Practices of Personal Protective Equipment Use Amongst Surgeons and Anesthetists During The COVID-19 Pandemic

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ABSTRACT

Objective — *To explore the practices of personal protective equipment (PPE) amongst the surgeons and anesthetists during the COVID-19 pandemic.*

Study design — *Cross-sectional study.*

Place & Duration of study — *Department of Surgery, Dow University of Health Sciences Karachi, from June 2021 to May 2022.*

Methodology — *Anesthetists and surgeons from various specialties practicing in constituent institutions of Dow University of Health Sciences (DUHS) were approached via email. After taking institutional review board (IRB) approval and informed consent, a validated questionnaire was send via email which was filled out by all the participating surgeons and anesthetists. The data were entered and analyzed using SPSS version 26. Chi square test was applied to find out the significance of the study variables.*

Results — *A total of 105 participants filled the questionnaire. Only forty-one (39%) participants had read WHO guidelines for surgery during COVID-19, pandemic. Forty-six (43.8%) healthcare professionals (HCPs) working in ORs had undergone training to don and doff PPE, and 46 (43.8%) reported any changes made to the ORs after the pandemic. More consultants were practicing donning coverall suits in OR compared to post-graduate trainees (PGTs) (p=0.004), whereas more PGTs underwent training for PPE-donning and doffing compared to the consultants.*

Conclusion — *There was a wide variation in the practices of PPE use among surgeons and anesthetists working in ORs during the COVID 19 pandemic.*

Key words — *COVID-19, Surgeons, Anesthetists, Personal protective equipment.*

INTRODUCTION:

The SARS-CoV-2C (COVID-19) disease that started in 2019 in China later spread to the whole of the world and declared as a pandemic by World Health Organization (WHO) in March 2020.[1,2] The intensity of this disease has waned over the years but not resolved completely. Health care workers (HCWs) are at an increased risk of the infection either through direct contact with the patients or indirect contact through multiple sources. In addition, HCWs are more likely to get infected than the general population.[1,3] WHO and the United States Centre for Disease Control and Prevention (CDC) have prepared standard SOPs for HCW that include utilization of PPE.[4] Adequate use of the PPE is reported to decrease the risk for infection.[1,5]

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Amongst HCWs, surgeons and anesthetists are at a higher risk of getting this infection.[6] Procedures like tracheal intubation, mechanical or non-invasive ventilation, tracheotomy, bronchoscopy as well as surgeries involving the respiratory tract, nose or oropharynx are particularly a high risk.[6] Various guidelines have been outlined by international organizations for specific surgical procedures during COVID-19 pandemic.[7] WHO has also provided some general guidelines for the operating room (OR).[6,8] However, it was observed that many of the HCWs were did not follow the SOPs during the pandemic. Many deaths amongst HCWs were also reported. This study was conducted to determine the practices of PPE use, and availability of PPE as well as the compliance to WHO guidelines by surgeons and anesthetists at one of the tertiary care hospitals in Pakistan so as to understand the pattern of working and attitude of HCWs during pandemic at their workplace.

METHODOLOGY:

A cross-sectional study was conducted from June 2021 to May 2022 at DUHS Karachi. IRB approval was obtained. Purposive sampling technique was used. Surgeons and anesthetists from all specialties, both consultants and post-graduate trainees employed in DUHS, who had worked in the OR during the COVID-19 pandemic were eligible and approached for this study. Surgeons and anesthetists who had abandoned/stopped their practice during COVID-19 pandemic were excluded from the study.

Participants were approached via email citing the link of the online semi-structured, pre-tested questionnaire. The identity of the participants and information retrieved were kept confidential. Data were entered and analyzed by SPSS version 21. Frequency and percentages were calculated for qualitative data like gender and place of practice while mean and standard deviation were calculated for quantitative data like ages and years of practice. Stratification was done with reference to the age, gender, and years of practice to control the effect modifier. Chi-square test was applied to find out the effect of these on outcome variable. A p value <0.05 was taken as significant.

RESULTS:

A total of 105 surgeons and anesthetists responded to the invitation and filled the online questionnaire. Mean age of the respondents was 35.17±8.797 year. Most of participants were married, living with the family and having elderly family members. Most of the responders were PGTs. Among the consultants, majority of the respondents were general surgeons, anesthetists, and obstetricians. Among the respondents 88 (83.8%) had already suffered from COVID-19 disease themselves and 32 (21.9%) had reported deaths in their families from the disease (table I).

Eighty-seven (82.9%) respondents agreed that their OR practice has changed. Surgical masks were used by 67 (63.8%) OR professionals followed by KN95 and N95 masks. Eye protection, coverall suits were used by less than 50%. Face shields were used by none of the respondents. Fort-six (43.8%) healthcare professionals (HCPs) working in ORs had undergone training to don and doff PPE. Only 46 (43.8%) told that there were changes made to the ORs after the pandemic. To the questions regarding the details of changes made, 38 (36.2%) concurred that they have separate PPE-donning and doffing rooms designated in their OR while only mirrors and posters demonstrating don/doff guidelines were available to 3 (2.9%) and 19 (18.1%) respectively. Though 70 (66.7%) of OR- HCPs had a dedicated OR for COVID-19 suspected and positive patients and measures like decreased traffic of staff in OR and door closure during surgery were undertaken but negative pressure system installation and high ventilation rates for 15-20 air changed per hour were only available to few. Forty-one (39%) reported to have read WHO guidelines for surgery during COVID-19 pandemic (table II).

In this study, males practiced donning eye protection more frequently (p=0.000) and coverall suits in OR (p=0.003), while more female OR-HCPs had undergone PPE donning and doffing training (p=0.004). Upon stratification on the basis of consultants and PGTs, the data showed that more consultants were practicing donning coverall suits in OR compared to PGTs (p=0.004), whereas more PGTs were provided training for PPE-donning and doffing compared to the consultants (p=0.011). The rest of the responses were statistically similar from both the strata with p>0.05.

The medical fields that practiced a stricter use of N95 masks were oral maxillofacial surgery (100%), pediatric surgery (100%), anesthesia (85.7%), ENT (83.3%) and general surgery (81.3%). Coverall suits were mostly worn by oral maxillofacial surgeons (100%), pediatric surgeons (100%) and neurosurgeons (66.7%). Lastly, eye protection was the most practiced by oral maxillofacial surgeons (100%) and orthopedic surgeons (53.8%).

Table I: Demographics of the Study Participants

Variables		Number (%)
Gender	Male	45 (42.9%)
	Female	60 (57.1%)
Relationship	Single	41 (39%)
	Married	64 (61%)
How many family members live with you?	None	1 (1%)
	1-5	83 (79%)
	More than 5	21 (20%)
Are elderly members over the age of 60 years living with you?	Yes	68 (64.8%)
	No	37 (35.2%)
Did anyone in your family have COVID-19?	Yes	42 (41%)
	No	62 (59%)
Did you yourself had COVID-19 disease?	Yes	88 (83.8%
	No	17 (16.2%)
Did anyone in your family die of COVID-19 disease?	Yes	32 (21.9%)
	No	82 (78.1%)
Specialty	Cardiothoracic	2 (1.9%)
	General surgery	32 (30.5%)
	Neurosurgery	6 (5.7%)
	Oral/maxillofacial	1 (1%)
	ENT	6 (5.7%)
	Pediatrics	2 (1.9%)
	Orthopedics	13 (12.4%)
	Vascular	5 (4.8%)
	OBGY	17 (16.2%)
	Anesthesia	21 (20%)
Are you a Consultant or PGT?	Consultant	33 (31.4%)
	PGT	72 (68.6%)
Years of practice	Less than1	09 (8.6%)
	One to five	41 (39%)
	Six to ten	40 (38.1%)
	Eleven to twenty	11 (10.5%)
	More than 20	04 (3.8%)

DISCUSSION:

Preventive measures are considered important in decreasing the spread of COVID 19 disease. This is one of the key messages learnt since the beginning of the pandemic from China.[9] HCPs are required to use PPE in order to protect themselves. There are number measures that can be adopted to achieve the goal.[10] SARS-CoV-2 transmission takes place via particles or droplets containing the virus as well as aerosol, via fomites and subsequent direct contact.[11-12]

The HCPs belonging to certain disciplines such as maxillofacial, ENT are more prone to get the infection since nasopharyngeal and oropharyngeal mucosal membranes have high viral load.[13] For all intimate and close contact situations that may arise during examining or treating the patients, full PPE is advocated.[13] Laparoscopic and other endoscopic should only be performed when there is no other option, and full PPE should be practiced during laparotomy.[14] Similar suggestions have been proposed by other professional bodies. In this study the practices related to PPE were not uniform. Facio-maxillary surgeons, ENT surgeons, anesthetists

Table II: Details of Responses

Questions	Responses	Number (%)
Did your OR practices change during COVID-19?	Yes	87 (82.9%)
	No	18 (17.1)
Which type of mask you used in the OR?	Surgical mask	67 (63.8%)
	KN95	30 (28.6%)
	N95	8 (7.6%
Did you wear coverall suit in OR?	Yes	25 (23.8%)
	No	68 (64.8%)
	Sometimes	12 (11.4%)
Did you wear eye protection cover in OR?	Yes	37 (35.2%)
	No	52 (49.5%)
	Sometimes	16 (15.2%)
Did you use face shield in OR?	Yes	0 (0%)
	No	105 (100%)
Were there separate rooms for donning & doffing PPE?	Yes	38 (36.2%)
	No	67 (63.8%)
Are there floor demarcation for clean and contaminated areas?	Yes	3 (2.9%)
	No	102 (97.1%)
Were mirrors provided in donning and doffing areas?	Yes	3 (2.9%)
	No	102 (97.1%)
Were observational windows installed?	Yes	3 (2.9%)
	No	102 (97.1%)
Were sanitizer dispensers installed in OR?	Yes	30 (28.6%)
	No	75 (71.4%)
Does your ORs have AGSS installed?	Yes	2 (1.9%)
	No	103 (98.1%)
Were posters displayed for donning and doffing guidelines?	Yes	19 (18.1%)
	No	86 (81.9%)
Were changes made to OR rooms?	Yes	46 (43.8%)
	No	59 (56.2%)
Was donning and doffing training provided?	Yes	41 (39%)
	No	64 (61%)
Were dedicated OR for COVID-19 positive and suspected patients present?	Yes	70 (66.7%)
	No	35 (33.3%)
Were anesthesia and intubation undertaken in negative pressure?	Yes	20 (19%)
	No	83 (79%)
	Don’t know	2 (1.9%)
Was there limited number of OR staff / essential personnel allowed only?	Yes	58 (55.2%)
	No	47 (44.8%)

Was high ventilation rate of 15-20 air changes per hour maintained in OR during surgery?	Yes	25 (23.8%)
	No	30 (28.6%)
	Don't know	50 (47.6%)
Were doors of OR closed during surgery?	Yes	59 (56.2%)
	No	37 (35.2%)
	Sometimes	9 (8.6%)
Have you read WHO guidelines for surgery during COVID-19 pandemic?	Yes	41 (39%)
	No	64 (61%)

and pediatric surgeons were more compliant than other consultants.

According to our study, only 57.8% male surgeons and 53.3% female surgeons reported that the OR staff was limited to essential personnel, thus highlighting the need to train OR personnel on how to enforce and follow international guidelines to prevent COVID-19 transmission. In our study, 22.7% male surgeons and 16.7% female surgeons reported the conduction of anesthesia and intubation in negative pressure ORs even though this set up is recommended in guidelines.[15] Negative pressure systems in ORs make sure that laminar flow is such that the air flows upwards from the surgical field.[16] Placing, exchanging and removing ETT should be performed in a negative pressure enabled OR or ICU.[16] In a situation of unavailability of negative pressure OR, intubation and extubation should be undertaken in a negative pressure ward or negative pressure intensive care unit. Employing portable high efficiency particulate air (HEPA) filter should be used in very high-risk cases where negative pressure alone is inadequate.

There is no doubt that an efficient usage of PPE has played a life-saving role globally amidst the COVID-19 pandemic for all HCPs, including surgeons. However, due to a lack of awareness, basic training and inadequate implementation of international guidelines, the usage of PPE among surgeons in our set up was not satisfactory. Such practices should be taken into account by the quality assurance department. A regular update must be provided to the surgeons and other HCPs including residents so as to ensure compliance with internationally accepted protocols. Logistics related provisions must also be adhered to so as to keep working environment safe for both the HCPs and patients.

LIMITATIONS OF THE STUDY:

The COVID 19 pandemic is over now. However, the data from a single university hospital added into evidence based medicine literature how HCPs varied in their clinical practices during the pandemic. A qualitative study as to why many of the study participants did not comply with international guidelines worth exploring. This may be conducted at a country level by professional organizations and societies.

CONCLUSION:

The study revealed the wide variation in PPE use practices, safety protocol implementation and compliance, availability of safety equipment and installations in healthcare settings. The reasons for lack of compliance to safe practices is another area that need attention.

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Received for publication: 16-02-2023

Accepted after revision: 08-03-3023

Author's Contributions:
Syed Ali Haider: Conception & design, data acquisition, analysis and interpretation of results, manuscript drafting & revising, final approval, agreement to be accountable. Shajie ur Rehman Usmani: Data acquisition, analysis and interpretation of results, manuscript drafting & revising, final approval, agreement to be accountable.

All authors approved final version of the manuscript.

Ethical Statement: Institution review board permission was taken prior to the study.

Competing Interest: The authors declare that they have no competing interest.

Source of Funding: None

How to cite this article:
Haider SA, Usmani SUR. Practices of personal protective equipment use amongst surgeons and anesthetists during the covid-19 pandemic. J Surg Pakistan. 2022;27 (4):133-38. Doi:10.21699/jsp.27.4.5.