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The Impact of Operating Room Nurses' Attitudes toward Wearing Personal Protective Equipment, Physical Discomfort, and Obsession with COVID-19 on Perceived Psychosocial Stress during the COVID-19 Pandemic: A Cross-sectional Study



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Purpose: This study describes the attitudes toward Personal Protective Equipment (PPE), physical discomfort with wearing PPE, obsession with Coronavirus Disease 2019 (COVID-19), and perceived psychosocial stress among operating room nurses during the COVID-19 pandemic and identifies factors affecting perceived psychosocial stress. **Methods:** This study used a descriptive, cross-sectional design to evaluate physical discomfort experienced when wearing PPE, attitudes toward PPE, and obsession with COVID-19. We collected the data between December 2020 and January 2021. The participants were 127 nurses who worked in operating rooms at three hospitals in South Korea. Perceived psychosocial stress was assessed using the Psychosocial Well-being Index Short Form. Data were analyzed using descriptive statistics, the independent t-test, one-way analysis of variance, Pearson correlation coefficients, and multiple linear regression. **Results:** Having a bachelor's degree ($\beta=.28, p=.031$), attitude toward PPE ($\beta=-.22, p=.011$), experiencing shortness of breath while wearing PPE ($\beta=.26, p=.008$), and obsession with COVID-19 ($\beta=.23, p=.006$) were identified as factors affecting the psychosocial stress of nurses who wore PPE and participated in surgery. **Conclusion:** Nurses who had a negative attitude toward PPE, experienced shortness of breath while wearing it, and had a high level of obsession with COVID-19 had higher psychosocial stress. To reduce the psychosocial stress of nurses who wear PPE and participate in surgery, we suggest research on education that can reduce repetitive thinking about infectious diseases, such as obsession with COVID-19. Additionally, support is needed to improve positive attitudes toward PPE and alleviate physical discomfort.

Key Words: COVID-19; Nurses; Operating rooms; Personal protective equipment

INTRODUCTION

The Coronavirus Disease 2019 (COVID-19) pandemic has posed a significant threat to human life and caused physio-psychosocial distress among the general population [1]. Healthcare professionals, in particular, who care for suspected or confirmed COVID-19 cases, have been advised to follow guidelines for wearing Personal Protective Equipment (PPE) during their duties [2]. This requirement can lead to considerable physical and mental challenges [3]. PPE has been an essential tool during the pandemic to

protect healthcare providers from COVID-19 and to prevent the spread of the virus [4]. However, wearing PPE can be physically uncomfortable [5], which adds to the burden of nurses' roles and work by exacerbating fatigue, exhaustion, and stress [6]. Intensive care unit nurses have reported experiencing heat (51%), thirst (47%), pressure (44%), and headaches (28%) due to wearing PPE [4]. In another study, participants also reported headaches, dehydration, insufficient rest, and skin peeling around the nose [7].

Despite these various discomforts, it has been found

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that a positive attitude toward wearing Personal Protective Equipment (PPE) is associated with better adherence to its use [8]. Conversely, a negative attitude toward PPE can lead to violations of recommended infection control measures or low compliance with PPE use [9]. Meanwhile, reports of improved attitudes toward PPE and increased compliance through education [10] suggest that proficiency in PPE use, gained through education, is associated with positive coping strategies and reduced stress.

During the COVID-19 pandemic, frontline healthcare providers have faced increased exhaustion due to overwhelming workloads. They have also grappled with concerns about burnout, post-traumatic stress disorder [11], and the fear of potentially infecting family and friends [12]. While a reasonable level of concern about COVID-19 is necessary for maintaining safety, excessive anxiety and rumination over infectious diseases can be detrimental to health [13]. Obsessive thinking patterns about COVID-19 have been linked not only to personal anxiety and depression but also to difficulties in work and social adaptation [14]. Furthermore, a study of medical staff working on the front lines found that an obsession with COVID-19 was associated with death anxiety and fatigue [15].

The operating room is an environment where infection prevention procedures are very important [16]. In South Korea, guidelines for surgery on COVID-19 patients have been issued, emphasizing the necessity of providing PPE to ensure safe surgical practices [17]. Consequently, nurses donning PPE in the operating room—including perioperative and anesthesia nurses—experienced an increased burden during operations involving COVID-19 patients. A qualitative study of Turkish operating room nurses revealed that they faced negative experiences during the COVID-19 pandemic, such as anxiety, psychological distress, and challenges associated with PPE use [18]. Operating room nurses were required to adhere to World Health Organization recommendations for PPE, which included wearing surgical masks and caps to prevent contamination [19]. These enhanced guidelines led to difficulties for nurses in terms of mobility during lengthy surgeries, excessive sweating, and the development of pressure ulcers [20]. Furthermore, the American Operating Room Association has reported that operating room personnel are under significant pressure and stress due to the pandemic [21]. Despite these international findings, there appears to be a gap in research concerning the physical discomfort and psychosocial stress experienced by operating room nurses in the domestic setting, particularly when wearing PPE for extended periods in the confined spaces of the operating room.

The purpose of this study was to describe the attitudes of operating room nurses toward PPE, the physical discomfort associated with wearing PPE, their preoccupation with COVID-19, and the psychosocial stress they perceived during the pandemic. Additionally, the study aimed to identify factors that influence the psychosocial stress perceived by nurses.

METHODS

1. Study Design

This study had a descriptive and cross-sectional design.

2. Setting and Samples

This study was conducted at three university hospitals in Seoul and Gyeonggi Province, South Korea, during the COVID-19 pandemic. Each hospital had a capacity exceeding 750 beds and adhered to identical surgical and operating room guidelines for PPE usage. Operating room nurses were mandated to don PPE when involved in surgery for COVID-19 cases. Study participants were selected from those who had performed surgery while fully equipped with PPE, which included an N95 or equivalent mask, gloves, goggles, face shield, long-sleeved gown, or a powered air purifying respirator. According to the national guidelines of South Korea, COVID-19 cases [22] encompass patients with a confirmed diagnosis of COVID-19, those suspected of being infected, symptomatic individuals who have not undergone a COVID diagnostic test, and patients requiring emergency surgery who have not received their COVID-19 test results.

The inclusion criteria for this study specified that participants must be nurses working in operating rooms who had worn PPE at least once during a surgical procedure in the past two weeks. The minimum sample size was determined based on a previous study [23], utilizing the G*Power 3.1 software. The parameters set for the sample size calculation included multiple linear regression with ten independent variables, an effect size of 0.15, a significance level of .05, and a power of .80, resulting in a minimum required sample of 118 participants. After adjusting for an anticipated dropout rate of 15%, the target sample size was increased to 136. Consequently, questionnaires were distributed to 136 individuals. The analysis was conducted using the responses from 127 participants who completed all questions, after excluding any unreliable responses.

3. Measurements

1) General characteristics

As general characteristics, we investigated sociodemographic characteristics and PPE use-related experience. The following sociodemographic characteristics were recorded: gender, age, marital status, presence of a cohabitant, education, job description, and number of cases. Marital status and the presence of a cohabitant were included based on their relevance to nurses' attitudes and perceptions toward PPE, as indicated in prior research [10]. Factors such as gender, age, cohabitation status, education level, and the number of cases handled were chosen for their association with the stress levels reported by nurses during the Middle East Respiratory Syndrome (MERS) outbreak [24]. In line with earlier studies [18], experiences related to PPE use were explored by assessing exposure to training on the proper donning and doffing of PPE, as well as the perceived work capability while wearing PPE compared to not wearing it.

2) Attitudes toward wearing PPE

Attitudes toward wearing PPE are a construct that encompasses an understanding of PPE usage, proficiency in donning and doffing PPE, and readiness to wear it despite potential discomfort. This concept was operationalized by Kim and Lee [10], who designed a measurement scale that uses a 5-point Likert scale, where 1 represents "not at all" and 5 signifies "very much." The scale consists of 10 items, and a higher cumulative score suggests a more favorable attitude toward PPE, a better grasp of its usage, and a greater willingness to tolerate any discomfort it may cause. Regarding the reliability of the items, Cronbach's α was .78 in the original study and .68 in the current study.

3) Physical discomfort

Physical discomfort associated with wearing PPE encompasses several types of discomfort reported by nurses when donning PPE. The list of forms of discomfort was derived from prior research on the physical discomforts experienced by healthcare providers who wore PPE while working during the COVID-19 pandemic [5,25,26]. This list was further reviewed by two nurses, each with over a decade of clinical experience, and two nursing professors. The forms of discomfort identified include warmth, thirst, skin injury, headache, inability to use the toilet, fatigue, sweating, shortness of breath, nausea, vomiting, dizziness, among others. Nurses were prompted to indicate whether they had experienced any of these discomforts with a simple "yes" or "no" response. Regarding the reliability

of these items in the present study, Cronbach's α was .56.

4) Obsession with COVID-19

The Obsession with COVID-19 Scale is designed to measure persistent and anxious thoughts about COVID-19. This scale includes four items that reflect the respondent's experiences over the past two weeks. Responses are recorded on a 5-point scale, where 0 indicates "not at all" and 4 signifies "always." Higher scores on the scale suggest a greater degree of obsessive or anxious thinking about COVID-19. The scale is publicly accessible and does not require formal authorization for use. Originally developed in the United States by Lee [27], the Korean version of the tool [14] was utilized in this context. The Cronbach's α coefficient was reported as .83 at the time of the scale's development, .72 for the Korean version in a subsequent study [14], and .74 in the current study.

5) Perceived psychosocial stress

Perceived psychosocial stress was evaluated using the Psychosocial Well-being Index Short Form by Chang [28], a modified Korean adaptation of the General Health Questionnaire. This instrument measures an individual's emotional and psychological well-being, which is essential for managing daily life activities. It comprises 18 items, each scored on a 4-point Likert scale from 0 (always) to 3 (not at all), where higher scores denote increased psychosocial stress. The reliability of the modified version was confirmed with a Cronbach's α of .90 [28], which was consistent with the α of .90 obtained in this study.

4. Data Collection and Ethical Considerations

This study received approval from the Institutional Review Board (IRB) of C University Hospital (IRB No. KC 20QADI0954) and was conducted from December 2020 to January 2021. We recruited eligible operating room nurses through official online chat windows and by posting research subject recruitment notices on the groupware internet bulletin boards. Participants were invited to voluntarily take part in the survey via an online link. At the time of data collection, participants were presented with a statement that outlined the study's purpose. It emphasized that participation was voluntary and that individuals could withdraw at any point during or after completing the questionnaire without any negative consequences. The statement also assured that the collected data would be used exclusively for research purposes. As a token of appreciation, participants in the study received

coffee coupons valued at 4,000 KRW (approximately 3 USD).

5. Data Analysis

The collected data were statistically analyzed using IBM SPSS version 25.0. Descriptive statistical analyses were performed to assess sociodemographic characteristics, experience with PPE, attitudes toward PPE, pre-occupation with COVID-19, and levels of psychosocial stress. Differences in psychosocial stress, based on the general characteristics of the participants and their experiences with PPE, were examined using the independent t-test and one-way analysis of variance. The Scheffé test was utilized for post-hoc analysis. Pearson's correlation analysis was employed to investigate the relationships between variables. Multiple linear regression analysis was applied to identify factors contributing to perceived psychosocial stress among nurses who wore PPE.

RESULTS

1. Sociodemographic Characteristics and Differences in Psychosocial Stress

A total of 127 operating room nurses completed the questionnaire. Most of the respondents were women (90.6%) and held bachelor's degrees (81.9%). The mean age of the participants was 31.51 years ($SD=6.36$). On average, the nurses had 8.18 years of clinical experience ($SD=6.40$), with 40.1% having practiced for between 5 and 10 years. Just over half of the nurses (57.5%) worked in the surgical unit, while the remainder (42.5%) were employed in the anesthesia unit. A significant portion of the nurses were single (63.8%), with one-third (36.2%) being married. Regarding living arrangements, 29.9% resided alone. On average, the nurses had participated in surgery while wearing PPE six times since the beginning of the COVID-19 pandemic.

Table 1. Differences in Psychosocial Stress by Sociodemographic Characteristics (N=127)

Variables	Categories	n (%) or M $\pm$ SD	Psychosocial stress	
			M $\pm$ SD	t or F (p)
Gender	Men	12 (9.4)	1.02 $\pm$ 0.42	-1.20 (.233)
	Women	115 (90.6)	1.17 $\pm$ 0.41	
Age (year)	20s	63 (49.6)	1.18 $\pm$ 0.45	0.18 (.839)
	30s	48 (37.8)	1.14 $\pm$ 0.39	
	≥ 40 s	16 (12.6)	1.14 $\pm$ 0.32	
		31.51 $\pm$ 6.36		
Marital status	Unmarried	81 (63.8)	1.18 $\pm$ 0.42	0.76 (.451)
	Married	46 (36.2)	1.12 $\pm$ 0.40	
Living with someone	Yes	89 (70.1)	1.21 $\pm$ 0.38	0.84 (.401)
	No	38 (29.9)	1.14 $\pm$ 0.43	
Education	Associate ^a	8 (6.3)	0.81 $\pm$ 0.43	3.23 (.043) a < b
	Bachelor ^b	104 (81.9)	1.19 $\pm$ 0.41	
	$\geq$ Master ^c	15 (11.8)	1.13 $\pm$ 0.35	
Clinical experience (year)	< 5	42 (33.1)	1.15 $\pm$ 0.47	0.05 (.956)
	5~<10	51 (40.1)	1.17 $\pm$ 0.44	
	≥ 10	34 (26.8)	1.15 $\pm$ 0.30	
		8.18 $\pm$ 6.40		
Department	Operation unit	73 (57.5)	1.13 $\pm$ 0.39	-0.79 (.433)
	Anesthetic unit	54 (42.5)	1.19 $\pm$ 0.44	
Number of operations for COVID-19 cases	< 5	62 (48.8)	1.17 $\pm$ 0.41	0.26 (.771)
	5~9	32 (25.2)	1.19 $\pm$ 0.41	
	≥ 10	33 (26.0)	1.12 $\pm$ 0.43	
		5.95 $\pm$ 5.31		

COVID-19=coronavirus disease 2019; M=mean; SD=standard deviation.

Upon examining the variation in psychosocial stress across general characteristics, a significant difference was observed in relation to educational level ($F=3.23, p=.043$). Subsequent post hoc analysis revealed that individuals with a bachelor's degree experienced significantly higher psychosocial stress compared to those with an associate degree (Table 1).

2. PPE Use-related Experiences, Physical Discomfort after Wearing PPE, and Differences in Psychosocial Stress

Most nurses had been trained on PPE donning and doffing (92.9%). If the ability to work unencumbered by PPE is 100, the average self-assessed competency of nurses performing tasks while wearing PPE was 59.29 ± 15.18 . The most common form of physical discomfort experi-

enced while wearing PPE was warmth (92.1%), followed by sweating (81.1%), shortness of breath (63.0%), and fatigue (61.4%). Regarding PPE-related experiences, it was found that shortness of breath ($t=3.66, p<.001$), fatigue ($t=2.19, p=.030$), and nausea/vomiting ($t=2.04, p=.044$) were associated with higher levels of psychosocial stress compared to cases without these discomforts (Table 2).

3. Correlations between Variables

Nurses reported experiencing an average of five forms of physical discomfort (5.20 ± 2.02) when wearing PPE. Their average attitude toward PPE scored 3.45 ± 0.33 , while their average score for obsession with COVID-19 was 4.49 ± 2.81 . The mean score for perceived psychosocial stress was 1.16 ± 0.41 .

Table 2. Differences in Psychosocial Stress by PPE Use-related Experience and Physical Discomfort After Wearing PPE ($N=127$)

Variables	Categories	n (%) or M $\pm$ SD	Psychosocial stress	
			M $\pm$ SD	t or F (p)
PPE use-related experience	Exposure to training on PPE donning and doffing	Yes	118 (92.9)	1.16 $\pm$ 0.42
		No	9 (7.1)	1.20 $\pm$ 0.37
	Perception of work capability when wearing PPE compared to when not wearing PPE	< 60%	45 (59.8)	1.22 $\pm$ 0.36
		$\geq$ 60%	82 (40.2)	1.13 $\pm$ 0.44
		59.29 $\pm$ 15.18		
Physical discomfort while wearing PPE	Warmth	Yes	117 (92.1)	1.15 $\pm$ 0.42
		No	10 (7.9)	1.29 $\pm$ 0.36
	Sweating	Yes	103 (81.1)	1.19 $\pm$ 0.43
		No	24 (18.9)	1.04 $\pm$ 0.30
	Shortness of breath	Yes	80 (63.0)	1.26 $\pm$ 0.42
		No	47 (37.0)	0.99 $\pm$ 0.36
	Fatigue	Yes	78 (61.4)	1.22 $\pm$ 0.40
		No	49 (38.6)	1.06 $\pm$ 0.41
	Inability to go to the bathroom	Yes	67 (52.8)	1.19 $\pm$ 0.43
		No	60 (47.2)	1.12 $\pm$ 0.40
	Skin injury	Yes	61 (48.0)	1.14 $\pm$ 0.38
		No	66 (52.0)	1.17 $\pm$ 0.44
	Thirst	Yes	53 (41.7)	1.21 $\pm$ 0.36
		No	74 (58.3)	1.12 $\pm$ 0.44
	Headache	Yes	44 (34.6)	1.16 $\pm$ 0.37
		No	83 (65.4)	1.16 $\pm$ 0.44
	Dizziness	Yes	39 (30.7)	1.18 $\pm$ 0.44
		No	88 (69.3)	1.15 $\pm$ 0.40
	Others	Yes	10 (7.9)	1.31 $\pm$ 0.48
		No	117 (92.1)	1.15 $\pm$ 0.41
	Nausea, vomiting	Yes	9 (7.1)	1.43 $\pm$ 0.48
		No	118 (92.9)	1.14 $\pm$ 0.40

M=mean; PPE=personal protective equipment; SD=standard deviation.

The number of forms of physical discomfort was significantly positively correlated with obsession with COVID-19 ($r=.18, p=.042$). Psychosocial stress showed a significant negative correlation with attitudes toward PPE ($r=-.29, p=.001$), and a significant positive correlation with obsession with COVID-19 ($r=.25, p=.005$) and the number of forms of physical discomfort ($r=.22, p=.014$) (Table 3).

4. Factors Influencing Psychosocial Stress

Multiple regression analysis was conducted to identify factors influencing the psychosocial stress of nurses wearing PPE. The goodness of fit of the regression model was confirmed ($F=5.19, p<.001$), and its explanatory power was approximately 21.1%. The Durbin-Watson statistic was 2.01, which was close to 2, satisfying the assumption of residual independence, and the variance inflation factors were all less than 10, indicating no problem with multi-collinearity.

The significance of the regression coefficient was assessed to identify factors affecting psychosocial stress. It was found that nurses with a bachelor's degree ($\beta=.28$,

$p=.031$) and those who experienced shortness of breath ($\beta=.26, p=.008$) while wearing PPE had high psychosocial stress. Additionally, higher psychosocial stress was associated with a negative attitude toward PPE ($\beta=-.22, p=.011$) and a higher obsession with COVID-19 ($\beta=.23, p=.006$) (Table 4).

DISCUSSION

This study explored the attitudes of operating room nurses towards PPE during the COVID-19 pandemic, as well as their experiences of physical discomfort resulting from PPE use, their preoccupation with COVID-19, and their perceptions of psychological stress. In the discussion section, we first examined the characteristics of the participants and then provided insights into the relationships among the main variables.

Regarding general characteristics, nurses holding a bachelor's degree reported significantly higher levels of psychosocial stress than those with an associate degree. Furthermore, possessing a bachelor's degree was identified as a significant predictor of psychosocial stress in the

Table 3. Correlations among Variables

($N=127$)

Variables	M $\pm$ SD	1	2	3
		r (p)	r (p)	r (p)
1. Number of forms of physical discomfort	5.20 $\pm$ 2.02	-		
2. Attitudes towards PPE	3.45 $\pm$ 0.33	-.17 (.058)	-	
3. Obsession with COVID-19	4.49 $\pm$ 2.81	.18 (.042)	.03 (.721)	-
4. Psychosocial stress	1.16 $\pm$ 0.41	.22 (.014)	-.29 (.001)	.25 (.005)

COVID-19=coronavirus disease 2019; M=mean; PPE=personal protective equipment; SD=standard deviation.

Table 4. Factors Influencing Psychosocial Stress

($N=127$)

Variables	B	SE	β	t	p	VIF
(Constant)	1.61	0.43		3.72	< .001	
Education						
Associate's	(ref.)					
Bachelor's	0.30	0.14	.28	2.19	.031	2.67
$\geq$ Master's	0.28	0.16	.22	1.73	.087	2.63
Physical discomfort						
Fatigue	0.12	0.08	.14	1.56	.121	1.34
Shortness of breath	0.22	0.08	.26	2.69	.008	1.46
Nausea, vomiting	0.20	0.15	.13	1.37	.172	1.35
Number of forms of physical discomfort	-0.03	0.02	-.15	-1.28	.204	2.14
Attitudes towards PPE	-0.28	0.11	-.22	-2.60	.011	1.14
Obsession with COVID-19	0.14	0.05	.23	2.80	.006	1.11
$R^2=.263$, Adj. $R^2=.211$, $F=5.19$, $p<.001$, Durbin-Watson=2.01						

Adj.=adjusted; COVID-19=coronavirus disease 2019; PPE=personal protective equipment; ref.=reference; SE=standard error; VIF=variance inflation factor.

regression analysis. However, a study focusing on nurses in tertiary hospitals during the MERS outbreak found no correlation between educational level and post-traumatic stress [24]. The variation in psychosocial stress related to academic qualifications may be affected by the age associated with obtaining these degrees. Although our study did not find a significant difference in psychosocial stress across age groups, individuals in their 20s experienced higher levels of stress compared to those in their 30s and 40s. Conversely, a separate study of nurses in tertiary general hospitals during the COVID-19 pandemic revealed no age-related differences in psychosocial stress. Instead, it showed that nurses with a professional degree experienced greater psychosocial stress than those with a bachelor's, master's, or higher degree [29]. Therefore, further research is warranted to examine this issue more comprehensively.

The average score for attitudes towards PPE among the participants was 3.45 points on a 5-point scale. This score was lower than that in the previous study [10], where the score for PPE attitudes among general nurses was 3.68, and also lower than the score of 3.98 reported in a study targeting nurses in small hospitals during the COVID-19 pandemic [30]. Given that this study focused exclusively on nurses working in operating rooms, it is possible that the specific nature of their duties—which include wearing PPE in addition to surgical attire and working in close proximity to patients in confined spaces for the duration of operations—may have influenced these results. Further research to explore the relationship between attitudes towards PPE and nurses' perceptions of their job performance could be valuable, especially since more than half of the operating room nurses in this study perceived their job performance to be less than 60% effective when wearing PPE. Participants felt that wearing PPE reduced their work performance; thus, it is necessary to investigate which characteristics of PPE hinder work performance and to conduct research aimed at improving this. It is also important to determine whether perceptions of decreased work performance due to PPE vary depending on the primary tasks of nurses in different departments. Additionally, research is needed to establish appropriate work and break times and frequencies for those wearing PPE. This study found that most participants (92.9%) had received training on how to properly don and doff PPE. This percentage is higher than the 84.4% observed during the MERS outbreak in South Korea in 2015 [10], the 84.2% reported during the early stages of the COVID-19 outbreak in a South Korean study, and the 83% reported in an international study conducted on intensive care unit nurses

[26]. Despite the high proportion of participants who have received PPE training, the low attitude toward PPE suggests that other factors influencing attitudes toward PPE should be considered. Previous research has indicated that an adequate supply of PPE can influence attitudes toward it [31]. There was also a significant correlation between awareness, including the provision of PPE, and attitudes toward PPE [10]. Therefore, ensuring a sufficient supply of PPE could be a strategy to improve attitudes toward it, and future research in this area is warranted. The results of this study indicated that a more negative attitude toward PPE was associated with higher psychosocial stress. However, since the survey questions on attitudes toward PPE included items related to stress, it is possible that this may have affected the results, which could be a limitation of this study.

Most operating room nurses in this study reported physical discomfort when wearing PPE, including feeling warm (92.1%), sweating (81.1%), experiencing shortness of breath (63.0%), and fatigue (61.4%). These findings contrast with those from another study of intensive care unit healthcare professionals, where heat (51%), thirst (47%), pressure (44%), and headaches (28%) were more commonly reported [26]. In research conducted on healthcare workers, 39% reported experiencing dyspnea when wearing PPE [25], which is less than the 63% in our study who reported a general sense of shortness of breath. The discrepancy may be due to the unique conditions of the operating room, where healthcare professionals are required to wear PPE for prolonged periods in confined spaces, all while maintaining intense concentration. Additionally, 34.6% of participants in this study reported headaches. This is in contrast to another study [32] on PPE-related headaches among healthcare workers, where 81% of participants reported headaches. Therefore, it is essential to prepare shift staff so that nurses can actively take breaks if they experience physical discomfort while wearing PPE and performing their duties. It is also important to establish working hours, break times, and their frequency in advance to ensure regular breaks. A plan to address these issues is necessary. Moreover, institutional, or organizational efforts to reduce nurses' discomfort are needed, such as providing or educating them on ways to alleviate physical discomfort during breaks. Future research should investigate the differences in departments and nursing tasks among nurses who wear PPE to better understand the variations in PPE-related discomfort. The regression analysis results from this study indicate that shortness of breath is a factor influencing psychosocial stress. This underscores the need to mitigate physical discomfort related

to breathing to alleviate psychosocial stress among operating room nurses. Previous studies among healthcare professionals during the COVID-19 pandemic in Singapore and India have shown associations between depression, anxiety, stress, and post-traumatic stress disorder with prior experiences of physical discomfort [33]. Therefore, it is crucial to ensure that surgical nurses have sufficient rest periods during procedures. Further research into the duration and frequency of these rest periods, as well as the need for additional staffing, is recommended.

In this study, the average Obsession with COVID-19 score was 4.49 out of 16 points. This result was lower than the 5.4-point score reported in a survey study of 110 doctors and nurses at a specialized infectious disease hospital in Romania [15]. Although both studies collected data around the end of 2020, when the severity of COVID-19 was comparable, the participants in the current study were nurses working in operating rooms, as opposed to the Romanian study, which included healthcare professionals on the front lines of infectious disease management. This difference in participant roles may account for the lower scores observed in the current study, as it focused specifically on nurses in surgical settings rather than on healthcare professionals directly involved in infectious disease care.

Obsession with COVID-19 was found to impact psychological and social stress, consistent with prior studies that have identified a strong correlation between high levels of COVID-19-related obsession and issues such as functional impairment, substance abuse, increased alcohol consumption, and suicidal behavior [14,27]. Moreover, the link between obsession with COVID-19 and heightened death anxiety, as well as elevated levels of exhaustion, suggests that COVID-19-related obsession may mediate the relationship between these two factors, reinforcing insights from earlier research [15]. This highlights the critical need for preventive strategies aimed at curtailing obsessive thoughts about COVID-19 and strengthening protective factors, including the resilience of healthcare professionals and the availability of social support [34].

The item-wise average score for psychosocial stress in this study was 1.16, closely aligning with the score of 1.21 reported in a previous study among nurses at a tertiary hospital during the COVID-19 pandemic [29]. A systematic review of the psychological and social impacts on healthcare professionals during COVID-19 and other infectious disease outbreaks has shown an increased risk for conditions such as trauma, stress-related disorders, depression, and anxiety [35]. Thus, there is a recognized need for improved psychological and social support for healthcare workers, as well as the provision of clearer in-

formation about diseases. Following the MERS outbreak, a study on nurses in a South Korean tertiary hospital revealed that interactions with suspected or confirmed MERS patients were significant factors contributing to post-traumatic stress [24]. Outbreaks of infectious diseases can cause elevated stress, anxiety, and depression in healthcare professionals, potentially leading to long-term effects [12]. It is therefore critical to establish ongoing psychological and social monitoring, as well as regular stress relief programs for nurses, even after the end of the COVID-19 pandemic.

During the COVID-19 pandemic, various measures were implemented internationally to mitigate the risk of infection transmission during surgical procedures. These included the use of PPE and the creation of decision-making algorithms for emergency operations [36]. In South Korea, the Korean Medical Association issued guidelines in March 2020 for managing operating rooms, anesthesia, patient care, and transportation during the pandemic [17]. Nurses involved in surgical procedures during an infectious disease outbreak face psychosocial stress due to the risk of infection and the need to adhere to evolving protocols and responsibilities, such as wearing PPE. This study is significant, as it explores the experiences and psychosocial stress of operating room nurses who wore PPE while participating in operations during the pandemic. The study is limited by the lack of similar prior research for comparison and by its focus on operating room settings to the exclusion of other departments, which affects its generalizability. Nonetheless, the findings suggest practical measures to alleviate the psychosocial stress of operating room nurses, such as providing rest periods and backup staff to reduce physical discomfort such as shortness of breath. Furthermore, the study recommends future research aimed at enhancing positive attitudes towards PPE and diminishing COVID-19-related anxieties through adequate PPE provision and education on infectious diseases.

CONCLUSION

In this study, we identified factors that influenced the psychosocial stress experienced by nurses who wore PPE while participating in surgical procedures. We found that attitudes toward PPE, experiencing shortness of breath when wearing PPE, and obsession with COVID-19 were significant influencing factors. Based on our findings, we recommend interventions to improve attitudes toward PPE, which could include ensuring an adequate supply and providing comprehensive education on its use. Additionally, strategies to mitigate excessive and repetitive

thought patterns concerning infectious diseases are warranted. Furthermore, given the unique environment of the operating room, we propose further research aimed at providing adequate rest periods and intervals during surgeries to alleviate the physical discomfort associated with wearing PPE. It may also be beneficial to organize staffing in a way that allows shift rotations to support these measures.

CONFLICTS OF INTEREST

The authors declared no conflict of interest.

AUTHORSHIP

Study conception and/or design acquisition - SYE and LO; analysis - SYE, LO, and LSJ; interpretation of the data - SYE, LO, and LSJ; and drafting or critical revision of the manuscript for important intellectual content - SYE, LO, and LSJ.

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