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Original Research Article

Risk assesment and management of exposure of health care workers to COVID-19 in a tertiary care hospital of South Gujarat

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ABSTRACT

Background: The COVID-19 outbreak affected 215 countries worldwide and was declared global COVID-19 pandemic on 11th March 2020 by WHO. Healthcare workers (HCWs) in India are faced with an incredibly high number of patients per worker and because of high infectivity of COVID-19, having higher chances of getting COVID-19 infection. The objective of the study was the risk categorization of HCWs and provide recommendation for HCWs exposed to COVID-19 based on risk categorization.
Methods: After obtaining informed and valid consent from HCWs based on standard WHO questionnaire HCW, who were exposed to COVID-19 were identified and categorised in to high risk and low risk health worker. Those who were at high risk of getting COVID-19 were advised quarantine for 14 days and rt pcr for Covid-19.
Results: Out of 200 participants, 51% were male and 49% were female with the majority of them being in the age group of 18-28 (40%). Out of 200, 190 (95%) were exposed to COVID-19. Majority of HCWs who were having high risk of getting COVID-19 infection were young between age group of 18-28 (66,39.7%, p :0.091), male (91,59.6%, p<0.001), doctors (119, 80.9%, p<0.001).
Conclusions: Young male doctors were more prone to get COVID-19 infection. It is important to protect HCWs from getting COVID-19 infections by taking various fundamental preventive measures like wearing proper PPE kits and adherence to strict hand hygiene.

Keywords: COVID-19, Health care worker, Personal protective equipment

INTRODUCTION

The novel coronavirus outbreak affected 215 countries worldwide. WHO announced the global COVID-19 pandemic on 11th March 2020.[1] Since we began understanding this viral illness, the infrastructures of healthcare facilities all around the world came under scrutiny. We were compelled to re-examine the safety protocols in hospitals for patients as well as our healthcare providers. We seek valuable experience in dealing with infectious disease outbreaks from our past. What sets apart the current situation is the unpredictability of the clinical course of COVID-19, Most patients will stay asymptomatic while actively shedding the virus in the form of respiratory droplets. Common presenting symptoms of COVID-19 are fever, fatigue, dry cough, shortness of breath and myalgia.[2] Less common symptoms are diarrhoea, nausea, vomiting, anosmia and ageusia. Hence it becomes critical to follow meticulous Infection Control and Prevention (IPC) guidelines in COVID-19 facilities, where highly infectious patients are kept in isolation. These locations

serve as a potential source of serious nosocomial outbreaks. We are at the dawn of a massive healthcare worker shortage, as most of them face prolonged exposure in densely infected surroundings.

Healthcare workers (HCWs) in Government COVID hospitals in India are faced with an incredibly high number of patients per worker. Employees of the medical institution who work for diagnosis, treatment, transportation or care of patients in terms of nursing, feeding or cleaning them or their surroundings, are included in the definition of a healthcare worker. The high density of patients in the clinics and wards is also a huge barrier to sufficient sanitisation and social distancing in and around the hospitals in India.

Studying the duration of working hours, the number of patients attended to and type of clinical setting (OPD, ICU, wards, ambulance, laboratory, etc) may yield a quantification and pattern of risk. WHO and ICMR recommend specific guidelines for a respiratory infection outbreak, which are mandatory to be adopted by all institutions and individual HCWs.[3]

The objective of the study was to determine the risk categorization of each HCWs and provide recommendation for HCWs exposed to COVID-19 based on risk categorization.

METHODS

A cross sectional study was carried out with a sample size of 200 in tertiary care hospital of south gujarat.Our study surveys the demography, work profiles and current practices of HCWs to categorise risk and eventually recommend a standard working plan for hospitals in our region. Before beginning to draw conclusions of overall HCW infection rate and pattern, we screened and interviewed HCW who acquired the disease. In our study, we aim to categorise the risk of exposure to HCWs in a range of settings.

Healthcare workers who were working in close contact with COVID-19 patients were approached for informed consent to gain insight into our study. Gross cross-sectional data was collected regarding the areas of hospital and staff most exposed to the virus. We adopted the standard WHO questionnaire (in English) for surveying the infection risk of healthcare workers in the COVID-19 hospital of our institution.[3] Data was collected in person during breaks in the duty hours and also by online google forms sent over mobile-devices. Investigators helped translate the form to workers not versatile in English. A total of 200 healthcare workers (HCWs) like residents, interns, nurses, cleaning staff and ward boys who consented to participate were included in this study. Before the questionnaire begins, the relevant contact information was recorded. Questions regarding the socio-demographic information included gender, age, residence, contact information, category of work, type of healthcare setting, number of shifts, and duration of work in dedicated COVID-19 units.

An indirect way of quantifying viral load was to ask the number of patients being taken care of in each COVID-19 facility. Regarding type of patient care duty questions like - degree of close contact with infected patients and their body-fluids, and HCW presence during heavy aerosol generating procedures and HCW contact with patients' environment and personal equipment, were included. Based on this information HCW who were exposed to COVID-19 were identified and they were further categorized into high risk and low risk based on the following details.

The survey questions are overall based on the risk of infection by respiratory droplets in air and fomites and HCWs' consistency in Infection Control Practices. The survey has a total of 7 sections: 1) Interviewer information, 2) Participants' information, 3) HCW interactions with COVID-19 patient, 4) Aerosol generating procedures information 5) Questions regarding adherence to IPC measures in healthcare activities and 6) during aerosol generating procedures, 7) Biological accidents by contact with patient's body fluids. Based on this, those health care workers who were exposed were identified. The practice-based questions had a range of 4 responses consisting of: "Always as recommended", "Most of the time", "Occasionally" and "Rarely". This practise based qestions were asked for adherence of HCW towards Personal protective equipment and based on this they were categerised in to high risk and low risk workers.The end section of the survey included a special note of "Accidents with biological material". For local standard care and prophylaxis monitoring, questions regarding the Influenza vaccine and Hydroxychloroquine use are added.

Those who were having a high risk of getting COVID-19 infection were advised for quarantine for 14 days and were asked to get themselves tested for COVID-19.

Data was entered in to MS Excel spread sheet and Chi-Square ad fisher exact test by SPSS version-17 was applied for data analysis.

RESULTS

A total of 200 HCW gave consent and took part in this study, out of which 102 (51%) were male and 98 (49%) were female. Table 1.0 and table 2.0 represents the age and sex wise distribution of HCW. Majority of this HCW were among age group of (44.5%) 18-28 years followed by 28-38 years (22.5%).

Table-1 also shows that majority of HCW who took part were doctors (65%) followed by nurse (23%) and cleaner (9%), while most of health care workers (90%) belonged to hospital.

Table 1: Distribution of HCW according to gender, age, occupation and health care setting.

Variables	Frequency	Percentage (%)
Gender		
Male	102	51
Female	98	49
Total	200	100
Age (years)		
18-28	89	44.5
28-38	45	22.5
38-48	33	16.5
48-58	21	10.5
≥58	12	6
Total	200	100
Type of health care personnel		
Doctor	130	65
Nurse	46	23
Lab. tech	6	3.0
Cleaner	18	9
Total	200	100
Type of health care setting		
Hospital	180	90
OPD	14	7
PHC	6	3
Total	200	100

Table 2: Distribution of HCW according to provision of care, face to face contact with Covid-19 patients and procedure preformed.

Did you provide direct care to a confirmed Covid-19 patient	Frequency	Percentage
Yes	190	95
No	10	5
Total	200	100
Did you have face-to-face contact (within 1 metre) with a confirmed Covid-19 patient in a health care facility?		
Yes	185	92.5
No	15	7.5
Total	200	100
Were you present when any aerosol-generating procedures were performed on the patient?	**Frequency**	**Percentage**
Yes	79	39.5
No	121	60.5
Total	200	100

Table-2 shows that around (95%) of HCW were involved in providing direct health care to Covid-19 patients and around (92.5%) of them had direct face-to-face contact (within 1 metre) with a confirmed Covid-19 patient. So 190 HCWs were considered as exposed to Covid-19 infection. Table 2 also shows that around 79 (39.5%) were present when any aerosol-generating procedures were performed on the patient.

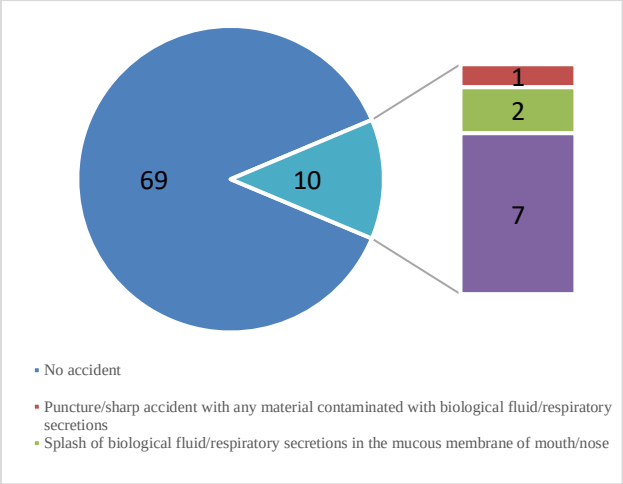

Figure 1: Distribution of HCW according to accident with respiratory secretion/ body fluid.

Figure 1 shows that, out of 79 HCWs who were present when any aerosol generating procedure was performed on the patient, around 10 health care workers had some kind of accident with body fluid /respiratory secretion, most of it (7,70%) were related to Splash of biological fluid/respiratory secretions on non-intact skin.

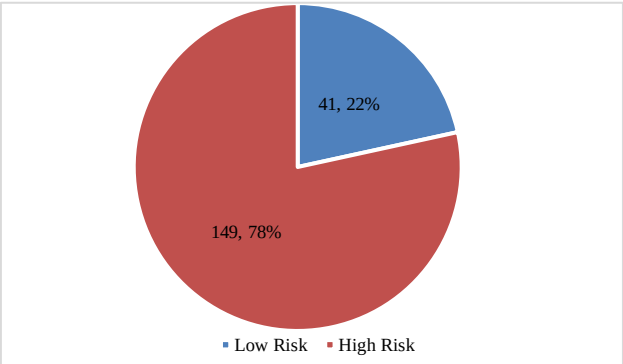

Figure 2: Risk categorisation of HCW.

Table 3: Association of risk categorisation with age.

Age (yrs)	Low Risk (%)	High Risk (%)	Fisher's exact P value
18-28	23(39.3)	66 (39.7)	
28-38	10 (21.4)	35(23.5)	0.091
38-48	8 (14.3)	25 (16.9)	
48-58	9 (23.2)	12 (10.3)	
Equal or more than 58	1 (1.8)	11 (9.6)	
Total	41 (100)	149 (100)	

As shown in Figure-2, out of 190 HCWs who had direct face-to-face contact with Covid-19 positive patients, 149 (78%) were having high risk of getting Covid-19 infection.

Table-3 shows that majority of health care workers who were exposed and fall under high risk belonged to age group of 18-28 though it was not significant.

Table 4: Association of risk categorisation with sex.

Sex	Low Risk (%)	High Risk (%)	Chi-square P value
Male	11 (19.6)	91 (59.6)	<0.0001
Female	30 (80.4)	58 (40.4)	
Total	41(100)	149 (100)	

As mentioned in table-4; majority of high risk health care worker were male and this association was significant with p value 0f <0.0001.

Table 5: Association of risk categorisation with occupation.

Occupation	Low Risk (%)	High Risk (%)	Fisher's exact P value
Doctor	6 (14.3)	119 (80.9)	
Nurse	28 (60.7)	16 (7.8)	<0.0001
Lab technician	1 (1.8)	5 (3.5)	
Cleaner and others	6 (23.2)	9(7.8)	
Total	41 (100)	149 (100)	

Table-5 shows that majority of health care worker who were exposed to Covid-19 and were having high risk of getting infection were doctors and it was significant with p value of <0.0001.

Table 6: Association of risk categorisation with health care setting.

Type of health care setting	Low Risk (%)	High Risk (%)	Fisher's exact P value
Hospital	41 (100)	130(87.6)	
OPD	0	14(9.3)	0.018
PHC	0	5(3.1)	
Total	41 (100)	149 (100)	

In Table-6 most of HCW who were having high chances of getting Covid-19 infection were working in hospital environment though it was not significant.

Table-7 shows that HCW working in health facilities where multiple patients were admitted had higher chances of getting infection and it was significant.

Table 7: Association of risk categorisation with health care facility.

Multiple COVID-19 patients in health care facility	Low Risk (%)	High Risk (%)	Fisher's exact P value
Yes	41 (100)	94 (76.4)	
no	0	29 (23.6)	<0.0001
Total	41 (100)	149 (100)	

DISCUSSION

Health care workers are playing a vital role in prevention and managing this pandemic worldwide and it is of our prime importance to make sure that HCWs are provided enough measures to make themselves safe from getting the infection.

In our study out of 200 participants, 51% were male and 49% were female with the majority of them being in the age group of 18-28(40%). The majority of study participants were doctors, working in hospitals where multiple patients of COVID-19 were receiving treatment. While around 1797(67%) physicians, 744 (27%) nurses took part in worldwide survey regarding use of PPE and health care worker carried out by Alexis Tabah a et al.[4]

In our study, out of these 200 health care workers, around 95% were involved in providing direct care to COVID-19 patients and around 185 HCW had close contact with COVID-19 patients. This 95% of health care workers were exposed to COVID-19, based on adherence and compliance to the use of personal protective equipment, they were categorized into high risk and low risk of getting infected. Out of 190 HCWs, 41 had a low risk of getting COVID-19 and 149 had a high risk of acquiring COVID-19 infection.

Similar results were found in Chou, Buckley et al, where they mentioned that health care workers are at high risk of getting infected and the strongest evidence on risk factors was on consistent and correct PPE use and decreased infection risk[5]. The association was most consistent for N-95 masks but was also observed for gloves, gowns, eye protection, and handwashing. Diedo delgado et al found that out of 899 health care workers aroun8d (889, 95%) had Access to gel hand sanitizer, disposable gloves (*n* = 853; 91.1%), disposable gowns (*n* = 630; 67.3%), disposable surgical masks (785; 83.9%), N95 masks (*n* = 516; 56.1%), and facial protective shields (*n* = 305; 32.6%).[6] In Alexis Tabah a et al. (1557, 58%) HCW reportedly used FFP2/N95 masks, waterproof long sleeve gowns (1623; 67%), and face shields/visors (1574; 62%) and HCWs reported widespread shortages, frequent reuse of PPE.[4]

In our study out of 200 HCWs, 79 were present during aerosol-generating procedure and around 10 had accidental exposure with body fluid / respiratory secretion of COVID-19 patients. As per Martina Ferioli et al,

healthcare workers are at high risk of contracting the infection particularly when applying respiratory devices such as oxygen cannulas or noninvasive ventilation.[7]

As shown in Table 3, most of the health care workers who were exposed and had higher chances of getting COVID-19 infection were between the ages of 18 to 28. While as per Xioquian lao et al, the majority of HCWs who acquired COVID-19 infection had a median (interquartile range) age of 36.5 (30.0-47.0) years.[8] This may compel hospital policy makers to check and regulate knowledge and adherence of IPC practices by young HCWs. Most of these young professionals also lack experience of working in flu outbreaks in the past, unlike their older counterparts.

In our study, the majority of HCWs who were having higher chances of getting COVID-19 infection were male (59.6%) and it was significant with a p-value of <0.05. In Xioquian lao et al, the majority of HCW who acquired COVID-19 infection (71.8%) were women.[8]

We found that doctors as HCW were at high risk of getting COVID-19 infections compared to other health care workers. While Xioquian lao et al found that non–first-line nurses younger than 45 years were more likely to be infected compared with first-line physicians aged 45 years or older (incident rate ratio, 16.1; 95% CI, 7.1-36.3; $P < 0.001$).[8] We found that young male doctors were more prone to get COVID-19 infection than any other health care worker, this is because majorly in the hospital young residents were involved in the treatment of COVID-19 patients and they were present during aerosol-generating procedures like keeping patient on high flow oxygen, non-invasive ventilation, intubation etc.

Young residents overall supervise and perform more responsibilities in wards and ICUs than nurses and older attending doctors, which leads to a higher cumulative dose of viral exposure. The requirement of the institution of segregating residents into COVID-19 and non-COVID-19 duties has also lead to an increased burden of infected patients per doctor. Our study was limited by small number of sample size and not being multi-centric because of which findings cannot be generalised. A multi centric study with larger sample size can provide a much needed and useful insight on this topic.

CONCLUSION

Young male doctors were more prone to get COVID-19 infection than any other subgroup of health care workers, this is because young residents were majorly involved in the treatment of COVID-19 patients and they were present during aerosol-generating procedures, like keeping patient on high flow oxygen, in non-invasive ventilation, intubation of critical patients etc.

Health care workers form the main pillar in the management of COVID-19 pandemics and it is important to protect them from getting COVID-19 infections. Besides creating a vicious gap in our efforts to treat patients, infected healthcare workers can become dangerous sources of outbreaks in this important community. Various fundamental preventive measures like wearing proper PPE kits and adherence to strict hand hygiene play a crucial role in protecting them. Proper knowledge, attitude and practice regarding the use of PPE is necessary among health care workers to avoid getting infected.

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