



Nurses' Attitudes Towards Barriers to the Use of Personal Protective Equipment in Selected AJA Healthcare Centers During the COVID-19 Epidemic: A Descriptive Analytical Study

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Abstract

Background: The use of personal protective equipment (PPE) is one of the most critical measures to protect healthcare staff from infections, particularly during outbreaks of infectious and emerging diseases. During the COVID-19 pandemic, the use of PPE was emphasized alongside vaccination as key strategies in preventing the spread of the virus.

Objectives: This study aimed to identify the barriers to PPE use from the perspective of nurses during the COVID-19 pandemic.

Methods: This was a cross-sectional descriptive-analytical study conducted with 230 nurses working in COVID-19 wards at five AJA hospitals in Tehran between November 1, 2021, and June 30, 2022. Nurses were selected using a convenience sampling method based on predefined inclusion criteria. Data were collected through a demographic questionnaire and a researcher-made 22-item questionnaire on barriers to PPE use. The data were analyzed using SPSS 19 statistical software, employing both descriptive and inferential statistical methods.

Results: Among the participants, 55.7% were male, 53.9% were married, and 84.8% held a bachelor's degree. The results showed that organizational barriers were more influential than individual barriers in the decision not to use PPE, with an average score of 97 out of 100. Furthermore, factors such as age, gender, wearing glasses, and nurses' work shifts were significantly associated with non-compliance with PPE use ($P < 0.05$).

Conclusions: Nurses identified organizational barriers as the primary reason for not using PPE. Given the critical role of PPE in preventing diseases, especially during crises like the COVID-19 pandemic, it is recommended that healthcare organizations ensure the availability of PPE and provide comprehensive training to nurses on the proper use of this equipment.

Keywords: Personal Protective Equipment, Nurse, COVID-19, Barriers

1. Background

In 2019, the spread of COVID-19 was identified as a major global public health concern (1). According to the World Health Organization (WHO), by August 2, 2023, more than 770 million people worldwide had been infected with the virus, and over 6.95 million had lost their lives. In Iran, there were 7.61 million reported infections and more than 146,000 deaths during this period (2). Initially, COVID-19 was recognized as a respiratory illness, but it was soon found to affect

multiple body systems (3). With an incubation period of 2 to 4 days and a high transmission rate, the virus spread rapidly across the globe (4). Common symptoms include fever, headache, persistent dry cough, shortness of breath, fatigue, lethargy, loss of smell and taste, skin rashes, and diarrhea (5, 6). On May 4, 2023, the WHO's COVID-19 Emergency Committee declared that the pandemic was no longer considered an emergency. However, it also stated that uncertainties about the virus's potential evolution remain and recommended continued precautions in the event of future infections

(7). Elderly patients and those with underlying conditions exhibit the highest mortality rates associated with the disease (8). However, healthcare providers are also particularly vulnerable (9), especially nurses (10). As frontline workers, nurses play a crucial role in diagnosis, treatment, and patient care (11). To effectively prevent and control infections, nurses can implement standard precautions, which significantly contribute to reducing the spread of such diseases (12). A key protective measure for healthcare staff is the use of personal protective equipment (PPE). Designed to act as a physical barrier between personnel and workplace hazards, PPE in medical settings aims to protect against pathogens and hospital-acquired infections (13, 14). Essential PPE includes masks, gowns, gloves, face shields, and protective eyewear, which must be used correctly by at-risk personnel (15). The PPE has been particularly emphasized as a critical tool in combating COVID-19. Improper or insufficient use of PPE significantly raises the risk of infection among healthcare workers, leading to workforce shortages and increased mortality rates (16). Adherence to standard precautions not only disrupts infection transmission chains but also aids in the effective management and reduction of infections through diligent healthcare practices (17).

Using this equipment is challenging and can cause various issues, including skin damage on the nose and behind the ears (16), reduced comfort, heat stress, diminished procedural skills, and decreased capacity to comply with PPE standards (18). To address these challenges, several studies have been conducted, yielding diverse findings. Kohangi and Najafi reported that the lack of sufficient protective equipment is the primary reason for non-compliance with protective standards among nurses (15). Similarly, Sharma et al. identified both organizational factors, such as equipment unavailability, and individual factors, such as ill-fitting PPE, as major barriers to usage in India (18). Badran et al. highlighted the unavailability of PPE and its interference with healthcare providers' ability and skill in delivering patient care as the most significant obstacles faced by medical staff during the COVID-19 pandemic (17). Furthermore, Ashinyo et al. found that the inadequacy of PPE was the leading cause of its low usage among healthcare workers (19). Various factors can act as barriers to the use of PPE, and it is essential to identify these barriers and assess their impact on non-

compliance (20). Key reasons for not using PPE include its rarity and high cost, lack of knowledge and awareness about proper usage, negative attitudes toward its use, low quality and weak effectiveness of the equipment, and side effects associated with long-term use (20, 21). Bauchner et al. highlights in his article that PPE is both scarce and expensive in many hospitals (22). However, a study by Chauhan et al. in India found PPE to be readily available, and no significant barriers to its use were reported (23).

2. Objectives

Given the critical role of PPE in reducing disease transmission, understanding the barriers to its use is essential for future planning and interventions. This is especially important in light of the limited number of similar studies conducted in military hospitals in Iran. Therefore, the present study aimed to identify the barriers to PPE use among nurses during the COVID-19 crisis.

3. Methods

This study was a cross-sectional, descriptive-analytical study conducted from November 1, 2021, to June 30, 2022. Among the 600 nurses working in the COVID-19 wards of five selected AJA hospitals in Tehran, the sample size was calculated to be 234 using Morgan's table, with a 10% margin of probability. A total of 230 participants were included in the study, selected through a convenience sampling method based on specific inclusion criteria. The inclusion criteria were: Willingness to participate and provide written informed consent, holding an associate degree in nursing or healthcare (or higher), having at least one month of work experience in COVID-19 departments (24), and being actively engaged in clinical activities. Participants who did not complete the questionnaire were excluded from the study.

3.1. Sampling

The objectives of the study were first explained to the head nurse and ward nurses, who were then invited to participate. Nurses who agreed to take part signed a written informed consent form before being enrolled in the study. Health guidelines were strictly followed throughout the process, with masks and disinfectant solutions provided to all participants. Subsequently,

questionnaires were distributed to the participants, accompanied by detailed instructions. Any questions raised by the nurses were addressed on the spot. Completing the questionnaire took approximately 15 - 20 minutes. If a nurse was fatigued, additional time was provided to complete the form. In some cases, the questionnaires were given to nurses to fill out at home, allowing them to return the completed forms during subsequent hospital shifts. The data collection tools included a demographic profile form for nurses and a researcher-developed questionnaire designed to assess barriers to using PPE.

3.2. Demographic Profile Form

This form gathered information on nurses' demographic characteristics, including age, gender, marital status, education, years of work experience, experience working with COVID-19 patients, underlying health conditions, Body Mass Index (BMI), use of glasses, and work shifts.

3.3. Researcher-Made Questionnaire

The questionnaire, developed by the research team, focused on identifying barriers to PPE use. The initial version of the tool was created based on relevant sources. It was then refined and finalized with 22 items, as approved by a panel of 10 faculty members from the AJA Faculty of Nursing and 10 clinical expert nurses. The questionnaire evaluates two domains: Individual barriers (15 items) and organizational barriers (7 items). Each item was scored using a 5-point Likert scale: Strongly agree (5 points), agree (4 points), neutral (3 points), disagree (2 points), strongly disagree (1 point). The total possible score ranged from 22 (minimum) to 110 (maximum).

Face validity was assessed using both qualitative and quantitative methods. In this study, the quantitative method was employed to assess content validity, using two key measures: The content validity ratio (CVR) and the Content Validity Index (CVI). The CVR and CVI values for the entire questionnaire were calculated as 0.86 and 0.98, respectively, indicating a high level of content validity. To evaluate the reliability of the questionnaire, Cronbach's alpha coefficient was calculated, yielding a value of $\alpha = 0.88$, demonstrating strong internal consistency.

In the qualitative phase, a survey was conducted with 10 nurses working in COVID-19 departments and 10 specialists in the field. They were asked to evaluate the appropriateness, simplicity, fluency, and comprehensibility of the questionnaire items. Their feedback was incorporated into the initial version of the tool, which consisted of 22 items (25). The questionnaires were completed in person, using a paper-based format. Each questionnaire required approximately 15 - 20 minutes to complete. Data analysis was performed using SPSS version 19 statistical software, applying both descriptive and inferential statistical methods, including independent *t*-tests and one-way ANOVA. A significance level of less than 0.05 was considered statistically significant. Before conducting statistical tests, the normal distribution of the data was confirmed using the Kolmogorov-Smirnov test.

To ensure ethical compliance, the study was approved by the Ethics Committee of the Army University of Medical Sciences ([IR.AJAUMS.REC.1399.243](#)), and the necessary implementation permit was obtained. The researcher introduced themselves and explained the study's objectives to participants, emphasizing that participation was entirely voluntary and would not affect their evaluations. Additionally, participants were assured of the confidentiality of their information.

4. Results

A total of 230 nurses participated in this research, with all their questionnaires deemed valid for analysis. The majority of participants were male (55.7%), married (53.9%), and held a bachelor's degree (84.8%). On average, they had 9.95 ± 8.44 years of work experience, including 22.74 ± 9.03 months of experience working in COVID-19 units ([Table 1](#)).

The average score for barriers to using PPE among nurses was 64.37 ± 15.33 . Organizational barriers scored higher, averaging 2.97 out of 5. Among these barriers, the statement "I have not received adequate training on how to correctly wear personal protective equipment" had the highest impact. For individual barriers, the statements "I do not believe in wearing personal protective equipment" and "I avoid using personal protective equipment because it may cause fear and stress in patients" were the most significant factors contributing to reduced PPE usage. Conversely, among

Table 1. Distribution of Absolute Frequency and Percentage of Research Units According to Demographic Characteristics

Demographic Characteristics	No. (%)	Mean ± SD
Age (y)		31.63 ± 9.03
18 - 30	122 (53.1)	
31 - 50	98 (42.6)	
> 50	10 (4.3)	
Gender		
Male	102 (44.3)	
Female	128 (55.7)	
Education		
BSc	195 (84.8)	
MSc	31 (13.5)	
PhD	4 (1.7)	
Marriage		
Single	106 (46.1)	
Married	124 (53.9)	
Work shift		
Morning	75 (32.6)	
Evening	23 (10)	
Night	36 (15.7)	
Two shifts	41 (17.8)	
Rotating	55 (23.9)	
Wearing glasses		
Yes	69 (30)	
No	161 (70)	
Underlying disease		
Yes	61 (26.5)	
No	169 (73.5)	
Type of underlying disease		
Lung disease	15 (6.52)	
Heart disease	14 (6.08)	
Endocrine disease	11 (4.78)	
Neuromuscular disease	6 (2.6)	
Others	38 (16.52)	
Work experience (y)		9.95 ± 8.44
<10	127 (55.2)	
10 - 20	74 (32.2)	
> 20	29 (12.6)	
BMI		24.57 ± 3.39
Low weight	32 (13.9)	
Proportional	131 (57)	
Overweight	61 (26.5)	
Fat	5 (2.2)	
Very fat	1 (0.4)	
Work experience in the COVID-19 department (mon)		22.74 ± 9.03
1 - 12	48 (20.9)	
13 - 24	128 (54.8)	
25 - 36	56 (24.3)	

Abbreviation: BMI, Body Mass Index.

organizational barriers, the statement "There is no proper ventilation in the departments" had the least impact. Similarly, the individual barrier "I sweat

constantly when wearing PPE" was ranked lowest in influencing reduced PPE use (Table 2).

Age ($P = 0.035$), gender ($P = 0.005$), work shift ($P = 0.004$), and use of glasses ($P = 0.044$) showed a

Table 2. Distribution of the Frequency and Average Barriers to the Use of Personal Protective Equipment in Nurses During the COVID-19 Pandemic by Item

Barriers to the Use of PPE	Min-Max	Mean \pm SD	Average Based on 1 to 5
Individual	7-35	19.69 \pm 6.07	2.81 \pm 0.86
Organizational	21-75	44.58 \pm 10.78	2.97 \pm 0.71
Total	30-110	64.27 \pm 15.33	2.92 \pm 0.69

Abbreviation: PPE, personal protective equipment.

statistically significant relationship with barriers to using PPE. Female nurses, those of older age, those working evening shifts, and those not using glasses experienced fewer barriers to using PPE (Table 3).

5. Discussion

This study aimed to identify the barriers to using PPE among nurses during the COVID-19 crisis. The findings revealed that organizational barriers had a more significant impact on the non-use of PPE compared to individual barriers. Consistent with these results, a study by Nikbakht Nasrabadi et al. identified organizational barriers – such as lack of equipment, time constraints, low supervision, and insufficient information – as major factors preventing personnel from using PPE (26). Similarly, Kohangi and Najafi conducted a study titled "Investigating the Factors Related to Non-Compliance with Standards of Personal Protective Equipment among Nursing Personnel" in Najaf Abad, Isfahan. Their findings showed that the most common reason for non-compliance with protective standards was a lack of adequate protective equipment (87.7%). Conversely, the least cited reasons were lack of belief in or knowledge about PPE standards (11%) (15). The alignment of findings across the three studies can be attributed to their being conducted in Iran, where similar organizational conditions influenced the provision of PPE.

Despite the importance of PPE being emphasized during nursing education and in-service training programs, specialized training for crisis-specific situations, such as the COVID-19 pandemic, was lacking. Nurses were not adequately trained on the prolonged use of specialized PPE, such as N95 masks, face shields, and protective suits, which were often required for entire shifts during the pandemic. Additionally, weaknesses in crisis management and the unpredictability of the COVID-19 pandemic meant that many countries, including Iran, lacked sufficient

reserves of PPE. This shortage led to increased costs, limited availability, and in some cases, misuse of PPE.

Although various factors can act as barriers to PPE usage, organizational challenges appear to play a larger role in Iran. Addressing these barriers through timely preparation, domestic production of PPE, and enhanced training programs could significantly improve compliance and encourage the use of PPE among healthcare personnel.

In a study by Badran et al. conducted in Jordan during the second wave of COVID-19, the findings revealed that the most significant barriers to using PPE among medical staff were the non-availability of PPE (35%), interference with their ability to provide patient care (29%), and insufficient time for donning and doffing PPE (23.2%) (17). Similarly, a study by Ashinyo et al. in Ghana identified the inadequacy of PPE as a key factor contributing to the low usage of PPE among healthcare workers (19). In India, George et al. examined the factors influencing PPE use among medical staff, highlighting that organizational policies, the availability of PPE, and its quality were the main determinants of whether or not PPE was used (21). Regarding the role of various factors, the study by Fan et al. in China identified improper sizing and concerns about the quality and effectiveness of PPE as major reasons for its underuse during the COVID-19 pandemic (20). Similarly, Sharma et al. highlighted individual, physiological, organizational, and environmental barriers as the key factors preventing PPE usage (18). Both of these studies were qualitative and relied on focused group discussions, whereas the present study is quantitative and descriptive-analytical in nature. Additionally, the research environments and organizational conditions in these studies differed from those of the current study.

Among the organizational barriers, the statement "I have not received the necessary training on how to properly wear PPE" had the greatest impact on the non-

Table 3. Distribution of the Mean and Standard Deviation of Barriers to the Use of Personal Protective Equipment in the Research Units According to Demographic Characteristics

Personal Information	N	Barriers to the Use of PPE (Mean \pm SD)	Test Result
Gender ^a			$t = 2.80$; $P = 0.005$
Male	128	66.77 \pm 14.07	
Female	102	61.14 \pm 16.31	
Marital status ^a			$t = 1.005$; $P = 0.31$
Married	124	63.33 \pm 14.74	
Single	106	65.37 \pm 16.27	
Education ^b			$F = 0.064$; $P = 0.93$
BSc	195	64.29 \pm 14.25	
MSc	31	63.83 \pm 21.18	
PhD	4	66.77 \pm 17.74	
Job ^b			$F = 2.38$; $P = 0.007$
Practical nurse	191	64.78 \pm 14.49	
Shift manager	27	57.59 \pm 15.79	
Head nurse	11	70.09 \pm 24.03	
Supervisor	1	66 \pm 1	
Work shift ^b			$F = 3.91$; $P = 0.004$
Morning	75	65.02 \pm 15.96	
Evening	23	52.73 \pm 16.54	
Night	36	67 \pm 14.91	
Two shifts	41	65.41 \pm 13.99	
Rotating	55	65.45 \pm 13.50	
Hospital ward			$F = 1.69$; $P = 0.18$
Critical ward	84	62.78 \pm 15.84	
Emergency ward	58	62.86 \pm 18.51	
General ward	88	66.63 \pm 12.06	
Glasses ^a			$t = -2.02$; $P = 0.04$
Yes	69	61.07 \pm 16.23	
No	160	65.50 \pm 14.69	
Underlying disease ^a			$t = 0.26$; $P = 0.79$
Yes	61	64.72 \pm 15.47	
No	169	64.11 \pm 15.32	
Age	-	-	$r^c = -0.13$; $P = 0.03$
Work experience	-	-	$r^c = -0.055$; $P = 0.40$
Work experience in the COVID-19 department	-	-	$r^c = 0.023$; $P = 0.72$
BMI	-	-	$r^c = -0.047$; $P = 0.48$

Abbreviations: PPE, personal protective equipment; BMI, Body Mass Index.

^a Independent t-test.

^b One-way ANOVA.

^c Pearson's correlation coefficient.

use of PPE. For individual barriers, the statements "I do not believe in wearing PPE" and "I use PPE less because it may cause fear and stress in patients" were the most significant contributors. Conversely, the item "There is no proper ventilation in the departments" among organizational barriers and "I sweat constantly when

wearing PPE" among individual barriers had the least impact on PPE usage. In line with the findings of the present study, Darda'u Rafindadi et al. in Malaysia identified the lack of training as a key factor preventing PPE use (27). Similarly, Yeon and Shin in South Korea demonstrated that training personnel could increase

PPE usage (28). However, in contrast to these studies, Chauhan et al. in India found that medical personnel had high knowledge, positive attitudes, and good performance regarding PPE use, and no significant barriers were reported (23).

Another finding of the study was that age, gender, and work shift of nurses were significantly associated with barriers to using PPE. Nurses who were younger, female, and working evening shifts reported fewer barriers to using PPE. In a study conducted by Ashinyo et al. in Ghana, the results showed that marital status, level of education, and major were significantly related to the use of PPE. Specifically, PPE usage was lower among widows and those with lower education levels (19).

One limitation of this study was the use of self-reported data, which may have led to a reporting bias, as participants might have been inclined to provide socially desirable responses. Since there was no way to control for this bias, the participants' statements should be interpreted with caution.

5.1. Conclusions

The findings of this study indicate that barriers to using PPE are moderate, with organizational barriers playing a more significant role. Given the critical importance of PPE in preventing diseases, particularly during crises such as the COVID-19 pandemic, it is recommended that organizations not only plan effectively but also provide comprehensive training to nurses on the proper use of PPE to enhance compliance.

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Footnotes

Authors' Contribution: M. N.: Writing – original draft, project administration and supervision; F. K.: Writing – original draft and article editing; A. H. P.: Data analysis; R. M.: Data curation.

Conflict of Interests Statement: The authors declare no conflict of interest.

Data Availability: The dataset presented in the study is available on request from the corresponding author during submission or after publication.

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