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Original Research Article

SARS-Cov-2 infection among health care workers working in COVID-19 and non COVID-19 clinical setting of a tertiary care teaching hospital

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ABSTRACT

Background: understanding the impact of COVID-19 on healthcare workers helps in developing newer strategies of infection prevention and control practices objectives were to determine the SARS-CoV-2 infection positivity rate and to identify the risk factors and outcome of SARS-CoV-2 infection among Health Care workers (HCWs) of a tertiary care center.
Methods: A longitudinal cross-sectional study was done among the HCWs of a tertiary care teaching hospital from March 2020 to Feb 2022 Inclusion criteria: All HCWs infected with SARS-CoV-2 during the study period and whose data available with testing and quarantine committee. Exclusion criteria was incomplete HCWs data.
Results: A 840 HCWs out of 2990 total HCWs were infected with SARS-CoV-2: infectivity rate was 28%. Majorities were females (53.9%). mean age was (35.6±1.006) years. nurses (33.8%) were most commonly affected followed by doctors (26%). Working at designated COVID-19 hospital was significantly associated with SARS-Cov-2 positivity compared to working in non- COVID-19 hospital, which was statistically significant at chi-square value of 6.636 at $p<0.01$. recovery rate was 99.8%; death rate was (0.2%) due to uncontrolled diabetes, alcoholism and smoking; positivity rate among unvaccinated was 6%.
Conclusions: there is a need to reduce high burden of SARS-CoV-2 positivity among HCWs. Revision of existing infection prevention and control (IPC) practices, development of innovative training strategies, constant reinforcement and supportive supervision of IPC practices has to be considered besides emphasizing the importance healthy life style measures.

Keywords: SARS-CoV-2, HCWs, COVID-19, High risk area, Co-morbidities

INTRODUCTION

The novel corona virus pandemic has exposed health care workers (HCWs) and their families to unprecedented levels of risk. Data from many countries across WHO regions indicate that COVID-19 infections among HCWs are far greater than those in the general population. Though HCWs represent less than 3% of the population in the large majority of countries and less than 2% in almost all low and middle-income countries, around 14% of COVID-19 cases reported to WHO are among HCWs. Thousands of HCWs infected with COVID-19 have lost their lives worldwide.[1]

As COVID-19 involves closer and longer duration of care which put the HCWs at higher risk of infection due to increased probability of spread.[2] HCWs being a valuable and scarce resource. If large number of Covid-19 affected health personnel gets isolated or quarantined, the same will have huge effect on the delivery of health services.[3]

So, it is important to understand the occurrence of COVID-19 infection and its risk factors among HCWs to prevent depletion of workforce. If unaddressed this can lead to critical shortages and negative impact on patient care, besides transmitting infection to vulnerable patients.[4]

As WHO's health worker safety charter says "No country, hospital or clinic can keep its patients safe unless it keeps its health workers safe and the impact of COVID-19 on the healthcare system and workers cannot be overlooked.[1] so understanding the exposure related factors and risk associated with developing COVID-19 infection is critical for reviewing existing infection prevention and control (IPC) recommendations.[5] Such evaluation will helps in formulating best practices or developing additional educational strategies at different levels of hospital services so as to further prevent COVID-19 infection among health care providers.[6]

Aims and objectives

Aim and objectives were to determine SARS-CoV-2 infection positivity rate among HCWs, to identify factors influencing SARS-CoV-2 infection among HCWs and to assess outcome of SARS-CoV-2 infection among HCWs.

METHODS

Type of study

The type of study conducted was longitudinal cross-sectional study.

Setting

Hassan institute medical sciences [HIMS] is a tertiary care teaching hospital run by state government providing both COVID-19 and non-COVID-19 health services to not only Hassan districts population but also to its neighbouring districts such as Kodagu, Chikkamagaluru Mandya and Tumakur of South Karnataka. Over 2990 employees comprising of medical and non-medical cadre work in the above institution all were given COVID-19 infection prevention and control (IPC) training during Feb 2020 to March 2020.

Study population

All health care workers of HIMS Hassan were included in the study.

Study period

Study was done from March 2020 to February 2022.

Sample size

Universal sampling-all health care workers infected with SARS-CoV 2 infection were considered.

Inclusion criteria

All health care workers of HIMS Hassan infected with SARS-CoV-2 infection during the study period and whose data available with testing and quarantine committee were included.

Exclusion criteria

Those with incomplete HCWs data was excluded.

Sample size estimation

Not applicable as secondary data of HCWS already available with testing and quarantine committee was considered after applying inclusion and exclusion criteria.

Method of data collection

After taking IEC Approval, secondary data of HCWS infected with SARS-Cov-2 infection available with testing and quarantine committee of HIMS Hassan from March 2020 to Feb. 2022 was entered into predesigned pretested proforma and was analyzed to find SARS-CoV-2 positivity rate and factors influencing the SARS-CoV-2 infection and its outcome.

Research tool

Pre-designed semi structured proforma was used.

Data analysis

Quantitative data was entered in MS excel and analysed using SPSS 26.v discrete variables were expressed in frequency and percentages. and continuous variables are presented as mean ± standard deviation (SD). Association between the **c**ategorical variables were analysed with chi-square test.

RESULTS

In the present study, a total of 840 HCWs out of 2990 total HCWs of tertiary center were infected with SARS-CoV-2. Calculated infectivity rate was 28% (840/2990).

Among the infected HCWs majority were females (53.9%). The mean age of infected HCWs was found to be (35.6±1.006) years. Most of them belonged to 31-40 years (37.5%) followed by 21-30 years (28.5%) (Table 1).

In above study, nurses (33.8%) were most commonly affected followed by doctors (26%). technicians (8.9%) were the least commonly affected group (Table 2).

Most common cause for SARS-Cov-2 infection during first and second wave was working in COVID-19 hospital (44.7%). the other causes were working in non-COVID-19 hospital (31.3%), contact with COVID-19 positive family member (15.7%), travel history (1.3%), peer exposure (4.9%) and community exposure (2.1%) among HCWs (Table 3) on applying chi square test, statistically significant association of 6.636 at p<0.01was found between SARS-Cov-2 infectivity with working in COVID-19 or non- COVID-19 hospital wards.

Co-morbidities were found in 8.64% and 12.3% of HCWs during 3rd and 2nd wave respectively, 1st wave co-morbidities data of HCWs was not available (Table 4). During 2nd wave two ICU admissions occurred of which one recovered whereas another one died (0.2) thus overall recovery rate was 99.8% (Table 5). Six percent of unvaccinated were infected with SARS-CoV-2 during 2nd wave in our study (Table 6) and no deaths were reported among them. Whereas one death (0.2%) occurred among the vaccinated group (Table 7).

Table 1: Basic characteristics of COVID-19 positive HCWs.

Variables	First wave N (%)	Second wave N (%)	Third wave N (%)	Total N (%)
Age (in years)				
18-20	1 (12.5)	1 (12.5)	6 (75)	08 (0.95)
21-30	50 (20.9)	94 (39.3)	95 (39.7)	239 (28.5)
31-40	76 (24)	102 (32.4)	137 (43.5)	315 (37.5)
41-50	57 (27.5)	56 (27)	94 (45.5)	207 (24.6)
51-60	18 (25.4)	15 (21.1)	38 (53.5)	71 (8.5)
Total	202 (24)	268 (31.9)	370 (44.1)	840 (100)
Mean age in years	34.87	38.3	36.6	35.6±1.006
Gender wise distribution of HCWs				
Male	94 (24.3)	143 (36.9)	150 (38.8)	387 (46.1)
Female	108 (23.8)	125 (27.6)	220 (48.6)	453 (53.9)
Total	202 (24)	268 (31.9)	370 (44.1)	840 (100)

Table 2: Occupation wise distribution of HCWs.

Type Of HCWs	First wave N (%)	Second wave N (%)	Third wave N (%)	Total N (%)
Doctors	51 (25)	66 (24.6)	101 (27.3)	218 (26)
Nursing officers	69 (34)	84 (31)	131 (35.4)	284 (33.8)
Technicians (Lab, radiology, dialysis OT, dental, ophthalmic, physio, pharmacy)	16 (7.9)	30 (11)	29 (7.8)	75 (8.9)
Housekeeping and supporting staff (Attenders, security, ambulance drivers)	48 (23.8)	51 (19)	79 (21.4)	178 (21.2)
Miscellaneous (Clerical staff biomedical and the IT engineers)	18 (8.9)	37 (13.8)	30 (8.2)	85 (10)
Total	202 (24)	268 (31.9)	370 (44.1)	840 (100)

Table 3: Causes for COVID-19 positivity among HCWs.

Causes for SARS CoV-2 positivity among HCWs	First wave N (%)	Second wave N (%)	Total N (%)	Chi square value
Working at COVID-19 hospital	104 (51.5)	106 (39.5)	210 (44.7)	6.636 at p<0.01 significant
Working at non COVID hospital	23 (11.4)	124 (49)	147 (31.3)	
Contact with COVID positive family member	44 (21.8)	30 (11.9)	74 (15.7)	
Travel history	03 (1.5)	03 (1.2)	06 (1.3)	
Peer exposure	21 (10.4)	02 (0.8)	23 (4.9)	
Community exposure	07 (3.5)	03 (1.2)	10 (2.1)	
Total	202 (42.9)	268 (57.1)	470 (100)	

*** Out of total 840 infected HCWs 370 (44.1%) got infected during third wave. but due to wide community spread of SARS CoV-2 infection during third wave we were unable to distinguish the causes of infection.

Table 4: Distribution of co-morbidities among HCWs.

Wave	Co-morbidities present N (%)	Co-morbidities absent N (%)	Total N (%)
Third wave	32 (8.6)	338 (91)	370 (58)
Second wave	35 (12.68)	234 (87.3)	269 (42)
Total	66 (10.34)	572 (89.65)	638 (100)

** First wave: Data on co-morbidities were not available in the records and no deaths were reported.

Table 5: Outcome of COVID-19 infection among HCWs.

HCWs	Death N (%)	Recovered N (%)	Total N (%)
With co-morbidities	1 (1.5)	65 (98.5)	66 (10.3)
Without co-morbidities	0	572 (100)	572 (89.7)
Total	01 (0.2)	637 (99.8)	638 (100)

Table 6: Vaccination status among COVID-19 positive HCWs.

COVID-19 positive HCWs vaccination status	Second wave N (%)	Third wave N (%)	Total N (%)
Fully vaccinated	207 (36)	366 (64)	573 (90.3)
Partially vaccinated	24 (100)	00	24 (3.7)
Unvaccinated	38 (100)	00	38 (6)
Total	268 (42)	370 (58)	635 (100)

Table 7: Vaccination status and outcome of COVID-19 infection.

Vaccination status	Death N (%)	Recovered N (%)	Total N (%)
Vaccinated	1 (0.2)	596 (99.8)	597 (94)
Unvaccinated	0 (00)	38 (100)	38 (6)
Total	01 (0.2)	634 (99.84)	635 (100)

DISCUSSION

In the present study the infectivity rate was 28%, which is above the WHO published values[1] in a study done at Kerala by Varghese et al the infectivity rate was 5.7%.[6] In Sabestian et al 5.62% of the HCWs were infected.[7] In a study done at Italy, Health-care workers accounted for 10-20% of all diagnosed cases of COVID-19.[8] In US study to Compare COVID-19 infections among healthcare and non-healthcare workers it was recorded (6.8%) HCWs and (93.2%) non HCWs were infected with COVID-19.[9] The high infective rate found in our study compared to other studies could be because all the above studies were done at the initial period of Covid-19 pandemic during which extensive community spread of SARS CoV-2 has not yet occurred.

Majority of HCW's infected with COVID-19 in our study were females (53.9%), so also in Varghese et al (86.3%) was women in Sabestian et al, 53.6% were females and majority were (51.3%) were staff nurses in the present study also, more number staff nurses (33.8%) were affected compare to other groups; the reason being in most of health care facilities female supporting staff are more employed compare to males.[6,7]

The mean age of HCW's in the present study was (35.6±1.006) as there was more number of junior doctors, staff nurses belonging to young age group was infected in our study. In Sebastian et al the mean age was 35 years.[7] In USA study, of 2,842 adult patients, mean age was 53±1.9 years and 53% were male; 193 (6.8%) were HCWs and 2,649 (93.2%) were non HCWs.[9]

Most common factor for COVID-19 positivity in our study was working in the COVID-19 hospital (44.7%) which was a high-risk area compared to other settings of clinical care.

So also, in Varghese et al (14.9%) infected belonged to in high-risk group and in Sebastian et al (30.6%) working at

emergency was the most common cause.[6,7] In a retrospective study done among HCWs of designated COVID-19 hospital at Wuhan; working at high-risk department, longer duty hours, and suboptimal hand hygiene after contacting with patients were linked to COVID-19 among HCWs.[5]

Contact with COVID-19 positive family members (15.7%), is another significant cause for HCW's infection in our study which is more than reported by Sabestian et al where in family exposure was (10.3%).[7]

The co-morbid conditions (Hypertension, diabetes mellitus, hypothyroidism, CVD) in our study were 10.3%. Two HCWs required ICU admissions; of which one died (0.2%) due to the presence of co-morbidities (uncontrolled DM and alcoholism). In Sabestian et al hospitalization rate was (5.5%) In a study done at Oman, 30.2% had pre-existing medical conditions.[7,10]

During 2nd wave, 6% of unvaccinated HCWs were infected with SARS CoV-2, In a study done at France during (February 9-18 of 2021) out of the 1965 respondent HCWs 23.1% were unvaccinated.[11] In a systematic review, SARS-CoV-2 infection was 10.1% among unvaccinated HCWs.[12] During 3rd Wave SARS-CoV-2 infection among the unvaccinated was not recorded in present study as all HCW's got vaccinated due to increased awareness.

The overall recovery rate was 99.84% in this study; one death (0.2%) was reported among vaccinated HCWs due to uncontrolled diabetes, alcoholism and smoking. in a systematic review to study the post vaccination SARS-CoV-2 infection among healthcare workers of fully vaccinated, partially vaccinated and unvaccinated HCWs, pooled proportion of COVID-19 infections was 1.3% (95% CI 0.6-2.9), 2.3% (CI 1.2-4.4), and 10.1% (95% CI 4.5-19.5), respectively.[12]

Limitation

The above results are based on analysis of secondary data which may have influenced by record and information biases.

CONCLUSION

A high burden of SARS-Cov-2 positivity was found among HCWs, due to hospital and non-hospital exposure to SARS-Cov-2 like contact with COVID-19 positive family member, travel related, peer and community exposure however working in COVID-19 hospital was found to be highly significant. To reduce future high burden of SARS-Cov-2 and related illness at hospital settings, its essential to reinforce and develop innovative training methods to impart infection prevention and control (IPC) skills among HCWs and also to have supportive supervision in place for same, apart from educating HCWs on healthy life style measures.

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