

The Use of Personal Protective Equipment and The Risk of Facial Pressure Sores among Nurses in Covid Isolation Rooms

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ARTICLE INFO

ABSTRACT

Article history

Received 13 July 2022

Revised 10 August 2022

Accepted 20 August 2022

This study aimed to determine the relationship between the use of personal protective equipment and the risk of facial pressure injury among nurses in the Raudhah 5 room of Muhammadiyah Hospital Bandung (RSMB). This study is a quantitative correlation study with a cross-sectional research design. The research population is 15 COVID-19 isolation nurses in RSMB with a total sampling technique. Bivariate analysis used is the contingency coefficient correlation test. Nurses that used personal protective equipment or more than 50% had a moderate risk of pressure injury as experienced by ten nurses (66.7%). The correlation coefficient test of personal protective equipment obtained a p-value= 0.537. There is no relationship between the use of personal protective equipment to the risk of facial pressure injury on nurses in RSMB. Nurses who use level 3 of PPE, especially in the facial area, should use dressings to prevent the risk of facial pressure injury.

Keywords

Nurses
Facial Pressure Sores
Personal Protection
Equipment
COVID-19

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Introduction

The world was shocked by the emergence of a new virus in early 2020 known as COVID-19. The virus infects humans. The reputed reservoir of transmission of COVID-19 is bats. WHO

announced that in March 2021, there were 113,820,168 confirmed cases of COVID-19 worldwide. Then for COVID-19 cases in Southeast Asia in February 2021, there were 2,148,044 confirmed cases [1]. Indonesia is ranked first in the highest COVID-19 cases in Southeast Asia; at the beginning of COVID-19 cases in 2020, only two cases were found, and currently, there have been 1,347,026 confirmed COVID-19 cases in March 2021. Especially in West Java province, there have been 212,874 cases of COVID-19, divided into 36,769 active cases, 173,741 recoveries, and 2,364 deaths. The Indonesian Doctors Association announced in January 2021 that 504 health workers died, consisting of 237 doctors, 15 dentists, 171 nurses, 64 midwives, ten medical laboratory personnel, and seven pharmacists [2].

The transmission of COVID-19 is effortless because it can be transmitted from one individual to another through droplets when sneezing, coughing, or even talking [3]. The impact on health workers, especially nurses at the frontline, is the increased workload of COVID-19 patients, weakness, and susceptibility to exposure to COVID-19. Nurses exposed to or positive for COVID-19 will experience symptoms such as cough, sore throat, fever, myalgia or arthralgia, fatigue, and headache. Nurses who are exposed to COVID-19 are symptomatic, and some are asymptomatic. The signs and symptoms after exposure to COVID-19 appear about five days. The incubation period of this virus is around twelve to fourteen days, but different covid-19 variants can have different incubation periods. If nurses infected with COVID-19 are not treated promptly, complications may arise. The heart and lungs are the two organs that are affected and can even cause the death of the patient [3].

However, COVID-19 transmission can be prevented by self-isolation, minimizing interactions with others, diligently washing hands with soap in running water or using hand sanitizers, always using a mask outdoors, not touching the face area, and always maintaining and applying to cough or sneezing ethics. However, these preventive measures are insufficient for nurses or other health workers working in hospitals or other health facilities to prevent the transmission of COVID-19. Nurses are the frontiers of the health care system. Therefore they are more likely to be infected with this dreadful coronavirus. Thus, they can protect themselves and prevent the transmission of COVID-19 by using personal protective equipment (PPE), among others.

PPE itself has a definition: equipment that maintains the safety of workers and people around them following the risks and hazards at work [4]. PPE must be adjusted to its standard and level of protection. The COVID-19 Handling Task Force recommends PPE based on the level of safety, and there are three levels of PPE that are adjusted to the group, location, coverage, and type of PPE [5]. PPE used by nurses when handling COVID-19 patients must be level 3 PPE consisting of goggles glasses, face shields, head coverings, head caps, N95 masks, gloves,

isolation gowns or suits, hazmats, and foot boots protection. LEVEL 3 PPE consists of several parts such as eye PPE, breathing, hands, protective clothing, and foot protection.

Facial PPE such as face shields made of glass, headgear, head caps, and N95 masks cause a risk of facial pressure sores. The continuous use of facial PPE can irritate the bridge of the nose, forehead, and on the mask strap. In addition, using airtight PPE causes excessive sweating, which results in redness, pain, itching, and increased friction on the skin surface [6]. Therefore, all of these induce a risk of facial injuries among nurses.

To Prevent the transmission of COVID-19, nurses must wear PPE when providing nursing care to infected patients. PPE level 3 is disposable, and the maximum use time is four hours [5]. Incidence of shortness of breath, blurred vision, nausea, fainting, vomiting, diarrhoea, and risk of pressure sores are noted among nurses wearing PPE for a prolonged period.

Level 3 personal protective equipment (PPE) used in the facial area is the leading cause of the risk of facial pressure sores [7]. Compressive wounds have a definition proposed by the National Pressure Ulcer Advisory Panel (NPUAP), namely local tissue necrosis. The pressure sores among nurses and other health care providers start from the use of masks, mask straps, goggles, glasses, and face shields when pressed on the bridge of the nose, ears and forehead and other bony parts of the cheeks. [6]. In addition, several impacts of using PPE for a prolonged time, such as; contact dermatitis, allergies, folliculitis, tenderness, redness, pigmentation, desquamation, and itching, are also noted.

Based on the preliminary study of interviews and questionnaires conducted among five nurses in the COVID-19 isolation room in Raudhah 5 Muhammadiyah Hospital Bandung. A total of 190 COVID cases from January–April 2021 is 190 as a total bed capacity. When serving the nurses rendering nursing care, use level 3 PPE with a duration of use higher than 4 hours; when using level 3 PPE, especially on the face of the nurse experiencing excessive sweating, redness occurs around the face, itching, rash and also pain. The risk of facial pressure sores in nurses occurs a lot in the area of the bridge of the nose, forehead, and ears. It is in line with research conducted by Ref. [6] on 4,306 doctors in 191 hospitals in the country. China has reported that as many as 42.8% of confirmed doctors have skin injuries due to using PPE. Descriptive research conducted in Malaysia on nurses in the ICU room experienced pressure sores on the nose due to a stricter N95 mask so as not to contract COVID-19 with the duration of using this N95 mask of about 5 hours. In addition, there was another descriptive study in 61 respondents with a questionnaire taking reported that there was a reaction that caused injuries to the faces of health workers who used N95 masks with wounds on the bridge of the nose (68.9%) and itchy faces (27.9%) [8].

A facial mask can cause itching, pain, and pressure sores due to friction and can increase the possibility of infection. In this case, preventive measures are to wear a soft dressing, change the PPE according to the required usage period, and provide a cool work environment so that health workers can reduce discomfort in using PPE [9].

In connection with the phenomenon of pressure sores risk that occurs in nurses and the importance of nurses preventing the risk of facial pressure sores in the fight against COVID-19, and the absence of those who have conducted research in Indonesia on this, the Author is interested in running a study with the title "the relationship between the use of personal protective equipment and the risk of facial pressure sores in nurses in room 5 of Muhammadiyah Hospital Bandung".

Literature Review

PPE is a standard of vigilance in preventing and controlling infections in all health facilities. The purpose of using PPE is to protect health workers and patients from exposure to diseases and pathogenic microbes. The type of PPE for health workers is divided into three levels of protection: [10] head protection, 3-layer surgical masks, N95 masks, goggles, face shields, gloves, protective clothing, and foot protection boots [5].

Pressure sores damage the skin area and soft tissues, and usually, there are protrusions in the bones due to medical or other devices. The risk of facial pressure sores in nurses during the COVID-19 pandemic is due to the duration of using PPE of about 4 hours. These pressure sores are caused by pressure, friction, shearing, and humidity. Pressure sores are classified into 4 stages and 2 additional stages [11][12][13].

Methodology

This quantitative correlational research will examine and explain the relationship between variables using *cross-sectional* research methods/designs [14]. The researchers intend to study the relationship between the use of PPE and the onset of the risk of facial pressure sores in nurses. The data was obtained from filling out the respondent's questionnaire sheet.

Result

A. Characteristics of Respondents

Table 1. shows the frequency distribution of characteristics of nurse respondents in Raudhah 5th Room of Muhammadiyah Hospital Bandung.

Table 1. Frequency distribution

Characteristic	Frequency	Percentage
Age		
21 - 30	4	26,7%
31 - 40	9	60%
> 40	2	13,3%
Gender		
Male	4	26,7%
Female	11	73,3%
Education		
DIII - Nursing	9	60%
Profession	6	40%
Ners/S.Kep., Ners		

Based on Table 1, the characteristics of respondents are most dominated by the age of 31 - 40 years old or nine respondents (60%), female or 11 respondents (73.3%), and the education category is more nurses with D-III graduates of Nursing as many as nine respondents (60%).

B. Use of Personal Protective Equipment

Table 2 shows the frequency distribution of nurses using PPE in Raudhah 5th Room of Muhammadiyah Hospital Bandung.

Table 2. Frequency Distribution of Nurse who uses PPE

Score	Frequency	Percentage
75%	9	60%
87,5%	4	26,7%
100%	2	13,3%
Total	15	100%

Table 2 shows the results of PPE use in nurses based on the number of research questionnaire statements and the number of respondents who answered 'Yes' in each statement. The score of the PPE use questionnaire was divided into three according to the number of 'Yes' answers in the PPE use questionnaire statement. The result of the average score of PPE use in nurses in the Raudhah room 5 with the help of the MS Excel application is 80%.

C. Risk of Facial Pressure Sores

Table 3 shows the frequency distribution of the risk of facial pressure wounds among nurses in Raudhah 5th Room of Muhammadiyah Hospital Bandung.

Table 3. Frequency Distribution of Risk of Facial Pressure Wounds

Level	Frequency	Percentage
Low Risk	1	6,7%
Moderate Risk	10	66,7%
High Risk	4	26,7%
Total	15	100%

Based on Table 3, the highest risk of facial pressure sores in room nurses in Raudhah 5 is a moderate risk (for)10 respondents (66.7%).

D. Cross-Tabulation of PPE Use against the Risk of Facial Pressure Sores

Table 4 shows the result of Cross-Tabulation of PPE Usage against the Risk of Facial Pressure Sores in Nurses in the Raudhah Room of Muhammadiyah Hospital Bandung in August 2021 (n=15).

Table 4. Cross-Tabulation of PPE Usage

Score	Risk of Facial Pressure Sores			Total	P-value	Correlation Coefficient
	Low Risk	Moderate Risk	Risiko Tinggi			
6 (75%)	1 11,1%	7 77,8%	1 11,1%	9 100%	0,537	0,415
7 (87,5%)	0 0%	2 50%	2 50%	4 100%		
8 (100%)	0 0%	1 50%	1 50%	2 100%		
Total	1 6,7%	10 66,7%	4 26,7%	15 100%		

Based on Table 4, the score of 6 PPE usage against the onset of the risk of facial pressure sores was low at nine at 0 for one person at 11.1%, medium risk for seven people at 77.8%, and high risk for one person at 11.1%. Score 7 PPE use against the onset of low risk of facial pressure sores as much as 0 or none 0%, medium risk two people 50%, and high risk two people 50%. Score 8 PPE use against the onset of low risk of facial pressure sores as much as 0 or none 0%, medium risk one person 50%, and high risk one person 50%.

Discussion

The characteristics of respondents in this study were seen from the demographic data of respondents. Based on the Table, most of the respondents aged 31–40 years were nine people 60%, 11 were female, 73.3% and had D-III Nursing education. Ref. [6] shows the results of her research that most nurses experience the prevalence of skin injuries with undergraduate education levels and nursing professions of the female sex, with an average age range of 32-40 years who use PPE level 2 and level 3 as well as a daily PPE use time of 4 hours and more than 4 hours. Logistic regression analysis showed that PPE levels, daily PPE use time, and gender could lead to the presence of excessive sweating, which increases the risk of skin injury significantly.

This is in line with research that conducted a survey using questionnaires to 65 health workers in China who are at the forefront of fighting COVID-19 with an average age of 30 – 39 years. The results of the 61 respondents who filled out the questionnaire showed that most were female, and as many as 56 people were 91.8% [8].

Based on the results of the bivariate analysis in Table 4, the results of p-value was 0.537 higher than 0.05, which means that H_0 is accepted or there is no relationship between the use of personal protective equipment and the risk of facial pressure sores in nurses in room 5 of Muhammadiyah Hospital Bandung.

Based on the analysis results, there is no relationship between the use of personal protective equipment and the onset of the risk of facial pressure sores from the time of use of PPE, especially in the facial area. The frequency of PPE use time is at most 3 hours and 30 minutes for as many as seven people, 46.7%. This is in contrast to the research stating that the duration of using PPE for > 6 hours is the main factor that causes pressure sores on the skin of the nurse's face. The results of other studies show that the duration of continuous use of PPE in health workers is more than 6 hours a day [15].

In addition, other possible factors support the study's results that there is no relationship between the use of PPE and the risk of pressure sores in nurses, namely by using foam dressings before using PPE, especially when using PPE on the face area states that [16] dressing precautions can minimize or even eliminate pressure and shearing at the site of pressure sore risk. The dressing serves to absorb sweat, can redistribute pressure, and this dressing does not cause a pruritus effect. Using such dressings reduces pressure injuries from more than 80% to 10% [17].

Using personal protective equipment for nurses or other health workers is an important thing that must be used to protect nurses or patients from the transmission of nosocomial infections and healthcare-associated infections. At the beginning of the emergence of a new virus variant known as COVID-19, controlling and breaking the spread chain became the main goal of care providers or health services. Nurses in charge of handling or caring for COVID-19 patients are required to use complete PPE, commonly called level 3 PPE consisting of coveralls and aprons, head coverings, N95 masks, google and Faceshield glasses, disposable sterile gloves, and protective shoes. This is done to minimize the transmission of COVID-19 either from patients or the nurses themselves. This is in line with the study's results, which stated that nurses' compliance in using PPE when providing care to COVID-19 patients who produce aerosols was 97.5%.

The use of personal protective equipment PPE according to Chinese regulatory regulations, every health worker needs to change PPE every 4 hours. But this is not in line with the facts on the ground. Nurses and other health workers sometimes have to work beyond the existing rules of about 8-12 hours, causing inconvenience to their users [6].

One of the effects caused by the prolonged use of PPE is the onset of pressure sores on the facial skin area caused by the use of PPE in face areas such as head caps, goggle glasses, face shields and N95 masks. This is in line with the study that out of 61 health workers, as many as

58 people, 95.1% reported adverse effects on facial skin, namely the presence of fibrosis scarring 68.9%, itching in the facial area 27.9%, damage to the skin 26.2%, dry skin 24.6% and redness in the face area 16.4% [8]. Pressure sores on the facial area are often at risk on the bridge of the nose, cheeks, ears, and forehead. It happens because these locations are the locations where PPE is used in the face area. PPE in these locations can cause friction with the skin of the face because the PPE material may be stiff and can damage the skin and subcutaneous tissue [18].

The risk of facial pressure sores can be classified into four stages. Stage 1 is characterized by intact skin, with non-whitening redness changes in sensitivity, temperature, and consistency can precede visual; stage 2 is characterized by a partial loss of skin thickness, with exposure to the dermis, pink or red wounds, moist, and may also appear as whole blisters or ruptures, tissue fat and deep tissues are not visible; stage 3 is characterized by loss of skin in total thickness, where fat is visible, no exposure to fascia, muscles, tendons, ligaments, cartilage and bone; stage 4 is characterized by a complete loss of skin thickness and loss of tissues with direct exposure or palpation of the fascia, muscles, tendons, ligaments, cartilage or bones [9].

The risk of facial pressure sores can be assessed using the Norton scale, which has three classification scores: a score lower than 15: high risk, 16 -18: medium risk, and higher than 19: low risk. The results of the analysis in this study were more nurses who experienced moderate risk of ten people (66.7%), high risk (26.7%), and low risk of 1 person (6.7%) [19]. Although the results showed that there was no relationship between the use of PPE and the onset of the risk of facial pressure sores because the duration of using PPE 3 nurses at most was 3 hours and 30 minutes. This still affects the risk of pressure sores for 3 hours because when the nurse provides nursing care for COVID-19 patients, they cannot touch PPE (especially those used in the facial area) even though it feels uncomfortable and painful [17].

Conclusion

The conclusion of the study entitled "The Relationship Between the Use of Personal Protective Equipment against the Risk of Facial Pressure Wounds Among Nurses in Raudhah Room 5 Muhammadiyah Hospital" is based on the contingency or physical correlation test, namely 0.537 higher than 0.05, the result decision shows that there is a moderate risk (no relationship between) in the use of personal protective equipment and the risk of facial pressure sores in nurses in Raudhah 5th Room of Muhammadiyah Hospital Bandung.

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