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The effect of Covid-19 phobia on work stress and psychological resilience of nurses exposed to surgical smoke in the operating room

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Abstract

The purpose of the study is to determine the effect of Covid-19 Phobia on the work stress and psychological resilience of nurses exposed to surgical smoke in the operating room emergency surgical interventions. This study was designed as descriptive and correlational research, and it was conducted with 160 nurses working in the operating room units of three different hospitals in Türkiye between the dates of August 2020 and May 2021. The work stress scale, brief resilience scale, and Covid-19 phobia scale (C19P-S) were used for data collection. It was determined that the mean work stress score of the nurses was high with a score of 40.11±4.91, the mean score for psychological resilience was moderate with a score of 15.00±3.95, and the mean score for C19P-S was high with a score of 71.58±15.45. There was a significant negative strong (r: -.706) correlation found between Covid-19 phobia and psychological resilience. It was found that there was a positive moderate significant correlation (r: .589) between Covid-19 phobia and work stress ($p<0.05$). Covid-19 phobia was determined high for nurses exposed to surgical smoke, Covid-19 phobia increased work stress for nurses and negatively affected their psychological resilience level.

Keywords: Covid-19 phobia, occupational stress, psychological resilience, surgical smoke

Introduction

The coronavirus (Covid-19) disease was declared a pandemic by the World Health Organization in March 2020 [1]. While elective surgeries can be postponed in such outbreak situations that cause pandemics [1,2], surgical interventions are still required for life-threatening health problems [2]. However, the prolongation of the pandemic enabled not only emergency surgeries but also elective surgeries to be performed without delay. This situation highlighted the necessity of protecting the health of the healthcare personnel working in surgeries as well as the health of the patients during the pandemic.

Operating rooms are units where serious and risky surgical interventions are made, advanced technological tools/equipment are used, and quick decisions are required.

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From this aspect, operating rooms become a stressful and risky work area for healthcare personnel working in the operating rooms [3,4]. In addition, the presence of surgical smoke that is not emphasized enough and that occurs during surgical interventions also poses a risk for healthcare personnel working in the operating rooms. Surgical smoke, which is defined as by-product gases released during surgical procedures, occurs as a result of the degradation and evaporation of tissue proteins and fat during the use of laser ablation, ultrasonic scalpels, high-speed surgical drills, electrocautery devices, and saws [5]. Vapor of surgical smoke may obstruct vision, odor of surgical smoke may be disturbing and may cause harmful particles to pass into the air [6]. It is reported in the literature that surgical smoke can contain carcinogens, various chemical agents, mutagenic gases [7,8], Human Immunodeficiency Virus (HIV), Human Papillomavirus (HPV), and Hepatitis B Virus (HBV) [9].

Covid-19 (SARS-Cov-2) can be detected in the lungs, oropharynx, colonocyte ACE2 receptors, gastric, duodenal, jejunal and ileal endothelial cells, as well as in the musculoris mucosa of these, and smooth muscle cells of the gastrointestinal tract [10,11], and even in stool [1]. Detection of the virus on all these listed

surfaces, presence of viral pathogens in surgical smoke [9,12,13], and reporting of HPV virus transmission through surgical smoke [14] raise concerns that SARS-Cov-2 virus can also be transmitted through surgical smoke [9]. In addition to this concern, the continuing increase in mortality due to Covid-19 and the virus has not yet been fully controlled may cause psychological problems such as fear, panic or phobia [15-17]. This situation may cause an additional increase in perceived work stress of operating room nurses who are already working under intense stress.

Work stress is defined as a situation that arises due to incompetency of the individual and/or physical or psychological reasons, which creates pressure on individuals [3]. Reactions to stressful situations and methods of coping with these stressful situations may vary for individuals. Some individuals may experience problems such as anxiety and depression when they stressful situations, and these problems may last for a long time. For some individuals; on the other hand, these negative conditions last for a short period of time, and these individuals can quickly return to their normal after a short time. The strength of individuals to recover and return back to their normal lives quickly is described by the concept of psychological resilience [18].

Referring to this situation, which was determined in line with the literature, as one of the issues that should be emphasized during the Covid-19 pandemic, this study was planned to determine the effect of Covid-19 Phobia on the perceived work stress and psychological resilience of nurses exposed to surgical smoke in the operating room.

Material and Methods

Research Design and Participants

This study was designed as descriptive and correlational research, and it was conducted with the nurses working in the operating rooms of three different hospitals in Türkiye's east and north between the dates of August 2020 and May 2021. The population of the study consisted of 178 nurses. In the calculation made according to the sample calculation formula, the universe of which is known, the minimum sample size for the research was determined as 122 with a margin of error of ±5% at the 95% confidence interval. Sampling inclusion criteria included working as a nurse in the operating rooms and being a volunteer for participation.

Data collection

The relevant literature was reviewed by the researcher [3-5,7,15,18-20] and the 18-question questionnaire, work stress scale, brief resilience scale, and Covid-19 phobia scale (C19P-S) were used for data collection. Due to Covid-19 measures, the data of the study was collected through the "Google Forms". The questionnaire prepared online via the platform was sent to the nurses who were willing to participate in the study through the nurses in charge of the operating room. The first part of this form consisted of a voluntary consent form prepared in accordance with the Declaration of Helsinki as well as a description regarding the purpose of this study. The research was completed with 160 operating room nurses who approved this form and filled it out completely.

Information Forms

It is the form that includes the demographic characteristics of the operating room nurses (age, sex, marital status, chronic diseases, working year, etc.), their knowledge and opinions about surgical smoke, and their diagnosis status regarding Covid-19.

Covid-19 Phobia Scale (C19P-S)

Scale is a 5-point Likert-type self-assessment scale with 4 sub-dimensions developed to measure the phobia that may develop against the coronavirus. The total C19P-S score is obtained by the sum of all sub-dimension scores. The total scale score ranges from 20 to 100 points, and higher scores indicate higher levels for sub-dimensions and for general coronavirus phobia [15]. The Cronbach's alpha coefficient of the scale was 0.92. In this study, Cronbach's alpha coefficient was found to be 0.95

Work Stress Scale

The scale, which was applied to women and men working at the National Center for Health Statistics by Suzanne Haynes, was adapted into Turkish by Aktaş (1996) and a reliability study was carried out accordingly. Assistance was received from the expert group for the adaptation of the scale. In the stress scale, a score of less than 12 indicates low stress, a score of 12-30 indicates a stressful situation, and a score greater than 30 indicates a high-stress situation. The Cronbach's alpha coefficient of the scale was found to be 0.87 [19]. In this study, it was found to be 0.80.

Brief Resilience Scale (BRS)

Smith et al. developed the scale, to measure the psychological resilience of individuals. (2008), and it is a 5-point likert-type, 6-item, self-reporting measurement tool. A total of 6 to 30 points can be obtained from the scale. After the items in the scale and coded in reverse are translated, high scores indicate high psychological resilience. The internal consistency reliability coefficient of the scale was found to vary between 0.80 and 0.91 [18-20]. In this study, it was found to be 0.86.

Ethical Considerations

This study was conducted in accordance with the principles of the Declaration of Helsinki. Necessary permissions were obtained from the scientific research platform of the Ministry of Health (2020-07-24T19_57_31). Ethical approval was obtained from the Ethics Committee of the relevant university (20/07/2020, 2020-81). Necessary permissions for the use of the scale were obtained by the developers. Participants participated in the study after reading the informed consent form and ticking the "I voluntarily agree to participate in this study" box on the first page of the online questionnaire.

Statistical analysis

IBM SPSS Statistics 25 (IBM Corp, Armonk, NY) program was used for statistical analysis of the findings obtained in the study. The fit of the data to the normal distribution was assessed with the Shapiro Wilks test. Descriptive statistical methods (mean, standard deviation, median, frequency, percentage, minimum, maximum) were used to evaluate the data. Pearson correlation analysis and regression analysis were used for normally distributed data.

Results

According to Table 1, it can be seen that the participants are 32.36±6.31 years old on average, they have been working in the

profession for 10.68±6.82 years and in the operating room unit for 8.47±5.33 years. It was found that 59.4% of the participants were married, 77.5% were university graduates, and 46.3% expressed their economic level as income equal to expense. It was also found that among the nurses participating in the study, non-smokers were the majority (55.6%), 80.6% of the participants did not have a chronic disease and 52.5% did not have a family member with chronic disease. It was determined that 83.8% of the participants, who worked more than 40 hours a week (73.1%), knew the harms of surgical smoke and 72.5% were disturbed by surgical smoke. Considering the rate of individuals diagnosed with Covid-19, it can be seen that this rate is 87.5% for the colleagues and 36.9% for the family members (Table 1).

Table 2 shows the equipment used by the participants to protect themselves from surgical smoke and the symptoms they experienced due to surgical smoke. Considering the equipment used by the participants to protect themselves from surgical smoke, it was determined that 100% of them used surgical masks, 32.5% of them used N95 masks, 83.8% of them used aprons, 48.1% of them used glasses, 60.5% of them used bonnets, and 25% of them used visors. In addition, 85% of the participants stated that central smoke evacuation systems were used in the operating rooms. Considering the symptoms experienced due to surgical smoke, it was determined that the participants experienced the following: headache (70.6%), respiratory problems (68.1%), fatigue (66.3%), allergic reactions (56.3%), GIS problems (54.4%), vision problems (43.1%), vertigo (32.6%), myalgia (21.9%), anxiety (13.1%), anemia (8.8%), and hepatitis (4.4%) (Table 2).

Table 1. Distribution of Participants by Descriptive and Medical Characteristics (n=160)

Descriptive Characteristics		n	%
Sex	Female	106	66.3
	Male	54	33.7
Marital status	Married	95	59.4
	Single	65	40.6
Education Level	High school	5	3.1
	Associate degree	20	12.5
	Undergraduate	124	77.5
	Graduate	11	6.9
Hospital Location	Malatya	73	45.6
	Çorum	48	30.0
	Diyarbakır	39	24.4
Income level	Income<Expense	68	42.5
	Balanced (equal)	74	46.3
	Income>Expense	18	11.2
Average Working Time (Weekly)	<40 hours	9	5.6
	40 hours	34	21.3
	34	117	73.1
	>40 hours	71	44.4
Smoking	Yes	89	55.6
	No	116	72.5
Are you disturbed by surgical smoke?	Yes	44	27.5
	No	134	83.8
Do you know about the harms of surgical smoke?	Yes	26	16.2
	No	31	19.4
Do you have any chronic illness?	Yes	129	100,0
	No	76	47.5
Is there a family member of yours with a chronic illness?	Yes	84	52.5
	No	140	87.5
Has anyone been diagnosed with Covid-19 in your work environment?	Yes	20	12.5
	No	59	36.9
Have any of your family members been diagnosed with Covid-19?	Yes	101	63.1
	No	101	63.1
Age (Mean+SD)		32.36±6.31	
Years of working (profession) (Mean+SD)		10.68±6.82	
Years of working (surgery unit) (Mean+SD)		8.47±5.33	

Table 2. Equipment Use of Participants

Equipment Used for Surgical Smoke Protection*	n	%
Surgical Mask	160	100,0
N95 Mask	52	32.5
Apron	134	83.8
Glasses	77	48.1
Central Smoke Evacuation Systems	136	85.0
Bonnet	98	60.5
Visor	40	25.0
Symptoms caused by surgical smoke*	**n**	**%**
Headache	113	70.6
Respiratory Problems	109	68.1
Fatigue	106	66.3
Allergic Reactions	90	56.3
GIS Problems	87	54.4
Vision Problems	69	43.1
Vertigo	52	32.6
Myalgia	35	21.9
Anxiety	21	13.1
Anemia	14	8.8
Hepatitis	7	4.4

*More than one answer can be selected.

Table 3 shows the correlations between the Work Stress Scale, the Brief Resilience Scale and the C19P-S. Mean scores of the participants for the Work Stress Scale were 40.11±4.91, the mean scores for the Psychological Resilience Scale were 15.00±3.95, and the mean scores for the C19P-S were 71.58±15.45. It was found that there was a significant moderate negative correlation (r:-.556) between work stress and psychological resilience, and a significant moderate positive (r:.589) correlation between work stress and Covid-19 phobia ($p<0.05$) was found. There was a significant negative strong (r:-,706) correlation found between Covid-19 phobia and psychological resilience ($p<0.05$; Table 3).

It can be seen that the regression model testing result to test the effect of perceived work stress on resilience is statistically significant ($F=70.726$, $p<0.05$); it can also be seen in Table 4 that psychological resilience negatively affects work stress ($\beta=-0.556$, $t=-8.410$, $p<0.05$). According to this finding, it can be said that as psychological resilience increases, work stress decreases accordingly. Accordingly, it is seen that the predictor variable of resilience explains 30.9% of the variance in the predicted variable of work stress ($R2=0.309$; Table 4).

According to another finding of Table 4, the results of the regression model in which psychological resilience is affected by Covid-19 phobia are statistically significant ($F=157.277$, $p<0.05$). According to this finding, Covid-19 phobia negatively affects resilience ($\beta=-0.706$, $t=-12.541$, $p<0.05$). Based on this finding, it can be said that as Covid-19 phobia increases, psychological resilience decreases as well. According to the established model, it is seen that the Covid-19 phobia predictor variable explains 49.9% of the variance in the psychological resilience predicted variable ($R2=0.499$; Table 4).

And according to the last finding of Table 4, the results of the regression model in which the Covid-19 phobia was affected by work stress were found to be statistically significant ($F=84.139$, $p<0.05$). According to this finding, it was determined that work stress positively affected Covid-19 phobia ($\beta=0.589$, $t=9.173$, $p<0.05$). Accordingly, it can be said that as work stress increases, Covid-19 phobia also increases. In the established regression model, it is seen that the predictor variable of work stress explains 49.9% of the variance in the predicted variable of Covid-19 phobia ($R2=0.347$; Table 4).

Table 3. Correlation analysis between variables

Variables	Mean±SD	Work Stress	Psychological Resilience	Covid-19 Phobia
Perceived Work Stress	40.11±4.91	1		
Psychological Resilience	15.00±3.95	r -.556** p=.000**	1	
Covid-19 Phobia	71.58±15.45	r: .589** p=.000**	r:-.706** p=.000**	1

****p<0.01, Pearson Correlation**

Table 4. Equipment Use of Participants

Dependant variable	Independant variable	β	t	P	F	Model (p)	R2
Perceived Work Stress	**Constant**		39.562	.000**	70.726	.000**	.309
	Psychological Resilience	-.556	-8.410	.000**			
Psychological Resilience	**Constant**		26.492	.000**	157.277	.000**	.499
	Covid-19 Phobia	-.706	-12.541	.000**			
Covid-19 Phobia	**Constant**		-.336	.737	84.139	.000**	.347
	Perceived Work Stress	.589	9.173	.000**			

Discussion

The work stress and psychological resilience levels of nurses exposed to surgical smoke in operating rooms and the effect of Covid-19 phobia on these two parameters were determined in this study.

Increasing awareness of surgical smoke has provided information not only about chemical toxins in surgical smoke, but also about particles that become aerosolized during surgical procedures [21]. It is known that these aerosol particles cause various health problems, especially respiratory tract disorders [22]. In order to be protected from such problems, various measures should be taken in the operating rooms. Current guidelines recommend that healthcare personnel wear FFP3 masks during aerosol-generating procedures, or liquid-resistant masks if they are not available [23]. In addition, the European Society of Coloproctology published a joint report on the measures to be taken together with EAES (European Association for Endoscopic Surgery) and SAGES in May 2020; according to this report, preoperative Covid-19 testing for all surgical patients, and appropriate filtration and ventilation of operating rooms for suspected or confirmed cases of Covid-19 were recommended for protection against the possible negative situations [24]. In the hospitals where this study was conducted, Covid-19 test is applied to patients before surgery as a clinical protocol. It was determined that in these hospitals, the recommendations of the associations and guidelines were taken into account, and surgical masks, N95 masks, aprons, goggles, central smoke evacuation systems and bonnets were frequently used to protect healthcare personnel against surgical smoke (Table 2). Similarly, Alcan et al. (2017) reported that surgical masks, aprons, aspiration catheters, and goggles were used to protect healthcare personnel against surgical smoke [7]. Despite all the precautions, nurses may experience some problems related to surgical smoke. It was determined in this study that headache, respiratory problems, fatigue and allergic reactions were frequently observed for operating room nurses due to surgical smoke (Table 2). Other studies in the literature also support this study in this regard. Studies have reported that similar problems (such as headache, respiratory problems, throat irritation, cough, and nausea and vomiting) are observed due to surgical smoke [7,25-27]. The results of this study, as well as other studies in the literature, show that operating room nurses exposed to surgical smoke experience similar symptoms despite taking similar protection measures. This situation reveals once again that surgical smoke poses a great risk for healthcare personnel working in operating rooms.

Despite the precautions taken in operating rooms [5], which naturally contain many stress factors, problems related to surgical smoke and detection of viruses in surgical smoke [9,12-14] can be an additional source of stress for the healthcare personnel working in these units; moreover, it raises the concern that the SARS-CoV-2 virus may be transmitted through surgical smoke [9,28]. In fact, in the Somashekhar et al. (2020) study, it is reported that one of the main concerns about surgical intervention during the pandemic is the fear of surgical smoke (for reasons such as the risk of viral contamination and exposure to smoke) [29]. According to results of this study, operating room nurses experienced fear at the level of phobia due to Covid-19, since the Covid-19 phobia score was high (Table 3). Among the reasons for this intense fear, it is reported that the spread of the Covid-19 virus, its mutations and the lack of information about the immune status of the infected people [30], as well as the risk of transmission of the disease to the healthcare personnel themselves and from themselves to their families. In addition, this situation emerges as an additional cause of anxiety for nurses [31,32]. In the study of Ünver and Yeniğün, different from this study, the Covid-19 fear levels of surgery nurses were found to be moderate [33]. However, the participants in this study were nurses working in surgical clinics, not operating room nurses. The absence of surgical smoke exposure in surgical clinics excludes the fear of smoke-induced contamination; we think that the reason for high level of phobia results in this study may be related to this situation.

Studies reveal that healthcare personnel experience psychological problems due to the pandemic. One of these studies is the study conducted in China determined that healthcare personnel are at high risk for mental disorders such as chronic stress due to their working conditions [34]. Other studies also report that the incidence of anxiety and stress disorder among healthcare professionals is high during the Covid-19 pandemic [35], and that the pandemic causes symptoms of post-traumatic stress disorder for healthcare personnel [31]. It is thought that all these psychological problems affect work stress. Results of this study also support these findings, and it was determined that the work stress of nurses was high (Table 3) and covid-19 phobia increased this stress (Table 4).

There is evidence that mental well-being is associated with psychological resilience [36]. In terms of pandemic conditions, in which illness anxiety and fear of death can develop further, the importance of the psychological resilience levels of healthcare personnel stands out even more. Psychological resilience enables to be more resilient to challenging life events [37] and to cope with these challenges, uncertainties and changes more effectively [38]. It is also known that individuals with low levels of psychological resilience are more negatively affected by the pandemic conditions [37]. Considering all these, it becomes clear that high levels of psychological resilience are important for operating room nurses to effectively fight against Covid-19 infection and protect their mental health. However, the psychological resilience levels of the nurses in this study was found moderate (Table 3). It was also determined that Covid-19 phobia affected the level of psychological resilience negatively (Table 4). Similar to this study, in the study conducted by Karataş and Tagay fear of Covid-19 negatively affects resilience against difficulties [39]. In another study conducted on the general population in Türkiye, it was reported that fear of Covid-19 reduced the level of resilience [40]. And low psychological resilience also increases work stress (Table 4). In the study of Gül et al., it was determined that the surgery nurses experienced more anxiety due to the fact that they were constantly exposed to workplace stress [32].

Limitations

This study had several limitations. First, the first limitation of the study is that it was limited to only three hospitals. The second limitation was the delay encountered in data collection due to the assignment of operating room nurses to different clinics during the pandemic process. The third limitation was that the research data could not be collected by face-to-face data collection method.

Conclusion

It can be said that the Covid-19 phobia of the nurses working in the operating rooms during the Covid-19 pandemic affects the levels of work stress and psychological resilience. Therefore, it is recommended to provide counseling services to operating room nurses in order to meet their psychological needs, improve their stress management and coping skills, increase social support mechanisms for nurses, and regulate working hours. In future studies, it is recommended to conduct studies evaluating how much surgical nurses are exposed to surgical smoke.

Conflict of interests
The authors declare that there is no conflict of interest in the study.

Financial Disclosure
The authors declare that they have received no financial support for the study.

Ethical approval
Ethical approval was obtained from the Ethics Committee of the relevant university (20/07/2020, 2020- 81).

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