

The obedience of medical personnel to using personal protective equipment in preventing the transmission of COVID-19 at a private hospital in Indonesia

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Abstract

Background: As one of the vulnerable groups to be infected by COVID-19, healthcare workers are required to obey the hospital rules and protocols. However, it may remain challenging for them, especially related to the provision of using personal protective equipment.

Objective: This study examined the obedience of medical personnel to personal protective equipment in preventing the transmission of COVID-19 at PKU Muhammadiyah Hospital Yogyakarta, Indonesia.

Methods: This cross-sectional study examined 259 medical personnel (medical doctors, nurses, and midwives) in the hospital. Descriptive statistics, Chi-Square test, and multiple logistic regression were used for data analysis.

Results: The majority of respondents were nurses (80.3%) and female (63.3%). Those who had a poor attitude would be three times more likely to have poor obedience to using personal protective equipment (*Adj. OR: 2.81, 95% CI: 1.52 - 5.19*). Sex, age, length of work, level of knowledge, level of motivation, and facility support were not correlated with obedience to using personal protective equipment.

Conclusion: The finding reported that many medical personnel were not obedient to using personal protective equipment because their response to disease prevention was poor. The results can be used for further intervention and education or training programs for medical personnel.

Keywords: COVID-19; Personal Protective Equipment (PPE); medical personnel; hospital; Indonesia

Background

Healthcare workers are one of the most vulnerable groups directly contacted with patients and need to keep their safety during the COVID-19 pandemic (Bahl et al., 2020; Tosepu, Effendy, & Ahmad, 2020).

They will be more in danger if there are many health problems related to Personal Protective Equipment (PPE). The COVID-19 pandemic has changed the demand and supply of PPE, especially for healthcare workers. A study in Australia revealed that a healthcare worker could have the risk of being infected around three times (Quigley, Stone,

Nguyen, Chughtai, & MacIntyre, 2021). A study in the United States of America compared the exports and imports of PPE (face masks, eye protection, and medical gloves) and particularly described how the exports decreased and imports increased before the pandemic and during the pandemic (Cohen & van der Meulen Rodgers, 2020; Tosepu, Effendy, Lestari, et al., 2020). The shortages of PPE have also happened in United Kingdom (UK) since the healthcare workers (HCWs) reported challenges such as the inappropriate provision of PPE, undefective training, and inadequate guidance (Hoernke et al., 2021). Due to these facts, it is reasonable that the majority of health workers have a problem with the obedience to using PPE during the COVID-19 pandemic. A study in Nigeria found that one determinant of healthcare worker mortality due to COVID-19 is the inadequate supply of PPE which made most of them even re-use it (Hoernke et al., 2021; Ilesanmi, Afolabi, Akande, Raji, & Mohammed, 2021; Toomey et al., 2020). The World Health Organization (WHO) has established a guideline about hand hygiene such as hand rub, hand wash, and times required for both (World Health Organization, 2015). One review study summarized that most surgical masks were deprived of supply leading to the high risk of contracting the patients regularly (Toomey et al., 2020). Furthermore, pharmacists are also encouraged to wear PPE consistently (Hasan, Kow, & Zaidi, 2021).

The adherence of healthcare workers to using PPE is varied around the world. A study in Egypt found the adherence to IPC (Infection Prevention and Control) measures was a significant determinant of COVID-19 cases among health workers (El-Sokkary et al., 2021; Telford et al., 2020). One preventive way to increase awareness about COVID-19 is by providing training. For instance, a study in the USA provided medical teams in the surgery room with training on using PPE, for example, donning and doffing processes (Neuwirth, Mattner, & Otchwemah, 2020). Furthermore, a previous study found training on PPE was important to ensure healthcare workers received regular updates and get monitored for the use of PPE (Barratt, Shaban, & Gilbert, 2020). However, using PPE in Turkey resulted in complaints of having dryness, irritation, and wound on the hands (Çiriş Yildiz, Ulaşlı Kaban, & Tanriverdi, 2020). In an evaluation of the PPE helper program, more than half of respondents met the PPE helper significantly more positive range of

statements (Castro-Sánchez et al., 2021; Haque et al., 2020). This study aimed to examine the obedience of medical personnel to using PPE in preventing the transmission of the COVID-19 pandemic, particularly at PKU Muhammadiyah Hospital, Yogyakarta, Indonesia.

Methods

Study Design

A cross-sectional study was carried out on medical personnel at PKU Muhammadiyah Yogyakarta Hospital, Indonesia.

Target Population and Sampling technique

The target population consisted of medical personnel such as medical doctors, nurses, and midwives who were in direct contact with and gave treatment to patients at PKU Muhammadiyah Yogyakarta, Indonesia. Data of health personnel were obtained from the hospital. Eligible respondents should be 1) permanent workers, 2) willing to sign informed consent forms, 3) and completed questionnaires. This study used the total sampling technique, which selected the entire study population as the sample. The sample size was 259 medical personnel at the hospital.

Instruments

Questionnaires consisted of closed-ended questions. Kuder Richardson 20 (KR-20) was used in the preliminary study for the reliability test of knowledge (0.818), the obedience of medical personnel (0.789), attitude (0.750), motivation (0.718), and facility support (0.736). A pre-test on 30 health personnel was conducted at another hospital that was located in the study areas. The research instrument used was a structured questionnaire composed of six parts: characteristics of the respondents, the obedience of respondents to using PPE, their knowledge of PPE, attitude to using PPE, their motivation to using PPE, and facility support checklist. The questions regarding characteristics of respondents asked about professions such as medical doctor, nurse, and midwifery. Sex (male and female), age, and duration of work (< 3 years and more than 3 years) were also asked in this part.

Obedience to using PPE was asked in ten statements about the use of PPE at the hospital. Every statement had the right and wrong answers. Wrong answers would get a '0' score, and right

answers were worth '1'. The four categories of the answers were never (N), sometimes (S), often (O), and always (A). The level of obedience to using the PPE was categorized into 'Good' and 'Poor'. Good was a category for right answers (always in positive statements and never in negative statements). Poor was the other category for the respondents with wrong answers of N, S, and O in positive statements and of S, O, and A in negative statements.

Knowledge of medical personnel (10 questions) was related to the respondents' use of PPE and prevention behavior. The attitude of medical personnel (11 statements) discussed the use of PPE and personal hygiene. The motivation of medical personnel (10 statements) was in relation to their courage to use PPE and apply prevention behavior and personal hygiene. The total median score of each knowledge, attitude, and motivation of medical personnel was classified into two groups: good for the total score of more than mean and poor for the total score of equal or less than mean.

Facility support (complete or incomplete facility) was assessed from 11 types of available facilities such as mask standard, respirator, goggles, face shield, examination gloves, surgical gloves, disposable gowns, coverall, heavy-duty apron, waterproof boots, and shoe cover. All of the available facilities would be categorized as complete, while one or

more facilities missing were categorized as incomplete.

Data Analysis

Outcome measurement was the level of obedience of medical personnel to using PPE (good or poor) concluded from ten statements. Descriptive statistics were used to determine the frequency, percentage, median and interquartile range for all variables. The Chi-Square test and multiple logistic regression were used to examine associations among variables.

Ethical Consideration

The research approval was obtained from the office of the Research Ethics Commission at PKU Muhammadiyah Yogyakarta Hospital (Certificate of Approval No. 0043/KT.7.4/X/2020). Then, informed consent forms were collected from participating respondents. After these two stages, the data collection was conducted in September 2020.

Results

Table 1 below shows that most respondents were nurses (80.3%) and females (63.3%). Most of them were middle-aged adults (36-55 years) (64.9%) and had worked for three years and more (92.7%).

Table 1 Characteristics of medical personnel at PKU Muhammadiyah Yogyakarta Hospital

Variables	Frequency (n)	Percentage (%)
Profession		
Medical doctors	29	11.2
Nurses	208	80.3
Midwives	22	8.5
Sex		
Male	95	36.7
Female	164	63.3
Age		
Young adults (18-35 years)	91	35.1
Middle-aged adults (36-55 years)	168	64.9
Duration of work (year)		
< 3 years	19	7.3
3 years and more	240	92.7

Table 2 describes the obedience of medical personnel to using PPE in detail. More than half of the respondents used PPE accordingly when treating patients. Most of the respondents immediately removed the masks after completing the intervention with patients. However, they did not

change the masks every 4 hours. More than half of them used a protective face shield when doing procedures. Additionally, the majority wore a gown only when helping patients. More than half of them always immediately changed the gown when it got splashed. On the other hand, the majority only used

a mask when leaving the room. More than half of them only used a mask, face shield, gown, and gloves after getting reminded by the senior workers. Furthermore, almost all of the respondents always

did not wear gloves when handling patients. In addition to using gloves, they just changed the gloves once a day.

Table 2 Distribution of level of obedience to using PPE per statement

Statements	Never (%)	Sometimes (%)	Often (%)	Always (%)
I use PPE according to the procedure when treating patients	0	0	154 (59.5)	105 (40.5)
I only use a mask when I leave the room	44 (17)	15 (5.8)	118 (45.6)	82 (31.7)
I immediately remove the mask after completing the intervention with patients	44 (17)	38 (14.7)	58 (22.4)	
I use a protective face shield when doing procedures where splashing liquid onto the face is required	0	10 (3.9)	114 (44)	135 (52.1)
I only use a mask, face shield, gown (apron), and gloves when getting reminded by the senior workers	15 (5.8)	53 (20.5)	47 (18.1)	144 (55.6)
I wear a gown (apron) only when helping patients	77 (29.7)	68 (26.3)	72 (27.8)	42 (16.2)
I do not wear gloves when handling patients	0	53 (20.5)	10 (3.9)	196 (75.7)
I immediately change my gown when it gets splashed with blood or fluids from the patient's body	0	0	123 (47.5)	136 (52.5)
I change my mask every 4 hours	25 (9.7)	101 (39)	89 (34.4)	44 (17)
I change my gloves once a day	10 (3.9)	5 (1.9)	20 (7.7)	224 (86.5)

Table 3 presents that 35% of the health personnel had poor obedience to using PPE. It could be seen from the level of knowledge (poor: 52.9%), level of

attitude (poor: 54.1%), level of motivation (poor: 49%), and facility support (incomplete: 3.1%).

Table 3 Distribution of independent variables and dependent variable

Variables	Frequency (n)	Percentage (%)
Obedience to using PPE		
Good	166	64.1
Poor	93	35.9
Min-Max: 26-37, Mean: 31.75, Std. Deviation: 2.538		
Level of knowledge		
Good	122	47.1
Poor	137	52.9
Min-Max: 26-40, Mean: 31.89, Std. Deviation: 2.901		
Level of attitude		
Good	119	45.9
Poor	140	54.1
Min-Max: 32-63, Mean: 39.06, Std. Deviation: 5.208		
Level of motivation		
Good	132	51
Poor	127	49
Min-Max: 25-35, Mean: 30.69, Std. Deviation: 2.533		
Facility support		
Complete	251	96.9
Incomplete	8	3.1

Table 4 Correlation between each independent variable and obedience to using PPE

Independent variables	n	Obedience to using PPE		Crude OR (95% CI)	p-value
		Good (%)	Poor (%)		
Sex					
Male	95	64.2	35.8	1	
Female	164	64	36	1.01 (0.6-1.71)	1.000
Age					
Young adults (18-35 years)	91	69.2	30.8	1	
Middle-aged adults (36-55 years)	168	61.3	38.7	1.42 (0.83-2.44)	0.257
Duration of work (year)					
< 3 years	19	68.4	31.6	1.23 (0.45-3.36)	
3 years and more	240	63.7	36.3	1	0.87
Level of knowledge					
Good	122	69.7	30.3	1	
Poor	137	59.1	40.9	1.59 (0.95-2.66)	0.102
Level of attitude					
Good	119	79	21	1	
Poor	140	51.4	48.6	3.55 (2.05-6.17)	0.0001
Level of motivation					
Good	132	75	25	1	
Poor	127	52.8	47.2	2.69 (1.59-4.55)	0.0001
Facility support					
Complete	251	64.1	35.9	1	
Incomplete	8	62.5	37.5	1.07 (0.25-4.596)	1.000

Table 5 Multiple logistic regression on the obedience of medical personnel to using PPE

Independent variables	Adj. OR	95% CI, for Adj. OR		p-value
		Lower	Upper	
Sex				
Male	1			
Female	1.12	0.64	1.97	0.69
Age				
Young adults (18-35 years)	1			
Middle-aged adults (36-55 years)	1.17	0.66	2.09	0.59
Duration of work (year)				
< 3 years	0.92	0.31	2.71	0.88
3 years and more	1			
Level of knowledge				
Good	1			
Poor	1.002	0.56	1.81	0.95
Level of attitude				
Good	1			
Poor	2.81	1.52	5.19	0.001***
Level of motivation				
Good	1			
Poor	1.75	0.94	3.26	0.08
Facility support				
Complete	1			
Incomplete	0.994	0.21	4.71	0.994

Table 4 shows that the chi-square test result displayed the majority of the respondents were female (164), of whom 64% showed good obedience to using PPE. Most of the respondents were middle-

aged adults (36-55), of whom 61.3% had good obedience. Level of knowledge and facility support were not significantly correlated with obedience to using PPE. Variables having a significant correlation

with obedience to using PPE were level of attitude ($p = 0.001$) and level of motivation ($p = 0.001$).

The multivariate analysis in Table 5 showed that medical personnel who had poor attitudes were three times more likely to have poor obedience to PPE. Duration of work, level of knowledge, level of motivation, and facility support were not significantly correlated with obedience to using PPE.

Discussion

The COVID-19 has emerged for more than a year and has become a new disease that has caused devastating effects on human life. With this outbreak, the solicitation for PPE has also been very high (Cohen & van der Meulen Rodgers, 2020) and has become a particular concern to those, including health workers who work at the forefront of dealing with this outbreak (Shaw, Flott, Fontana, Durkin, & Darzi, 2020). In addition to dealing with large numbers of patients, working overtime and using PPE also may cause health workers to get tired quickly (Battista, Ferraro, Piccioni, Malzanni, & Bussi, 2021; Shaukat, Ali, & Razzak, 2020). In addition, PPE deficiency has also occurred in Indonesia (Tosepu et al., 2021). Therefore, very high-quality PPE is required for maximum prevention (Wise, 2021).

Some medical personnel sometimes and often used PPE during their practice at the hospital. This shows that the worrying spread of COVID-19 does not make them use PPE to protect themselves. It is required to better understand COVID-19 transmission together with high-quality clinical data in encouraging health workers to show a good attitude to using PPE (Ippolito et al., 2020). Although a decrease in the COVID-19 infection rates is a shadow of the PPE measures, the use of PPE should appropriately protect healthcare workers (Stewart, Thornblade, Diamond, Fong, & Melstrom, 2020).

The majority of the respondents were women and the middle-aged adult group, as well as had worked for more than three years. Yet, age, sex, and duration of work did not have a significant correlation with obedience to using PPE. A previous study in Nigeria showed that sex had a significant relationship, while age and years of practice had no

significance as the current study showed (Oche et al., 2020). However, it is still necessary to carry out interventions for medical personnel of all ages and different duration of work which possibly will determine their skills.

Facility support at the hospital was almost fulfilled. Almost all of the health workers had good knowledge of using PPE. However, most of them still had a poor attitude, as it happened in Nigeria (Alao, Durodola, Ibrahim, & Asinobi, 2020). Over workload due to the increasing number of patients every day is possibly the reason (Battista et al., 2021). Recruiting more health personnel might be an excellent solution for dividing fair shifts of work. However, this study contradicts a study in Bangladesh where health personnel had a good attitude towards the use of PPE (Hossain et al., 2021).

Strength and Limitation of the Study

Investigations on obedience to using PPE in preventing the spread of COVID-19 might be rare in Indonesia. Health personnel in all Indonesian regions were not included in this study, and thus future studies could collect more data from greater numbers of respondents. However, the current results may still be beneficial to the authorized units to set preventive strategies for controlling the spread of COVID-19.

Conclusion

This study revealed some baseline factors related to obedience to PPE use in preventing the spread of COVID-19 among health personnel at PKU Muhammadiyah Yogyakarta Hospital, Indonesia. Many health personnel had good knowledge about COVID-19 characteristics, but some were not obedient to using PPE. Attitude to disease prevention measures was in turn correlated significantly with poor obedience to using PPE. This study might benefit the authorized units, including the central government, the Indonesian Ministry of Health, and local municipalities in Indonesia. The results can be used as references for further intervention and training programs for medical personnel.

Declaration of Conflicting Interest

All of the authors declare no conflict of interest in this study.

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Author Contribution

Conceptualization (EPH and DS), methodology (EPH and DS), data analysis (VAE and SS), investigation (EPH and DS), resources (EPH, DS, and SS), writing original draft preparation (DS, MM, and SS), writing review and editing (DS, MM and SS), visualization (DS, VAE, and SS), supervision (DS and MM), and project administration (EPH and DS). All authors approved the final version of the manuscript.

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