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Original Research Article

Healthcare workers infected with COVID-19 in a tertiary care center in Kerala

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ABSTRACT

Background: Health care workers are at the forefront of the fight against COVID-19. There is a high risk of them contracting the infection and then transmitting it to vulnerable patients and colleagues. Therefore, it is critical to investigate the prevalence and risk factors among HCWs. This study describes the characteristics of healthcare workers who tested positive for COVID-19 in a tertiary care hospital in India.
Methods: A cross-sectional study was conducted among HCWs from a tertiary care center with a real-time - polymerase chain reaction (RT-PCR) test positive for COVID-19 on a nasopharyngeal swab from July 2020 to January 2021. All healthcare workers with confirmed SARS-CoV-2 infection were contacted over the telephone to collect data regarding their probable source of contact, usage of personal protective equipment, and clinical course. Their treatment history was extracted using electronic health records.
Results: During the study period, 192 HCWs were RT-PCR positive for COVID-19. The mean age of the study participants was 34.01 years. Among the infected, 23.4% were male employees, while the remaining 76.6% were female employees. Nurses were most commonly affected (36.5%), followed by doctors (22.9%) and housekeeping staff (15.6%). Infected HCWs acquired the infection from the hospital in 73.4% of cases, while 38.6% had direct contact with patients or colleagues.
Conclusions: HCWs have an increased risk of COVID-19 infection at the workplace. Strengthening of infection control measures as well as strict follow-up of precautionary measures needs to be ensured, even during break time and work hours.

Keywords: Health care workers, Nurses, COVID-19, Personal protective equipment, Duration of negativity, Epidemic curve

INTRODUCTION

Emerging and re-emerging infectious diseases are global public health concerns. Since its outbreak in Wuhan, China, in December 2019, a new corona virus has affected the global population, having medical, social and economic implications.[1] A significant proportion of cases could be attributed to occupational exposure among healthcare workers. COVID-19 is the first new occupational disease to be described in this decade. This has thrown several new challenges for the health care system as well as the health care staff on a global scale. Health care workers (HCW) are at high risk of acquiring infections during novel disease outbreaks, especially before the transmission dynamics are fully outlined.[2] However, our previous experience dealing with SARS-CoV and MERS-CoV outbreaks has prepared us for this novel challenge.[3] Because of the risk of infecting vulnerable patients, it is critical to investigate the prevalence and risk factors among HCWs. A serious concern is that further depletion of the workforce due to infection among the HCWs could lead to critical

shortages and adversely impact patient care.[4] Aerosol-generating procedures are associated with high occupational exposure, emphasizing the importance of HCWs wearing personal protective equipment (PPE). But worryingly, the high-transmission efficiency of the causative agent SARS-CoV-2 could also lead to infections beyond such settings.[5] To reduce nosocomial spread, understanding the rate of infected HCWs is essential, even among asymptomatic cases. According to various studies, the infection rate among HCWs is reasonably low. Most of the infected HCWs were found to be asymptomatic for the preceding 30 days. This supports the necessity for periodic screening of HCWs for COVID19.To better comprehend how to protect staff, it is indispensable to understand the predisposing factors for HCW infection and nosocomial transmission.[6,7] It is crucial for any country to protect its healthcare workers, which are the most critical resource at the time of a pandemic. If existing manpower is lost due to infection or death, these skilled human resources cannot be replenished quickly.[8] With the increasing number of healthcare workers getting infected with COVID-19 disease, it is necessary for a country like India to ensure appropriate measures to protect its healthcare workers. [9]The purpose of this study was to examine the rates of infection among different categories of HCWs and to describe the characteristics of those who tested positive.

METHODS

Study design and participants

A descriptive cross-sectional study was conducted between 22 July 2020 and 31 January 2021 in a 900-bed tertiary hospital in South Kerala. This hospital was a government designated center for COVID-19 testing and treatment. The study center employs nearly 2500 frontline HCWs. The HCWs were tested by real-time reverse transcription-polymerase chain reaction (RT-PCR) tests if they reported symptoms or were exposed in the hospital or community to a confirmed COVID-19 case. Exposure to a confirmed COVID-19 case was defined as contact with a person with laboratory confirmation of COVID-19 infection, irrespective of clinical signs and symptoms involved in any of the following-providing direct care without proper personal protective equipment (PPE) for COVID-19 patients, staying in the same close environment as a COVID-19 patient (including the workplace, classroom, household, gatherings), traveling together in close proximity (≤1 m) with a symptomatic person who later tests positive for COVID-19.

Measurement tools and methods

The study included all HCWs from the study center who tested positive for the RT-PCR test, regardless of whether they were symptomatic or not. Once they had been sent to isolation either at their home or hospital, within two days, all health-care workers with confirmed SARS-CoV-2 infection were contacted over the telephone and a questionnaire-based interview was administered. The data collected included baseline demographic information, the type of health care worker, the probable source of infection and history of contact with their colleagues, possible breaches while using Personal Protective Equipment (PPE), the course of clinical symptoms and treatment. Data from the hospital's electronic health records, including the need for supplemental oxygen or other interventions, were extracted. The study was approved by the institutional ethics committee and verbal informed consent was obtained from all health-care workers before data collection. All the contacted HCWs consented to be included in the study. Data was de-identified before analysis.

Statistical analysis

Collected data was entered into an MS Excel spreadsheet, cleaned and coded appropriately and analyzed using the SPSS version 18 software. Baseline characteristics of the study subjects were explained in terms of frequency, percentages, and mean. The Chi-square test was applied and a $p \leq 0.05$ was considered statistically significant.

RESULTS

During the study period, 192 COVID-19 infections in healthcare workers were identified at a tertiary care center in Kerala with a test positivity rate of 21.2% and the proportion of infected hospital staff was 7.6% (192/2500). The mean age of the study population was 34.01 years. Housekeeping staff had the highest proportion of staff getting infected in any category of HCWs (Table 1).

Table 1: Polymerase chain reaction (PCR) testing confirms the proportion of infected health care workers with COVID-19 among all hospital HCWs.

Variables	Total Number of HCWs	Total infected	Percentage infected
Gender			
Male	875	45	5.1
Female	1625	147	9
HCW type			
Nurse	910	70	7.6
Doctor	600	44	7.3
House-keeping Staff	110	30	27
Technician	185	15	8.1
Admin-istration	215	13	6
Pharmacy	210	10	4.7
Others	275	10	3.6

Among the infected, 23.4% were males while 76.6% were female staff. Forty-one individuals (53.6%) required inpatient care in the study center, 20 (14.6%) received care at a government hospital near their home and 9 (31.8%) were isolated at home.

Table 2: Association between symptomatic status and various other factors in the study sample.

Variables	Category	Symptomatic status N (%)		Total (%)	P value
		Yes	No		
Treatment/isolation	Government	13 (12.7)	15 (16.7)	28 (14.6)	0.370
	Own hospital	60 (58.8)	43 (47.7)	103 (53.6)	
	Home Isolation	29 (28.4)	32 (35.6)	61 (31.8)	
Duration for negativity (days)	<10	50 (49)	53 (58.9)	103 (53.6)	0.377
	11- 15	46 (45.1)	32 (35.6)	78 (40.6)	
	15-20	5 (5.6)	6 (5.9)	11 (5.7)	
Co morbidity	Present	19 (18.6)	16 (17.8)	35 (18.2)	0.870
	Absent	83 (81.4)	74 (82.2)	157 (81.8)	
HCW type	Nurse	44 (43.1)	26 (28.9)	70 (36.5)	0.01
	Doctor	20 (19.6)	24 (26.7)	44 (22.9)	
	Housekeeping staff	17 (16.7)	13 (14.4)	30 (15.6)	
	Technician	9 (8.8)	6 (6.7)	15 (7.8)	
	Administration	6 (5.9)	7 (7.8)	13 (6.8)	
	Pharmacy	6 (5.9)	4 (4.4)	10 (5.2)	
	Others	10 (11.1)	0	10 (5.2)	

Table 3: Association between the type of acquisition and the variables studied.

Variable	Category	CA	HA	Total	P value
		N (%)	N (%)	N (%)	
Age (years)	<25	5 (9.8)	20 (14.2)	25 (13.0)	0.18
	26 to 35	27 (52.9)	83 (58.9)	110 (57.3)	
	36 to 45	9 (17.6)	26 (18.4)	35 (18.2)	
	>46	10 (19.6)	12 (8.5)	22 (11.5)	
Gender	Male	19 (37.3)	26 (18.4)	45 (23.4)	0.007
	Female	32 (62.7)	115 (81.6)	147 (76.6)	
Co morbidity	No	35 (68.6)	122 (86.5)	157 (81.8)	0.005
	Yes	16 (31.4)	19 (13.5)	35 (18.2)	
HCW Category	Nurse	13 (25.5)	57 (40.4)	70 (36.5)	0.03*
	Doctor	15 (29.4)	29 (20.6)	44 (22.9)	
	Housekeeping Staff	4 (7.8)	26 (18.4)	30 (15.6)	
	Technicians	6 (11.8)	9 (6.4)	15 (7.8)	
	Administration	4 (7.8)	9 (6.4)	13 (6.8)	
	Pharmacy	3 (5.9)	7 (5)	10 (5.2)	
	Others	6 (11.8)	4 (2.8)	10 (5.2)	

CA- Community acquisition HA- Hospital acquisition

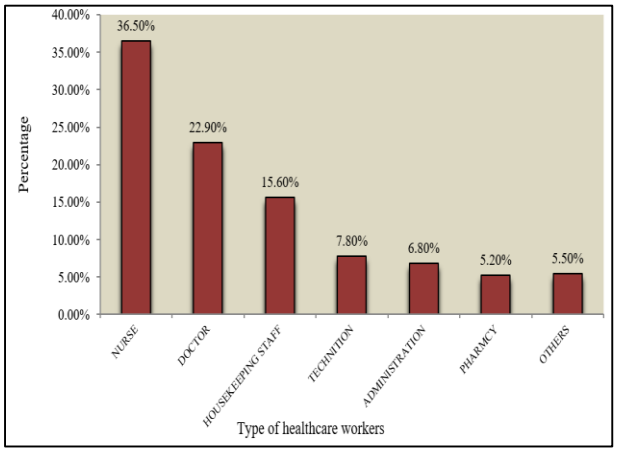

Figure 1: Type of HCW among the total infected.

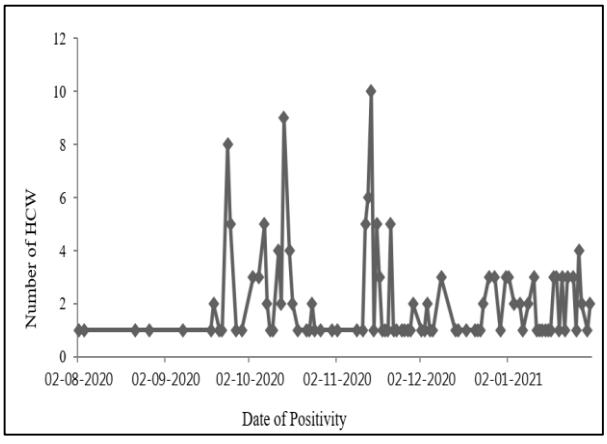

Figure 2: Epidemic curve of health care worker infections at tertiary care centers.

Only one of the study population required admission to the intensive care unit (ICU), while none required mechanical ventilation, and there were no deaths. The epidemic curve showed 2 peaks, one in October and the other in mid-November, of which the second peak reported the highest number of cases (Figure 2). Among the healthcare workers, symptoms were reported mostly by nurses (36.5%), followed by doctors (22.9%) and housekeeping staff (15.6%) (Table 3). Bivariate analysis showed a significant association between HCW type and symptomatic status and between HCW type and the type of acquisition (Table 4). Over 20% of hospital-acquired infections were from contact with another infected colleague, particularly during "break" times, as the HCWs were not compliant with social distancing and universal masking while going out to get food. The duration of negativity ranged from 9 to 20 days, with 11.43 days being the longest. Over 18% of the infected HCWs had chronic diseases and all had an uneventful recovery.

DISCUSSION

Healthcare workers experience an increased risk of COVID-19 infection not only due to their close contact with highly infectious patients, but also through exposure to undiagnosed or subclinical infectious cases. Protection of HCWs from infection is critical for the resilience of the health system now tasked with facing a major pandemic like COVID-19. However, despite all efforts to protect HCWs, some exposure is inevitable.

Among a total of 2500 healthcare workers, 192 were identified to have acquired COVID-19 infection during the study period in a tertiary care center in Kerala. In this study, HCWs aged 26-35 years (38.6%) were more susceptible to infection, similar to a previous study conducted in Oman.[10] However, 64% of infected HCWs were female, which may be due to the fact that the majority of HCWs, particularly nurses, are female, which is consistent with the study conducted by Fusco et al in Italy.[14] In study settings as varied as Qatar and Wuhan, nurses and administrative staff were the most common affected HCWs and our study also threw up similar results.[9,11] If there is a breach in their personal protection while managing patients, health care personnel working in hospitals are at an increased risk of contracting the COVID-19 disease. Updating hospital policy on infection control measures requires information on the influence of various exposure related factors.[13] PPE breaches were rarely reported in our study. Even though COVID-19 appropriate measures were strictly followed on the hospital premises, it was undone by the neglect of precautions during their break time or at the place of their residence inside the hospital campus. Health care workers are a high risk group for acquiring an infection and an increase in cases among them substantially affects the functioning of the health care system, which in turn affects health care delivery to the public. A large number of COVID-19 affected health personnel being isolated for treatment and their close contacts being quarantined have a serious impact on the hospital's services during these critical times.[12] This study has a few limitations. First, there may have been an underestimation of the symptoms, as these were reported in the initial days of quarantine, when the interview was conducted as part of contact tracing. The HCWs might have developed more symptoms later that were not reported. Another limitation was the performance of diagnostic tests. Nasopharyngeal swabs are commonly used to obtain samples for molecular testing, but false-negative results have been reported (sensitivity-86% specificity-96%). As a result, the prevalence of COVID-19 among HCWs may have been underestimated.

As COVID-19 positive cases showing no symptoms have been identified in several studies, some cases in the same manner might have been missed. Lastly, enough data was not collected to ascertain transmission from HCWs to patients. It is recommended that training in knowledge and skills for prevention and control of COVID-19 among all categories of healthcare providers should be imparted regularly. Hospital personnel training should include the type of PPEs, their proper use, cleaning, re-use and appropriate support. During the COVID pandemic, hospital-based care was critical for reducing mortality. Provision of high-quality care in hospitals would be compromised by a high infection rate among health care workers. Because of large numbers of staff furloughs, the remaining staff experienced high workloads. It is pertinent that the morale of health care workers is kept high by various means, like adequate supply of high quality personal protective equipment, provision of financial incentives and psychological support.

Irrespective of the presence or absence of symptoms, random periodic testing of health care workers needs to be done. This is critical to reducing infection rates among HCWs and to ensuring reliable availability of the workforce in the current COVID-19 pandemic. Active training of healthcare workers regarding recommended hygienic practices and barrier precautions is important. As per WHO guidelines, systematic training for the use, removal, and disposal of PPEs as well as Infection Prevention and Control (IPC) practices before being exposed to COVID-19 patients are the rights of health workers. Moreover, ensuring the willingness of health care workers to work in designated COVID-19 wards is essential. Trust in being protected is the strongest factor influencing the motivation of health workers at the time of a pandemic. Healthcare workers (HCWs) are at increased risk of healthcare associated infections due to the frontline nature of their work.

CONCLUSION

In conclusion, even in a setting heavily involved in the management of patients with COVID-19, the prevalence of infection among HCWs was reasonably low. Nurses were more likely than other HCWs to contract infections,

and a large number of them developed symptoms, with the majority contracting the infection at the hospital. Continuous, recurrent education on infection control practices should be imparted to all health care workers regularly. Healthcare workers are at increased risk of being exposed to viruses within hospitals, but they can also be a source of transmission by introducing a virus into the hospital.

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