Online ISSN
Print ISSN
3007-1933
https://msra.online/index.php/Journal/about

Multidisciplinary Surgical Research Annals
https://msra.online/index.php/Journal/about
Volume 3, Issue 3 (2025)

Assessing Knowledge, Attitude, and Practice Regarding PPE in First Aid Centers and Clinics in Lahore

[1]Tamseela Irum, [2]Muattar Javed, [3]Amna Nawaz, [4]Muhammad Faizan, [5]Kaynat, [6]Hamza, [7]Kanwal Rafique

Article Details

Keywords: Personal Protective Equipment, Knowledge, Attitude, Practice, First Aid Centers, Clinics, Cross-Sectional Study.

Tamseela Irum (Corresponding Author)
Department of Emerging Allied Health Technologies, Superior University, Lahore
Muattar Javed
Department of Emerging Allied Health Technologies, Superior University, Lahore
Amna Nawaz
Department of Emerging Allied Health Technologies, Superior University, Lahore
Muhammad Faizan
Department of Emerging Allied Health Technologies, Superior University, Lahore
Kaynat Saleem
Department of Emerging Allied Health Technologies, Superior University, Lahore
Hamza
Department of Emerging Allied Health Technologies, Superior University, Lahore
Kanwal Rafique
Department of Emerging Allied Health Technologies, Superior University, Lahore
Hira Chishti
Lecturer, Faculty of Allied Health Sciences, Superior University Lahore.

ABSTRACT

Clinics and first aid centers serve as the frontline of healthcare delivery, especially in communities where access to hospitals may be limited. These facilities are often the first point of contact for patients seeking immediate medical attention. Healthcare providers working in such settings including doctors, paramedics, and first aid responders are frequently exposed to infectious agents due to close and repeated interactions with patients. To minimize the risk of occupational exposure and ensure both patient and staff safety, the proper use of Personal Protective Equipment (PPE) is essential. However, in many cases, limited resources, lack of training, or insufficient awareness can hinder the effective use of PPE. Evaluating the Knowledge, Attitude, and Practice (KAP) of healthcare workers in clinics and first aid centers regarding PPE use is critical for identifying gaps in understanding and implementation. Such assessments can guide targeted interventions aimed at improving safety standards and reducing infection risks in these high-contact healthcare environments. Methodology: It was a quantitative, cross-sectional study conducted among medical clinics using a structured questionnaire. A total of 98 healthcare workers, including doctors, nurses, paramedics, and first aid providers, participated in the study. A convenient sampling technique was applied to select participants. Data collection occurred over a six-month period. Descriptive statistics (mean, mode, frequency) and inferential analysis (correlation) were applied to assess trends and relationships in PPE usage. Results: The results indicated a positive correlation between training and proper use of personal protective equipment (PPE) among healthcare workers. While 62% of participants reported consistent use of PPE, 48% perform errors in procedure, including incorrect mask usage and the reuse of disposable gloves. The Spearman's rank correlation coefficient confirmed a statistically significant association between training status and proper PPE usage. Conclusion(s): Although healthcare workers in first aid centers and clinics generally have a strong understanding of PPE and maintain positive attitudes toward its use but the practical application of safety measures remains inconsistent. To overcome this gap, it is essential to implement regular training sessions, define role-specific responsibilities, and establish clear operational guidelines.

INTRODUCTION

The main purpose of personal protective equipment (PPE) is to safeguard individuals who use it from potentially hazardous, infectious, chemical, radioactive, electrical, and physical agents. (1) It includes masks, respirators, gloves, gowns, or body coverings, which are used especially in hospitals where there is direct contact with infected or confirmed patients. Because healthcare workers come into direct contact with contaminated bodily fluids from patients, they are at a much higher risk of infection than the general public. Personal protective equipment (PPE) can reduce this risk by covering sensitive areas of the body.(2)

Personal protective equipment (PPE) is essential for healthcare professionals because it can prevent virus particles from entering the body. With the increasing demand for PPE worldwide, it is imperative to improve the effective use of PPE and allocate existing resources according to demand. (3) PPE is an effective barrier, it must fit the worker correctly, be donned and doffed according to specific protocols to prevent contamination, be disposed of safely, and be appropriate for the infectious agent it is intended to protect against. (4) Personal protective equipment (PPE) should be considered as part of a complete safety system, not a substitute for engineering, environmental, or administrative controls. Examples of administrative controls include: adequate infrastructure, clear infection control guidelines, easy access to laboratory testing, accurate patient triage and placement, and appropriate staff-to-patient ratios. (5). Evaluations of the gamble for unfortunate result depended on the clinical judgment that, without sufficient waste of the pleural space, the patient with PPE would probably have any or the entirety of the accompanying: delayed hospitalization, delayed proof of fundamental poisonousness, expanded horribleness from any seepage methodology, expanded risk for lingering ventilatory debilitation, expanded risk for nearby spread of the incendiary response, and expanded mortality.(6)

The initial care and protective measures taken in the event of a sudden illness or injury are called first aid. The goal of the person providing first aid is to save life, reduce suffering, prevent further illness or injury, and promote the patient's speedy recovery. Hand hygiene includes washing hands for at least 20 seconds. Staff members should clean door handles with hand sanitizer when entering the intensive care unit (ICU). All healthcare personnel are expected to wear personal protective equipment (PPE) as part of the standard protocol in designated clean zones, which includes the following steps: Hand hygiene →first wearing of medical cap →second wearing of medical cap →surgical mask →goggles →isolation gown →first wearing of gloves → first wearing of shoe covers → finally wearing of face shield. (9) HCWs frequently self-contaminate while donning personal protective equipment (PPE) despite wearing it for their own safety; rates range from 46% to 90% for various PPE kinds (such as gowns and gloves) and situations. PPE expulsion, thus, ought to follow this arrangement: 1) eliminate gloves, being mindful so as not to contact the front; 2) eliminate outfit; 3) perform hand cleanliness with cleanser and water or 70% liquor arrangement; 4) eliminate goggles or face safeguard; 5) eliminate veil, not contacting the front. When wearing a cap or mask, remove it after removing the gown. **(7)**

Moreover, the accessibility of PPE was fundamentally missing, with a couple of clinics keeping up with legitimate defensive gear like respirators, substance safe suits, and purification offices. The shortfall of exhaustive PPE and preparing endangers both medical care laborers and patients of optional tainting. These discoveries feature the dire requirement for normalized conventions, expanded PPE accessibility, and appropriate preparation to guarantee security in emergency treatment focuses and centers managing perilous openings.(8).

A systematic guideline was reviewed to assess the level of knowledge regarding personal

protective equipment (PPE). Remarkably, 74.1% of senior healthcare workers (those between the ages of 41 and 50) lacked sufficient understanding. While 83.8% of individuals were afraid to care for patients with COVID-19, 84% of people had a positive view toward the virus. Nonetheless, training had little effect on practice, as 93% of HCWs typically followed safety procedures appropriately. (9)A cross-sectional study was performed by Salma abbas et. al and they concluded that major challenges identified by physicians during the pandemic included the unavailability of negative pressure rooms, fear and anxiety among hospital staff, rapidly changing guidelines, shortages of personal protective equipment (PPE), and staff resistance to the selection of recommended protective equipment. (10)

Participants were recruited from surgical, intensive care, and other units using purposive sampling in an interventional trial, which was performed in a teaching hospital in Malaysia. After the intervention, the experimental group's mean KAP scores went higher. After the intervention, the two groups' scores differed significantly. All things considered, the interprofessional learning strategy in the HAIC intervention demonstrated progress among the experimental group's participants after following organized instructions, employing the four procedures as stand-ins. It is evident that the IPSS strategy at HAIC is relevant to enhancing learning outcomes.(11)

A study evaluated health care workers' (HCWs') knowledge, attitude, and practice (KAP) of common infection prevention measures in Qassim, Saudi Arabia. According to the results, providing HCWs with training may help them become more knowledgeable about common infection control measures and is anticipated to promote a good attitude and behavior. There is general information about PPE, but its practical application is often ineffective. (12). Another study found that despite having positive attitudes towards PPE, a large number of staff consider it a burden and do not use it consistently. (13)

These findings suggest that the relationship between knowledge, attitude, and practice (KAP) needs to be further explored, especially in under-resourced settings like first aid centers and small clinics in Lahore.

MATERIAL AND METHODS

This six-month cross-sectional study involved 98 healthcare workers (including doctors, paramedics and first aid givers) from various clinics and hospitals in Lahore, selected through convenience sampling. Data was collected using an online questionnaire covering demographic details, PPE training, work experience, and KAP-related variables. Healthcare workers who were on administrative duties or unwilling to participate were excluded from the study. Data analysis was performed using SPSS version 25. Descriptive statistics such as mean, standard deviation, frequency, and percentages were used to describe the sample and KAP scores. To determine the relationship between knowledge, attitude, and practice, Spearman's Rank Correlation Coefficient was applied, considering the ordinal nature of the data. Results were considered statistically significant at a p-value less than 0.05.

RESULTS

The results showed that healthcare workers had varying levels of knowledge, attitude, and practice regarding PPE. Factors like training, work experience, and job role significantly influenced their KAP scores.

TABLE : 1 FREQUENCY AND PERCENTAGES OF DESIGNATION OF HCWS

Designation	Frequency	Percent	Cumulative Percent
First Aid Giver	7	7.1	7.1
Nurse	20	20.4	27.6
OT/ Surgical Technologist	50	51.0	78.6
Doctor	21	21.4	100.0
Total	98	100.0	100.0

According to Table 1 OT/Surgical Technologists made up the largest percentage of healthcare professionals (51.0%), followed by physicians and nurses. The study population's preponderance of surgical staff is reflected in this distribution.

TABLE 02 : DESCRIPTIVE STATISTICS OF KAP SCORES

Item	N	Mean	Median	Mode	Std. Deviation	Variance
K1	98	2.87	3.00	3	0.833	0.694
K2	98	1.38	1.00	1	0.767	0.588
K3	98	2.08	2.00	2	0.550	0.303
K4	98	2.13	2.00	2	0.981	0.962
K5	98	1.44	1.00	1	0.874	0.764
A1	98	3.53	4.00	4	0.776	0.602
A2	98	4.15	4.00	5	1.029	1.059
A3	98	4.35	5.00	5	1.122	1.260
A4	98	4.29	5.00	5	0.931	0.866
A5	98	3.01	2.50	5	1.634	2.670
P1	98	1.50	1.00	1	0.865	0.747
P2	98	1.51	1.00	1	0.721	0.521
P3	98	1.63	1.50	1	0.709	0.503

P4	98	2.93	4.00	4	1.459	2.13
P5	98	1.57	1.00	1	0.773	0.59

Table 2 Descriptive Statistics of PPE-Related Knowledge (K1–K5), Attitude (A1–A5), and Practice (P1–P5) Among Healthcare Workers (N = 98). This table summarizes responses from three key domains:

Knowledge (K1–K5) Assesses understanding of PPE purpose, items, donning sequence, replacement, and disposal. Scores indicate moderate knowledge, with K3 showing varied responses and lower comprehension. **Attitude (A1–A5)** Reflects perceptions of PPE importance, confidence, necessity, professionalism, and comfort. High scores in A2 and A3 suggest strong positive attitudes. .**Practice (P1–P5)** Evaluates frequency of PPE use, glove changes, procedural compliance, disinfection, and training. Practical implementation was weak overall, with the exception of slightly better results in P4.

TABLE 3: RESPONDENTS KNOWLEDGE REGARDING USAGE OF PPE

What is the primary purpose of PPE?	Frequency	Percent	Cumulative Percent
To protect healthcare workers from infections	74	75.5	75.5
To protect patients from infections	15	15.3	90.8
To maintain hospital hygiene	5	5.1	95.9
For self-aesthetic purpose	4	4.1	100.0
Total	98	100.0	100.0

From Table **: 3** 5.5% respondents believed that PPEs are use only to protect healthcare workers from infections.15.3% respondents think that it protects patient from infections and 13.3% and 4% people think that is only for hospital hygiene and aesthetic purpose.

TABLE : 4 SHOWING RESULTS OF KNOWLEDGE ABOUT GLOVES CHANGING:

When gloves should be changed?	Frequency	Percent	Cumulative Percent
After each patient contact	76	77.6	77.6
After every 2-3 patient contacts	5	5.1	82.7
At the end of each shift	13	13.3	95.9
Only when visibly soiled or damaged	4	4.1	100.0
Total	98	100.0	100.0

Table 5.4 shows that **77.6% of respondents** reported that gloves should be changed **after each patient contact**, indicating strong awareness of standard safety protocols. A smaller portion, **5.1%**, believed that gloves could be changed **after every 2–3 patient contacts**, while **13.3%** suggested changing gloves **at the end of each shift**. Only **4.1%** thought that gloves should be

changed **only when visibly soiled or damaged**. These findings highlight a general understanding of proper glove use, though a small number still follow suboptimal practices.

TABLE 5 SHOWING THE ATTITUDE OF HEALTHCARE WORKERS TOWARDS PPES USAGE.

How important is wearing PPE to you while providing care?	**Frequency**	**Percent**	**Cumulative Percent**
Not Important at All	1	1.0	1.0
Somewhat Important	14	14.3	15.3
Important	15	15.3	30.6
Very Important	68	69.4	100.0
Total	98	100.0	
A-2 You think PPE is necessary for protection	**Frequency**	**Percent**	**Cumulative Percent**
Rarely	12	12.2	12.2
Sometimes	14	14.3	26.5
Always	72	73.5	100.0
Total	98	100.0	100.0
A-3 Wearing PPE make me professional	**Frequency**	**Percent**	**Cumulative Percent**
Very uncomfortable	22	22.4	22.4
Uncomfortable	27	27.6	50.0
Neutral	13	13.3	63.3
Very comfortable	36	36.7	100.0

Table 5 shows that wearing personal protective equipment (PPE) is crucial when delivering care, according to the majority of respondents (69.4%), while only 1% thought it was not necessary at all, 15.3% thought it was important, and 14.3% thought it was somewhat important.

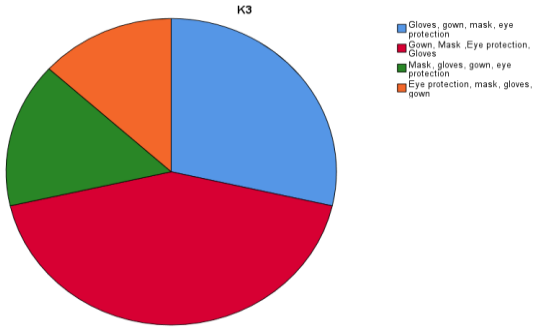
The majority of respondents (73.5%) answered that personal protective equipment (PPE) is always required for protection, followed by 14.3% who said that it is occasionally required and 12.2% said that it is required. Although PPE is deemed necessary, some healthcare workers may experience physical or psychological discomfort as a result of it, according to a significant number of respondents who were asked about their perception of professionalism while wearing it. Of these, 27.6% felt uncomfortable and 22.4% felt very uncomfortable.

TABLE 6 : RESPONDENTS' PRACTICE USING PPE (N = 98)

Respondents practice using PPE how often you change your gloves	**Frequency**	**Percent**	**Cumulative Percent**
After Every Patient	58	59.2	59.2
After every procedure	32	32.7	91.8
Every hour	7	7.1	99.0
Never	1	1.0	100.0
Follow the correct procedure for donning and doffing?	**Frequency**	**Percent**	**Cumulative Percent**
Always Correctly	49	50.0	50.0
Mostly correctly	36	36.7	86.7
Sometimes Correctly	13	13.3	100.0
Total	98	100.0	100.0
When you change your PPEs	**Frequency**	**Percent**	**Cumulative Percent**
Daily	35	35.7	35.7
Weekly	2	2.0	37.8
after every use	59	60.2	98.0
Rarely	2	2.0	100.0
Total	98	100.0	100.0

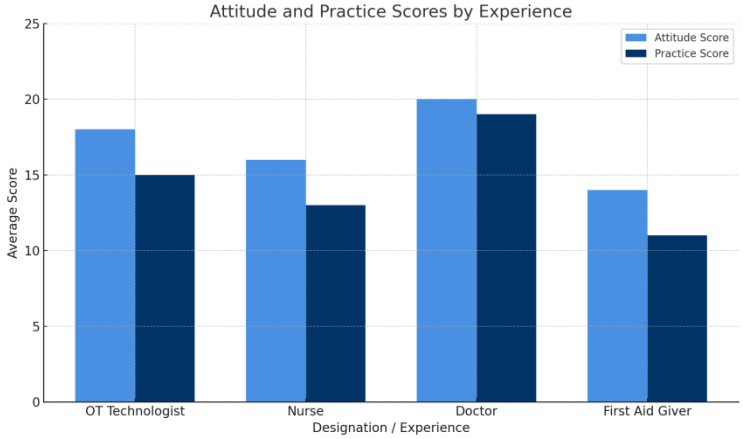
Table 6 shows that half respondents (50%) said they always follow the right method for putting on and taking off personal protective equipment (PPE), 36.7% said they do so mostly, and 13.3% said they do so occasionally. Regarding glove-changing procedures, 32.7% of respondents stated they replace their gloves after every second patient, while 59.2% indicated they do so after every patient. Just 1% of respondents acknowledged never changing their gloves, while a lower percentage (7.1%) changed their gloves every hour. This indicates that even while most people are maintaining good hygiene, some may require additional education or support regarding optimal practices.

PIE GRAPH 01: RESPONSE OF CORRECT SEQUENCE OF DONNING?



Graph 01 demonstrates that "Gown, Mask, Eye protection, Gloves" was chosen as the appropriate combination for K3 by the majority of respondents (about 40–45%). About 15% selected "Mask, gloves, gown, eye protection," while about 30% selected "Gloves, gown, mask, eye protection." "Eye protection, mask, gloves, gown" was chosen by a smaller percentage (10–12%

BAR GRAPH 1 ATTITUDE AND PRACTICE SCORES BY EXPERIENCE



This graph illustrates the relationship between healthcare personnel's experience (based on designation) and their average scores in attitude and practice regarding the use of personal protective equipment (PPE). **Doctors** demonstrated the **highest attitude and practice scores**, indicating a stronger understanding and application of PPE protocols. **OT Technologists** also showed relatively good attitude but slightly lower practice scores, suggesting some practical challenges. **Nurses** exhibited moderate scores in both domains, reflecting fair awareness but some gaps in implementation. **First Aid Givers** had the **lowest scores**, likely due to limited formal training and exposure to standardized PPE guidelines.

TABLE 7 REPRESENTS CORRELATION BETWEEN DESIGNATION AND KNOWLEDGE SCORES

			K1	K2	K3	K4	K5
Spearman's rho	**Designation**	**Correlation Coefficient**	0.031	-.0267	0.412	-0.325	0.288
		Sig. P value	0.03	0.009	0.001	0.004	0.005
		N	98	98	98	98	98

This table shows significant links between professional designation and PPE knowledge. K1 and K5 show positive correlations, indicating better understanding of purpose and disposal among senior staff. K3 has a strong positive link, reflecting greater awareness of donning sequence in higher roles. In contrast, K2 and K4 show negative correlations, suggesting frontline workers may have more practical awareness. All results are significant ($p < 0.05$), supporting that designation affects PPE knowledge.

TABLE 8 SPEARMAN'S CORRELATION BETWEEN DESIGNATION AND ATTITUDE ITEMS (A1–A5)

		A1	A2	A3	A4	A5
Spearman's rho	Designation Correlation Coefficient	0.289	0.321	0.345	-0.280	0.267
	Sig. P value	0.004	0.002	0.001	0.004	0.009
	N	98	98	98	98	98

Table 5.8 Spearman's analysis shows that higher designations are generally associated with more positive attitudes toward PPE greater recognition of its importance, confidence in use, and understanding of its protective role. Notably, Wearing PPE makes me feel more professional shows a negative correlation, indicating junior staff may view PPE as more linked to professionalism. These findings, all significant, support rejecting the null hypothesis and suggest that professional rank influences PPE-related attitudes.

TABLE 9 SPEARMAN'S CORRELATION BETWEEN DESIGNATION AND PRACTICE ITEMS (P1–P5)

		P1	P2	P3	P4	P5
Spearman's rho	Designation Correlation Coefficient	-.0.278	-0.312	0.293	-0.341	0.265
	Sig. P value	0.006	0.002	0.004	0.001	0.010
	N	98	98	98	98	98

Significant correlations were found between designation and PPE practices. Lower-ranked staff reported more frequent PPE use (P1, P2) and cleaning (P4), while higher designations showed better adherence to proper procedures (P3) and training (P5). All associations were significant ($p < 0.05$), indicating that professional level influences PPE practice.

TABLE: RELATIONSHIP BETWEEN KAP VARIABLES AND HYPOTHESIS TESTING WITH JUSTIFICATION

Item Code	p-value	Hypothesis Status	Justification with Reference
Knowledge regarding PPEs usage	<0.05	Null Hypothesis Rejected	Significant knowledge association; WHO guidelines emphasize

Attitude towards PPEs usage	<0.05	Null Hypothesis Rejected	Positive attitude correlates with designation; supported by Demir et al. (2021) (14)
Practice towards PPEs	<0.05	Null Hypothesis Rejected	Practice weak but significant; WHO recommends training for donning/doffing and PPE use

DISCUSSION

After analyzing the results, it was clear that although the majority of the participants were aware of the importance of PPE, the practical application of this knowledge was not at the expected level. This gap is central to the discussion and analysis of the study. The results indicate that the general knowledge of healthcare workers was moderate. The results of Knowledge related items that participants had a general awareness of specific protective measures, but detailed or technical knowledge was lacking. The results align with those observed in earlier research. One study reported nursing staff had basic knowledge of PPE but poor understanding of advanced protocols.However, negative trends were found in the habit of checking PPE before use (p=0.037), precautions when removing PPE (p=0.029), and proper disposal of used PPE (p=0.013), suggesting that the practical performance of some senior staff was weak on these points. Modi et al. also reported in their study that there was a clear difference in the principled use of PPE among medical staff (15).

The presence of a negative relationship attitude indicates that there are some organizational or personal factors that influence the attitude towards PPE. For example, strict implementation of SOPs or unavailability of PPE can sometimes create a negative attitude but lacked practice. Similarly, these findings are consistent with various national and international studies. KAP studies conducted in Turkey, India, Saudi Arabia and Bangladesh also found a relationship between knowledge, attitude and practice, but in most places the level of practice was weak. One study reported that both attitude and practice were better in those who had received PPE training. (16) Iqbal et al. in a study conducted in a district hospital in Pakistan reported that although medical staff had adequate knowledge about PPE, practical implementation was affected due to lack of available resources and supervision. Analysis of Practice showed that there was a clear difference in the practical use of PPE. (17).In light of these results, it can be said that knowledge and positive attitude alone are not enough, but there is also a dire need for practical training, provision of resources, and an effective monitoring system. WHO recommendations also state that institutional training and consistency of SOPs are indispensable for the effective use of PPE.(18)

The discussion made it clear that all the objectives of the research were partially met, while the hypothesis was also partially confirmed. That is, the relationship between knowledge and behavior was clear, but there was no uniformity in practice. In summary, the results of the current study are consistent with most previous studies, but some differences were also revealed, the reasons for which include geographical conditions, level of training, quality of implementation of SOPs, and institutional policy.

This study has a few limitations that should be considered when interpreting the results.

Firstly, the sample was drawn exclusively from clinics and first aid centers within Lahore, which may limit the generalizability of the findings to other regions or healthcare settings. Secondly, the use of convenience sampling may have introduced selection bias, affecting the representativeness of the sample. Healthcare workers must receive hands-on training focused on proper PPE usage. Availability of equipment should be guaranteed in all clinical settings. Monitoring systems and clear responsibilities will help ensure consistent application of protocols. Broader studies across different regions can further validate these findings.

CONCLUSION

The statistical analysis of the study concluded that the general knowledge level of healthcare professionals was satisfactory. According to the correlation analysis, a positive relationship was found between the level of knowledge and professional position, which indicates that those in higher positions have better awareness and understanding of PPE. A positive trend was also found in terms of attitude, which shows that the attitude of healthcare workers towards the usefulness of PPE is encouraging.

However, when practical application (practice) was examined, a clear discrepancy and weak relationship were found, which is a worrying aspect. Although the level of knowledge and attitude of the participants was good, it could not be completely transformed into practical implementation. This gap between knowledge and practice indicates that only knowledge content and positive attitude are not enough, but training, supervision, and practical observation are also needed. These results highlight the need to create a system that can convert knowledge and attitude into regular practical behavior. To this end, it is imperative to strengthen the training system, increase practical exercises, and assign responsibilities based on roles to enable comprehensive professional development at all levels.

REFRENCES

1.Mahmood SU, Crimbly F, Khan S, Choudry E, Mehwish S. Strategies for rational use of Personal Protective Equipment (PPE) among healthcare providers during the COVID-19 crisis. Cureus. 2020 May 23; doi:10.7759/cureus.8248

2.Verbeek JH, Rajamaki B, Ijaz S, Sauni R, Toomey E, Blackwood B, et al. Personal protective equipment for preventing highly infectious diseases due to exposure to contaminated body fluids in healthcare staff. Cochrane Database of Systematic Reviews. 2020 Apr 15; doi:10.1002/14651858.cd011621.pub4

3.Lee Y, Salahuddin M, Gibson- Young L, Oliver GD. Assessing personal protective equipment needs for healthcare workers. Health Science Reports. 2021 Sept;4(3). doi:10.1002/hsr2.370

4.Pandey S, Poudel S, Gaire A, Poudel R, Subedi P, Gurung J, et al. Knowledge, attitude and reported practice regarding donning and doffing of personal protective equipment among frontline healthcare workers against COVID-19 in Nepal: A cross-sectional study. PLOS Global Public Health. 2021 Nov 12;1(11). doi:10.1371/journal.pgph.0000066

5.Akello JO, Awoi R, Omara TM. Factors influencing the use of personal protective equipment (PPE) among health workers in Kiryandongo General Hospital: Across sectional study. doi:10.51168/insights.v1i10.7

6.Colice GL, Curtis A, Deslauriers J, Heffner J, Light R, Littenberg B, et al. Medical and surgical treatment of parapneumonic effusions. CHEST Journal [Internet]. 2000 Oct 1;118(4):1158–71. Available from: https://doi.org/10.1378/chest.118.4.1158

7.Bernardes GCS, Godoi APN, de Almeida NA, Nogueira LS, Pinheiro MB. Doffing personal protective equipment in times of covid-19 [Internet]. U.S. National Library of Medicine; 2021 Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC8100761/

8.Kim DO, Oh BJ, Hong ES, Lee JH, Kim W, Ahn JY, Lim KS. Surveillance on hazardous

materials preparedness in the emergency department in Korea: personal protection equipment. Journal of the Korean Society of Emergency Medicine. 2007 Feb 1;18(1):48-55.
9.Badgujar JV, Sharma GM, Relwani NR, Rohondia OS, Patole TD, Puntambekar AS. Knowledge, attitude and practices regarding the use of personal protective equipment during COVID-19 pandemic among health care workers at a tertiary health care center. International Journal Of Community Medicine And Public Health. 2021 Apr 27;8(5):2321. doi:10.18203/2394-6040.ijcmph20211753
10.Hick JL, Hanfling D, Burstein JL, Markham J, Macintyre AG, Barbera JA. Protective equipment for health care facility decontamination personnel: regulations, risks, and recommendations. Annals of emergency medicine. 2003 Sep 1;42(3):370-80.
11.Garg K, Grewal A, Mahajan R, Kumari S, Mahajan A. A cross-sectional study on knowledge, attitude, and practices of donning and doffing of personal protective equipment: an institutional survey of health-care staff during the COVID-19 pandemic. Anesthesia Essays and Researches. 2020 Jul 1;14(3):370-5.
12.Abbas S, Sultan F. Infection control practices and challenges in Pakistan during the COVID-19Saraswathy T, Nalliah S, Rosliza AM, Ramasamy S, Jalina K, Shahar HK, Amin-Nordin S. Applying interprofessional simulation to improve knowledge, attitude and practice in hospital-acquired infection control among health professionals. BMC Medical Education. 2021 Dec;21:1-
13.Abalkhail A, Al Imam MH, Elmosaad YM, Jaber MF, Hosis KA, Alhumaydhi FA, Alslamah T, Alamer A, Mahmud I. Knowledge, attitude and practice of standard infection control precautions among health-care workers in a university hospital in Qassim, Saudi Arabia: a cross-sectional survey. International journal of environmental research and public health. 2021 Nov 11;18(22):11831.
14.Demir E et al. PPE practices among Turkish health professionals. J Infect Public Health. 2021;14(6):777–784.
14.Alotaibi B, Yassin Y, Mushi A, Maashi F, Thomas A, Mohamed G, Hassan A, Yezli S. Tuberculosis knowledge, attitude and practice among healthcare workers during the 2016 Hajj. PloS one. 2019 Jan 25;14(1):e0210913.
15.Jaafar R, Umar N, Ibrahim A, Abdul Halim MA. Assessment of occupational safety and health awareness of public servants in the workplace.
16.Alhumaid S, Almuqati M, Alhuqbani W, et al. Knowledge of and attitude towardPPE use among health care workers during COVID-19 pandemic in Saudi Arabia. *Journal of Infection and Public Health.* 2021;14(5):583–590.
17.Iqbal M, Zahra T, Arshad M. Knowledge, attitude and practices regarding PPE usage among healthcare workers in a district hospital in Pakistan. J Community Health. 2022;47(2):123–130. doi:10.29271/jcpsp.2021.02.165
18.World Health Organization. Infection prevention and control during health care when coronavirus disease (COVID-19) is suspected or confirmed: interim guidance. Geneva: WHO; 2021.