and sleep is bidirectional and complex (Yang et al., 2008). However, in this study, SWB may be more related to patients' physical limitation. The mental and emotional burden caused by physical limitations may have had a negative impact on spiritual awareness. The nature of

spirituality and its aspects of peace, meaning and faith dimensions, helps individuals cope with stressful situations (Duarte et al., 2020). Given that sleep problems are a serious stressor of this disease, people who practice individualized religious rituals are better able to cope with physical and emotional distress. For example, Ghadampour et al. (2018) showed that spirituality therapy improved sleep quality and mental toughness among older individuals. This demonstrates the potential value of considering spirituality as part of comprehensive symptom management, as highlighted in Miller et al. (2021)' study addressing cancer patients' concern about sleep quality.

CONCLUSION

This study demonstrated moderate associations between SWB and key domains of sleep quality, anxiety, and QoL. Higher anxiety levels and lower sleep quality and QoL were associated with lower SWB scores. In addition, medication adherence and home device support were found to be effective factors for SWB scores. These results confirmed the close relationship between SWB and QoL. Furthermore, there is evidence of a linear relationship between SWB and the reported decline in sleep quality and mental health in people with COPD. Medication adherence and requirements for the use of home support devices have been more recent frameworks for SWB. It may be recommended to include these variables in SWB assessment tools for health professionals. Spiritual support services, which are becoming increasingly common in medical settings, issues such as adherence, sleep hygiene, and the use of supportive devices may need to be incorporated into spiritual support interventions. Research on SWB may highlight the need to assess the comprehensive care needs of COPD patients, who lead a stressful and difficult lives. Greater focus on this issue could draw the attention of medical professionals to neglected areas of care. Therefore, contributing to the emergence of new approaches in clinical practice may facilitate the care management of COPD patients. Nevertheless, healthcare managers and policy makers need to assist medical professionals in developing and implementing care tools (e.g., checklists, clinical practice guidelines, evidence-based protocols) that focus on SWB interventions. In the future, further studies can be planned to reveal the mediating or moderating relationships between these variables.

Limitations

This study had several limitations. First, this study was cross-sectional, so a causal relationship could not be established. However, these observations can serve a guide for further longitudinal and clinical studies. Second, this was the first study in which SWBS was used in a COPD population. Therefore, the results could have been compared with those of measurement tools developed and used in different populations. Additionally, sleep quality in this population was also investigated for the first time. Therefore, further research is needed that repeatedly analyses variables to determine the spiritual needs of individuals raised in a particular culture. Finally, the sample size was small and patients were recruited from a single institution.

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Conflict of Interest

No conflict of interest has been declared by the authors.

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Glass Particle Contamination and Using the Filter Needle: A Cross-sectional Study

Nida Nur Söğüt [1], Arzu Erkoç [2*]

[1]İstanbul University-Cerrahpaşa, Institute of Graduate Studies, İstanbul, Türkiye
[2]İstanbul University-Cerrahpaşa, Florence Nightingale Faculty of Nursing, İstanbul, Türkiye

ABSTRACT:
Purpose: To identify the levels of knowledge of nurses and physicians about the contamination of micro-sized glass particles in medicine content when opening glass ampoules containing parenteral medicines and the use of filter needles in reducing contamination. When the medicine ampoule is broken and opened, spill into the ampoule and contaminates the medicine. Medicines contaminated with glass particles pose a potential danger when they are administered parenterally to patients.
Material and Methods: This study was planned as a descriptive cross-sectional study. The study was conducted with a total of 600 healthcare professionals, 300 physicians and 300 nurses, working in a university hospital between October and November 2020. The data were collected using the "Personal Information Form" and the "Information Form about Glass Particle Contamination and Filter Needle Use".
Results: The highest response to the question "medicine contaminated with glass particles can cause complications in the patient" was I do not know at 52.7%. The highest number of correct answers at the rate of 76% was given to the question "particle scattering to buffer/fingers at glass ampoule opening". When nurses were asked "presence of micro-sized glass particles in the medicine drawn from the ampoule to the syringe" and "preventing from giving glass particles with the medicine to the patient", the rate of correct answers was higher with significant differences compared to physicians.
Conclusion: Healthcare professionals had moderate knowledge of glass particle contamination and the use of filter needles. Variables such as profession, number of ampoules used in the clinic, and educational status affect the level of knowledge. Findings inform to stresses the need to raise awareness for reducing glass particle contamination.
Keywords: *Contamination; Filter needle; Glass particle; Healthcare professionals*

**Corresponding author: Arzu Erkoç, email: arzu.erkochut@iuc.edu.tr*

INTRODUCTION

The medicines packaged in glass ampoule form are frequently used in many departments that provide health care services such as intensive care units, emergency service departments and operating rooms (Erkoc Hut & Bayır, 2017; Carbone-Traber & Shanks, 1986). These ampoule form medicines are injected to patients by subcutaneous, intramuscular, intravenous, intraarticular and intrathecal routes. When the ampoule is broken and opened, a large number of micro- and/or macro-sized glass particles form, spill into the ampoule and contaminate the medicine (Erkoc Hut & Yazici, 2021). Medicines contaminated with glass particles pose a potential danger when they are administered parenterally to patients (Bukofzer, 2015; Carbone-Traber & Shanks, 1986). In the literature, it is reported that glass particles smaller than 7 µm reach organs such as brain, lung, liver, kidney, spleen and small intestine, lead to inflammatory reactions and damage, and particles in size 7-12 µm block capillaries and cause to embolism and thrombus (Timmons, Liu, & Merkle, 2017; Bukofzer, 2015; Langille, 2013; Jack, 2010; Preston & Hegadoren, 2004). It is emphasized that in addition to various pathological changes such as phlebitis and granuloma, glass particles may also

lead to the development of pulmonary hypertension and granulomatous pulmonary arteritis (Joo, Sohng, & Park, 2016; Jack, 2010; Preston & Hegadoren, 2004; Puntis, 1992; Turco & Davis, 1971). Medicines with glass particle contamination threaten the patient safety (Sogut & Erkoc Hut, 2022). Furthermore, this situation is also considered to negatively affect safe medicine administration. Therefore, it is recommended to use a filter needle when drawing up the medicine from the ampoule for prevent contamination (Cassista et al., 2014; Heiss-Harris & Verklan, 2005; Preston & Hegadoren, 2004; Sabon et al., 1989). The using of filter needles in parenteral medicine administration, risk of health problems in patients may be reduced, and accordingly patient safety can be ensured (Joo, Sohng, & Park, 2016; Harmon, 2014; Heiss-Harris & Verklan, 2005).

No studies were found about the awareness of healthcare professionals about glass particle contamination in parenteral medicines and using filter needle in clinic. Based on this gap in the literature, the aim of this study is to determine the knowledge levels of nurses and physicians about glass particle contamination in ampoule medicines and using filter needle to reduce contamination. For this purpose, answers to the following questions were sought.

Q1: What is the knowledge level of healthcare professionals about glass particle contamination in ampoule form medicines?

Q2: Is there a difference between the knowledge levels of healthcare professionals about glass particle contamination according to their sociodemographic characteristics?

Q3: What is the knowledge level of healthcare professionals about the using filter needle to reduce glass particle contamination?

Q4: Is there a difference between the knowledge levels of healthcare professionals about the using filter needle according to their sociodemographic characteristics?

MATERIAL and METHODS

Purpose and Type of the Study

This is a descriptive, comparative and cross-sectional study.

Sampling and participant

The study was conducted with healthcare professionals in a university hospital between October 2020 and November 2020. A total of 1716 healthcare professionals, including 736 physicians and 980 nurses, working in a university hospital in Istanbul constituted the population of the study. The sample size was calculated using the appropriate sampling method (5% margin of error, 80% power of the study). The sample selection criteria for the study were determined by the "purposive sampling" method. For a more precise evaluation of data, the aim was to reach 300 participants from each occupational group. The sample comprised 35% of the population and the study was completed with 300 nurses and 300 physicians.

The inclusion criteria for the study were agreeing to participate in the study, and working as a physician or nurse in the inpatient departments or outpatient departments of the internal medical sciences and surgical medical sciences, in intensive care units, operating rooms, and in units affiliated with these departments where diagnostic tests are performed and medicine administration is performed in the hospital.

Data Collection Tools

Healthcare professionals included in the study were listed and all of them were visited. Appointments were made for those who wanted to voluntarily participate in the study for time periods when they were available. Before starting interviews with the participants, the Informed Consent Form related to the study was read and their consent was obtained. The data were collected in the form of questions and answers by the researcher with the face-to-face interview method in an area approved by the participants, and responses were recorded on the relevant forms. It took approximately 5 minutes to collect the data and record them on the relevant forms. The data were collected using the "Personal Information Form" prepared by the researcher in accordance with the literature and the “Information Form about Glass Particle Contamination and Filter Needle Use” (Harmon, 2014; Zabir, Choy, & Rushdan, 2008; Sabon et al.,1989).

Personal Information Form

This included 12 questions about the personal (age, gender, etc.) and descriptive characteristics of healthcare professionals regarding medicine use in ampoule form (average number of ampoules used daily in the unit, opening techniques for glass ampoule medicines, etc.).

Information Form about Glass Particle Contamination and Filter Needle Use

This included 8 questions about participant information regarding glass particle contamination and filter needle use (micro-sized glass particles from the ampoule neck contaminate the medicine, cause complications, etc.) during the opening of the glass ampoule medicines. Since all of the questions constituted verbal data, answer options of "Yes", "No" and "I don't know" were created. The items from 1st question and the 8th question measuring the knowledge level of the participants were used in order to test the internal consistency of the responses of healthcare professionals. The participants were given "1 point" for the correct answer to each item and "0 points" for the wrong answer or the answer I don't know. In this state, the Kuder-Richardson 20 test, which is used to test the internal consistency of the answers given to true-false type questions, was performed and the internal consistency coefficient was calculated as $\alpha = 0.70$. The answer “Yes” for the 1st, 2nd, 3rd, 4th, 6th, 7th and 8th questions and the answer “No” for the 5th question were considered correct in order to perform the analyses. It was considered that all participants who answered "I don't know" gave an incorrect answer to the relevant question.

Statistical Analysis

The data obtained as a result of the study were evaluated in the computer environment using the IBM SPSS Statistics 21 package program. The data were analyzed at a confidence interval of 95% and at a significance level of $p<0.05$. For the analysis of the data, descriptive (number, percentage), psychometric (Kuder-Richardson 20) and non-parametric comparison analyses (Chi-square) were used.

Ethical Approval

Ethics committee approval was obtained from a university (March 05, 2020; Decision No: 38298), following international standards and the principles adopted by the World Medical Association Declaration of Helsinki. Institutional approval was obtained from the departments of nursing at the universities. Verbal and written consent were obtained from nurses and physicians. The Informed Consent Form was read and their consent was obtained.

RESULTS

Demographic characteristics

The mean age of the healthcare professionals was 32.08 ± 6.66 (Min= 21, Max= 65) years and the majority (64.5%) of them were female. Of the nurses, 86.3% had undergraduate education or higher. Among the healthcare professionals, 48.3% worked in the departments related to internal medicine sciences and 51.7% of them worked in departments related to surgical medicine sciences in the hospital. The professional experience was 9.01 ± 7.48 years (Min= 1, Max= 34) for nurses and 5.78 ± 5.50 years (Min= 1, Max= 38) for physicians. Glass ampoule medicines were used in all departments where healthcare professionals worked. The mean number of glass ampoule medicines used per day was 44.71 ± 25.76 (Min= 2 , Max= 300) in the department of employment, that these ampoules were mostly (71.5%) broken with bare hands, and that a 21 Gauge (G) needle was used to draw the medicines into the syringe by 80.5% (Table 1). The glass ampoule medicines were administered to patients most frequently by intravenous (98.5%) and intramuscular (78.8%) routes (Table 1).

Healthcare professional knowledge about glass particle contamination and the use of filter needles

The answers of healthcare professionals to the questions about glass particle contamination and the use of filter needles are presented in Table 2. While 75.3% of the healthcare professionals indicated that micro-sized glass particles spilled from the ampoule neck into the ampoule when opening glass ampoule medicines and contaminated the medicine, it was determined that 52.7% of them did not have any

idea whether complications occurred in the patient when medicines with glass particle contamination were used. Most knew that glass particles were scattered on the buffer that touches the neck of the ampoule while opening it, that the needle diameter used when drawing the medicine from the ampoule into the syringe was effective in reducing the passage of glass particles, and that there were micro-sized glass particles in the medicine drawn into the syringe. However, only 44.7% of healthcare professionals indicated that measures could be taken to prevent administration of glass particles to the patient with the medicine.

The rate of healthcare professionals answering the questions correctly were rated as follows; less than 40% was poor knowledge level, between 40-60% was moderate knowledge level, and over 60% was good knowledge level.

Table 1. Distribution of descriptive characteristics of healthcare professionals

Descriptive characteristics		Nurse (n = 300)	Physician (n = 300)	Total (n = 600)
		n (%)	n (%)	n (%)
Gender	Female	239 (79.7)	148 (49.3)	387 (64.5)
	Male	61 (20.3)	152 (50.7)	213 (35.5)
Educational status	High school and pre-graduate education	44 (14.7)	-	44 (7.3)
	Undergraduate	217 (72.3)	-	217 (36.2)
	Master's Degree	37 (13.3)	273 (91.0)	310 (51.7)
	PhD Degree	2 (0.7)	27 (9.0)	29 (4.8)
Working departments	Medical departments	140 (46.7)	150 (50.0)	290 (48.3)
	Surgical departments	160 (53.3)	150 (50.0)	310 (51.7)
Ampoule opening technique	Cotton buffer	41 (13.7)	9 (3.0)	50 (8.3)
	Ampoule opener	1 (0.3)	-	1 (0.2)
	Sponge	10 (3.3)	-	10 (1.7)
	Syringe sheath	84 (28.0)	26 (8.7)	110 (18.3)
	Bare hands	164 (54.7)	265 (88.3)	429 (71.5)
Needle diameter used when drawing up medicine	18 G	36 (12.0)	51 (17.0)	87 (14.5)
	21 G	256 (85.3)	227 (75.7)	483 (80.5)
	22 G	7 (2.3)	15 (5.0)	22 (3.7)
	Other	1 (0.3)	7 (2.3)	8 (1.3)

G: Gauge

Table 2. Distribution of statements about glass particle contamination and the using of filter needles

Questions about glass particle contamination and the using of filter needle	Yes	No	I do not know	Knowledge level
	n (%)	n (%)	n (%)	%
1.Micro glass particle contamination occurs when opening the ampoule	452 (75.3)	34 (5.7)	114 (19.0)	75.3
2.Medicine contaminated with glass particles can cause complications in the patient	169 (28.2)	115 (19.2)	316 (52.7)	28.2
3.Particle scattering to buffer/fingers at glass ampoule opening	456 (76.0)	35 (5.8)	109 (18.2)	76.0
4.Large volume ampoules cause more glass particle contamination than small volume ampoules	271 (45.2)	65 (10.8)	264 (44.0)	45.2
5.Using a needle with a small lumen diameter prevents glass particles from being drawn into the syringe	69 (11.5)	279 (46.5)	252 (42.0)	46.2
6.The diameter of the needle is effective in reducing the passage of glass particles	436 (72.7)	56 (9.3)	108 (18.0)	72.7
7.Presence of micro-sized glass particles in the medicine drawn from the ampoule to the syringe	340 (56.7)	56 (9.3)	204 (34.0)	56.7
8.Preventing from giving glass particles with the medicine to the patient	268 (44.7)	39 (6.5)	293 (48.8)	44.7

"Yes" answer correct =1st, 2nd, 3rd, 4th, 6th, 7th and 8th questions; "No" answer correct = 5th question

< 40% = poor knowledge, 40-60% = moderate knowledge, >60% = good knowledge

Table 3. Distribution of correct answers to the questions in terms of profession

Questions about glass particle contamination and the using of filter needles	Profession	False	True	P-Value
		n (%)	n (%)	
1. Micro glass particle contamination occurs when opening the ampoule	Nurse	62 (20.7)	238 (79.3)	χ^2 =5.166
	Physician	86 (28.7)	214 (71.3)	p<0.023*
2. Medicine contaminated with glass particles can cause complications in the patient	Nurse	194 (64.7)	106 (35.3)	χ^2=15.231
	Physician	237 (79.0)	63 (21.0)	p<0.001***
3. Particle scattering to buffer/fingers at glass ampoule opening	Nurse	40 (13.3)	260 (86.7)	χ^2=37.427
	Physician	104 (34.7)	196 (65.3)	p<0.001***
4. Large volume ampoules cause more glass particle contamination than small volume ampoules	Nurse	144 (48.0)	156 (52.0)	χ^2=11.312
	Physician	185 (61.7)	115 (38.3)	p<0.001***
5. Using a needle with a small lumen diameter prevents glass particles from being drawn into the syringe	Nurse	139 (46.3)	161 (53.7)	χ^2=12.387
	Physician	182 (60.7)	118 (39.3)	p<0.001***
6. The diameter of the needle is effective in reducing the passage of glass particles	Nurse	92 (30.7)	208 (69.3)	χ^2=3.356
	Physician	72 (24.0)	228 (76.0)	p=0.067
7. Presence of micro-sized glass particles in the medicine drawn from the ampoule to the syringe	Nurse	102 (34.0)	198 (66.0)	χ^2=21.285
	Physician	158 (52.7)	142 (47.3)	p<0.001***
8. Preventing from giving glass particles with the medicine to the patient	Nurse	131 (43.7)	169 (56.3)	χ^2=33.043
	Physician	201 (67.0)	99 (33.0)	p<0.001***

*p<0.05; **p<0.01; ***p<0.001, χ2: Chi-Square

Table 4. Distribution of correct answers to the questions in terms of number of ampoules used

Questions about glass particle contamination and the using of filter needles	Number of ampoules used	False	True	P-Value
		n (%)	n (%)	
1. Micro glass particle contamination occurs when opening the ampoule	≤ 50	107 (26.5)	297 (73.5)	χ^2=2.201
	≥ 51	41 (20.9)	155 (79.1)	p=0.138
2. Medicine contaminated with glass particles can cause complications in the patient	≤ 50	68 (22.7)	231 (77.3)	χ^2=0.150
	≥ 51	38 (24.4)	118 (75.6)	p=0.699
3. Particle scattering to buffer/fingers at glass ampoule opening	≤ 50	297 (73.5)	107 (26.5)	χ^2=1.728
	≥ 51	134 (68.4)	62 (31.6)	p=0.189
4. Large volume ampoules cause more glass particle contamination than small volume ampoules	≤ 50	110 (27.2)	294 (72.8)	χ^2=7.064
	≥ 51	34 (17.3)	162 (82.7)	p<0.008**
5. Using a needle with a small lumen diameter prevents glass particles from being drawn into the syringe	≤ 50	239 (59.2)	165 (40.8)	χ^2=9.341
	≥ 51	90 (45.9)	106 (54.1)	p<0.002**
6. The diameter of the needle is effective in reducing the passage of glass particles	≤ 50	230 (56.9)	174 (43.1)	χ^2=5.851
	≥ 51	91 (46.4)	105 (53.6)	p<0.016*
7. Presence of micro-sized glass particles in the drug drawn from the ampoule to the syringe	≤ 50	125 (30.9)	279 (69.1)	χ^2=8.102
	≥ 51	39 (19.9)	157 (80.1)	p<0.004**
8. Preventing from giving glass particles with the drug to the patient	≤ 50	191 (47.3)	213 (52.7)	χ^2=7.834
	≥ 51	59 (35.2)	127 (64.8)	p<0.005**

*p<0.05; **p<0.01; ***p<0.001, χ2: Chi-Square

The participants had good level of knowledge for their responses to the question (76%) "particle scattering to buffer/fingers at glass ampoule opening", while they had poor knowledge level for the question (28.2%) “medicine contaminated with glass particles can cause complications in the patient" (Table 2).

There was no filter needle or filter metal/plastic cannula in any department where the healthcare professionals worked. Furthermore, 99.8% of healthcare professionals indicated that there was no procedure about the use of filter needles to prevent glass particle contamination in the departments they worked, or they did not know if there was any. Correct answers from healthcare professionals to the questions were compared based on profession, number of ampoules used, glass particle contamination and use of filter needles. In the study, significant differences were found between the correct answers to some questions (p <0.05) (Table 3, Table 4).

While there were statistically significant differences

between correct answers of healthcare professionals to the 1st question according to their profession ($p < 0.05$), there were highly significant differences between their correct answers to the 2nd, 3rd, 4th, 5th, 7th and 8th questions ($p < 0.001$). It was determined that nurses gave more correct answers to the questions compared to physicians. It was observed that nurses generally had moderate and good knowledge about glass particle contamination and the use of filter needles (Table 3). The mean number of glass ampoule medicines used per day in the department where healthcare professionals worked caused a statistically significant difference between correct answers to the 5th and 8th questions ($p < 0.05$) and a highly statistically significant difference between correct answers to the 3rd, 4th, 6th and 7th questions ($p < 0.01$). Healthcare professionals working in departments where an average of 50 or more glass ampoule medicines were used per day had a higher rate of correct answers and generally had moderate and good knowledge (Table 4).

DISCUSSION

Glass ampoule medicines have been used in medical treatment for many years. While ampoule medicines are broken at the neck and opened, a large number of particles are formed and spill into the medicine content, which causes contamination (Erkoc Hut & Bayir, 2017; Carraretto et al., 2011; Lee et al., 2011; Yorioka, Oie, & Kamiya, 2009; Kawasaki, 2009; Lye & Hwang, 2003; Sabon et al., 1989). It is of great importance to raise awareness of healthcare professionals about the formation of micro- and macro-sized glass particles during the preparation of glass ampoule medicines for treatment and to take measures to avoid administering the contaminated medicine to the patient. Contamination can be easily recognized since macro-sized glass particles are visible to the naked eye. In this case, the medicine is destroyed without use (Sogut & Erkoc Hut, 2022). However, micro-sized glass particles cannot be seen with the naked eye since they are small enough to require a microscope to be seen. Therefore, contamination is an important problem (Erkoc Hut & Yazici, 2021). In the results of the study, it was remarkable that the mean age of healthcare professionals was 32.08 ± 6.66 years and that the mean duration of professional experience was 7.40 ± 6.76 years. In the hospital where the study was conducted, the workload increased due to the COVID-19 pandemic and healthcare professionals occasionally were on sick leave due to being infected. Moreover, the fact that employees over the age of 65 were declared a risk group by the government and granted leave of absence due to pandemic measures may also have affected the results of the study.

In the study by Erkoc et al., the mean number of glass ampoule medicines used in the clinics per day was mostly 20 or more and 34.3% of the nurses opened the ampoules without using any protective materials (Erkoc et al., 2015). In this study, the mean number of glass ampoule medicines used per day, and opening the ampoules with cotton, sponge and similar material without supporting the ampoule neck were found to be quite high, which may have been affected by the crowdedness of the hospital where the study was conducted. Furthermore, the increase in the workload of healthcare professionals due to the COVID-19 pandemic may have affected the results of the study. In this study, most healthcare professionals (75.3%) knew that while glass ampoule medicines are being prepared for administration, micro-sized glass particles form while opening them by breaking and spill into the medicine content causing contamination. In a study conducted by Harmon, a training program for the use of filter needles was prepared for anesthesiologists and anesthesia nurses, and pre-test and post-test evaluations were performed. It was reported that before training, 16% of the participants always used filter needles while preparing medicines for treatment, while 40% of them did not have filter needles in the medicine preparation area. However, it was demonstrated that with the training, there was an increase in the positive approach of the participants regarding the use of filter needles (Harmon, 2014). In our study, it can be said that healthcare professionals had a high level of knowledge about glass particle contamination of the medicine content when opening glass ampoule medicines by breaking. The fact that the majority of them had an undergraduate

education or higher is thought to have affected their rate of following the literature for professional development.

The study revealed that most healthcare professionals do not know that complications may occur as a result of administering medicines with glass particle contamination to the patient. It is reported in the literature that as a result of parenteral administration of glass ampoule medicines, various inflammatory effects and some pathological changes such as granuloma formations occur in the body and lead to complications that damage various organs (Zabir, Choy, & Rushdan, 2008; Heiss-Harris & Verklan, 2005; Preston & Hegadoren 2004; Sabon et al., 1989). In some studies, it was demonstrated that medicines contaminated with glass particles reached the cells, tissues and organs and caused inflammatory reactions, occluded capillaries and caused embolism and thrombus (Joo, Sohng, & Park, 2016; Preston & Hegadoren, 2004; Lye & Hwang, 2003; Puntis et al., 1992; Turco & Davis, 1971). Based on this information, it is thought-provoking that ampoule medicines are still used intensively today. The results of the study are an important resource indicating healthcare professionals need to be informed in more detail about the subject. It is considered that there is a need to raise awareness.

In the study, the majority of healthcare professionals indicated that glass particles were scattered on the buffer support or finger surface that came into contact with the neck when opening ampoules. This result suggests that glass contamination may have occurred in the contents of some medicines. However, healthcare professionals may think that these glass particles only scatter on the buffer that comes into contact with the ampoule neck. No study in this regard could be found in the literature. It is likely that glass particles spill into the medicine content and contaminate the medicine during the opening of medicine ampoules by breaking (Carraretto et al., 2011; Lee et al., 2011; Lye & Hwang, 2003; Sabon et al., 1989). When macro glass particles falling into the ampoule are seen, the medicine is not used and the ampoule is completely discarded. However, spilling of micro glass particles into the ampoule cannot be seen with the naked eye and this poses a threat to patient safety (Lee et al., 2011; Lye & Hwang, 2003). In this respect, if glass particles are seen in the area where the ampoule neck is held, it should not be forgotten that glass particle contamination may have occurred in the medicine content.

In the literature, it was reported that medicine ampoules with a volume of 20 ml cause more glass particle contamination, while medicine ampoules with a volume of 1 ml cause less glass particle formation compared to ampoules with a larger volume (Carbone-Traber & Shanks, 1986). In the study, nearly half of the healthcare professionals argued that large-volume ampoules may cause more glass particles to spill into the medicine content while opening compared to small-volume ampoules. No study evaluating the knowledge of healthcare professionals about this issue could be found in the literature. In the study, it was observed that the green needle tip was most frequently used to draw medicines from glass ampoules into the syringe. However, as the lumen diameter increases, it allows more glass particles to pass into the chamber of the syringe. It is known that 23 G size needles allow fewer glass particles to pass since they have a smaller diameter; however, 18 G size needles allow more glass particles into the chamber of the syringe since they have a larger diameter (Harmon, 2014; Zabir, Choy, & Rushdan, 2008; Lye & Hwang, 2003; Carbone-Traber & Shanks, 1986). In the hospital where the study was conducted, healthcare professionals use the materials available in their departments for medicine administrations. It was observed that 21 G size green needle tips were mostly found in the departments. Therefore, the fact that the green needle tip was most frequently used for drawing ampoule medicines may have affected the results of our study. Furthermore, most of the healthcare professionals thought that the lumen diameter of the needle tip used may reduce the drawing of glass particles into the syringe. In accordance with these results, it can be said that healthcare professionals did not have detailed information about the subject.

The use of a filter needle or a syringe filter during the preparation of glass ampoule medicines for administration reduces the amount of glass particle

contamination, and it is recommended to primarily use a filter needle to minimize the harm that may occur to the patient (Erkoc Hut & Yazici, 2021; Preston, & Hegadoren, 2004). In the study, a small number of healthcare professionals had syringe filters or inline filter apparatus in the departments they worked. Some healthcare professionals emphasized that there was a syringe filter in the kit of an antifungal medicine in the clinic and that they used this filter while preparing the medicine for treatment. In the study, it was revealed that there was no filter needle or filter metal/plastic cannula in any of the departments. Furthermore, there was no procedure regarding the use of filter needles in the departments. With regard to the use of filters to reduce the passage of glass particles, institutions such as the American Society of Health System Pharmacists and the Infusion Nurses Association indicate the need to use filter needles with a pore opening of 5 µm (Infusion Nurses Society, 2016; American Society of Health-System Pharmacists, 2014). In the study by Harmon, while 72% of the participants indicated that they did not have knowledge about any policy or standard regarding glass ampoule medicines and the use of filter needles in hospitals, 65% indicated that they were not aware of any institution or organization with standards for the use of filter needles with ampoules (Harmon, 2014). No study about the use of filter needles in our country could be found. The fact that procedures for the use of filter needle have not become widespread in our country may have affected the results of our study.

In the study, there was a significant difference between variables such as profession, professional experience, number of ampoules used in the clinic and educational status among the sociodemographic characteristics of healthcare professionals, and their answers to some of the questions about glass particle contamination and the use of filter needles. It was observed that nurses gave more correct answers to the questions compared to physicians. Nurses working in health institutions are responsible for parenteral medicine administration, intravenous, intramuscular and subcutaneous medicine administrations at the request of the physician (Official Newspaper of the Republic of Turkey, 2011). Furthermore, the fact that intravenous administration was the most common method in the study may also have affected this result, which may be due to the fact that nurses made more observations on the subject. Professional experience and the number of ampoules used in the clinic can be considered as important factors for the implementation of interventions to prevent particle contamination. In the study, a significant difference was found between the number of glass ampoules used in the departments where healthcare professionals work and the answers to some questions about knowledge level. There were less correct answers to the questions about the scattering on the buffer or fingers while supporting the ampoule neck, the formation of glass particles according to different ampoule volumes, the use of small lumen diameter needle tip for the transfer of contaminated medicines, and interventions to prevent the administration of micro glass particles to the patient with the medicine in the group using mean 50 or less ampoules per day was 50 compared to the group using 50 or more ampoules. In the study conducted by Harmon, 91% of the participants indicated that they used an average of 1-15 glass ampoules per day (Harmon, 2014). The high number of glass ampoules used in the departments where healthcare professionals worked indicates that they have more information about particle contamination.

In the study, a significant difference was found between training status about the use of filter needles of healthcare professionals and the answers to some questions about their knowledge level. In the study, healthcare professionals who had not received any training gave significantly more incorrect answers to the questions about the spillage of glass particles into the medicine when opening ampoules by breaking, whether contamination caused complications, formation of glass particles according to different ampoule volumes, and the use of small lumen diameter needle tip for the transfer of contaminated medicine. The study showed that the number of people trained in the use of filter needles was low; however, the number of wrong answers to the questions was parallel to this. Among the healthcare professionals participating in the

study (n = 36) who indicated that they received training about glass particle contamination and the use of filter needles, while 44.4% of them gained this information during their school education, 16.7% gained this information from the articles/books they read, 19.4% gained this information from friend chats, and 19.4% gained this information through in-house training. In the study by Harmon, while the majority of the participants (67%) were trained about the use of filter needles in the institution where they worked, 2% learned it from course books, 2% learned it from laboratory experiments, 16% learned it in all these areas together, and 12% did not learn from any of these areas (Harmon, 2014). The absence of filter needles in the departments of the hospital where the study was conducted may have affected the results of our study. Training about glass particle contamination and the use of filter needles is important in clinics.

CONCLUSION

In conclusion, healthcare professionals had moderate knowledge about glass particle contamination and the use of filter needles. Variables such as profession, the number of ampoules used in the clinic, and educational status may affect the level of knowledge. However, the departments where healthcare professionals worked did not have an effect on their level of knowledge. It is necessary to improve the awareness of physicians who plan patient prescriptions and nurses who administer medicines to patients in this regard. It is of great importance to establish clinical procedures for the use of filter needles during the preparation of glass ampoule medicines for administration in healthcare institutions. Findings inform to stresses the need to raise awareness in terms of reducing glass particle contamination in parenteral medicine administration. It is recommended to plan education for healthcare professionals about glass particle contamination and the use of filter needles in order to draw attention to patient safety.

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Conflict of Interest

No conflict of interest has been declared by the authors and no funding sources supporting the study.

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The Effect of the Symptom Level on the Illness Perception in Individuals Undergoing Hemodialysis: Cross-Sectional Study

Fatma Özkan Tuncay [1]*, Nesligül Aybek [2]

[1]Sivas Cumhuriyet University, Health Sciences Faculty, Department of Medical Nursing, Sivas, Türkiye
[2]Sivas Cumhuriyet University Hospital, Emergency Department, Sivas, Türkiye

ABSTRACT:
Purpose: This research was conducted to identify the effect of the symptom level on the illness perception in individuals undergoing hemodialysis.
Material and Methods: The study was performed with 240 participants who had the hemodialysis procedure in dialysis units of hospitals and one private dialysis center in a province and satisfied the criteria to be included in the research.
Results: In the study, it was found that nearly all patients experienced symptoms such as itching, numbness/tingling in the feet, feeling tired and dry skin. In the sample group that had a negative illness perception, it was found that the symptoms experienced alongside the hemodialysis procedure affected the illness perception, and there was a moderately positive relationship between these two variables.
Conclusions: In this context, it was recommended that the frequency and the severity of symptoms of patients undergoing hemodialysis should be regularly followed and these patients' illness perception levels should be evaluated.
Keywords: *Illness perception; hemodialysis; symptom*

**Corresponding author: Fatma Özkan Tuncay, email: fozkan@cumhuriyet.edu.tr*

INTRODUCTION

The end-stage renal disease, which is a crucial public health issue in Turkey and across the world, is a chronic condition resulting in the loss of kidney functions, leading to the uremic syndrome, and requiring a complex treatment procedure (Akyol, 2016; Chaiviboontham et al., 2020). In Turkey, the point prevalence of end-stage renal disease requiring renal replacement was identified as 993.5 in one million as of the end of 2021 (Ministry of Health and Turkish Society of Nephrology Joint Report, 2019). The hemodialysis procedure is one of the most preferred treatment methods for raising the quality of life and lowering mortality and morbidity rates in patients diagnosed with end-stage renal disease, however, it gives rise to numerous symptoms affecting the quality of life of patients (Dikmen and Arslan, 2020; Taşkın Yilmaz et al., 2020). Fatigue, itching, muscle cramps, nausea-vomiting, lack of appetite, edema, sleep problems, the feeling of uneasiness, and sexual dysfunction are among the most frequently exhibited symptoms (Dikmen and Arslan, 2020; Hindistan and Deniz, 2018; Taşkın Yilmaz et al., 2020). These symptoms exhibited during the hemodialysis procedure make the process difficult for patients as fully relaxing therapies have not been found yet. Failing to define patients' symptoms adequately most of the time is underlined as the most significant factor leading to this situation. Also, it is stated that, to a large extent, health workers are uninformed about the physical and emotional symptoms of patients constantly

undergoing hemodialysis and are unaware of the seriousness of these symptoms (Cho et al., 2018). In studies of KDIGO (Kidney Disease Improving Global Outcomes) on complementary care for the illness, it is advocated that patients undergoing hemodialysis should be routinely screened in terms of symptoms, and it is necessary to identify the affected areas of life (National Kidney Foundation, 2013; Cox et al., 2017). Patients undergoing hemodialysis have difficulty in continuing their daily life activities, as well as entertainment and social activities, depending on the symptoms experienced by them. The resulting situation disrupts the physical and psychological well-being of individuals and affects their quality of life and illness perception levels (Akgöz and Arslan, 2017; Nabolsi et al., 2015).

Illness perception is a concept directly affecting individuals' experiences during the illness period, illness process, and coping mechanisms and is an implication of their beliefs and expectations about any illness or symptom (Karabulutlu and Karaman, 2015; Karatay and Sevinç, 2016). How an illness is perceived by an individual plays a significant role in the individual's coping with illness symptoms and their consequences as well as affecting the individual's life in all dimensions (Jonsbu et al., 2012; Steca et al., 2013). The illness process is shaped by the patient's perception of the illness and illness-related experiences, and hence, the meaning of experienced symptoms differs for each patient (Karabulutlu and Karaman, 2015; Uysal and Akpınar, 2013). As well as the medical symptoms, findings, and diagnosis of a physical illness, the way in which a person perceives the illness affects the consequences of the illness. Thus, finding out how an illness is perceived, as well as identifying the factors affecting the illness perception, is important to understanding the experienced problems and planning the relevant interventions (Karabulutlu and Karaman, 2015). It is reported that the negative illness perception leads to intense unhappiness and depression and increases mortality whereas it is accepted that the positive illness perception supports self-esteem and autonomy. In light of the above points, it is important to evaluate illness perceptions of hemodialysis patients who are risky in terms of the change in the illness perception due to the illness process and the symptom load. In the relevant literature, it is possible to find studies that analyzed the symptoms in individuals undergoing hemodialysis and examined the relationship between these symptoms and variables such as depression, anxiety, dependence, and quality of life (Akgöz and Arslan, 2017; Bai et al., 2015; Dikmen and Arslan, 2020; Nabolsi et al., 2015). However, it is discerned that the relationship between illness symptoms and illness perception was not adequately examined, and there were a limited number of studies in the relevant literature in Turkey and across the world. In fact, illness perception is quite important to perceiving the symptoms, making sense of them, and planning interventions to eliminate them. In this context, it is considered that this study will fill the above gap in the relevant literature and present scientific data for the improvement of nursing practices that are used in hemodialysis units.

MATERIAL and METHODS

Purpose and Type of the Study

The research aims, to find out the illness perception and symptom levels of individuals undergoing hemodialysis, to identify the relationship between these two variables, and, to reveal socio-demographic and illness-related factors affecting the symptom level and illness perception.

Sampling and participant

The research population is a total of 280 individuals undergoing hemodialysis in dialysis units of a university hospital and a public hospital and a private dialysis center. The sample size for the research was not calculated, rather, efforts were made to contact all individuals satisfying the criteria to be included in the research sample, and hence, the study was concluded with a total of 240 participants. In the research, the inclusion criteria were designated as (1) being diagnosed with chronic renal disease and accordingly continuing to undergo hemodialysis for a minimum of one year, (2) being aged 18 years or above, (3) having no cognitive disorder and communication barrier, and (4) agreeing to participate in the study upon being informed about the research. Individuals whose dialysis treatment

duration was more than one year and who were under the age of 18 were not included in the sample.

Data Collection Tools

Researchers collected the research data by visiting dialysis centers from 1 January 2023 to 1 May 2023. Participant patients who were divided into two groups were undergoing hemodialysis in three times every week (the first group on Monday, Wednesday, and Friday, and the second group on Tuesday, Thursday, and Saturday), and researchers visited dialysis centers every day except Sunday. The research data were collected with the face-to-face interview technique in the period when the patient underwent hemodialysis and felt comfortable. After patients consented to join the research upon being informed about it, surveys were administered to patients in a convenient meeting room in dialysis centers. On average, it took 15-20 minutes to administer the surveys to a patient. The research data were collected with the survey forms detailed below.

Descriptive Information Form

Prepared by researchers in light of the relevant literatüre (Dikmen and Arslan, 2020; Hindistan and Deniz, 2018), this form contained 14 questions seeking to find out patients' sociodemographic characteristics and illness- and treatment-related data.

Dialysis Symptom Index (DSI)

Weisbord et al. (2004) developed the DSI to identify the hemodialysis patient's symptoms and how much these symptoms affected the patient. Developed from the Memorial Symptom Assessment Scale Short Form, the DSI comprises 30 items. Whether a symptom has been experienced for the last seven days is answered by the respondent as either yes or no. If the respondent's answer is yes, how much the symptom has affected the respondent is evaluated through a five-point Likert scale (1= Never, 2= Little, 3= Somewhat, 4= Much, 5= A Great Deal). A respondent's total DSI score is calculated by summing all points obtained from each DSI item. The total DSI score ranges from 0 to 150 points. A total DSI score of 0 shows that the respondent exhibits no symptoms. A total DSI score approaching 150 points indicates that symptoms have a large effect on the respondent. Önsöz and Usta Yeşilbakan (2013) performed a validity and reliability study for the DSI in Turkish. In the study by Önsöz and Usta Yeşilbakan (2013), Cronbach's alpha coefficient was calculated as 0.73 for the DSI.

Brief Illness Perception Questionnaire (B-IPQ)

The B-IPQ developed by Broadbent et al. (2006) has eight sub-scales containing open-ended response items and rated from 0 to 10 points. The first sub-scale is "Consequences" (How much does the illness affect your life?), the second sub-scale is "timeline" (How long do you think your illness will continue?), the third sub-scale is "personal control" (How much control do you have over your illness), the fourth sub-scale is "Treatment control" (How much do you think your treatment will help your illness?), the fifth sub-scale is "Identity" (to what degree do you experience symptoms related to your illness?), the sixth sub-scale is "concern" (how much are you concerned with your illness?), the seventh sub-scale is "understanding" (how well do you understand what your illness is?), and the eighth sub-scale is "emotional representation" (how much does your illness affect you emotionally?). High scores obtained from the B-IPQ and its sub-scales refer to negative illness perceptions (Kahyaoğlu Süt, 2017). In our study, Cronbach's alpha coefficient was calculated as 0.80 for the B-IPQ.

Statistical Analysis

The data were analyzed by using the SPSS 22.0 software (SPSS, Inc., Chicago, IL, USA). In the statistical analysis of the study, the mean value was taken, the Kolmogorov-Smirnov Z test was used to test the normal distribution of the scale means, Independent Sample T test, One Way Anova and the Kruskal-Wallis test was applied. To determine the relationship between itching and sleep quality, Pearson's correlation analysis was utilized. The statistically significant level was accepted as $p<0.05$.

Ethical Approval

Before the research, the written ethical endorsement was obtained from the ethics

committee of a university (Decision no: 2022-10/16), and also, permissions were received from institutions where the research would be carried out. Besides, each patient to be included in the research was informed about the research content and was told that participation in the research was voluntary, and then, the patient submitted an informed consent form. The study was conducted in full compliance with the principles of the Declaration of Helsinki.

RESULTS

Participants' sociodemographic and clinical characteristics

It was found that the mean age of the sample group was 61.78±1.41 years, and of all participants, 52.1% were male, 63.3% were primary school graduates, 74.6% were married, 58.3% were undergoing hemodialysis for 1-5 years, and nearly all of them (90.8%) had an illness history other than chronic renal disease.

Symptoms experienced by participants

In Table 1, the symptoms of participant patients undergoing hemodialysis and the severity of their symptoms were exhibited in the context of the DSI. In Table 1, symptoms affecting patients most frequently are listed as itching (%99.2), numbness or tingling in the feet (%98.8), feeling tired/decreasing energy (%98.8), dry skin (%98.3), difficulty in falling asleep (%97.9) and staying asleep (%97.1), lack of appetite (%97.1), muscle cramps (%95.8), and feeling sick (%95.8), and it is discerned that these symptoms were experienced by nearly all participant patients.

Participants' mean DSI and B-IPQ scores

Table 2 indicated the mean DSI score of participant patients, as well as mean scores obtained by patients from the B-IPQ and its sub-scales.

Table 1. Symptoms experienced by participants (n:240)

Symptoms	Symptom frequency	Symptom severity (min:0 max:5)
	n (%)	Mean ±sd
Itching	238 (99.2)	3.21±0.96
Numbness or tingling in feet	237 (98.8)	3.12±1.02
Feeling tired or lack of energy	237 (98.8)	3.51±0.89
Dry skin	236 (98.3)	3.55±0.97
Difficulty falling asleep	235 (97.9)	3.52±1.00
Decreased appetite	233 (97.1)	3.08±1.09
Difficulty staying asleep	233 (97.1)	3.70±2.79
Muscle cramps	230 (95.8)	1.22±0.77
Feeling sick	230 (95.8)	3.44±1.10
Drowsiness/dizziness	212 (88.3)	1.47±0.96
Dry mouth	212 (88.3)	2.44±1.23
Difficulty keeping legs still	211 (87.9)	2.18±1.36
Feeling anxious	201 (83.8)	2.18±1.48
Feeling sad	190 (79.2)	1.58±1.27
Muscle pain	189 (78.8)	1.93±1.32
To worry	188 (78.3)	1.45±1.17
Constipation	181 (75.4)	1.42±1.12
Headache	180 (75.0)	1.10±0.93
Nausea	173 (72.1)	0.91±0.79
Bone and joint pain	163 (67.9)	1.70±1.48
Difficulty concentrating	157 (65.4)	1.06±1.03
Cough	137 (57.1)	0.95±1.17
Shortness of breath	134 (55.8)	3.09±1.87
Feeling angry	124 (51.7)	0.81±1.11
Vomiting	117 (48.8)	0.51±0.72
Diarrhea	111 (46.2)	0.62±0.86
Decreased interest in sex	104 (43.3)	1.35±1.76
Difficulty getting sexual satisfaction	103 (42.9)	1.30±1.76
Swelling in the legs	96 (39.8)	3.77±1.68
Chest pain	85 (35.4)	0.41±0.84

Table 2. Participants' mean DSI and B-IPQ scores

SCALES	Score range	Min-Max	Mean±sd
DSİ Total	0-150	0-96	57.05±14.27
B-IPQ Total	0-80	17-75	62.78±7.86
1. Consequences	0-10	1-10	8.15±1.41
2. Timeline	0-10	2-10	9.16±1.75
3. Personal control	0-10	1-10	7.06±1.52
4. Treatment control	0-10	2-10	9.29±1.37
5. Identity	0-10	2-10	7.70±1.23
6. Concern	0-10	1-10	7.17±1.67
7. Understanding	0-10	1-10	7.93±1.50
8. Emotional representation	0-10	1-10	6.29±1.77

Table 3. The relationship between participants' DSI and B-IPQ scores

DSI	B-IPQ	Consequences	Timeline	Personal control	Treatment control	Identity	Concern	Understanding	Emotional representation
r	0.326	0.357	0.146	0.046	0.154	0.350	0.333	0.059	0.366
p	0.000	0.000	0.024	0.474	0.017	0.000	0.000	0.364	0.000

Table 4. The comparison of participants' mean DSI and B-IPQ scores as per certain socio-demographic variables

Variables	DSI Mean±sd	B-IPQ Mean±sd
Gender		
Women	59.71±15.16	62.81±9.45
Men	55.04±13.49	62.75±6.08
t/p	2.521/**0.012**	0.064/0.950
Age		
18-39 year	56.12±16.63	63.66±8.57
40-50 year	58.80±13.71	63.58±7.04
> 50 year	56.80±14.00	61.87±8.01
F/p	0.635/0.531	1.469/0.232
Education level		
Literate and lower	60.62±16.82	63.50±6.46
Primary school	56.20±13.68	62.02±8.76
High school and higher	55.20±11.45	65.66±3.27
KW/p	4.665/**0.010**	4.392/1.111
Marital status		
Single	54.04±15.19	63.06±7.30
Married	58.38±14.10	62.68±8.06
t/p	1.073/**0.043**	0.324/0.734
Duration of disease		
1-5 years	56.05±15.29	62.42±7.82
6-10 years	58.23±12.90	62.35±8.75
> 10 years	59.90±13.62	64.67±6.38
F/p	0.837/0.434	1.395/0.250
Other disease		
Yes	57.15±14.64	65.57±8.12
No	56.04±10.05	64.86±4.05
MU/p	2.240/0.609	2.073/0.294

According to these mean scores, it was found that patients had a nearly medium level of symptom severity and nearly negative illness perception. Upon the review of patients' mean B-IPQ sub-scale scores, it was identified that patients obtained relatively high mean scores from B-IPQ sub-scales of "consequences", "timeline", and "treatment control".

The relationship between participants' DSI and B-IPQ scores

In Table 3, which analyzed the relationship between participant patients' DSI and B-IPQ scores, it was discerned that patients' DSI scores had moderately positive relationships with their B-IPQ scores and B-IPQ "consequences", "identity", "concern", and "emotional representation" sub-scale scores and weak positive relationships with their B-IPQ "timeline" and "belief in the treatment" sub-scale scores.

The comparison of participants' mean DSI and B-IPQ scores as per certain socio-demographic variables

In the analysis for the comparison of participant patients' mean DSI and B-IPQ scores as per certain socio-demographic variables, it was found that patients who were female, patients who were illiterate, and patients who were married obtained higher mean DSI scores than other corresponding groups of patients and these differences between groups of patients were statistically significant whereas other socio-demographic variables had no statistically significant effect on hemodialysis symptom levels. In the study, also, patients' illness perceptions were examined as per certain socio-demographic variables, however, it was discerned that there was no statistically significant difference between groups of patients in terms of illness perception (Table 4).

DISCUSSION

In this study that was performed to identify the relationship between symptoms and the illness perception in patients undergoing hemodialysis, it was discerned that the most common physical symptoms were itching, numbness/tingling in the feet, dry skin, lack of appetite, and sleep problems whilst feeling anxious, upset, and angry and worrying were the most common psychological symptoms. In the study by Akgöz and Arslan (2017), feeling tired and a decrease in energy (74.3%), headache (62.9%), and bone and joint pains (61.0%) were identified as symptoms experienced most by the patients. Findings in support of the result of our study were obtained also in studies conducted with similar groups of patients in Turkey (Göriş et al., 2016; Taşkın et al., 2020). In the study by Almutary et al. (2013), it was stated that symptoms such as fatigue or lack of energy, feeling sleepy, pain, itching, and dry skin were experienced most frequently by patients undergoing hemodialysis, and also, it was asserted that psychological symptoms such as feeling anxious, worrying, nervousness, and sadness were disturbing for patients. In the study by Zamanian and Kharameh (2015), it is discerned that the most reported physical symptom was fatigue (85.3%) while the most reported psychological symptom was uneasiness (77.9%). The study by Chaiviboontham et al. (2020) listed the most experienced symptoms as itching, dry skin, muscle pain, dry mouth, muscle cramps, and difficulty in staying asleep. In a similar vein, the study by Cho et al. (2018) stated that constipation, dry skin, itching, fatigue, muscle cramps, sleep problems, and anxiety were frequently experienced by patients. It is discerned that the result on the rates of symptoms in our research was consistent with the relevant literature. Numerous symptoms experienced during the hemodialysis treatment affect individuals' daily life activities and makes the process of adaptation to the illness difficult by leading to role changes, disruption in family life, and changes in body image and self-esteem. Therefore, it is important to identify these symptoms and plan interventions aimed at controlling them.

Moreover, in the current study, itching was identified as one of the symptoms that had the highest severity and were exhibited most by patients. Itching is a disturbing symptom experienced by patients diagnosed with chronic renal disease. Factors, such as the accumulation of waste materials on the skin due to the inability to get rid of them from the body and the loss of skin moisture along with aging, are known to have significant effects on symptoms of dry skin and itching (Dikmen and Arslan, 2020). Even if itching alone is not a life-threatening problem, it affects the quality of life and daily life activities of patients, leads to anxiety, depression, and physical and mental fatigue, and shapes the patient's adaptation to the illness in a negative direction (Pereira and Stander, 2017; Simonsen et al., 2017).

In previous studies, it is discerned that another highly severe symptom experienced frequently by patients undergoing hemodialysis was fatigue. The L-carnitine deficiency due to the increase in bodily excretions and decrease in kidney performance during the dialysis treatment process leads to fatigue in patients undergoing hemodialysis. Besides, anemia, sleep disorders, malnutrition, and changes in mental status increase fatigue levels (Hindistan and Deniz, 2018; Cox et al., 2017). Also in different studies in the relevant literature, fatigue and decrease in energy are reported as frequently experienced symptoms (Bossola et al., 2018; Dikmen and Arslan, 2020; Hindistan and Deniz, 2018). It is put forward that the symptoms experienced frequently by hemodialysis patients, such as numbness in the feet and bone/joint pain, were often associated with the rise in the potassium level, uremia, and iron-deficiency anemia. Likewise, it is stated that symptoms related to the gastrointestinal system, such as constipation, nausea, vomiting, and the lack of appetite, were associated with abnormal BUN (blood urea nitrogen) levels, inadequate dialysis, and drug side effects (Chaiviboontham et al., 2020). It is emphasized that controlling these symptoms was an integral part of illness management. It is suggested that individuals' adaptation to the illness and their coping with the illness developed and their perceptions of the illness improved through the nurses' understanding of the symptoms and planning of the most suitable nursing intervention plans related to symptoms (Cho et al., 2018).

Furthermore, in the current study, patients' mean DSI and B-IPQ scores were compared as per certain variables. In the analysis, it was found that patients who were female, patients who were married, and patients who were illiterate obtained significantly higher mean DSI scores than other corresponding groups of patients whereas other variables had no statistically significant effect on hemodialysis symptom levels. Likewise, in the study by Hindistan and Deniz (2018), it was found that participants who were illiterate and participants who were female obtained significantly higher mean DSI scores. Similar results were found also in the study by Caplin et al. (2006) and the study by Göriş et al. (2016). In the relevant literature, there are different studies supporting the findings of our research (Kim and Evangelista, 2010; Weisbord et al., 2004). Higher symptom load and severity levels in women undergoing hemodialysis can be associated with women's higher illness perception levels and the continuation of their socially designated roles and responsibilities during the treatment process (Akgöz and Arslan, 2017). Besides, in our study, it was found that patients with relatively low-level education were more affected by hemodialysis-related symptoms. In similar studies conducted with patients undergoing hemodialysis, it was identified that patients with high education levels obtained higher mean physical health scores than those with low education levels (Göriş et al., 2016; Hindistan and Deniz, 2018). It is considered that patients will use coping mechanisms better and cope with illness symptoms more successfully as their education levels increase. The ability to control illness symptoms more easily along with the increase in an individual's self-care power as the education levels rise (Akgöz and Arslan, 2017) can be considered as the reason for obtaining this finding.

The presence of illness symptoms affects the ways of individuals to perceive the illness. The illness perception is defined as the patient's beliefs about the illness and cognitive outlook toward the illness, and this outlook is shaped by the experience of illness symptoms (Karabulut and Karaman, 2015). In the current study, the relationship between patients' DSI and B-IPQ scores was analyzed, and it was found that patients' DSI scores had moderately positive relationships with their B-IPQ scores and B-IPQ "consequences", "identity", "concern", and "emotional representation" sub-scale scores. In light of this finding, it can be said that hemodialysis patients who had a high symptom load were more affected by the illness process, felt their illness-related complaints more intensely, were more worried about their illness, and were more emotionally affected by the illness. Symptoms experienced during the illness process create a "symptom load" in hemodialysis patients. Influencing individuals' lives, the symptom load causes individuals to perceive the illness negatively and feel worried and anxious about the illness. Prompting negative physical, psychological, and

emotional reactions in general, this situation makes it difficult to cope with the illness and leads to a negative illness perception (Almutary et al., 2013). In the study by Karabulutlu and Karaman, it was found that hemodialysis patients experiencing fatigue and power loss had negative perceptions of the illness duration, illness consequences, and emotional representations.

This result was explained by the view that participants accepted chronic renal disease as an illness that is difficult to cure and manage. In the study by Schick-Makaroff and Molzahn (2017), it was identified that patients experiencing symptoms such as fatigue, sleep problem, itching, loss of appetite, and feeling unwell were more affected by the illness, and as the symptom seriousness of the illness increased, the negative illness perception increased and coping with the illness became more difficult. In studies conducted with groups of patients diagnosed with diseases other than the chronic renal disease, it was identified that there was a relationship between illness symptom seriousness and illness perception, and as the symptom load increased, the illness perception was negatively affected (Knowles et al., 2017; Kalfoss et al., 2019). Patients undergoing hemodialysis have to cope with numerous symptoms throughout the illness process (Akgöz and Arslan, 2017). Considering that these symptoms affected the illness perception negatively, it can be asserted that planning the nursing services necessary to enhance the hemodialysis patient's adaptation to the illness is important.

Study Limitations

Our study has certain limitations. As this study was carried out in three dialysis centers in our province in Turkey, its results cannot be generalized to the entire population. Through multi-center studies, it will be possible to identify general symptom clusters in the population of Turkey. Also, this study was performed in a specific period, and as symptoms can change over time, studies that continuously conduct follow-ups are needed.

CONCLUSION

In the study, it was found that nearly all patients experienced symptoms such as itching, numbness/tingling in the feet, feeling tired/decreasing energy, dry skin, difficulty in falling asleep and staying asleep, lack of appetite, and muscle cramps. In the sample group that had a negative illness perception, it was found that the symptoms experienced alongside the hemodialysis procedure affected the illness perception, and there was a moderately positive relationship between the two variables. In this context, it can be recommended that the frequency and severity of symptoms of patients undergoing hemodialysis be regularly followed and these patients' illness perception levels be evaluated. Also, it can be said that, by controlling hemodialysis symptoms effectively, the illness perception can be shaped in a more positive direction. It is considered that research results can guide the care planning and care practice and the preparation of symptom protection programs for patients.

Conflict of Interest

There are no potential conflicts of interest.

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Comparison of Attitudes towards Sports, Physical Activity Levels and Sleep Quality of University Students in Different Departments after the COVID-19 Pandemic**

Eda Onur [1]*, Engin Çağlar [2], Ayşem Ecem Özdemir [1], Öznur Kaya Sağlam [1], Mustafa Oğuz Kethüdaoğlu [3], Zeynep Kaçar [1]

[1]İstanbul Gelişim University Faculty of Health Sciences Department of Physiotherapy and Rehabilitation, İstanbul, Türkiye
[2]Fenerbahçe University Faculty of Health Sciences Department of Physiotherapy and Rehabilitation, İstanbul, Türkiye
[3]Sivas Cumhuriyet University Faculty of Health Sciences Department of Physiotherapy and Rehabilitation, Sivas, Türkiye

ABSTRACT:
Purpose: With closure of universities and lockdown during COVID-19 period, time spent at home has increased and physical and social activity has decreased. This situation caused mental problems, especially sleep disorders, in students. With restriction of physical activity during COVID-19 period, number of individuals doing sports decreased, and number of inactive individuals increased. Aim of this study is to compare attitudes towards sports, physical activity levels and sleep quality of students of Physiotherapy and Rehabilitation Department and Coaching Department.
Material and Methods: 25 Physiotherapy and Rehabilitation and 25 Coaching students included in our study. Demographic information of participants was recorded in form prepared by researchers. Attitudes towards sports were evaluated with Attitude Towards Sports Scale, physical activity levels were evaluated with International Physical Activity Questionnaire, and sleep quality was evaluated with Pittsburgh Sleep Quality Index. SPSS 24.0 program was used for statistical analysis and significance value was accepted as $p<0.05$.
Results: Age, height, weight, body mass index and gender values of participants were similar between groups. When their attitudes towards sports were examined, there was a significant difference in favour of Coaching students in total score, sub-dimension of being interested in sports and sub-dimension of doing active sports ($p<0.05$). No significant difference was found in sub-dimension of living with sports of Attitudes Towards Sports Scale, physical activity levels and sleep quality ($p>0.05$).
Conclusion: Results we obtained show that attitudes towards sports of students of Coaching department are higher than students of Physiotherapy and Rehabilitation department, but there is no difference in their physical activity levels and sleep quality.
Keywords: *Attitudes towards sports; COVID-19; physical activity; sleep quality*

**Corresponding author: Eda Onur, email: edaonur0508@gmail.com*

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INTRODUCTION

Coronaviruses are viruses that induce conditions ranging from the common cold to more dangerous conditions like Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV). World Health Organization (WHO) published examples (on 31.12.2019) of pneumonia of unexplored etiology in Wuhan, China. Virus was specified (on 07.01.2020) as a brand-new coronavirus type that has not been observed in people before. After that, name of 2019-nCoV disease was took as COVID-19, then virus was named SARS-CoV-2 because of its similarity to SARS-CoV (T. C. Sağlık Bakanlığı Halk Sağlığı Genel Müdürlüğü,

2020). COVID-19 disease has affected the entire world in a short time and has become a global health problem by being declared a pandemic. In addition to affecting health and survival, the disease has caused many changes in social and economic life, creating a period of social distancing (Alaca et al., 2022; Zalewska et al., 2021). These changes were caused by both the disease itself and the measures taken to prevent its spread.

As a result of COVID-19, many educational institutions have canceled face-to-face education and adopted the online education style. The move of both education and a huge variety of activities to the online world has caused many people to start spending more time with computers, smartphones and other electronic devices (Garrett, 2020; Siste et al., 2020). The transition of universities to online education in Türkiye from March 2020 to June 2021 caused university students to spend more time with devices such as computers and smartphones and receive online education. (Yükseköğretim Kurulu, 2020). With the closure of universities and lockdown on the agenda, the time spent at home has increased and physical and social activity has decreased. This situation caused mental problems, especially sleep disorders, in students (Dong et al., 2020; Qiu et al., 2020; Xiang et al., 2020; Wolf et al., 2021; Stanton et al., 2020).

With the restriction of physical activity in the COVID-19 period, the number of individuals doing sports decreased, and the number of inactive individuals increased. Sport is defined as a pedagogical, biological and social phenomenon that improves the physical and mental health of the individual, regulates social behaviors, and raises mental and motor features to a certain level (Varol et al., 2017). The concept of attitude is defined as a cognitive, emotional and behavioral predisposition that a person organizes based on his/her experience, motivation and knowledge towards himself/herself or any social subject, object or event around him/her (İnceoğlu, 2011).

When the literature is examined, although there are many studies on university students after COVID-19, to our knowledge, there is no study comparing the attitudes towards sports, physical activity levels and sleep quality of students studying in two different departments. In this direction, the aim of our study is to compare the attitudes towards sports, physical activity levels and quality of sleep of the students of the Physiotherapy and Rehabilitation Department (PRD) and the Coaching Department (CD).

The hypotheses of our study; attitudes towards sports, physical activity levels and quality of sleep of the students of the CD are higher than the students of the PRD.

MATERIAL AND METHODS

Purpose and Type of the Study

This article was produced from the corresponding author's (first author) bachelor degree thesis. This research was presented as an oral presentation at the 2nd International Eurasian Health Sciences Congress held on 15-16 June 2023 as an abstract. Our study was designed as prospective and parallel study. Our study was carried out at Istanbul Gelişim University in May - June 2023 in accordance with the Helsinki Declaration. Snowball randomization method was used in our study and data were gathered through face-to-face meetings with participants. Study's aim and content were explained to the individuals participating in our study, and both verbal and written consent was received.

Sampling and Participants

While students from the PRD and the CD were included in our study, students who did not want to complete the questionnaires and didn't volunteer to participate in study were excluded. The sample size of our study was decided at the end of the G*Power analysis for 80% power, using the data obtained as a result of the pilot study we conducted at the beginning of the study. Sample size was decided as 20 for each group, with a total of 40 participants. Considering the possibility of missing data, the study was terminated with 25 participants for each group and 50 participants in total. During the study, 58 students were interviewed, but 8 students were not included because they did not volunteer to participate in the study (Figure 1).

Data Collection Tools

The demographic characteristics of the individuals were recorded using a form prepared by the

researchers of this study. The primary output of our study was the students' attitudes towards sports, while the secondary outcome were physical activity level and sleep quality.

Students' attitudes towards sports were evaluated with the "Spora Yönelik Tutum Ölçeği" (Attitude Towards Sports Scale – ATSS) developed by Şentürk (2015). This scale consists of 3 sub-dimensions (interest in sports, living with sports, doing active sports) and 25 items which is a 5-point Likert-type scale (Şentürk, 2015).

Student's physical activity levels were examined with the International Physical Activity Questionnaire (IPAQ), which has Turkish validity and reliability (Craig et al., 2003; Sağlam et al., 2010; Öztürk, 2005). In the last 7 days with the questionnaire, the duration (min.) of vigorous physical activity, the duration (min.) of moderate physical activity, duration of (min.) walking and sitting for one day were questioned. The results obtained were calculated by the original calculation method described by Craig et al. According to the total physical activity score, the physical activity levels of the participants were categorized as low (below 600 metabolic equivalents [METS]), medium (between 600-3000 METS) and high (above 3000 METS) (Craig et al., 2003). The quality of sleep of the students was examined with the Pittsburgh Sleep Quality Index (PSQI), which was validated and reliable in Turkish (Buysse et al., 1989; Ağargün, 1996).

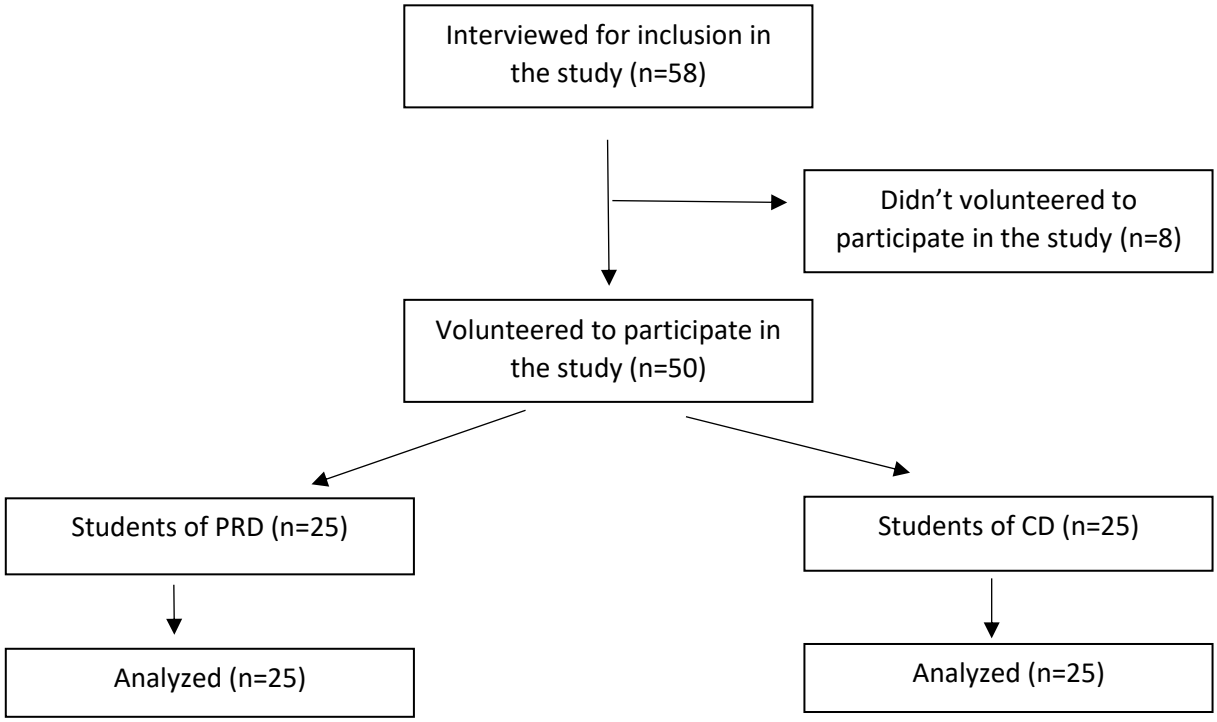

Figure 1. Flow Diagram

PSQI, which examines the sleep quality of the person for the last 1 month, comprises 24 questions. 19 of these are self-report questions and are responded by the participant himself. 5 questions are responded by the roommate of participant and are are not involving in the total score. Self-report questions include various factors affiliated with sleep quality. The 18 items participating in the scoring are grouped as 7 component points. These components supplies information about subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, use of sleeping pills and daytime sleep function. Each question is evaluated from 0 to 3. The aggregation of the scores of the 7 components provides the total PSQI score. The total PSQI score ranges from 0 to 21. Quality of sleep of those with a total score of 5 and less is deliberated "good", and those with a total score more than 5 are deliberated

as "poor". PSQI score more than 5 indicates that the person has severe trouble in at least 2 areas of sleep or mild or moderate trouble in more than 3 areas.

Statistical Analyses

The data collected from this study were analyzed using version 24.0 of the IBM SPSS package program, which is a statistical analysis program. The suitability of the data to the normal distribution was evaluated with the Kolmogrov – Smirnov test. Descriptive features were given with mean and standard deviation. Mann-Whitney U test was used for comparisons between two groups and Chi-Square test was used for comparison of qualitative data. Statistical significance was evaluated at the $p<0.05$ level.

Ethical Approval

Ethics committee approval was received from Istanbul Gelişim University Non-invasive Studies Ethics Committee for the study (19.04.2023 / 2023-04).

RESULTS

50 individuals, 20 male (10 PRD, 10 CD), 30 female (15 PRD, 15 CD) participated in the study. The groups were almost identical in terms of demographic characteristics (Table 1).

When the attitudes towards sports of the students participating in the study were examined, a statistically significant difference was observed in favour of the Coaching department students in the first sub-dimension (p=0.010). In the second sub-dimension, it was not statistically significant between the groups (p=0.104). A statistically significant difference was observed in favour of the students of the Coaching department in the third sub-dimension (p=0.003). When the total score was examined, the attitudes towards sports of the students of the CD were observed to be statistically higher than the students of the PRD (p=0.005) (Table 2).

Although there was no statistically significant difference in physical activity levels evaluated with IPAQ between the groups, there was a numerical difference in favour of the students of the Coaching department (p=0.680) (Table 3).

There was no statistically significant difference between the groups in the level of sleep quality examined by PSQI (p=0.747). It was observed that the mean scores of the two groups were similar (Table 4).

Table 1. Students' Demographic Characteristics

	Department	n	Mean ± (SD)	p
Age	Physiotherapy and Rehabilitation	25	22.60 ± (2.23)	0.809[1]
	Coaching	25	22.44 ± (1.55)	
Height	Physiotherapy and Rehabilitation	25	169.08 ± (7.51)	0.869[1]
	Coaching	25	169.04 ± (8.93)	
Weight	Physiotherapy and Rehabilitation	25	62.40 ± (8.57)	0.712[1]
	Coaching	25	64.60 ± (12.23)	
BMI	Physiotherapy and Rehabilitation	25	21.96 ± (1.66)	0.502[2]
	Coaching	25	22.33 ± (2.18)	

SD: Standart deviation, BMI: Body mass index, p[1]: Mann-Whitney U test, p[2]: Students' t test

Table 2. Students' Attitudes Towards Sports

	Department	Median (IQR)	p
ATSS 1st Sub-Dimension (interest in sports)	Physiotherapy and Rehabilitation (n=25)	45 (11)	**0.010**
	Coaching (n=25)	52 (10)	
ATSS 2nd Sub-Dimension (living with sports)	Physiotherapy and Rehabilitation (n=25)	25 (8)	0.104
	Coaching (n=25)	29 (3)	
ATSS 3rd Sub-Dimension (doing active sports)	Physiotherapy and Rehabilitation (n=25)	21 (6)	**0.003**
	Coaching (n=25)	25 (5)	
ATSS Total Score	Physiotherapy and Rehabilitation (n=25)	93 (21)	**0.005**
	Coaching (n=25)	106 (18)	

ATSS: Attitude Towards Sports Scale, IQR: Interquartile range, p: Mann-Whitney U test

Table 3. Students' Physical Activity Level

	Inactive	Minimally Active	High Active	p
Physiotherapy and Rehabilitation (n=25)	11 (44%)	8 (32%)	6 (24%)	0.680
Coaching (n=25)	6 (24%)	5 (20%)	14 (56%)	

p: Chi-square test

Table 4. Students' Sleep Quality

	n	Mean ± (SD)	p
Physiotherapy and Rehabilitation	25	13.7 ± (3.13)	0.747
Coaching	25	13.5 ± (1.96)	

SD: Standart deviation, p: Independent samples t test

DISCUSSION

As a result of the statistical analysis of the data acquired in our study, which was conducted to compare the attitudes towards sports, physical activity levels and quality of sleep of the students of the PRD and the CD, it was found that the attitudes towards sports of the students of the CD were higher than the students of the PRD. Thus, our first hypothesis was accepted. However, there was no difference in physical activity level and sleep quality between the groups. Therefore, our other two hypotheses were rejected.

Sport is a concept that brings individuals together, socializes them and unites them for the same purpose. Sports not only strengthens the individual physically but also helps make him/her mentally and psychosocially stronger. Sports has many positive contributions to human life, one of the most important of these contributions is the development of a positive attitude towards sports in the individual by uniting individuals towards a specific goal (Efe, 2023). In the study conducted in Ankara Yıldırım Beyazıt University to determine the attitudes towards sports of university students studying in faculties other than Sports Sciences Faculty, it was found that university students studying outside the field of sports generally had high attitude scores towards sports (Koçak, 2014). In another study, the attitudes towards sports of students studying at different faculties at Marmara University were compared. The study group of the research consists of 195 people (91 female and 104 male) in total, including Marmara University PRD (44 students), CD (89 students), Nutrition and Dietetics Department (62 students). As a result of the research, a significant relationship was observed among students who are interested in sports as an amateur or professional in their families and their attitudes towards sports. In addition, it was observed that there was a significant difference among students of the PRD and the CD in favour of the students of the PRD. The reason for this is interpreted as PRD students have more knowledge about sports injuries and are more interested in the improvement of sports-related disorders (Göksel et al., 2017). Our study and the results of these studies are not parallel. We think that the reason for this is the enlarge in the time spent at home with the pandemic period and the students directing themselves to different activities that they can do at home. Because these individuals are restricted from leaving their homes by governments all over the world to prevent the spread of the disease. In addition, the concept of e-sports, which has become popular in recent years, causes the time spent in front of the computer to increase. As the time spent at home increased during the pandemic period, individuals showed more interest in this area. For all these reasons, university students' attitudes towards sports differ before and after the pandemic period.

In a study comparing the physical activity prominence of individuals before and during the COVID-19 pandemic, a total of 870 individuals, 413 female and 457 male, living in different cities of Turkey, over the age of 18, were included in the study. As a result, a significant decrease was found in

the physical activity levels of individuals during the pandemic compared to the pre-pandemic period (Ünlü et al., 2020). In a systematic review of studies investigating the physical activity levels of university students during the pandemic period, 9 studies (Ács et al., 2020; Alarcón et al., 2021; Barkley et al., 2020; Gallè et al., 2020; Gallo et al., 2020; Karuc et al., 2020; Maher et al., 2021; Sañudo et al., 2021; Savage et al., 2020) stated that the level of physical activity decreased, while only 1 study (Romero-Blanco et al., 2020) stated that it increased (López-Valenciano et al., 2021). These results are parallel with the results of our study. The physical activity level of the students in these two departments, where it is known how important physical activity is, is not at the expected level. Because during the COVID-19 pandemic, the symptoms affecting the musculoskeletal system and mobility of individuals with the disease, as well as the measures taken by local and general government authorities to prevent the spread of the disease, caused the life style of almost everyone to change and reduced the level of physical activity during this period.

Researching the quality of sleep of university students in the COVID-19 period, Marelli et al. (2021) stated that the social isolation experienced during this period had a significant effect on both sleep quality and psychosocial aspects of 307 Italian university students, and that female students were more affected than male students. In another study, Dongol et al. (2022), in their study with 2474 university students, showed that insomnia problem and stress level increased and quality of sleep decreased in the COVID-19 period. Martinez-de-Quel et al. (2021), in their study involving 693 university students, reported that the rapid lifestyle change with the COVID-19 period adversely affected sleep quality. Although there was no difference between departments in our study, when the results of the questionnaire were evaluated, it was observed that the quality of sleep was low. Therefore, our study is parallel with the sources in the literature. A systematic review and meta-analysis, including 63 studies to examine and synthesize changes in sleep quality and sleep disorders in the general population from before the COVID-19 lockdown, stated that sleep quality decreased and the rate of individuals with poor sleep quality increased during the COVID-19 pandemic period. Approximately 57% of the participants in the studies included in the research stated that their sleep quality changed during the pandemic period, while approximately 37% of them stated that their sleep quality changed for the worse. Additionally, the studies included in the study reported a decrease in sleep efficiency and an increase in sleep disorders and sleeping pill consumption (Limongi et al., 2023). The COVID-19 pandemic has been characterized by multiple waves, and several sleep variables appear to be weakened by the repeated implementation of strict restrictive measures that can initiate or aggravate sleep disorders.

As a limitation of our study, we can say that only students from one of the departments of the Faculty of Health Sciences and Faculty of Sport Sciences are included. In future studies, we suggest adding all departments in these faculties and conducting research with more participants.

CONCLUSION

With the closure of universities and lockdown during the COVID-19 period, the time spent at home has increased and physical and social activity has decreased. This situation caused mental problems, especially sleep disorders, in students. With the restriction of physical activity in the COVID-19 period, the number of individuals doing sports decreased, and the number of inactive individuals increased. The results we obtained show that the attitudes towards sports of the students of the CD are higher than the students of the PRD, but there is no difference in their physical activity levels and sleep quality.

Conflict of Interest

Authors declare that there are no conflict of interest between them. Also, we note that our manuscript contains original material.

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Factors Influencing Spiritual Well-Being among People with Chronic Obstructive Pulmonary Disease

Gökçe Çıplak [1]*, Ülfet Vatansever Özbek [1], Betül Acunaş [1]

[1]Division of Neonatology, Department of Pediatrics, Trakya University, Faculty of Medicine, Edirne, Türkiye

ABSTRACT:

Purpose: To determine the role of different scoring systems in predicting mortality and morbidity risk of preterms who are younger than 32 weeks and/or have a birth weight of less than 1500 g.

Material and Methods: Preterm infants with a gestational age (GA) of less than 32 weeks and/or a birth weight (BW) of less than 1500 grams, who were admitted to the neonatal intensive care unit (NICU) between June 2014 and June 2016, were included in this study. The SNAP-PE-II and CRIB scores in the first 12 hours of life and the NTISS scores at 24, 48, and 72 hours of life were calculated for all newborns. Mortality rate, length of hospital stay, and morbidities were prospectively recorded. The patients were divided into two groups as survivors (Group 1) and non-survivors (Group 2). The data obtained were then statistically compared between the two groups.

Results: A total of 120 preterm infants constituted the study group. There were significant differences between the groups with respect to all studied risk scores ($p<0.001$). All scores showed satisfactory discrimination and calibration abilities for mortality. As for the morbidities, all of the scores were found to be higher in patients with morbidities than those without, but the situation changed when the ROC analyses were performed and sensitivity and specificity values were calculated.

Conclusion: This is one of the few studies that evaluated the relationship between the scoring systems used to predict mortality risk and common morbidities in extremely preterm patients.

Keywords: *Scoring systems; CRIB; SNAP-II; SNAP-PE-II; NTISS*

**Corresponding author: Gökçe Çıplak, email: gokcehch@hotmail.com*

INTRODUCTION

Improvements in perinatal and neonatal care have increased the survival rate of preterm infants that also have higher rates of mortality and morbidity. Common morbidities due to preterm birth are respiratory distress syndrome (RDS), patent ductus arteriosus (PDA), necrotising enterocolitis (NEC), bronchopulmonary dysplasia (BPD), intraventricular haemorrhage (IVH), and retinopathy of prematurity (ROP) (Chawanpaiboon et al., 2019; Acunaş, Uslu and Baş, 2018). In neonatal intensive care units, predetermination of the mortality risk and the severity of diseases that may lead to mortality is extremely important both for being prepared for severe conditions that may be encountered such as early mortality during follow-up and answering the parents' questions. Various scoring systems have been developed to predict the mortality risk. Scoring systems are used to predict patient prognosis, to compare different groups in clinical trials, to evaluate the performance of different units, to predict early and late complications as well as mortality, and to perform relevant interventions in advance (McLeod et al., 2020; Zeng, Shi and Li, 2023) The desired features of a neonatal scoring system are ease of use, early applicability after birth, and an

ability to the calculate the risks of mortality and morbidity and treatment cost. More comprehensive scoring systems have been developed over the years, which are based on physiologic parameters reflecting the initial clinical status of the patient and the treatments applied to the patient (Erdem, 2003). Score for Neonatal Acute Physiology - Perinatal Extension (SNAP-PE-II), which can be administered in the first 12 hours postnatally, consists of nine different parameters including mean blood pressure, lowest body temperature, PO2/FiO2 ratio, serum pH value, presence of convulsions, urine volume, birth weight, fifth-minute Apgar score, and the presence of a small for gestational age (SGA) (Richardson et al., 2001). Clinical Risk Index for Babies (CRIB), uses information about base deficit and oxygen demand in the first 12 hours of life, along with birth weight, gestational age in weeks, and congenital malformation(s) (Brito et al., 2003). Neonatal Therapeuetic Intervention Scoring System (NTISS), a modification of the Adult Therapeuetic Intervention Scoring System (TISS) used in adults, was created to provide a treatment-based disease severity assessment tool for use in neonatal intensive care (Gray et al., 1992).

Our aim is to determine the role of different scoring systems in predicting mortality and morbidity risk of preterms who are younger than 32 weeks and/or have a birth weight of less than 1500 g.

MATERIAL and METHODS

Purpose and Type of the Study

Our purpose is to determine the role of different scoring systems in predicting mortality and morbidity risk of preterms who are younger than 32 weeks and/or have a birth weight of less than 1500 g.

Sampling and participant

Preterm infants with a gestational age (GA) of less than 32 weeks and/or a birth weight (BW) of less than 1500 grams , who were admitted to the neonatal intensive care unit (NICU) between June 2014 and June 2016, were included in this study. The SNAP-PE-II and CRIB scores in the first 12 hours of life and the NTISS scores at 24, 48, and 72 hours of life were calculated for all newborns.

Data Collection Tools

Mortality rate, length of hospital stay, and morbidities including RDS, IVH, NEC, BPD, ROP, and PDA were prospectively recorded. Mode of delivery, 1st and 5th minute Apgar score, gender, gestational age in weeks, and birth weight were obtained from the patients' neonatal epicrises or medical records. Prospectively recorded data were evaluated retrospectively. The patients were divided into two groups as survivors (Group 1) and non-survivors (Group 2). The data obtained were then statistically compared between the two groups.

Statistical Analysis

For descriptive statistical evaluation, percentage (%) and frequency values were used for categorical variables while median, minimum, maximum, mean and standard deviation values were used for numerical variables. Chi-square test was performed for categorical variables and Mann-Whitney U (MWU) test for numerical variables for comparing the groups. A p value of less than 0.05 was considered statistically significant for all statistical tests. Spearman correlation coefficient (r) was used to evaluate the relationship between numerical variables. The area under the ROC curve was calculated to evaluate the discrimination and calibration of mortality scores. The score was considered to be discriminative if the area under the ROC curve was above 0.80. The point on the ROC curve with the highest specificity and sensitivity was determined as the cut-off point. Specificity and sensitivity were calculated for that cut-off point. With this calculation, patients with a mortality risk above the cut-off point constituted the group with expected mortality. Thus, the relationship between scores and the expected and observed mortality rates was evaluated. The same calculations were performed separately for the morbidity rates. All statistical tests were performed using the Statistical Package for Social Science (SPSS) 11.0 software package.

Ethical Approval

Ethics approval for the study was obtained from the Local Ethics Committee on 15.06.2016, with a protocol number of 12/16 and a protocol code of

TUTF-BAEK 2016/160.

RESULTS

A total of 128 preterm infants followed up in the NICU between June 1, 2014 and June 30, 2016 were included in the study. Six patients were excluded from the study because they died before the 72nd hour of life; two patients were also excluded because they were referred from an external center. A total of 120 preterm newborns constituted the study group. Ninety-six surviving infants were considered as Group 1 and 24 non-surviving infants were considered as Group 2.

Mean gestational age in weeks was 29 ± 1.8 weeks in Group 1 and 26 ± 2.3 weeks in Group 2; mean birth weight was 1260 ± 386 g in Group 1 and 833 ± 300 g in Group 2. When the two groups were compared, the difference between BW, GA, presence of SGA, and the 1st and 5th minute Apgar scores were statistically significant (p<0.001). There was no statistically significant difference between the groups in terms of gender and mode of delivery (Table 1).

The mortality rate of the whole study group was 20%. When individual morbidities were analyzed, the most common morbidity was NEC of any stage (60%), which was followed by RDS (58%), IVH of any stage (32%), BPD of any stage (21%), ROP of any stage (12%), and hemodynamically significant PDA (hsPDA) (3%). Stage 1 NEC, RDS, and IVH of any stage were significantly more common in Group 2 compared with Group 1 (p<0.001) (Table 2).

There were significant differences between the groups with respect to all studied risk scores (p<0.001).The areas under the ROC curve of the scores in the Group 2 were calculated as 0.86 for CRIB, 0.85 for NTISS-24, 0.81 for NTISS-48, 0.81 for NTISS-72, 0.84 for SNAP-II, and 0.90 for SNAP-PE-II (p<0.001). All scores showed satisfactory discrimination and calibration abilities for mortality (Table 3).

Table 1. Comparison of Demographic Data

	All patients (n=120)	Group 1 (n=96)	Group 2 (n=24)	p
Caesarean section, n (%)	103 (86)	12 (87)	5 (79)	0,329
Gender (male), n (%)	50 (42)	42 (44)	8 (33)	0,488
Gestational age (week)†	28,8 ± 2,3	29 ± 1,8	26 ± 2,3	<0,001*
Birth weight (gram) †	1175 ± 407	1260 ± 386	833 ± 300	<0,001*
SGA, n (%) †	38 (31,7)	23 (24)	15(62,5)	<0,001**
Apgar 1' †	9 (2-10)	9 (2-10)	3 (2-9)	<0,001*
Apgar 5' †	10 (4-10)	10 (5-10)	7 (4-10)	<0,001*

***** Independent Samples T-test ** Chi-square test **†** (mean±SD)

Tablo 2. Comparison of preterm morbidities

	All patients (n=120)	Group 1 (n=96)	Group 2 (n=24)	p*
NEC, n (%)	72 (60)	61 (63,5)	11 (46)	0,161
Stage 1	36 (30)	36 (37,5)	-	<0,001
Stage 2	34 (28)	24 (25)	10(42)	0,130
Stage 3	2 (2)	1(1)	1(4)	0,361
RDS, n (%)	69 (58)	47 (49)	22 (92)	<0,001
IVH, n (%)	39 (32)	19 (20)	20 (83)	<0,001
Stage 1-2	25 (20)	17 (18)	8 (33)	<0,001
Stage 3	14 (12)	2 (2)	12 (50)	<0,001
hsPDA, n (%)	4 (3)	2 (2)	2 (8)	0,178
BPD, n (%)	25 (21)	22 (23)	4 (16)	0,591
Mild	13 (11)	12 (12)	1 (4)	0,461
Moderate	9 (7,5)	7 (8)	2 (8)	0,572
Severe	3 (2,5)	2 (3)	1 (4)	0,491
ROP, n (%)	15 (12)	12 (12,5)	3 (12,5)	0,652

* Chi-square test **NEC:** Necrotising Enterocolitis, **IVH:** Intraventricular haemorrhage, **hsPDA:** Hemodynamically Significant Patent Ductus Arteriosus, **BPD:** Bronchopulmonary Displasia, **ROP:** Retinopathy of Preterm

Table 3. Comparison of risk scores

Risk Scores	Group 1 (n=96)	Group 2 (n=24)	p*
CRIB	1,5±2,2	7±4,3	<0,001
NTISS-24	12,3±3,2	16,5±2,5	<0,001
NTISS-48	11,9±2,5	14,5±1,9	<0,001
NTISS-72	12,1±2,5	14,5±1,7	<0,001
SNAP-II	7,2±9,5	27,2±16,5	<0,001
SNAP-PE-II	17,9±19,2	58±23,8	<0,001

* Independent Samples T-test (mean±SD)

Table 4. Distribution of sensitivity and specificity of risk scores for all morbidities

	CRIB	NTISS-24	NTISS-48	NTISS-72	SNAP-II	SNAP-PE-II
RDS						
Sensitivity (%)	87	88	88	73	78	78
Specifity (%)	51	85	79	85	83	73
Cut-off	0,5	11,5	11,5	12,5	6,5	13,5
ROP						
Sensitivity (%)	64	73	80	86	71	86
Specifity (%)	67	72	57	57	70	69
Cut-off	1,5	15,5	12,5	12,5	14	30,5
BPD						
Sensitivity (%)	65	73	68	80	73	72
Specifity (%)	71	62	47	62	65	64
Cut-off	1,5	13,5	12,5	12,5	10	24,5
Moderate-Severe BPD						
Sensitivity (%)	91	75	66	91	67	75
Specifity (%)	69	54	54	56	60	60
Cut-off	1,5	12,5	12,5	12,5	10	24,5
IVH						
Sensitivity (%)	92	92	85	-	92	100
Specifity (%)	80	74	73		69	89
Cut-off	3	15,5	13,5		12,5	47,5

NEC: Necrotising Enterocolitis, **IVH:** Intraventricular Hemorhage, **hsPDA:** Hemodynamically Significant Patent Ductus Arteriosus, **BPD:** Broncopulmonary Displasia, **ROP:** Retinopathy of Preterm

When the risk scores were evaluated in terms of morbidities, all risk scores were significantly higher in patients with RDS, ROP, and BPD. The discrimination and calibration abilities of all scores were satisfactory only for patients diagnosed with RDS. NTISS-24 was the best scoring system for RDS, having a sensitivity of 88% and a specificity of 85%. The discrimination and calibration abilities of the scores for ROP, BPD, and anaemia were not satisfactory. CRIB, SNAP-II, SNAP-PE-II, SNAP-PE-II, and NTISS scores calculated at 48 hours were significantly different between patients with and without PDA. The discrimination and calibration abilities of these scores were found to be satisfactory. At the cut-off point for the diagnosis of PDA, SNAP-PE-II score was the best scoring system, having a sensitivity of 100% and a specificity of 69%. The distribution of risk scores was evaluated separately in patients diagnosed with BPD, with and without moderate or severe BPD. Moderate or severe BPD was detected in 12 of 120 patients. When the scores of patients with and without moderate or severe BPD were compared, a significant difference was found between all of the scores. Only the CRIB score had satisfactory discrimination and calibration abilities in this sense. The sensitivity and specificity of the CRIB score at its best cut-off point for the diagnosis were 91% and 69%, respectively. In severe IVH, the prognosis is poor and the likelihood of sequelae is high. Therefore, only patients with severe IVH were selected. When the risk scores were compared in patients with and without IVH, a significant difference was found between all of the scores, except for NTISS, calculated at 72 hours. The

discrimination and calibration abilities of all scores were found to be satisfactory. The sensitivity and specificity of the SNAP-PE-II score for the diagnosis of IVH at its best cut-off point were calculated as 100% and 89%, respectively. For all morbidities, the sensitivity and specificity values of the risk scores for those with and without a significant difference between the diagnosed and undiagnosed groups were calculated by a ROC analysis. The distribution of sensitivity and specificity values of the risk scores for all morbidities studied are given on Table 4.

DISCUSSION

Various scoring systems have been developed to predict the mortality risk in various conditions. Scoring systems are used to predict the prognosis of a patient, to compare different groups in clinical studies, to evaluate the performance of different units, to predict early and late complications and mortality, and to perform relevant interventions in advance. The desired features of a neonatal scoring system are ease of use, early applicability after birth, and an ability to calculate the risks of mortality and morbidity and treatment cost. More comprehensive scoring systems have been developed over the years, which are based on physiologic parameters reflecting the initial clinical status of the patient and the treatments applied to the patient (Pollack et al., 2000; Dorling, Field and Manktelow, 2005; Garg, Sharma and Farahbakhsh, 2018).

In our study, we aimed to evaluate the relationship between the scoring systems CRIB, SNAP II, SNAP-PE-II II, SNAP-PE-II II, and NTISS and the mortality and morbidity rates in extremely preterm infants hospitalized in the NICU. The mortality rate of the extremely preterm group in our NICU was found to be 20%. In a multicenter study involving 1668 newborns conducted in Turkey, newborns younger than 32 weeks or weighing less than 1500 grams had a mortality rate of11.3%, while the corresponding mortality rate was 16.8% in a single-center study (Asker et al.,2016; Atasay et al. 2003). In a study published from Portugal, including 100 newborns with a birth weight of less than1500 grams and an age of less than 31 weeks, the mortality rate was 21% (Sarquis, Miyaki and Cat, 2002). In a study of 494 neonates published from Brazil, overall NICU mortality was 8.9%, while infants weighing less than 1500g had a mortality rate of 31.3%. (Zardo and Procianoy, 2003). Our study found a mortality rate that is similar to mortality data on preterm reported both from our country and other countries. The fact that our study group consisted of extremely preterm infants and that more treatments and interventions were performed are probably the main reasons for the high mortality rate found in our study.

In our study, when the scores of the surviving infants were compared with those of the non-surviving infants, a statistically significant difference was found between the two groups for all of the scores studied. When the score distribution of the groups was compared, it was observed that all risk scores were significantly higher in the group of non-surviving infants. All risk scores had satisfactory discrimination and calibration abilities for mortality, with SNAP-PE-II being the best score. These findings were consistent with the literature data. A similar study, which used the NTISS score at 24, 48, and 72 hours and included 172 preterm newborns weighing less than1500 grams, found lower scores in survivors (Wu et al., 2015). In a study using the CRIB, SNAP, SNAP-PE, SNAP-PE-II, and SNAP-PE-II scores, the scores were higher in the non-surviving group compared to the surviving group both in the whole study group and patients having a birth weight of less than 1500 grams (Zardo and Procianoy, 2003). Similar results were reported by a study using the CRIB, CRIB-II and SNAP-PE-II scores in infants weighing less than 1500 grams and (Gagliardi et al., 2004). Karaarslan et al. (Karaarslan et al., 2017) used the CRIB-II and SNAP-PE-II scores in 189 newborns younger than 32 weeks of age and weighing less than 1500 g. A comparison of the surviving and non-surviving groups revealed higher scores in the non-surviving group.

Although many studies have evaluated the relationship between the available scores and mortality, the number of studies evaluating the relationship with the scores and various morbidities is rather limited. In our study, all scores that were studied were found to be higher in patients with morbidities compared to those without, although the situation changed when the ROC analyses were performed and the sensitivity and specificity values

were calculated. For the morbidities, all scores had a satisfactory discriminatory power in predicting the risk of IVH and RDS, whereas the CRIB, SNAP-II and SNAP-PE-II scores had a satisfactory discriminatory power for PDA. In terms of sensitivity and specificity, SNAP-PE-II was superior to other scores for IVH and PDA while NTISS-24 was the best one for RDS. The CRIB score was better than the other scores in predicting moderate and severe BPD.

In a recent study with a large sample size, both the CRIB-II and SNAPPE-II scores were found to have good predictive ability while CRIB-II was better than SNAPPE-II for all the morbidities (Vardhelli et al., 2022). The studies evaluating CRIB-II alone showed that the predictive ability of CRIB-II performed well for the important morbidities like ROP, BPD, and IVH (Lee et al., 2019; Phillips, Dewhurst and Yoxall, 2011; Sullivan et al., 2016).

In our study, no significant difference was found between the scores of patients with and without surgical NEC. This may be explained by the low number of patients diagnosed with surgical NEC. When the patient groups with and without NEC of any stage were compared, the CRIB and NTISS-72 scores were significantly higher in the NEC-positive group. In a study including 62 patients diagnosed with NEC, the SNAP-II and SNAP-PE-II scores were found to be higher in the group requiring surgical intervention and lower in the group that survived. It was concluded that the scores could be used to predict the prognosis of NEC and the risk of surgery (Lin et al., 2013)

According to our results, the CRIB, NTISS-48, SNAP-II and SNAP-PE-II scores were significantly higher in the group with PDA. The ROC analysis showed that the CRIB, SNAP-II, and SNAP-PE-II scores had satisfactory discrimination and calibration abilities. In a large study, the treatment approach in patients diagnosed with PDA was evaluated in 1097 preterm infants weighing less than1000 grams and younger than 33 weeks. The SNAP-PE-II score was found to be significantly higher in the conservative approach group compared with the other groups (Sadeck et al., 2014). In a study including 91 patients with a gestational age of less than 28 weeks diagnosed with PDA, the CRIB-II score was found to be significantly higher in the group with clinical findings compared with the group without clinical findings (Yoo et al., 2017).

All the scores studied in our study significantly predicted the diagnosis of ROP. However, when a ROC analysis was performed, and sensitivity and specificity values were calculated according to the cut-off point, it was seen that the scores did not perform well in risk prediction. In our study, patients with and without ROP requiring treatment were evaluated separately in terms of the scores. The difference between all scores except NTISS-48 and NTISS-72 was significant. The ROC analysis showed that discrimination and calibration abilities of the scores fort his diagnosis remained unsatisfactory. In a study that compared the SNAP-PE-II score in very low birth weight infants with and without ROP, it was observed that the score was higher in patients with ROP compared with those without. However, after logistic regression analysis and ROC curve results, it was thought that the score was not capable enough for risk assessment (Fortes Filho et al., 2009). In the study involving 503 preterm infants, 299 patients with ROP were divided into two groups consisting of 35 patients requiring surgical treatment and 264 patients not requiring it. The CRIB score was found to be higher in patients requiring surgical treatment; it was concluded that the score could be used to predict prognosis (Yang, Donovan and Wagge et al., 2006).

In our study, when patients with and without moderate and severe BPD were compared, a significant difference was observed between all of the scores. When a ROC analysis was performed, only the CRIB score was found to have a satisfactory discriminatory power. We found that there was a significant difference between all of the scores when patients with and without moderate and severe BPD were compared. When a ROC analysis was performed, only the CRIB score was found to have a satisfactory discriminatory power. In a study involving 303 preterm newborns younger than 28 weeks of gestational age, the patients were divided into four groups: BPD-free, mild BPD, moderate BPD, and severe BPD. The CRIB score was found to be higher in patients with severe BPD (Bruno et al., 2015). A study from Turkey including 246 preterm infants found that high SNAPPE-II values showed a

satisfactory discriminatory power for predicting neonatal morbidities, and as a common and independent risk factor for ROP and BPD (Özcan et al., 2017).

In our study, the CRIB, NTISS-24, NTISS-48, SNAP-II, and SNAP-PE-II scores were higher in the group with severe IVH compared to the IVH-free group. A ROC analysis showed that the discrimination and calibration abilities of these scores were satisfactory. A prospective, multicentre study collected mortality, morbidity and CRIB score data of 10680 preterm newborns weighing less than 1500 grams from 68 units. The predictive ability of the CRIB score for mortality and risk of severe IVH was evaluated in newborns divided into five different groups according to birth weight. They compared the CRIB score, gestational week, and birth weight (Guzmán Cabañas et al., 2009).

CONCLUSION

In conclusion, our study is one of the few studies that evaluated the relationship between the scoring systems used to predict mortality risk and common and important morbidities in severely preterm patients. It was concluded that all of the scores performed well in predicting mortality risk. As for the morbidities, all of the scores were found to be higher in patients with morbidities than those without, but the situation changed when the ROC analyses were performed and sensitivity and specificity values were calculated. Among the morbidities, all of the scores had a satisfactory discriminatory power in predicting the risk of IVH and RDS, whereas the CRIB, SNAP-II, and SNAP-PE-II scores had a satisfactory discriminatory power for PDA. In terms of sensitivity and specificity, SNAP-PE-II was superior to the other scores for predicting IVH and PDA while NTISS-24 performed the best for RDS. The CRIB score was better than the other scores in predicting moderate and severe BPD. This study is a single-center clinical study, and its most important limitation is the small number of patients. A particular limitation is that the NTISS score is based on the assumption that all physicians have similar approaches to neonatal care; furthermore, differences in treatment approaches, training and clinical experience of physicians affect the NTISS score. Further studies are needed to clarify whether these differences affect the predictive power of the scores in predicting mortality and morbidity.

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Conflict of Interest

No conflict of interest has been declared by the authors.

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Review Article

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Current Overview of Clinical and Radiological Findings Associated with Cerebral Amyloid Angiopathy

Betül Kızıldağ [1]*, Nursel Yurttutan [1]

[1]Kahramanmaraş Sütçü İmam Üniversity, Faculty of Medicine, Department of Radiology, Kahramanmaraş, Türkiye

ABSTRACT:
Purpose: In this review, the pathophysiology, clinical manifestations, and radiological findings of sporadic CAA will be detailed.
Material and Methods: Cerebral amyloid angiopathy (CAA), the second most common cause of spontaneous acute intracerebral hemorrhage after hypertension in the elderly population is characterized by brain parenchymal damage secondary to hemorrhage and ischemia caused by the accumulation of Aβ protein in the walls of small arteries and arterioles. Advanced age is the most significant risk factor for CAA. While the definitive diagnosis requires histopathological examination through autopsy/biopsy, the probable or possible diagnosis of CAA is based on clinical features as well as characteristic neuroimaging findings.
Results: With the increasing elderly population and the growing prevalence of succesibility-weighted magnetic resonance imaging sequences in routine, it becomes imperative to have a thorough understanding of the imaging spectrum associated with CAA. Early diagnosis is extremely critical in patients with CAA who have not yet developed intracranial hemorrhage. Furthermore, patients with CAA may present clinically transient focal neurological episodes or cognitive impairment, which can be mistaken for transient ischemic attacks caused by convexity subarachnoid hemorrhage.
Conclusion: Additionally, before initiating newly introduced anti-amyloid monoclonal antibody drugs in Alzheimer's disease, it is necessary to exclude signs of CAA. Moreover, the anticipated side effects of these drugs often manifest imaging abnormalities resembling inflammation or bleeding associated with CAA, necessitating familiarity with the imaging findings of CAA.

Keywords: *Cerebral amyloid anjiopathy; magnetic resonance imaging; susceptibility weighted imaging; cerebral hemorrhage*

**Corresponding author: Betül Kızıldağ, email: dr.betulkizildag@hotmail.com*

INTRODUCTION

Cerebral amyloid angiopathy (CAA) is a vasculopathy first described by Oppenheim in 1909, characterized by the accumulation of beta-amyloid (Aβ) protein in the walls of cortical and leptomeningeal vessels, particularly associated with cortical and lobar hemorrhage. CAA is the second most common cause of spontaneous acute intracerebral hemorrhage (figure 1) after hypertension in geriatric population (figure 2) (Biffi and Greenberg, 2011). Alongside age-related sporadic types, there are also genetic forms characterized by the accumulation of different types of amyloid at earlier ages. The accumulation of Aβ protein in the walls of small arteries and arterioles leads to parenchymal damage by causing hemorrhage and ischemia. Histologically, deposition of amyloid within media and adventitia layers of vessel wall results in thickening, hyalinization, and smooth muscle loss (Vinters, 1987). Advanced age is the most important risk factor for SAA, with the frequency increasing from 7.3% in the first 10 years after the age of 65 to 17.6% and further to 34.6% after the age of 85 (Greenberg and Vonsattel, 1997). While CAA is a well-known significant cause of lobar

intracerebral hemorrhage, convexity subarachnoid hemorrhage (SAH) can present with less known clinical manifestations characterized by transient neurological symptoms in this patient group (Banerjee et al., 2017). While the definitive diagnosis of CAA requires histopathological examination through autopsy or biopsy, the probable or possible diagnosis of CAA is based on clinical features and characteristic neuroimaging findings (Charidimou et al., 2022).

The wide spectrum of additional clinical and radiological features of CAA makes its early recognition radiologically even more crucial. With the increasing elderly population and the widespread use of sensitivity-weighted magnetic resonance imaging (MRI) sequences in routine practice, familiarity with the imaging spectrum associated with CAA becomes imperative. It is known that antiplatelet and anticoagulant medications commonly used in elderly patients due to accompanying diseases increase the risk and recurrence of intracranial hemorrhage in CAA patients (Biffi et al., 2010). Therefore, early diagnosis is extremely critical, especially in CAA patients who have not yet developed intracranial hemorrhage. Furthermore, CAA patients may present clinically with transient focal neurological episodes or cognitive impairment, which can be mistaken for transient ischemic attacks caused by convexity subarachnoid hemorrhage. Additionally, the side effects of newly introduced anti-amyloid monoclonal antibody drugs in Alzheimer's disease often manifest imaging abnormalities resembling inflammation or bleeding associated with CAA. This necessitates familiarity with imaging findings to distinguish between these conditions (Withington and Turner, 2022).

MATERIAL and METHODS

Purpose and Type of the Study

Systematic search was done via Pub med database on January 2023 by using the terms cerebral amyloid angiopathy (MesH) which returned 899 articles of related topic of which concerning radiological findings were further included. This review will detail the pathophysiology, clinical, and radiological findings of sporadic CAA.

Pathophysiology

In the pathogenesis of CAA, inadequate clearance of Aβ protein from interstitial fluid of central nervous system (CNS) is implicated. Perivascular spaces are areas of continuity between the tunica adventitia of arterioles, and subarachnoid space as well as cerebrospinal fluid. It is hypothesized that the removal of Aβ protein from the interstitial fluid in brain parenchyma primarily occurs through retrograde drainage of these perivascular spaces into the cervical lymphatic system (Morrone et al., 2015). Age-related conditions such as arteriosclerosis, previous traumas or infarctions contribute to decreased clearance of Aβ protein (Tarasoff-Conway, 2015). In CAA, there is an accumulation of soluble vascular Aβ derived abundantly from the amyloid precursor protein (APP), which is a transmembrane glycoprotein encoded on chromosome 21 and heavily produced in brain cells, consisting of 40 amino acids (Hawkes et al.,2014). This protein is different from the amyloid protein found in Alzheimer's disease, which accumulates in different locations, is 42 amino acids long, and has less solubility in water (Attems et al., 2004). Although they are distinct pathologies, CAA is detected in 90% of Alzheimer's disease cases, while only 25% of CAA patients have concomitant Alzheimer's disease (Ellis et al..1996). In CAA, vessels with a diameter smaller than 2 mm, primarily arterioles but less frequently capillaries, and rarely venules, are damaged by the accumulation of Aβ. The involvement is patchy and segmental, with both normal and abnormal vessels coexisting. Posterior brain regions, particularly occipital, posterior temporal, and parietal lobes, are prone to involvement. Cerebellar involvement typically emerges in later stages. Basal ganglia, thalamus, and white matter vasculature are preserved areas compared to the small vessel disease associated with hypertension (Charidimou et al.,2012a).

In the early stages, the accumulation of Aβ in the tunica adventitia leads to thickening of the vessel wall, while subsequent Aβ saturation of the adventitia results in decreased accumulation within the smooth muscles of the tunica media. Furthermore, the cytotoxic effect of Aβ leads to smooth muscle loss, resulting in vascular fragility and

thinning of the vessel Wall (Revesz et al., 2002).

For sporadic CAA, the presence of the apolipoprotein E (APOE) ε4 allele associated with vascular fragility, while APOE ε2 allele in relation with vascular accumulation of Aβ, have been identified as risk factors (Charidimou, 2015a). Light microscopy revealing presence of amyloid protein in the vessel wall with Congo red staining exhibiting green apple birefringence is the traditional diagnostic method. However, achieving a more sensitive and specific definitive diagnosis is feasible through immunohistochemical demonstration of anti-Aβ antibodies (Tarasoff-Conway et al., 2015).

In clinical practice, the updated Modified Boston Criteria are utilized to diagnose probable or possible CAA based on imaging and clinical findings without necessity for histopathology known as gold standard (Table 1) (Charidimou et al., 2022).

Table 1. Boston Criteria Version 2.0

Classification	Modified Boston Criteria (version V)
Final Diagnosis	Full postmortem examination • Spontaneous intracranial hemorrhage, cortical subarachnoid hemorrhage, transient focal neurological attacks, or cognitive impairment, or dementia development. • Severe CAA accompanied by vasculopathy. • Absence of other diagnostic lesions.
Pathology-supported probable CAA	Clinical findings and pathological tissue diagnosis (hematoma evacuation or cortical biopsy). • Spontaneous intracranial hemorrhage, cortical subarachnoid hemorrhage, transient focal neurological attacks, or cognitive impairment, or dementia development. • Presence of varying degrees of CAA in the specimen. • Absence of other diagnostic lesion.
Probable CAA	Age 50 or older, with clinical findings and MRI or CT • The clinical presentation in the form of spontaneous intracranial hemorrhage, cortical subarachnoid hemorrhage, transient focal neurological attacks, or cognitive impairment, or dementia; presence of at least 2 definite lobar hemorrhagic lesions on T2*-weighted MRI; concomitant presence of intracranial hemorrhage, cerebral microbleeds, or superficial siderosis of the convexity. OR • One lobar hemorrhagic lesion and one white matter feature (severely dilated perivascular spaces in the centrum semiovale or multifocal pattern of white matter hyperintensity). • The absence of other potential causes for hemorrhage or cortical superficial siderosis. • The absence of deep hemorrhagic lesions (intracranial hemorrhage or cerebral microbleeds) on T2*-weighted MRI. • Cerebellar lesions are not considered deep or lobar hemorrhages.
Probable CAA	Being over 50 years of age, with clinical findings and MRI or CT imaging: • With clinical presentation such as spontaneous intracranial hemorrhage, cortical SAH, transient focal neurological attacks, or cognitive impairment, or dementia, at least two of the following will be present; The presence of lobar hemorrhagic lesions on T2*-weighted MRI in association with any of the following: intracranial hemorrhage, cerebral microbleeds, or convexity subarachnoid hemorrhage (SAH) or cortical superficial siderosi, OR • "A white matter feature (severe visible periventricular white matter hyperintensity or a multifocal pattern of white matter hyperintensity) • The absence of other potential causes that could lead to hemorrhage or cortical superficial siderosis. • The absence of deep hemorrhagic lesions (intracranial hemorrhage or cerebral microbleeds) on T2*-weighted MRI. • Cerebellar lesions are not considered deep or lobar hemorrhages.

CAA (cerebral amyloid angiopathy); MRI (magnetic resonance imaging); CT (Computed tomography); SAH(Subarachnoid hemorrhage); PVD (pervascular distance)

Ethical Approval

Because of nature of the study, ethical approval was vaived.

RESULTS and DISCUSSION

Hemorrhagic Radiological Findings of CAA

Lobar hemorrhage, microbleeds, convexity subarachnoid hemorrhage (cSAH) and cortical superficial siderosis (cSS) (figure 1) are radiologically identified lesions associated with cerebral hemorrhage detected by CT and/or MRI and integrated into the Modified Boston Criteria 2.0 version, serving as diagnostic criteria for "possible or probable SAA" without the need for biopsy (figure 1) (Charidimou et al., 2022). In computed tomography (CT), particularly cSAH and lobar hemorrhage, appear as high-density lesions in the acute phase and is initially preferred modality due to high sensitivity for diagnosis (figure 4,5) Additionally, in magnetic resonance imaging (MRI) MRI, T2*-weighted gradient recalled echo (GRE) sequences are preferred due to their sensitivity to magnetic susceptibility effects of blood degradation elements such as hemosiderin, showing lesions associated with acute hemorrhage like lobar hemorrhage and cSAH, as well as chronic blood elements such as cerebral microbleeds and cortical superficial siderosis (cSS). (figure 1)Susceptibility weighted imaging (SWI) is an advanced MRI technique that includes the T2*-weighted GRE sequence, providing three-dimensional, high spatial resolution, magnitude, and phase information. It has become widely used in recent years for visualizing hemorrhagic lesions (Schweser, 2010).

Lobar hemorrhages are located in the cortical, subcortical, or gray-white matter junction and typically develop secondary to involvement of cortical or leptomeningeal arterioles with a diameter of less than 2 mm. These lobar hemorrhages differ from those involving deep structures such as basal ganglia, thalamus or pons, which occur secondary to bleeding from perforating arterioles in hypertensive patients and have central locations. Lobar hemorrhages are more frequent and severe in the posterior location of the occipital lobes (figure 4,5). Lobar hemorrhages manifest with clinical symptoms of hemorrhagic stroke, such as headache, altered consciousness, focal neurological deficits, or seizures, which are often reported depending on the location and size of the hemorrhage. Recurrence of bleeding is possible and worsens the clinical presentation (figure 4,5) (Greenberg and Charidimou, 2018).

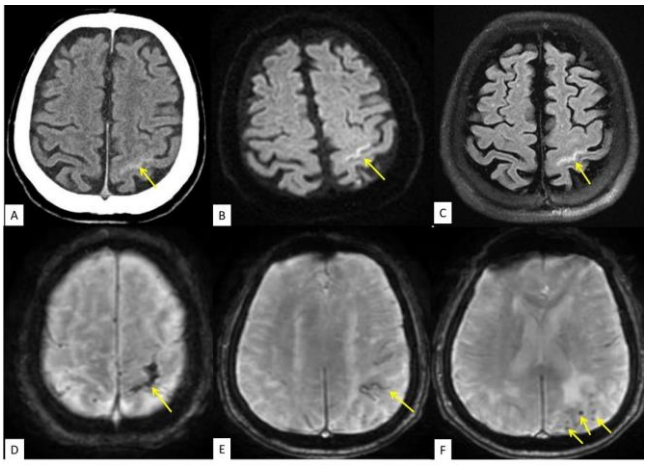

Figure 1. A 72-year-old male patient presented to the emergency department with sudden onset of speech disturbance, slurring of speech, and weakness in the right arm and leg, lasting approximately 8-10 minutes. On non-contrast cranial CT scan (A), a hyperdense lesion consistent with convexity subarachnoid hemorrhage (cSAH) is observed in the left precentral gyrus (arrow). On the same day, the hemorrhagic area identified on diffusion weighted imaging (DWI) (B) appears hyperintense (arrow), while it is indistinguishable on ADC (not shown). On the FLAIR sequence (C), the lesion is identified as hyperintense in the hemorrhagic area. On the same level on the successibility-weighted imaging (SWI) sequence, acute hemorrhagic area appears hypointense, while at lower levels, cortical superficial siderosis area (D) attributable to hemosiderin deposition on the surface of the gyrus, and multiple millimetric foci of susceptibility at cortical levels, which are typical findings accompanying cerebral amyloid angiopathy (E), are seen, not discernible on other sequences or CT. Additionally, there are patchy multifocal hyperintense lesions with partial coalescence at the level of deep white matter, indicative of white matter ischemic lesions.

Cerebral microbleeds are typically round or oval-shaped low signal foci, 2-10 mm in diameter, detected on SWI sequences located in or adjacent to the cortex. Patients are usually asymptomatic. Cerebral microbleeds, unlike the microbleeds associated with deep-seated arteriopathy in chronic hypertensive patients, are peripherally located similar to lobar hemorrhages. It is suggested that lobar hemorrhage arises from the unchecked progression of cerebral microbleeds. This also explains the bimodal occurrence of hemorrhagic lesions in CAA, presenting as either microbleeds or macrobleeds (lobar hemorrhage)(Greenberg et al., 2012).

Although cerebral microbleeds are known to be asymptomatic, they are suggested to be one of the factors responsible for cognitive impairment in CAA patients (figure 1,4,5) (Poels et al., 2012).

Besides hypertension (figure 2), many other etiologies can lead to cerebral microbleeds, each presenting with different demographic and clinical features. During the diagnostic process, a wide differential diagnosis list including diffuse axonal injury, cerebral vasculitis, acute hemorrhagic leukoencephalitis, hereditary arteriopathies, cerebral vasculopathy, cavernous malformations (figure 3), cerebral fat embolism, radiotherapy, encephalitis, hemorrhagic metastases, hypoxemia, Moya Moya disease, and posterior reversible encephalopathy syndrome (PRES) needs to be ruled out radiologically and clinically (Sharma et al, 2018). The cSAH refers to acute bleeding within one or more sulci at the level of the convexity. It appears as curved hyperdensity limited to thin sulci on CT scans. In MRI, fluid attenuated inversion recovery (FLAIR) sequences, acute hemorrhage has high signal intensity.

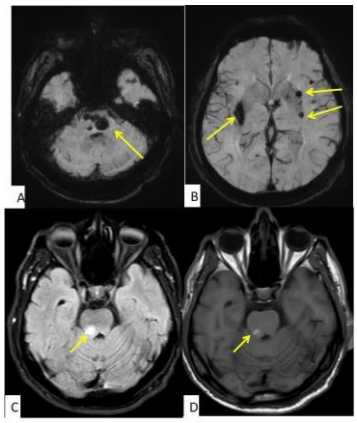

Figure 2. A 54-year-old male patient presented with complaints of headache and nausea. Successibility-weighted imaging (SWI) sections reveal bilateral hemorrhagic foci at the level of the brainstem in the pons (A) and at the slice passing through the basal ganglia (B). On the right side of the pons, hyperintense acute hemorrhagic focus is observed on FLAIR (C) and T1-weighted (D) sections. These findings were compatible with hypertensive hemorrhage.

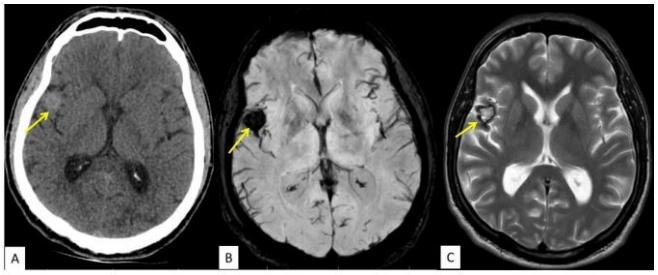

Figure 3. A 43-year-old male patient presented to the emergency department with facial and tongue twitching and difficulty speaking. On CT scan (A), a round lesion containing hyperdense bleeding is observed at the lobular level in the temporal lobe parenchyma adjacent to the right sylvian fissure. While the hemorrhage appears as a distinct signal-free area on SWI section, it is observed as hyperintense with a hypointense rim surrounding it on T2-weighted section (C). These findings were compatible with cavernoma

It develops as a result of extension from leptomeningeal vessels or more rarely, intralobar hemorrhage. Clinical manifestations are more specific and different from typical presentation of aneurysmal rupture or perimesencephalic subarachnoid hemorrhage in occurring in the basal cisterns or Sylvian fissure which patients present sudden severe headache typically described as, markedly headache. These patients typically describe transient focal neurological symptoms that spread within minutes, lasting less than 30 minutes. This is referred to as transient focal neurological episodes associated with CAA (figure 1). The pathophysiology involves cortical spreading depolarization phenomena. Headache may be mild or absent (Smith et al., 2021).

Distinguishing these transient symptoms from aura in migraine, focal Jacksonian seizures, and especially transient ischemic attacks (TIAs) can be challenging. Furthermore, these symptoms may herald future lobar hemorrhage, and failure to recognize them may increase the risk of lobar hemorrhage, particularly in patients using antiplatelet or antithrombotic drugs, which are more dangerous in these cases (Charidimou et al. 2012b).

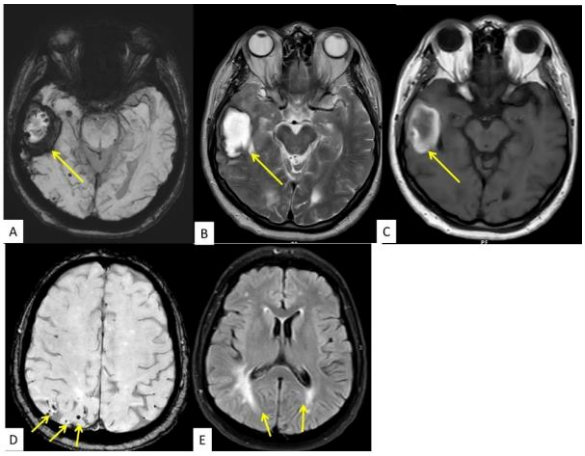

Figure 4. A 67-year-old male patient with a history of coronary artery disease and taking 100mg/day aspirin presents with headache and blurred vision. On SWI section (A), signal loss is observed in the right temporal lobe parenchyma consistent with a lobar hematoma; on T2 (B) and T1 (C) weighted sections, a large lesion containing signal indicative of acute parenchymal hematoma is seen. Multiple microbleed foci accompany on the SWI slices (D) passing from above. On FLAIR section (E) passing through the ventricular level, patchy hyperintense foci consistent with periventricular white matter ischemia are observed. These findings were compatible with propable cerebral amyloid anjiopathy related lobar haematoma.

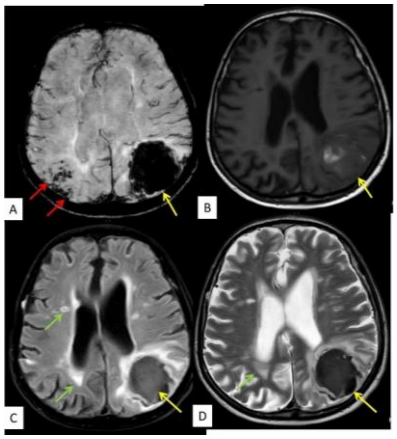

Figure 5. An 81-year-old male patient presented to the emergency department with confusion, agitation, and incontinence. A large lobar hemorrhage area is observed in the left occipital lobe, with distinct hypointensity on SWI (A), iso to hyperintensity on T1-weighted section (B), hypointensity on FLAIR (C) and T2-weighted (D) sections, surrounded by a hyperintense vasogenic edema area. Additionally, microbleed foci consistent with propable cerebral amyloid angiopathy (SAA) are visualized on SWI (A) in the right occipital region (red arrows). Hyperintense foci indicative of white matter ischemia are present on FLAIR and T2-weighted sections.

In the subacute and chronic stages, blood products appear as low signal hemosiderin on SWI sequences on the cortical surface, termed cSS. C SS may not always manifest clinically. Many diseases presenting cSAH and cSS should be considered in the differential diagnosis. Several entities affecting supratentorial vascular structures, such as reversible cerebral vasoconstriction syndrome, vasculitis, venous thrombosis, infective endocarditis, Moya Moya disease, and posterior reversible encephalopathy syndrome (PRES), are among the leading causes (Sharma et al., 2018).

Distinguishing cSS, which appears as hypointense in SWI, from flow-related signal loss, calcifications, hemorrhagic infarcts, aggregated microbleeds, and thrombosed cortical vessels radiologically is also necessary (Charidimou et al., 2015b).

Cortical superficial siderosis of the central nervous system (CNS) is a different entity is characterized as superficial siderosis that occurs at infratentorial level and is characterized by hearing loss, ataxia, and pyramidal symptoms.

Non-Hemorrhagic Radiological Findings in CAA

In CAA, cerebral deep white matter areas, such as the periventricular white matter, becomes vulnerable to ischemia and infarction due to involvement of penetrating arterioles (Atttems et al., 2011).

Cerebral white matter is predominantly supplied by penetrating arterioles that cross the cortex via leptomeningeal arteries without any anastomoses. In cases of CAA, particularly in moderate to severe cases, stenosis or occlusion of these arteries can leads to ischemia in the white matter. Furthermore, loss of smooth muscle in the vessel wall leads to impaired cerebral autoregulation and the expected vascular wall response to focal ischemia does not occur (Atttems et al., 2011).

This results in chronic ischemia in the white matter and leads to acute infarct areas in the form of lobar lacunes or microinfarcts (Lee and Markus ,2006, Kimberly et al.,2009).

In cases where smooth muscle loss is severe, gray matter is also involved in the process, particularly resulting in atrophy in the posterolateral cortex. Chronic ischemic areas in the white matter appear as hypodensities on CT and hyperintensities on MRI. Multiple focal hyperintense ischemic lesions in the white matter are one of the non-hemorrhagic lesions integrated into the Boston criteria (V2.0) in the possible or probable diagnosis of CAA (Charidimou, A et al.,2022).

When lesions merge, leukoaraiosis occurs; subcortical U fibers are preserved due to dual vascular supply. (figure 1,4,5). Lobar lacunes, which are larger than microinfarcts, typically range from 3 to 15 mm in diameter. They show diffusion restriction in acute phase, appearing as hyperintense on diffusion-weighted images and hypointense on apparent diffusion coefficient (ADC) maps, representing areas of acute cytotoxic edema (Kimberly, W. T., et al.,2009).

Table 2. The hemorrhagic and non-hemorrhagic lesions detected on brain imaging in cerebral amyloid angiopathy

Hemorrhagic lesions	Non-Hemorrhagic lesions
Lobar hemorrhage	Cerebral white matter hyperintensities related to ischemia
Cerebral microbleeds	Lobar lacunar infarct/Microinfarct
Convexity subarachnoid hemorrhage	Dilated perivascular spaces in the centrum semiovale
Cortical superficial siderosis	Cortical atrophy

Dilated periventricular spaces (PVS) in the centrum semiovale

The removal of amyloid proteins from the interstitial fluid via perivascular spaces has been defined as one of the most important clearance pathways (Morrone, C. D., et al.,2015). As a result of damage to perivascular drainage, the saturation of vessel walls with Aβ protein leads to expansion of perivascular spaces through retrograde flow, further impairing perivascular drainage and perpetuating a vicious cycle (Charidimou, A., et al.,2014).

Dilatation PVSs are another non-hemorrhagic lesion

integrated into the Modified Boston criteria for the possible or probable diagnosis of CAA. While perivascular spaces are indistinguishable radiologically on CT, on MRI, they appear as linear or oval hyperintense vascular structures parallel to the course of the vessels on T2-weighted images. It has been demonstrated that dilated PVSs at the level of the centrum semiovale are associated with more severe CAA histopathologically. Additionally, an increase in the frequency of cortical microbleeds and cSS has been reported to correlate with dilated PVSs (Koo, 2016).

Dilated PVSs observed at the level of the basal ganglia have been reported to be associated with hypertensive arteriopathy (Martinez et al.,2013).

Cognitive Impairment/Cognitive Decline

In patients with CAA, cognitive impairment or functional losses are attributed to lesions such as microbleeds, chronic white matter ischemia, and lobar lacunes. Due to the strategic locations of these lesions, they are believed to alter cognitive functions or progressively decrease them due to disruption in neural network flow. In lobar hemorrhage (Maia et al., 2007) or CAA related inflamation (Auriel et al., 2016), cognitive decline is sudden and progressive. It is also known that the presence of CAA contributes to cognitive decline in patients with Alzheimer's disease (Viswanathan and Greenberg, 2011).

CAA related inflammation

Inflammation associated with CAA is the perivascular inflammation resulting from an autoimmune reaction to vascular Aβ protein. The presence of the APOE e4 allele is particularly implicated in this autoimmune process (Eng et al., 2004).

The clinical presentation includes subacute or rapidly progressive cognitive impairment, headache, focal neurological signs, seizures, and alterations in consciousness. MRI typically reveals asymmetric, subcortical hyperintense lesions on T2 and FLAIR sequences. On CT, the corresponding findings for lesions are hypodense subcortical areas. Although it may be challenging to differentiate from entities like vasculitis or PRES both clinically and radiologically, the presence of other imaging findings associated with CAA supports the diagnosis (Auriel et al., 2016).

Amyloid-Related Imaging Abnormalities (ARIA) associated with Alzheimer's drugs

Even though both CAA and Alzheimer's disease stem from abnormalities in amyloid clearance mechanisms, the mechanisms of brain damage and resulting clinical manifestations differ (Greenberg et al.,2020).

Recently approved by the FDA for disease-modifying treatment, anti-amyloid monoclonal antibody drugs like aducanumab and lecanemab are being used in patients with mild cognitive impairment or mild Alzheimer's dementia who test positive for amyloid. Before treatment, MRI is commonly used non-invasively to visualize structural changes. In MRI, it is of critical importance not only in identifying non-neurodegenerative etiologies but also in evaluating the pattern and extent of neurodegeneration, and determining whether the patient is suitable for anti-amyloid therapy. In brain MRI imaging, patients should not exhibit the defined findings associated with CAA, such as five or more microhemorrhages, any superficial siderosis, lobar macrohemorrhage, large territorial infarct, small infarcts, or widespread white matter disease, in order to be considered suitable for treatment. One of the most concerning side effects associated with anti-amyloid monoclonal antibodies approved by the FDA is the occurrence of amyloid-related imaging abnormalities (ARIA) presenting in two distinct patterns. The risk of developing ARIA increases with higher doses of anti-amyloid therapy, the presence of the APOE ε4 allele, and the presence of more than four microhemorrhages or severe white matter disease on imaging prior to treatment. It typically occurs within the first 6 doses. While often asymptomatic, mild cases appear to be less common compared to moderate and severe cases (Brashear et al.,2018).

ARIA-edema (ARA-E) manifests as vasogenic edema in the posterior cortical-subcortical white matter and resembles the imaging findings of inflammation associated with CAA. Most patients are asymptomatic, and it typically resolves within 4-16 weeks(%74). ARIA hemarorrhage (ARIA-H) ,on the other hand, is characterized by the development of microscopic or macroscopic areas of hemorrhage or siderosis in the brain parenchyma While ARIA-E is almost always transient, ARIA-H tends to be stable

over time (Charidimou et al.,2012b).

CONCLUSION

CAA is one of the common causes of hemorrhagic stroke in the elderly population. Particularly in recent years, with the routine use of hemorrhage-sensitive SWI imaging, a diagnosis of possible or probable CAA can be made based on clinical and radiological findings without histopathological confirmation. With increasing familiarity among radiologists and neurologists regarding the different imaging and clinical findings associated with CAA, clinicans can weigh the risks and benefits of anticoagulant medication use based on individual patient profiles before the onset of lobar hemorrhage. Consequently, this approach can prevent recurrent bleeding and prove beneficial for patients. Other conditions apart from CAA, which cause microbleeds and cortical superficial siderosis in the brain, should also be considered in the differential diagnosis. The imaging findings associated with Alzheimer's disease drugs in clinical use can manifest as hemorrhagic or inflammatory features similar to those seen in CAA.

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Conflict of Interest

Authors declared no conflict of interest

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Research Article

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The Effects of Quince Seed Jelly and Human Milk on Nipple Fissures During Early Postpartum**

Sevgi Kelek [1], Gülbahtiyar Demirel [2]*

[1]Department of Operating Room Services, Tokat Vocational School of Health Services, Tokat Gaziosmanpasa University, Tokat, Türkiye
[2]Department of Midwifery, Faculty of Health Sciences, Sivas Cumhuriyet University, 58140 Sivas, Türkiye

ABSTRACT:
Purpose: In experimental studies, it has been reported that the jelly made from the quince seed is effective in healing wounds and has no side effects or contraindications. This study was conducted to determine the effect of quince seed jelly and human milk, respectively, used in the early postpartum period, on nipple fissures.
Material and Methods: The research was a randomised controlled study. In total, 426 mothers who met the research criteria were selected for the study, which was conducted at the obstetrics and gynaecology department of two hospitals between 2015–2017 in Sivas city of Turkey. The 426 mothers were distributed equally into three groups (n=142 per group): the human milk, quince seed jelly and the control group. Mothers in the intervention groups applied quince seed jelly and human milk, respectively, on their nipples and areola after every breastfeeding. All mothers were evaluated for nipple fissures on the 1st, 3rd, 7th, and 10th days postpartum.
Results: Mothers with the highest number of problems in the first 10 days postpartum belonged to the control group (61.3%-62%), followed by the human milk group (19%), whereas, the quince seed group experienced the least problems (2.8%-5.6%, p<0.05). Nipple pains and fissures were most common in the mothers assigned to the control group.
Conclusion: Mothers who applied either quince seed jelly or human milk to their nipples and areolas after each breastfeeding, compared to a control group, were less likely to have either nipple fissures or nipple pain during the first 10 days postpartum.
Keywords: *Early postpartum; human milk; nipple fissures; quince seed jelly; women*

*Corresponding author: Gülbahtiyar Demirel, email: gulbahtiyar_doganer@hotmail.com

*This study was presented as an oral presentation at the 5th International & 9th National Midwifery Students Congress in Amasya on 03-05 May, 2018. Study was deemed worthy of the first prize in the oral presentation

INTRODUCTION

Human milk is a unique food that fully supports the development of the baby (the protection and development of the immune system, etc.), (Cangol & Sahin, 2014; Italianer et al., 2020; Kucuk & Gocmen, 2012). During the breastfeeding period, infants can experience various difficulties in receiving only human milk for six months due to problems caused by the mother or the infant (Tanriverdi et al., 2014; Unsur et al., 2014). The most common issue related to breastfeeding is nipple fissures (Cangol & Sahin, 2014; Fraser & Cullen, 2008). Nipple fissures have many causes (e.g., incorrect breastfeeding technique, incorrect breast hygiene) (Carlander et al., 2010; Gozukara, 2014). In the first weeks postpartum, nipple fissures are seen in 15-41% (Kirlek & Balkaya, 2013) and 58% (Buck et al., 2014) of the mothers who breastfeed. Nipple fissures occurring in the first 1-2 weeks of the breastfeeding period (i.e. early postpartum period) may cause mothers to cease breastfeeding (Cangol & Sahin, 2014; Fraser & Cullen, 2008; Unsur et al., 2014). In

the literature, the use of complementary and alternative therapies to increase human milk and to maintain breastfeeding is of particular interest in the postpartum period (Bazzano et al., 2016; Birdee et al., 2014; Esfahani et al., 2015). It is known that the proper breastfeeding position is taught and ointments that contain vitamins A, D and E, such as baby oil or vaseline, are applied locally, to prevent nipple fissures (Magalhaes et al., 2009; Salarfard et al., 2020). The WHO (2020) recommend that breastfeeding mothers should keep their nipples clean and dry. The studies suggest safe, effective, inexpensive and natural methods (human milk, olive oil, hot tea, keeping the breast dry, etc.) for nipple fissures instead of pharmacological agents, such as cream, ointment, oil (lanolin, aloe vera, etc.), lotion or moisturiser (Atan & Sirin, 2012; Bazzano et al., 2016; Kirlek & Balkaya, 2013). Nonetheless, controversy surrounds the effect of quince (cydonia oblonga) seed as an alternative strategy to prevent nipple fissures (Hemmati et al., 2012; Jouki et al., 2014; Tamri et al., 2014). Quince seed is a valuable source of health benefits owing to its antioxidant, anti-microbial and anti-ulcerative properties (Deng et al., 2020; Fromm et al., 2012; Hemmati et al., 2012). Quince seed contains cydonine, phenolic compounds, organic acids, free amino acids and pectin (Aghmiuni et al., 2020; Jouki et al., 2014; Magalhaes et al., 2009). In various studies, it has been reported that the jelly made from the quince seed is effective in healing wounds (attributed to the antioxidants, which increased fibroblast activity and collagen production, facilitated the formation of granulation tissue and increased blood circulation, etc.) and has no side effects or contraindications (Aghmiuni et al., 2020; Ghafourian et al., 2015; Hemmati et al., 2012; Tamri et al., 2014; Toppo & Pawar, 2015; Vamsi et al., 2014). Currently, no literature studies exist on the effect of quince seed jelly in preventing nipple fissures, whereas, the impacts of human milk have been evaluated (Kirlek & Balkaya, 2013).

MATERIAL and METHODS

Purpose and Type of the Study

This study was conducted to determine the effect of quince seed jelly and human milk, respectively, used in the early postpartum period, on nipple fissures. The study was a three-armed randomised controlled research. Official permissions were obtained from the institutions, approval from the ethics committee (2014/466) The study was registered retrospectively on 2 Sept 2020 (after completion of the trial) at clinicaltrials.gov (trial number NCT04536597).

Sampling and Participant

The research was conducted at the obstetrics and gynaecology departments of two hospitals in Sivas city of Turkey. The sample size used in this study was calculated using power analysis (R 3.3.2). The population of the research consisted of births delivered at a university hospital (for caesarean section - 3rd level health institution) and a state hospital (for vaginal birth - 2nd level health institution). In the previous year (2014), a total of 2110 primiparous women gave birth, of which, 679 (32.2%) were delivered by caesarean section. In the postpartum period, the rate of nipple fissures observed is 15% in the reference study (Kirlek & Balkaya, 2013). 426 the primiparous mothers were planned to be included in the study, taking into account the parameters of =0.43 the effect size, =0.05 first type error level and =0.20 second type error level, 0.80 test power. Of 426 mothers, 284 mothers created the intervention group (n=142 in the human milk group; n=142 in the quince seed jelly group), and 142 mothers formed the control group. At the same time, the distribution of the 426 mothers was strafied according to the ratio of those who gave birth via caesarean section (epidural anaesthesia) (32.2%) and the ratio of those who gave standard vaginal birth (67.8%), so that the number of mothers who delivered by caesarean section was equal to 45 (caesarean birth n: 45, standard vaginal birth n: 97) in each group.

Mothers who accepted to participate and met the research criteria (e.g., primiparous, age over 19 years, having no health problems affecting the breastfeeding and nipple) were assigned to one of three groups. The mothers in the sample were numbered. For this, a systematic sampling method was used, in which mother number 1 was assigned to the first group, mother number 2 to the second group and mother number 3 to the third group.

Repeatedly, mother number 4 was assigned to the first group, mother number 5 to the second group, mother number 6 to the third group. This process continued until the number of samples was completed. Interventions to be made in groups 1, 2 and 3 were also established by the drawing lots method (Figure 1).

Data Collection Tools

Data were collected using various forms, including a Personal Information Form, which records sociodemographic characteristics; a Breast Care and Correct Breastfeeding Technique Control Form, which determines proper breast care and breastfeeding practices; a Breast Hygiene Questionnaire, to assess practices for breast hygiene; a Breast Care Monitoring Form, which questions breast care in the last 24 h, and a Satisfaction Question Form, which identifies the mothers' opinions about the method applied. The forms, which were based on the literature, were prepared and filled by the researcher (Fraser & Cullen, 2008; Carlander et al., 2010; Gozukara, 2014; Hemmati et al., 2012; Jouki et al., 2014; Kirlek & Balkaya, 2013). Each form was completed with the mother at the hospital or by visiting each house and using the face-to-face interviewing technique by the researcher (Figure 2).

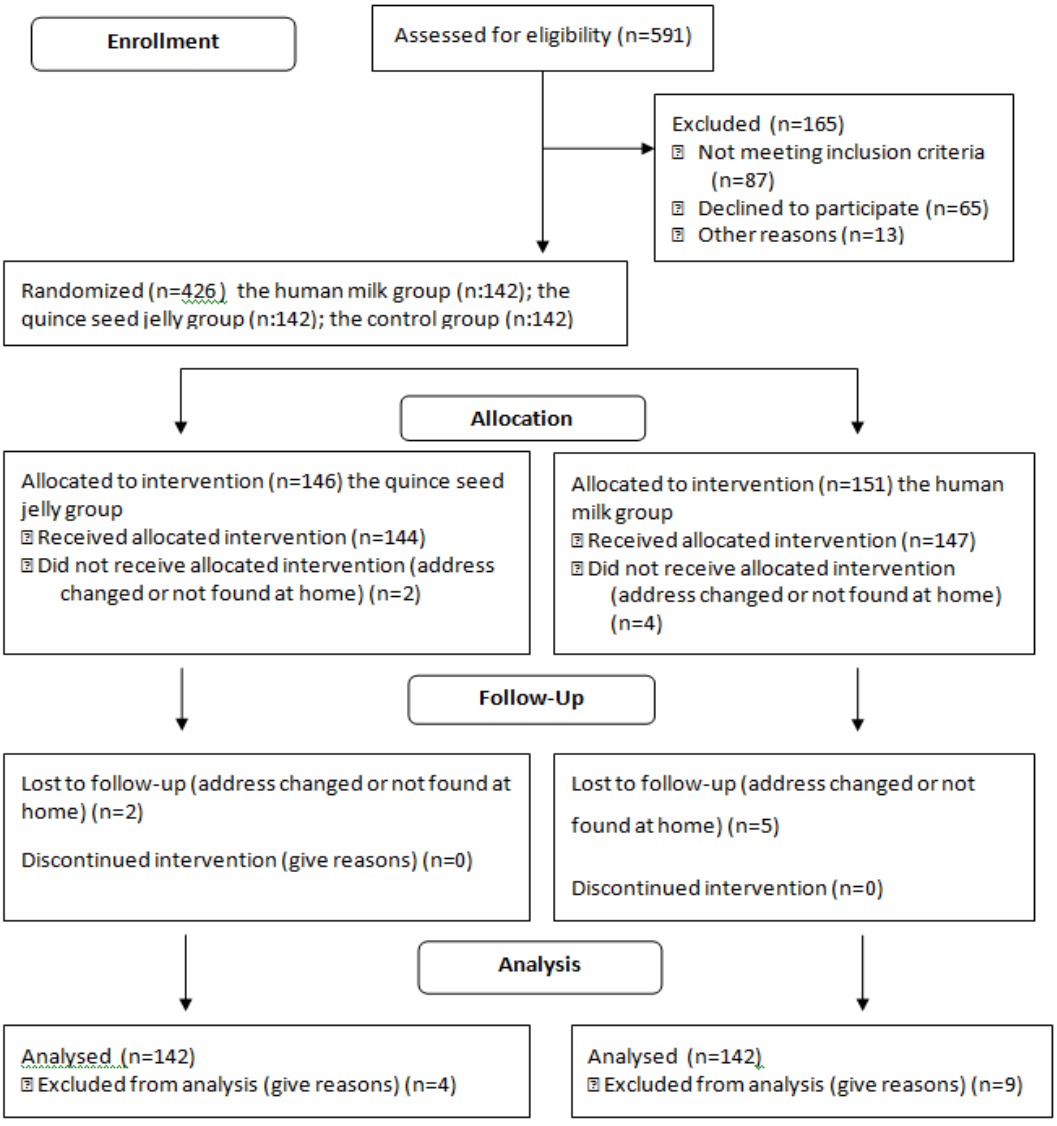

Figure 1. CONSORT Diagram

1st, 3rd, 7th and 10th days: 1st, 2nd, 3rd and 4th interview		
1st group: Human milk	**2nd group: Quince seed jelly**	**3rd group: Control**
Informed Consent Form (1st day)	Informed Consent Form (1st day)	Informed Consent Form (1st day)
Personal Information Form (1st day)	Personal Information Form (1st day)	Personal Information Form (1st day)
Breast Care and Proper Breastfeeding Technique Control Form (1st, 3rd, 7th days)	Breast Care and Proper Breastfeeding Technique Control Form (1st, 3rd, 7th days)	Breast Care and Proper Breastfeeding Technique Control Form (1st, 3rd, 7th days)
Breast Hygiene Questionnaire (1st, 3rd, 7th and 10th days)	Breast Hygiene Questionnaire (1st, 3rd, 7th and 10th days)	Breast Hygiene Questionnaire (1st, 3rd, 7th and 10th days)
Breast Care Monitoring Form (3rd, 7th and 10th days)	Breast Care Monitoring Form (3rd, 7th and 10th days)	Breast Care Monitoring Form (3rd, 7th and 10th days)
Human Milk Application Steps (1st, 3rd and 7th days)	Quince Seed Jelly Application Steps (1st, 3rd and 7th days)	
Satisfaction Question Form (10th day)	Satisfaction Question Form (10th day)	Satisfaction Question Form (10th day)
It was evaluated whether problems such as nipple fissures and nipple pain developed in the groups during the first 10 days postpartum		

Figure 2. Flowchart of the Data Collection Process

Personal İnformation Form

This form was filled during the first interview at the hospital. It comprised seventeen questions and included those related to sociodemographic characteristics of the mothers and information about pregnancy, childbirth and postpartum.

Breast Care And Proper Breastfeeding Technique Control Form

This form, which consisted of four questions about breast care and sixteen questions about proper breastfeeding technique was completed on the 1st day postpartum at the hospital, on the 3rd day at the hospital or by visiting the home, and on the 7th day by home visit.

Breast Hygiene Questionnaire

This survey contained six questions about the frequency of washing hands before breastfeeding, cleaning the nipples, etc. The form was filled after observations made on the 1st day postpartum at the hospital, on the 3rd day at the hospital or by visiting the home, and on the 7th and 10th days during the home visits.

Breast Care Monitoring Form

There were ten questions in this form, whether she continued breastfeeding, what problems (e.g., nipple fissures) occurred in the breasts in the last 24 hours, etc. This form was used for the primary outcomes of study. The form was filled on the 3rd day postpartum at the hospital or by visiting the home, and on the 7th and 10th days during the home visits by the researcher. If any of the mothers in all three groups developed a nipple fissure, they were directed to the health institution and recorded that they developed a nipple fissure, and the application was terminated in these mothers.

Satisfaction Question Form

This form ascertained the satisfaction from the breast care practice, using four questions. The

satisfaction question form was filled on the 10th day postpartum, during the home visit.

Data Collection

The data were collected by the researcher between 15.10.2015 and 10.05.2017. Written informed consent was obtained in person at the time of enrolment in the study. Upon mothers first meeting at the hospital, their written consent was obtained. The Personal Information Form (first interview), Breast Care and Correct Breastfeeding Technique Control Form (first, second, third interview), Breast Hygiene Questionnaire (first, second, third, fourth interview), the Breast Care Monitoring Form (second, third, fourth interview) and the Satisfaction Questionnaire (fourth interview) were administered to the mothers, and their answers were recorded.

Mothers who individually applied human milk and quince seed jelly were given training on how to apply the treatment and informed that reapplication was required after each breastfeeding. Mothers in the groups who used human milk and quince seed jelly, respectively, were re-informed about the practices and reapplied (second, third interview). The quince seed jelly prepared by the researcher was given to the mothers (first, second, third interview) and the interview was terminated. The interviews were completed in 15–20 min, including the training. Any kind of application that the mothers in the control group did for the nipple fissures were recorded on the 1st, 3rd, 7th and 10th days postpartum, by the researcher. It was evaluated whether problems such as nipple fissures and nipple pain developed in the groups during the first 10 days postpartum (Figure 2).

Interventions

Application of quince seed jelly: Quince seed jelly, prepared using only the seed of the quince by the researcher, was given to the mothers belonging to this group. Briefly, 3 g (2–3 pieces) of quince seeds are placed in 100 mL water and heated to boiling for 10 min. The prepared jelly was used for 3 days, immediately after cooling and was stored by the woman in the refrigerator (1-3 degrees), (Baytop, 1999; Tanker & Tanker, 1991).

On the 1st day postpartum, the researcher provided the mothers with practical training at the hospital, regarding the application of quince seed jelly to the nipple and areola and leaving it to dry. Jelly removed from refrigerator when applied to nipple and areola. This training was repeated on the 3rd, 7th and 10th days by visiting each house and using the face-to-face interviewing technique, to ensure that the mothers followed it precisely. The training process was completed in 5–10 min, including questions and answers. Every 3-4 days (days 1, 3, 7 and 10), quince seed jelly prepared by the researcher was given to the mothers to continue applying, according to the procedure. The mothers were asked to apply it after every breastfeeding.

Human milk application: Mothers in this group received practical training, conducted by the researcher on the 1st day postpartum at the hospital, on applying a few drops of their human milk to the nipples and areola after each breastfeeding and leaving it to dry. This training lasted 5–10 min. The human milk application of mothers in this group was recorded on the 1st, 3rd, 7th and 10th days, by the researcher.

Statistical Analysis

The homogeneity of the distribution in the groups and the similarity of the variances were evaluated using the Levene's test. The normal distribution suitability of the variables was examined by the Kolmogorov–Smirnov test. One-way analysis of variance (ANOVA) was used to compare three or more groups with normal distribution suitability of the variables. Kruskal–Wallis's H test was used in the comparison of three or more groups with no normal distribution suitability. The Chi-square and exact tests were performed in the analysis of group distributions in categorical variables. Descriptive statistics were expressed as mean ± standard deviation (SD), median (min-max) and n (%). Statistical significance was accepted at $p<0.05$. The SPSS 23.0 package was used throughout the data analysis.

Ethical Approval

Each stage of the research was conducted in accordance with ethical principles. Written

permission was obtained from the ethics committee (dated 01.08.2014, no. 2014/466) and from the institutions (dated 13.11.2014, no. 75723911/044-464) before the application. Mothers who approved the informed consent form were included in the study. Written permissions of mothers who participated in the research voluntarily were taken after consent forms were read. If any of the mothers in all three groups developed a nipple fissure, they were directed to the health institution and recorded that they developed a nipple fissure, and the application was terminated in these mothers.

RESULTS

In the groups, sociodemographic (educational status etc.), pregnancy and birth (primiparous, etc.), correct breastfeeding technique, proper breast care, monitoring and hygiene characteristics were homogeneously distributed. Appropriate breast care and applications (e.g., washing hands before breastfeeding) related to breast, as well as accurate breastfeeding technique (e.g., while breastfeeding, most of the areola in the mouth), were strictly applied in the groups, from the 1st to 10th day postpartum. Participants in the control group applied the olive oil, creams (Lansinoh, etc.) for the prevention the nipple fissures and pain relief (39.4%), ($p<0.05$).

The majority of the mothers in the study provided only human milk as the first food and as the food in the first 24 h postpartum, breastfeeding in the first 30 min after birth, and then breastfeeding at 1–2 h intervals while maintaining an average of 5-20 min breastfeeding duration. The average birth weight of the infants in the groups was 3100–3200 g ($p>0.05$) (Table 1).

Table 1. Distribution of mother and infant postpartum characteristics (N = 426)

Some postpartum Related Characteristics		Groups (n=142)						X^2 p
		Control n(%)		Human milk n(%)		Quince seed n(%)		
First nutrition of baby	Human milk	114	(80.3)	124	(87.3)	119	(83.8)	4.376 0.357
	Baby formula	25	(17.6)	18	(12.7)	21	(14.8)	
	Sugared water	3	(2.1)	0	(0.0)	2	(1.4)	
Bab's nutrition in the first 24 h	Only human milk	100	(70.4)	116	(81.7)	104	(73.2)	11.102 0.156
	Human and cow milk	25	(17.6)	21	(14.8)	30	(21.1)	
	hHHuman milk and baby formula	17	(11.9)	5	(3.5)	8	(5.6)	
Timing of first breastfeed	First half an hour	90	(63.4)	71	(50.0)	73	(51.4)	8.623 0.071
	First 1-2 hours	36	(25.4)	58	(40.8)	53	(37.3)	
	First 3-4 hours	16	(11.3)	13	(9.2)	16	(11.3)	
Frequency of breastfeeding	with 1-2 hours intervals	119	(83.8)	127	(89.4)	127	(89.4)	2.758 0.252
	with 3-4 hours intervals	23	(16.2)	15	(10.6)	15	(10.6)	
Average breastfeeding duration	5-10 minutes	64	(45.1)	70	(49.3)	66	(46.5)	0.871 0.929
	11-20 minutes	51	(35.9)	45	(31.7)	51	(35.9)	
	21-30 minutes	27	(19.0)	27	(19.0)	25	(17.6)	
Birth weight		Mean±SD		Mean±SD		Mean±SD		
		3182,4±362,8		3214,8±339,2		3188,0±380,2		0,675

Chi-Square test; Exact test; Anova; α:0.05

On the 10th day after birth, 62.0% (n=88) of the control group, 19.0% (n=27) of the human milk group and 2.8% (n=4) of the quince seed jelly group developed nipple pain and fissure in the breasts ($p<0.05$). Within the first 10 days postpartum, the group with the most problems (nipple pain and fissure) was the control group while the least problems occurred in the quince seed group. From the 1st to 10th day postpartum, the nipple fissure was observed in 28.2% - 31.0% of the control group and 0.08% - 0.09% of the human milk group whereas, no nipple fissure transpired in the quince seed jelly

group (p<0.05) (Table 2).

There was a significant difference in the mothers' satisfaction from the breast care practices (p<0.05) among the groups, being highest in the quince seed (100%), followed by human milk (93.0%) groups, respectively. Mothers in the intervention groups (quince seed, human milk) were satisfied with the practices because they prevented nipple fissures and decreased nipple pain. All of the mothers in the quince seed group (100%) stated that they would recommend this practice to other mothers (Table 3).

Table 2. Distribution of problems occurring after breast care application according to interview days (N = 426)

			Groups (n=142)			
Problems Occurring in Breast	**Day of Life**		**Control n(%)**	**Human milk n(%)**	**Quince seed n(%)**	**X^2 p**
Problems occurring in breast	3rd day	Occurred	87(61.3)	27(19.0)	8(5.6)	119.814 0.001*
		Not occurred	55(38.7)	115(81.0)	134(94.4)	
	7th day	Occurred	87(61.3)	27(19.0)	7(4.9)	120.049 0.001*
		Not occurred	55(38.7)	115(81.0)	135(95.1)	
	10th day	Occurred	88(62.0)	27(19.0)	4(2.8)	131.836 0.001*
		Not occurred	54(38.0)	115(81.0)	138(97.2)	
Occurring problem	3rd day	Nipple pain	46(32.4)	12(0.08)	6(0.04)	9.861 0.043*
		Nipple fissure	40(28.2)	12(0.08)	0(0.0)	
		Breast fullness	1(0.01)	3(0.02)	2(0.01)	
	7th day	Nipple pain	42(29.6)	12(0.08)	4(0.03)	18.317 0.001*
		Nipple fissure	42(29.6)	12(0.08)	0(0.0)	
		Breast fullness	3(0.02)	3(0.02)	3(0.02)	
	10th day	Nipple pain	40(28.2)	11(0.08)	1(0.01)	30.013 0.001*
		Nipple fissure	44(31.0)	13(0.09)	0(0.0)	
		Breast fullness	3(0.02)	3(0.02)	3(0.02)	
		Bleeding nipple	1(0.01)	0(0.0)	0(0.0)	

Chi-Square test; Exact test; α:0.05; *The difference is statistically significant

Table 3. Distribution of mothers' satisfaction from breast care practises (N = 426)

		Groups (n=142)			
Satisfaction from Practises		**Control n(%)**	**Human milk n(%)**	**Quince seed n(%)**	**X^2 p**
Satisfaction from the practise	Satisfied	80(56.3)	132(93.0)	142(100.0)	87.691 0.001*
	Dissatisfied	62(43.7)	10(7.0)	0(0.0)	
The reason for being satisfied from practises	Decreased the pain	50(62.5)	67(47.2)	30(21.1)	41.177 0.001*
	Prevented nipple fissure	10(12.5)	35(24.6)	38(26.8)	
	Both	20(25.0)	40(28.2)	74(52.1)	
The reason for being not satisfied from practises	Not decreased the pain and not prevented nipple fissure	62(43.7)	10(0.07)	0(0.0)	- -
Recommending the practise to other mothers	Recommending Not recommending	75(52.8) 67(47.2)	125(88.0) 17(12.0)	142(100.0) 0(0.0)	71.043 0.001*

Chi-Square test; Exact test; α:0.05; *The difference is statistically significant

DISCUSSION

Feeding human milk within the first days of life is important for establishing breastfeeding (Bostanci & Inal, 2015; Calik et al., 2017). Regular breast care is highly recommended to be conducted so that the feeding can continue smoothly after birth. Problems related to the breast (e.g., mastitis, nipple fissure) may arise in women who do not perform regular breast care (Atan & Sirin, 2012; Cangol & Sahin, 2014). In the prevention of nipple problems, the correct breastfeeding technique (the mother's proper holding of the baby to the breast, appropriate breastfeeding time and frequency) and breast care are favoured over creams, lotions, ointments and moisturisers (Atan & Sirin, 2012; Carlander et al., 2010; Gozukara, 2014). In women in the intervention group, breast problems were detected less frequently than in the control subjects. In the current research, proper breast care and applications related to breast hygiene, as well as breastfeeding technique increased in the groups from day 1 postpartum, with the given training. Nearly all of the participants in the groups carried out the practices (breastfeeding and breast care) correctly (p>0.05).

Infants may have some difficulties in taking only human milk in the first 6 months because of reasons originating from the mother or infant (Fraser & Cullen, 2008). Nipple fissure stands out among these reasons (Atan & Sirin, 2012; Cangol & Sahin, 2014; Fraser & Cullen, 2008; Kirlek & Balkaya, 2013). There are many reasons for nipple fissures (e.g., incorrect breastfeeding technique, care and hygiene, etc.) (Carlander et al., 2010; Gozukara, 2014). Nipple fissures often occur in the early postpartum period (Fraser & Cullen, 2008). Elucidating the exact cause of maternal breast infections is ongoing, but nipple fissure is the main risk factor (Kepekci et al., 2012). Cleaning the nipples before breastfeeding and proper breast hygiene practices performed by the mothers in our study (e.g., washing hands with soap before breastfeeding) were applied correctly and appropriately from the 1st to 10th day postpartum (p>0.05).

Various methods (e.g., vitamins, ointment, lotion, jelly, oil) exist to prevent the problems that may develop in the breast during the postpartum period (Fromm et al., 2012; Jouki et al., 2014). Nowadays, human milk, olive oil and quince seed jelly are commonly used to prevent nipple fissures (Jouki et al., 2014; Tamri et al., 2014; Kirlek & Balkaya, 2013). Participants in the control group of our study mostly applied olive oil, creams (Lansinoh, Bepanthen, etc.) for the nipple fissures (39.4%). One randomized controlled trial demonstrated the superiority of olive oil over human milk in preventing nipple fissures (Cordero et al., 2015). Kirlek and Balkaya (2013) reported that the application of human milk decreased the nipple pain while olive oil decreased the possibility of nipple fissures occurring. Also, several studies have shown that the quince seed jelly promotes wound healing (Aghmiuni et al., 2020; Fromm et al., 2012; Ghafourian et al., 2015; Hemmati et al., 2012; Toppo & Pawar, 2015; Vamsi et al., 2014; Zhong et al., 2010). In Hemmati et al.'s (2012) work, quince seed jelly displayed a healing effect on skin lesions in rabbits (by inhibiting proteins synthesised by T-2 toxin, acting as plugs between the skin to prevent water evaporation, as antioxidants, as growth factors, by affecting fibroblast activities, facilitating the formation of granulation tissue, increasing blood circulation and, finally, by neutralising the dermal toxicity of the toxin).

In recent years, natural products have been widely used to improve health (Aghmiuni et al., 2020; Jouki et al., 2014; Tamri et al., 2014). Due to its antioxidant, anti-microbial and anti-ulcerative properties, as well as its softening and soothing effects on the skin, quince seed jelly is an important source to prevent nipple fissures (Aghmiuni et al., 2020; Ghafourian et al., 2015; Kawahara et al., 2017). In our study, mothers with the most problems in the first 10 days after birth belonged to the control group (61.3, 61.3 and 62% on the 3rd, 7th and 10th day, respectively). In contrast, the least problems arose in the quince seed jelly group (5.6, 4.9 and 2.8% on the 3rd, 7th and 10th day, respectively). Nipple fissures accounted for 46% - 50% of the individuals who developed a breast problem in the control group, during the first 10 days postpartum. During the same period, nipple fissures occurred in 0.08% - 0.09% of the mothers with a breast problem in the human milk group but were not seen in the quince seed jelly group. Sahin et al. (2013) reported that 34-96% of postpartum mothers had a painful nipple problem.

In our study, nipple pain was noticed in 40-46, 11-12, and 1-6 individuals in the control, human milk and quince seed groups, respectively, in the first 10 days after birth. Thus, the breast issue (nipple pain) disappeared most in the quince seed group, followed by the mothers who applied human milk. It can be said that the quince seed jelly is the most effective at preventing nipple fissures and human milk has a moderate benefit. Applications to prevent nipple pains and fissures (e.g., human milk, olive oil) may increase the level of satisfaction in mothers as in Kirlek and Balkaya's study (2013). In our study, the mothers in the intervention groups (quince seed jelly, human milk) were pleased with the practices because they prevented nipple fissures and decreased nipple pain. At the same time, the natural and low-cost quince seed jelly and human milk increased the satisfaction rate.

CONCLUSION

Human milk and quince seed jelly are effective in preventing nipple fissures and reducing nipple pain. Mothers who applied either quince seed jelly or human milk to their nipples and areolas after each breastfeeding, compared to a control group, were less likely to have either nipple fissures or nipple pain during the first 10 days postpartum. In line with these results, mothers may be advised to use quince seed jelly and human milk to prevent nipple fissures and reduce nipple pain in the early postpartum period.

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Conflict of Interest

The authors declare that there are no conflict of interests.

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