

PPE-related physical health issues: impacts on work performance of the healthcare workers in hospital settings during the outbreak of COVID-19: A literature review.

Bachelor's degree thesis

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<p>Abstract:</p> <p>The purpose of this literature review is to explore what are the causes of physical health related issues from wearing PPE and how does the use of PPE affect healthcare workers' work performance.</p> <p>Physical health related issues from wearing PPE are new emerging problems since the outbreak of COVID-19. This thesis finds out what are the causes and factors that affect the physical health and work performance of the healthcare workers. To preserve the health and safety of the healthcare workers, the "Health Promotion" theory by Nola J. Pender plays the role of theoretical framework to identify the issues of wearing PPE.</p> <p>Inductive research method is done by coding, classifying, and separating into themes from the articles chosen from Google Scholar. 10 articles were chosen after the application of inclusion and exclusion criteria. The results from the articles highlighted the use of PPE for prolonged periods in hot or intensive environment leading to headaches, skin problems, fatigue, breathlessness, and discomfort. The reason for poor work performance by the healthcare workers was the prolonged period causing bad vision, hard to communicate, wrong size of PPE use, & hard to handle tools. This thesis helps the health organizations to identify issues from the use of PPE.</p>	
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FOREWORD

I would like to give special thanks to those who supported, being patient, understanding and guided me through this time. I would also like to thank my closest ones for their moral support throughout this period. Lastly, I extend my thanks to the supervisor for providing me with relevant materials and guidance that I needed throughout this study.

1 INTRODUCTION

COVID-19 is a viral pneumonia disease caused by a new coronavirus called SARS-CoV-2. Compared to the number of people affected worldwide by COVID-19, nearly all will experience mild respiratory symptoms and with no medical care need, while some with no prior to age group are more probably to be affected heavily by the virus either leading to death or needing for intense medical care. (World Health Organization, 2022)

In the medical field, Personal protective equipment (PPE) is commonly used in surgical wards, infection wards, home care, in medical equipment handling as well as when nurses in taking care of patients for example in suspected or confirmed COVID-19 cases. (WHO, 2020)

The World Health Organization (WHO) defines PPE in healthcare field as a use of set of devices to prevent the transmission of contagious biological agents (WHO, 2022).

During the outbreak of COVID-19, a contagious virus that spread and infecting lot of people throughout the world leading sharp rise in hospitalization (Salway, Silvestri, Wei, & Bouton, 2020). Controlling the spread of the virus while giving care interventions to the COVID-19 suspected patients has been unpredictably challenging. Studies show that even with the use of PPE (Personal Protective Equipment), the medical staff getting infected (MacIntyre, Chughtai, Seale, Richards, & Davidson, 2015); (Yeom, et al., 2011).

The purpose of this study is to mainly focus on what are the causes of physical health related issues from wearing PPE and how does the use of PPE affect healthcare workers' work performance.

The background of this article will show an idea of what is PPE-related issues. The theory selected for this thesis is "The Health Promotion" by Nola J. Pender and the details about the theory will be explained under the theoretical framework. As this thesis is a literature review using inductive research method, together 10 scientific articles collected from Google Scholar database, analyzed and reviewed. Methodology chapter will

present the details about how the process was undertaken. The results or findings from the chosen articles are presented in the Findings chapter which continues with discussion that briefly answers the research questions with the findings. Lastly, followed by conclusion, limitation, acknowledgement, conflict of interest and funding.

2 BACKGROUND

COVID-19 (Coronavirus disease) is a highly contagious disease related to SARS-CoV-2, which appeared first in China, in December 2019, causing massive spread and death rate worldwide, and even letting survivors with long lasting health problems (JOHNS HOPKINS MEDICINE, 2022). As the COVID-19 cases increased, the hospitalization of COVID-19 patients also increased forcing the healthcare workers to have personal protective equipment (PPE) on for infection control while taking care of them (Masatoshi, et al., 2020); (Xiaoqin, et al., 2020).

The outbreak of new contagious viruses for example, COVID-19, made a bid impact in creating distress, and alarming spread of the disease turning, especially when the whole situation of the disease was not under control. In the healthcare team, nurses play important role in controlling and stopping the spread of contagious diseases. The support of the medical staff is essential for those who are isolated due to the infection. Furthermore, even the nurses were under lots of pressure, concern, and stress with the lack of information about COVID-19. However, frontline nurses are the ones to provide care interventions to the infected patients directly. (Shu-Ching, Yeur-Hur, & Shiow-luan, 2020)

In nursing perspective, PPE is a set of protective equipment worn to lower the risk of exposure through direct/indirect physical contact to hazard situations which might result in occupational injuries and health problems (American Nurses Association, 2022) (UNITED STATES DEPARTMENT OF LABOR, 2022). Results of the study by Mokhtari, et al., 2021 highlighted the availability or lack of PPE when providing care for COVID-19 patients, having bad impacts on nurses' health and safety (Mokhtari, et al., 2021). During the outbreak of COVID-19, the demand for PPE skyrocketed globally with a rising price in spring 2020 due to the shortage of PPE (HUS, 2022).

In order to control the increase of transmission of deadly infectious diseases, the health professionals are forced to wear PPE, as they are at high risk of getting infected while

exposing themselves for a prolonged period of time and giving care interventions to the COVID-19 patients (Xiaoqin, et al., 2020).

The use of PPE is to protect the workers. However, Whelehan;Connelly;& Ridgway claims that some of the studies shows that the healthcare workers often experience trouble in giving good care to patients and their work performance got impacted badly to some degree while having to wear so many layers of PPE (Whelehan;Connelly;& Ridgway, 2020). Different companies and brands have different instruction in wearing, in which they want the healthcare workers to follow. Varying of donning and doffing of PPE instruction may also have high risk of getting infected (Hegde, 2020).

3 THEORETICAL FRAMEWORK

Nola J. Pender, who came up with Health Promotion Model in 1982. She is a nursing theorist, an author and professor at the University of Michigan. Nola J. Pender started researching health-promoting behaviour in the mid of 1970s and got to publish the Health Promotion Model in 1982. (Pender, Nursing Theory, 1982)

The Health Promotion Model is the process to uplift or inspire people to live within the environment by teaching them the healthy behaviours that improve the level of one's well-being and comprehend the health potential (Pender, Nursing Theory, 1982). When briefly explained, the Health Promotion Model states that every individual is different with their own personalities and knowledge affecting their successive performance. In health-promoting behaviour, with the help of nursing approaches, the verity of behavioural knowledge can be transformed to have desired behavioural outcome that result in better health outcomes with effective skills that leads to higher quality of life throughout all progressive stages (Pender, Nola Pender: Health Promotion Model, 1982).

According to World Health Organization, the definition for Health Promotion is when the people take control over, and improve, their health. This not only helps the people to cope with but also identify their health problems. This can be achieved by building a supportive healthy environment, improving societal activities and individual activities. (WHO, 2021)

During the outbreak of COVID-19, worldwide, had created a boundary between healthcare workers and patients, due its contagious nature. Use of PPE has broken those boundaries and the care interventions were assured to patients when help needed. The PPE is used for the workers protections. However, intense care interventions with having to wear PPE for long period of time, the healthcare workers suffered from PPE-related physical health problems and facing difficulties in work performance while wearing PPE.

Health promotion theory in this context plays the role of minimizing the risk of contamination by providing information on donning and doffing of PPE. As the theory suggests, need for improvement when identifying the health problems. In other words, when knowing the healthcare workers suffering from PPE-related physical health is-

sues, namely, headaches, pressure injuries, and decreased work performance. Ultimately, all leading to the risk of patient safety. In order to prevent hazards to patients during care interventions, all are indications for improvements such as, recommendations for providing healthcare workers 15 minutes break after every four hours use of PPE, which gives the chance to prevent injuries, to get relieved from having headaches and also to hydrate themselves properly.

As the theory suggests, that the desired behavioural outcome can be used to have better health results. Which in this context, the safety and health of the healthcare workers are ensured when provided with proper instruction on the use of PPE, such behavioural change minimizes the risk of getting infected and improves the moral strength of the healthcare workers when working with infected patients.

4 AIM & QUESTION

The aim of this study is to conduct a literature review in order to explore health issues that could be related to wearing personal protective equipment (PPE) experienced by healthcare workers and explore how wearing PPE could have an impact on work performance.

In order to reach the aim of the study the following research questions have been posed:

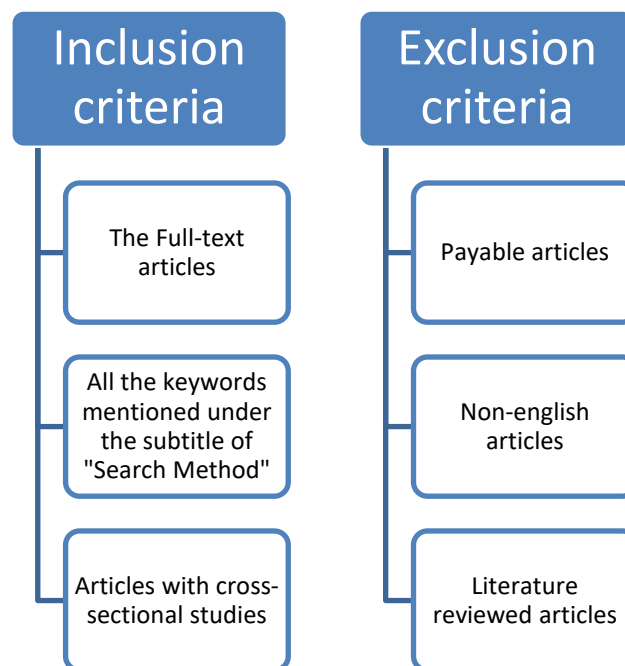
- What are the causes of physical health related issues from wearing PPE?
- How does the use of PPE affect healthcare workers' work performance?

5 METHODOLOGY

5.1 Search Method

A inductive research method used regarding PPE-related physical health issues affecting work performance of healthcare workers. The methods for selection criteria are as follows; Google Scholar was primarily used as a search engine to identify the relevant information from the results of articles to back up the findings. The Boolean operators used “AND” and “OR”. Selected keywords were PPE-related health problems, nurses, COVID-19, and work performance. The author of this study identified following inclusion criteria: The Full-text articles, all the keywords mentioned above, healthcare workers, and articles with cross-sectional study. Exclusion criteria: Payable articles, not English written articles, and literature reviewed articles as shown in Figure 1.

Figure 1 Inclusion and Exclusion Criteria



5.2 Data Extraction

Two phases involved in the extraction of this literature review. In the first phase of the extraction is based on the title and abstract of the articles. All selected titles' abstracts were classified for further scanning of relevant information. The second phase is all about the full-text articles obtained for the suitability test. The data extraction from the articles is to be done with the inclusion and exclusion criteria for the suitable paper selection. The following papers were utilized as shown in Table 1. Furtherly, with the inductive reasoning, the contents were extracted using the Keywords of this thesis on a tool called "Find on page" option to find out the specified information.

5.3 Classification of selected articles

With the combine use of keywords and the Boolean operators together and the keywords are not quoted as shown; 'PPE-related health problems AND nurses AND covid-19 AND work performance', 61 articles resulted after the usage of search engine and the keywords of this thesis (Google, 2021). 43 articles were excluded after the analysis of abstracts and the titles from the articles. The rest of the 18 articles were assessed for the eligibility of inclusion and exclusion criteria. Articles with full text met inclusion criteria. As shown in Figure 2, these articles then analyzed and classified accordingly with following categories; work performance, PPE-related health issues, healthcare worker, COVID-19, and full text article. Lastly, resulting in 10 main articles as shown in Figure 3.

Figure 2. Selection criteria for ten main articles after Inclusion and Exclusion criteria

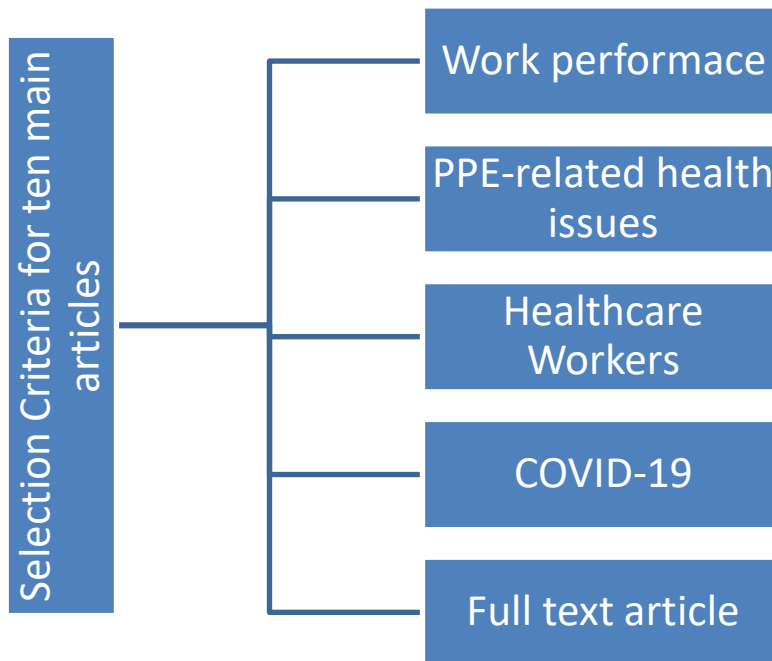


Figure 3. flowchart of articles selection



5.4 Data analysis

Deeper analysis of all 10 chosen articles was done by the author of this paper to gain the deeper understanding of the PPE-related physical health issues and the Use of PPE impacting on work performance of healthcare workers. After familiarizing the important notes of the articles. The extraction of the contents relevant to the findings was done using the Keywords of this thesis with the help of a tool called “Find on page” option. Using the same extraction method, similarity of those 10 articles were analyzed. The selection of articles and the selection of contents, focusing on the two main factors as mentioned above, were extracted. In findings, under each of the research question the extracted contents from 10 main articles are explained respectively to the articles’ given number in the Table 1.

Table 1. List of articles.

Author/Authors	Title of the article	Year	Journal
1. Ong, et al.	Headaches Associated With Personal Protective Equipment – A Cross-Sectional Study Among Frontline Healthcare Workers During COVID-19	2020	Headache: The Journal of Head and Face Pain
2. Duan, et al.	Personal Protective Equipment in COVID-19 Impacts on Health Performance, Work-Related Injuries, and Measures for Prevention	2021	Journal of Occupational and Environmental Medicine
3. Jose, et al.	Health Problems and Skin Damages Caused by Personal	2021	Indian Journal of Critical Care Medicine

	Protective Equipment: Experience of Frontline Nurses Caring for Critical COVID-19 Patients in Intensive Care Units		
4. Jiang, et al.	The prevalence, characteristics, and related factors of pressure injury in medical staff wearing personal protective equipment against COVID-19 in China: A multi-centre cross-sectional survey (this article was found under the related article of “Update to device-related pressure ulcers: SECURE prevention. COVID-19, face masks and skin damage”)	2020	International Wound Journal
5. Hajjij, et al.	Personal Protective Equipment and Headaches: Cross-Sectional Study Among Moroccan	2020	Cureus

	Healthcare Workers During COVID-19 Pandemic		
6. Rosner, E.	Adverse Effects of Prolonged Mask Use among Healthcare Professionals during COVID-19.	2020	Journal of Infectious Diseases and Epidemiology
7. Davey, et al.	Heat stress and PPE during COVID-19: impact on healthcare workers' performance, safety and well-being in NHS settings	2021	Journal of Hospital Infection
8. Wei, et al.	The Physical and Psychological Effects of Personal Protective Equipment on Health Care Workers in Wuhan, China: A Cross-Sectional Survey Study	2020	Journal of Emergency Nursing
9. Nkemjika, et al.	Personal protective equipment related skin reactions in healthcare professionals during COVID-19	2021	International Wound Journal
10. Agarwal, et	Difficulties En-	2020	Cureus

al.	<p>countered While Using PPE Kits and How to Overcome Them: An Indian Perspective</p>		
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5.5 Ethical consideration

The core responsibility of any good research is, when the plan for always collecting data with professional code, to ensure the safety of any of matters that gets involved in research. Marcelle Cacciattolo accepts that the validation and reliability of collected data can be compromised when researcher reveals an unethical behavior, such behavior not only put a researcher at harm might also the participants in unnecessary stress.

(Cacciattolo, 2015)

In Finland, an institute called Finnish National Board on Research Integrity TENK monitors ethics of all platforms of research. To prevent misconduct of a research, this article follows the instruction of the institute (TENK, 2020). The thesis writing guidelines of Arcada University of Applied Science were followed in this article. Google Scholar database was used primarily for literature review in this article. Harvard referencing has been used to show credit to the author of the sources. Copy and paste of data have been avoided in order to omit plagiarism.

6 FINDINGS

6.1 What are the causes of physical health related issues from wearing PPE?

1. Study (Ong, et al., 2020) results shows that the use of N95 face mask or protective eyewear or both together for either over 4 hours in a day or 15 days in a month had the same higher probability of developing de novo PPE-associated headaches. However, majority of the participants reported the use of both N95 face mask and protective eyewear with the help of strappers that come behind the head, causing external compression headache when worn for over an hour. On the other hand, study states that participants with the medical history of pre-existing headache got their background headache triggered due to the frequent use of PPE with few other contributing reasons (such as sleepless, physical, and emotional stress, improper eating habits, dehydration), leading slightly more than half of these participants to seek for acute medication treatment. Developing of de novo PPE-related headache is even greater in participants with the diagnosed pre-existing headaches. Headaches are not only the anatomical problems experienced by the healthcare workers but also facial and neck pain due to the pressure and friction from the use of PPE.
2. According to the findings of this article (Duan, et al., 2021), high number of healthcare workers reported using PPE for over 5 hours resulted in discomforts, heavy breathing, PPE-related tension injuries, skin problems, and even higher percentage of health professionals reported mental pressure than physical pressure. 10% of the participants had difficulties returning to their normal life.
3. The participants were forced to continuous use of PPE with double gloving on the average of 6 hours per day for a week during September 2020, when COVID-19 cases were starting to rise to its peak. The adverse health effects to health professionals from PPE use, the results were headache, heavy sweating,

and hard to breath. Higher percentage of reports were facial and ears damages. (Jose, Cyriac, & Dhandapani, 2021)

4. With duration of over 4 hours of PPE use had greater number of health professionals affected by PPE-related pressure issues, in most of them were male. Sweating was also reported with a higher percentage. The findings of the article state that the anatomically affected area of the body is mostly the various parts of the head due to the prolonged PPE use. (Jiang, et al., 2020)
5. More than half of the participants experienced PPE-use-related headache. 41 of the participants were eligible for “never experienced headache” category and for 45 of them this is a pre-existing head pain except that it became stronger with PPE use. “Never experienced headache” and background history of the participants has no connection according to the findings. Associated factors were found even though the participants, who were wearing masks for over 4-hours period, experiencing the PPE triggered head pain. The only associated factor was shift hours were longer than normal. (Hajjij, et al., 2020)
6. Results of the study (Rosner, 2020) reveal that there are various effects from the use of mask for a prolonged period. Out of all, commonly reported effect was headache from 71.4% of the participants having no knowledge about the pre-existence of medical history and the rest of complains were skin damage, appearance of acne, and cognitive impairment after prolonged use of mask.
7. According to this study (Davey, Lee, Robbins, Randeve, & Thake, 2021), the increase in sweating was experienced by almost all of them, out of factors such as discomfort, ‘hot’ feeling and sweating. However, headache with tiredness was highly reported under the heat associated symptoms.
8. In this article (Wei, et al., 2020),
PPE use effects: Results from unsuitable feeling in PPE differed with gender wise stating that female experienced symptoms more than male. Authors think that the reasons behind this difference are the type of work designated for both gender, type of PPE use, the way of expressing discomfort depending on their cultural and gender background such as physic and mental state.
Time: According to the results of the study, almost half of healthcare workers spent 4 to 6 hours and some even 6 to 8 hours of their time after donning PPE,

but on the other hand, out of all, almost 61% of the participants believed 4 to 6 hours as the limit to endure PPE use.

Discomfort: Blurry vision with goggles was most received discomfort related complaints from healthcare workers. Second in the list is pressure sore mostly on the nose bridge with no specified PPE item. More than half reported injuries were skin damage, dry skin, skin erosion, and eczema.

9. In the one-day conducted test of this study (Nkemjika, et al., 2021), more than half of the healthcare workers using PPE reported working for over 2 hours with no relief and reports of this study reveals the most anatomically affected area was the various parts of head. Highlights of the report reveals the appearance of sores red skin and pressure damage when the PPE used for over 8 hours. From the survey questionnaire, more than $\frac{3}{4}$ of the participants also reported skin related problems occurring on the face with especially sores red skin from the use of PPE for 3 days continuously in a period of 3 or more hours.
10. Out of different number of hours such as 6, 5, 4, 3, 2, 1 hours reported, 4 hours duration was reported by a high number of participants at least in 2 PPE kits. In this study, the PPE-related issues are arranged from highest number of participants experienced to lowest; accordingly, lot of sweat secretion, foggy vision of goggles or visors, discomfort, tiredness, breathing difficulty, head pain from continuous PPE use, and skin damage from the use of PPE repeatedly. (Agarwal, Agarwal, & Motiani, 2020)

6.2 How does the use of PPE affect the healthcare workers' work performance?

1. The results of the study (Ong, et al., 2020) show a slight decrease in work performance for example the combine use of mask and goggles cause a foggy vision due to the build-up of moist warm air on goggles.
2. Study (Duan, et al., 2021) resulted in majority of healthcare workers had tough time performing tasks due to thick protective equipment. While others had impaired vision, hard to communicate, time-consuming with PPE on, elevated risk of infection when doffing PPE, and danger of getting hurt due to sharp tools.

3. Heavy sweating from the use of PPE causing agitation, discomfortness, foggy vision from wearing goggles, restricted movements from inappropriate size of jumpsuits, and dehydration and drying of mouth. Difficulty to hold objects. All these leading to the contribution of poor performance in care interventions (Jose, Cyriac, & Dhandapani, 2021)
4. On the other hand, this study (Jiang, et al., 2020) compared its results to the findings of another article (which talks about DRPI (device related pressure injuries) caused to patients in ICU) saying that compare to patients, medical staff undergo intense care activity and mental pressure along with PPE use that increases the possibility of medical staff getting DRPI.
5. Reports says that the use of PPE affected job associated health quality of $\frac{3}{4}$ of healthcare workers with a negative change in breathing behaviours. More than half of the participants responded that the combine use of face mask and goggles affecting their vision leading to poor work performance. (Hajjij, et al., 2020)
6. Cognitive impairment resulting in poor care interventions due to prolonged usage of PPE. Recommendations were discussed in this study to take preventive measures for reducing prolonged use of mask and intervention for skin damage after the use of PPE. (Rosner, 2020)
7. Leaving 8.5% of the participants, the rest of them complained of PPE's negative impact on the participants' work performance. Findings on the additionally collected information from the use of each PPEs reveal many adverse themes such as breathing difficulties, poor communication, poor visibility, menopausal women experiencing heat associated issues, and work environment with poor temperature control and all contributing to poor work performance. This study has highlighted with the discussion of missing information regarding, of which PPE items were often doffed, when more than half of participants removed the PPE seeing the increasing risk of infection. The conclusion of this article stressed, that before the second wave of COVID-19 hits, the need for reducing PPE-related hazards along with heat-related stressors in healthcare workers. (Davey, Lee, Robbins, Randeve, & Thake, 2021)
8. Work performance: compared to other units, in ICU healthcare workers highly had trouble working in PPE and authors believe the reason is because of intensive activity work with critical patients. (Wei, et al., 2020)

Rest: However, almost 54% participants from this article believed that one day off requirement after the end of the shift, while more than 27% thought the need for 12 hours off after the end of the shift.

9. The primary goal of this study (Nkemjika, et al., 2021) was to minimize the injuries to skin of healthcare workers, which helps to prevent shortage of staff that might cause the healthcare workers to work under pressure with fewer staff.
10. After wearing PPE, 4/5 of the participants revealed difficulties in work performance such as, poor communication, understanding, hearing problems, and many other minor contributors. (Agarwal, Agarwal, & Motiani, 2020)

7 DISCUSSION

7.1 What are the causes of physical health related issues from wearing PPE?

Personal Protective Equipment (PPE) worked as a bridge between healthcare workers and patients, connecting them by providing or getting care interventions during the outbreak of COVID-19. The healthcare worker not only faced the challenge of COVID-19, but also challenges from wearing PPE. According to the findings, almost half the above-mentioned articles in the findings indicate a high number of headache reports on the average of wearing PPE for over 4 hours. Simply highlighting, that the prolonged use of PPE is more likely to increase the issue of having chronic headaches (Ong, et al., 2020) (Jose, Cyriac, & Dhandapani, 2021) (Hajjij, et al., 2020) (Davey, Lee, Robbins, Randeve, & Thake, 2021) (Rosner, 2020) (Agarwal, Agarwal, & Motiani, 2020).

Ong, et al., 2020 reveals that the chances of developing de novo headache (also known as headache, which occurs often suddenly with no warning without prior history of headaches (Great Ormond Street Hospital for Children, 2016)) and triggering of pre-existing headaches are greater when the use of PPE is over 4 hours.

However, the study by Hajjij, et al, 2020 were able show contrast results and compare them to the study conducted by Ong, et al, 2020 saying that fewer De Novo PPE induced headache found in Hajjij, et al, 2020 study than Ong, et al, 2020, explaining that it is due to different working condition and shift rotation.

On the other hand, the findings of the authors Davey.S.L, et al, 2021; & Agarwal.A, et al, 2020 from the study of having to wear PPE in a hot atmosphere resulted almost in same results. However, the high number of heat-related symptoms' reports from respondents of above mentioned both articles vary due to the studies are conducted in different country. Davey.S.L, et al, 2021 states that, among all the respective symptoms of heat-related illness from wearing PPE; highly reported was headache, the rest are; fa-

tigue, excessive sweating and dizziness. The study conducted by Agarwal.A, et al, 2020, shows that all of respondents experienced excessive sweating, the rest of symptoms are; eyesheild's fogginess, discomfort, difficulty breathing, fatigue, headache from prolonged use and device related pressure damage on the skin, as respectively.

Discomfort is due to full use of PPE at once with hot and humid atmosphere for prolonged period of time (Rosner, 2020); (Davey, Lee, Robbins, Randeva, & Thake, 2021); (Agarwal, Agarwal, & Motiani, 2020). Prolonged use of face mask leading low oxygen intake and dehydration are reason behind the breathlessness and fatigue (Rosner, 2020); (Jose, Cyriac, & Dhandapani, 2021). Moreover, having to take care of critical patients in intensive care unit while wearing PPE under intense activity in the unit leads to heavy sweating, making the moisture skin soft and easy to break (Jiang, et al., 2020).

Almost in every researched case shown in Table 1, either having to wear PPE during summer or wearing PPE for long time, both create symptoms such as, discomfort, heavy breathing, tiredness, and PPE-related pressure injuries.

The study on the PPE-related pressure damage on the skin by Jiang, et al., 2020; Nkemjika, et al., 2021; & Wei, et al., 2020 state that the longer the use of PPE by a healthcare worker, the chances of having PPE-related pressure damage on the skin are higher.

7.2 How does the use of PPE affect the healthcare workers' work performance?

Having to wear PPE for prolonged periods in a hot or intensive environment affected not only the physical health of the health professions but also their work performance in many ways. The result from the findings of the decreased work performance of the medical staff are as listed; the combine use of mask and goggles cause a foggy vision due to the build-up of moist warm air on goggles, which can lead to hazard events with risk of patient safety. Cognitive impairment leading to poor care performance. Medical staff with the use of thick protective equipment had hard time communicating with team members and patients, time-consuming when working with PPE on. Heavy sweating from the use of PPE causing agitation, discomfortness, restricted movements from inap-

appropriate size of jumpsuits, difficulty breathing and dehydration and drying of mouth. Difficulty to hold objects. Elevated risk of infection when removing PPE after the use. (Ong, et al., 2020); (Duan, et al., 2021); (Jose, Cyriac, & Dhandapani, 2021); (Hajjij, et al., 2020); (Rosner, 2020); (Agarwal, Agarwal, & Motiani, 2020)

However, the authors Davey, et al., 2021 highlighted with the discussion of missing information regarding, of which PPE items were often doffed, when more than half of participants removed the PPE seeing the increasing risk of infection. The conclusion of this article stressed, that before the second wave of COVID-19 hits, the need for reducing PPE-related hazards along with heat-related stressors in healthcare workers. Reports from Hajjij, et al., 2020 study even says that the use of PPE affected job associated health quality, $\frac{3}{4}$ of healthcare workers with a negative change in breathing behaviours.

On the other hand, before the begin of study by Jose, et al., 2021, teaching and practicing of PPE use was conducted and the participants were even monitored during every donning and doffing of PPE to minimize the chances of contamination. Ignorance of PPE-related problems can lead to patient safety risks and refusal to work

While other studies listed the reasons for decreased work performance of the healthcare provider. The study by (Jiang, et al., 2020) compared its results to the findings of another article (which talks about DRPI (device related pressure injuries) caused to patients in ICU (intensive care unit)) saying that compare to patients, medical staff undergo intense care activity and mental pressure along with PPE use that increases the possibility of medical staff getting not only DRPI but also working with pain created by DRPI.

As the Health Promotion model by Nola J. Pender suggests, coping from wearing PPE to prevent infection from spreading or giving care intervention are not only the part of the health promotion. Yet identifying those problems from the use of PPE helps to improve the quality of care and patient safety. The use of PPE for prolonged period of time and frequently in an intensive environment, where healthcare workers have to intensively using PPE creates different issues for example, headache from the use of tight face mask for longer time with less oxygen to breath, sweating heavily from wearing all the protective equipment in an intensive and hot atmosphere, and pressure damages on the skin from wearing PPE for longer time. All not only contributing to decreased work per-

formance but also contributing to hazard events which can end with risk of patient safety.

8 CONCLUSION

Against highly contagious diseases, PPE still plays the main role of recommendation for effective prevention; however, prolonged use of PPE-related health issues experienced by healthcare workers have to be recognized by health organizations in order to preserve healthcare workers' health and safety. To relieve those issues, with the help of health promotion theory by Nola J. Pender this study revealed information on what issues need to be noticed by health organization. Providing medical staff with a proper or sufficient intervals between their working hours help to prevent any health issues, hydrating themselves before and after use of PPE, which lead to healthcare workers being able to perform their work properly. By making sure the availability of the PPE and also providing healthcare workers with proper instruction on the use of PPE not only ensure the safety and the health of the healthcare workers but also improves their moral strength to work with infected patients. This matter has already been discussed in a study (Wei, et al., 2020). Nursing educational institutions like universities and colleges can take this under consideration and include in their curriculum for students to have awareness of these issues.

This study has several limitations. Firstly, the data search was limited to the sources which were available free, obstructed the author from getting the most useful sources for this article. Secondly, information regarding “PPE-related health issues” is a broad topic on its own in different aspects of health care in different countries for example, working conditions, weather, different healthcare departments and so on.

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