Detection of Asymptomatic COVID-19 Infection among Healthcare Workers of a Tertiary Care Hospital in Northern Gujarat, India

KOMAL PATEL[1], PURAV PATEL[2], GAUR BHUMIKA[3], PARUL SHAH[4]

ABSTRACT

Introduction: The Coronavirus Disease-2019 (COVID-19) pandemic has emerged from Wuhan, China in late 2019 and spread across the world in few months. This pandemic has affected people all over the world in terms of not only health but also psychologically, economically and socially. Early diagnosis by Real Time Polymerase Chain Reaction (RT-PCR) test helped the health system to isolate the patient and prevent the spread of the disease in community.

Aim: To know the prevalence of asymptomatic COVID-19 infection among healthcare workers.

Materials and Methods: This study was a cross-sectional study and focused on early detection of asymptomatic COVID-19 infection among Healthcare Workers (HCW) by RT-PCR test. Total of 356 samples were collected of all HCW working in

Nootan Medical College and Research Centre Visnagar, Gujarat, India, in month of May 2021. Data were analysed on basis of job profile, working area and vaccination status. Chi-square test was used for statistical analysis.

Results: Out of total 356 samples, six were positive showing prevalence of 1.68%. Out of these six positive workers two had exposure to COVID-19 positive patients at home in last 10 days. No significance was found in positivity rate in relation to job profile, working area in hospital and vaccination status.

Conclusion: This study reveals low prevalence of asymptomatic infection among HCWs engaged in COVID-19 related duties. The HCWs are at highest risk of contracting infection, hence it is necessary to protect their safety and health as infection among them can spread to other co-workers and patients.

INTRODUCTION

A novel Coronavirus (CoV) named '2019-nCoV' or 'SARS-CoV-2' by the World Health Organisation (WHO) is responsible for the ongoing pandemic of respiratory tract infection that started in December 2019 in Wuhan City, Hubei Province, China [1]. Coronaviruses did not draw global concern until the 2003 Severe Acute Respiratory Syndrome (SARS) pandemic, followed by the 2012 Middle East Respiratory Syndrome (MERS). Coronaviruses are inherently categorised into four major types: gammacoronavirus, deltacoronavirus, betacoronavirus and alphacoronavirus. The first two types mainly infect birds, while the last two mostly infect mammals [2,3]. Since its origin in 2019, more than 178 millions of populations have been infected which resulted into more than 38 lacs of human death worldwide. Alone in India, more than 29 million cases has been reported so far [4]. The HCW are main frontline soldiers in the management of the current pandemic of coronavirus. The HCWs are at highest risk of contracting infection and across the world, many of them have been infected with the SARS-CoV-2 and have lost their lives during this pandemic. So, it is necessary to protect safety and health of the frontline workers as infection among them can be transferred to other coworkers and other non COVID-19 patients. The HCWs in this study were defined as persons working in healthcare set up who have possibility for direct or indirect exposure to patients or infectious materials as part of their duty [5]. Many studies were done earlier across the world to know prevalence of COVID-19 infection in HCWs which shows prevalence rate ranging from 0% to 11% [6-16]. So this study was focused on early detection of asymptomatic COVID-19 infection among HCWs by RT-PCR test in molecular laboratory so that prevalence rate of asymptomatic COVID-19 infection in our institution could be determined, and also after that early isolation and prevention of transmission can be managed effectively.

Study objectives

- The primary objective is to detect the asymptomatic COVID-19 infection in HCWs.
- The secondary objective is to association the rate of infection in relation to COVID-19 vaccination.

MATERIALS AND METHODS

This was a cross-sectional study conducted at Molecular Laboratory in Nootan Medical College and Research Centre, Visnagar, from 3rd May to 29th May in year 2021. Total of 356 samples were collected from different HCWs engaged in designated COVID-19 hospital. Convenient sampling method was used and no exact calculation was made to determine samples size but efforts were put to enroll maximum possible number of participants in the study. Approval was taken from Institutional Ethics Committee (Reg no: ECR/1432/Inst./GJ/2020) before initiation of the study and informed consent was taken from each participant. (IEC/NMCRC/APPROVAL/43/2021).

Inclusion criteria: Asymptomatic HCWs who were willing to provide their consent were included in the study.

Exclusion criteria: The HCWs who were having clinical signs/symptoms of COVID-19 or pregnant women were excluded from the study.

Out of total 361 HCWs-Doctors, nursing staff, technicians, paramedical, housekeeping and security staff were screened, 356 found eligible and willing to provide consent for participation were enrolled in this study. History of exposure and clinical parameters were taken to check eligibility and then after enrollment data related to demographic details, working area, vaccination details [6], were collected and analysed.

Study Procedure

All participants were classified in three groups.

- Group A was from core area which was directly exposed to COVID-19 positive patients.
- Group B included the health workers which were not exposed to COVID-19 positive patients but engaged in day to day hospital duties.
- Group C comprised of the workers who indirectly provided support to COVID-19 care and were less frequently exposed to hospital environment.

Nasopharyngeal and throat swabs were collected from participants by trained personnel in designated sample collection area. Then samples were packed and transported to molecular laboratory in triple layer packaging in thermo coolant. All samples were checked for leakage and matched with request form and then processed in Biosafety Level-2 (BSL-2) standard laboratory. Samples were processed by RT-PCR method to detect presence of COVID-19 infection. During this process, different steps such as aliquoting, Ribonucleic Acid (RNA) extraction, preparation of mastermix solution, PCR plating and PCR process in themocycler were followed. The RNA extraction was performed by manual method by HIMEDIA MB615 (Lot no 0000481088) in REMI NEYA 16R machine and PCR process was carried out by Trupcr SARS-CoV-2 qPCR kit-V 3.2 (lot no COV-19/V3 2/2021/15) in BIORAD CFX 96 thermo cycler.

STATISTICAL ANALYSIS

Data were entered in Microsoft Excel 2016 and analysis was done by Epi-info software version 7.2. Qualitative or categorical variables were expressed in terms of frequency and percentage. Quantitative variables were expressed in terms of mean and standard deviation.

The [Table/Fig-1] shows that total of 356 HCWs were included in this study out of which 106 (29.78%) were from core area A, while 176 (49.44%) from core area B and 74 (20.79%) were from core area C. All the participants were categorised based on age, gender and job profile. Vaccination status of participants was also recorded. Those individuals who had completed two doses of Covaxin/Covishield atleast 14 days prior, were grouped under fully vaccinated, those who received one dose of vaccination were grouped under partially vaccinated and those who did not take vaccine were considered non vaccinated.

The [Table/Fig-2] shows incidence of asymptomatic COVID-19 positive HCWs among core area A was 2.83%, in core area B was 1.14% and in core area C was 1.35%. On applying Chi-square test between job profile and COVID-19 positivity, obtained χ^2 value was 1.21 with p-value of 0.55 (>0.05), which was statistically not significant. So, there was no statistical association between core working area and COVID-19 positivity.

The [Table/Fig-3] shows incidence of asymptomatic COVID-19 positive among doctor was 3.39%. Doctor and technical staff were more prone for getting infected as the incidence of COVID-19 positivity among technical staff was also found to be 2.04%. No housekeeping and security staff was detected COVID-19 positive. On applying Chi-square test between job profile and COVID-19 positivity, χ^2 value was 1 and p-value was 0.8 (>0.05), which was statistically not significant. So, there was no statistical association between job profile and COVID-19 positivity.

The [Table/Fig-4] shows incidence of asymptomatic COVID-19 positive among fully vaccinated was 1.32% in partially vaccinated

Parameters		Core area						Total=356
		Group A=106		Group B=176		Group C=74		
		Total no.	Percentage (%)	Total no.	Percentage (%)	Total no.	Percentage (%)	
Age	20-35 years	82	77.36	120	68.18	63	85.14	265
	36-50 years	20	18.87	53	30.11	10	13.51	83
	> 50 years	4	3.77	3	1.70	1	1.35	8
Gender	Male	36	33.96	96	54.55	62	83.78	194
	Female	70	66.04	80	45.45	12	16.22	162
Job profile	Doctors	23	21.70	36	20.45	0	0.00	59
	Nurses	47	44.34	42	23.86	0	0.00	89
	Technical staff	26	24.53	39	22.16	33	44.59	98
	Administration/maintenance staff	2	1.89	34	19.32	26	35.14	62
	Housekeeping and security staff	8	7.55	25	14.20	15	20.27	48
Vaccination	Fully vaccinated	76	71.70	62	35.23	13	17.57	151
	Partially vaccinated	29	27.36	98	55.68	19	25.68	146
	Non vaccinated	1	0.94	16	9.09	42	56.76	59

[Table/Fig-1]: Demographic and clinical parameters of participants.

Chi-square test was used for statistical analysis and p<0.05 was considered as statistically significant value at 95% confidence interval.

RESULTS

There were 356 participants in this study who gave consent to provide their sample of nasopharyngeal and throat swab. Among them, six were found positive by RT-PCR method showing prevalence of 1.68%.

COVID-19 RT-PCR test result	Total no.	RT-PCR positive	Percentage (%)	χ^2 value/ p-value
Core area A	106	3	2.83	
Core area B	176	2	1.14	1.21/0.55
Core area C	74	1	1.35	

[Table/Fig-2]: Prevalence of asymptomatic COVID-19 infection among Healthcare Workers (HCW) in reference to job working area.

Job profile	RT-PCR positive N (%)	RT-PCR negative N (%)	Total no.	χ^2 value/p-value
Doctors	2 (3.39)	57 (96.61)	59	
Nurses	1 (1.12)	88 (98.88)	89	
Technical staff	2 (2.04)	96 (97.96)	98	1/0.8
Administration/maintenance staff	1 (1.61)	61 (98.39)	62	
Housekeeping and security staff	0	48 (100)	48	

[Table/Fig-3]: Prevalence of asymptomatic COVID-19 infection among Healthcare Workers (HCW) in reference to job profile.

was 2.05% and in non vaccinated was 1.69%. On applying Chi square test between job profile and COVID-19 positivity, X^2 value was 0.24 with p-value 0.88 (>0.05), which was statistically not significant. So, there is no statistical association between vaccination status and COVID-19 positivity.

COVID-19 RT-PCR test result	Total no.	RT-PCR positive	Percentage (%)	χ^2 value/ p-value
Fully Vaccinated	151	2	1.32	
Partially vaccinated	146	3	2.05	0.24/0.88
Non vaccinated	59	1	1.69	

[Table/Fig-4]: Prevalence of asymptomatic COVID-19 infection among Healthcare Workers (HCW) in reference to vaccination status.

DISCUSSION

In this cross-sectional study, we collected samples for SARS-CoV-2 RT-PCR testing from 356 asymptomatic HCWs engaged in providing healthcare services to COVID-19 patients. Out of which six HCWs were positive. HCWs are at high risk of getting infection during their duty as they are routinely exposed to COVID-19 patients and their surrounding environment [7]. The main objective of this study to identify asymptomatic COVID-19 positive HCW so earliest isolation and preventive measures can be taken because they can transmit COVID-19 infection to their co-worker as well as other patients and close contacts at home also.

Many studies have been conducted across the different parts of the world and also in India to determine the prevalence of SARS-CoV-2 infection. Lowest prevalence 0% and 0.2% was observed in study of Al-Zoubi NA et al., in Jordan and in study of Temkin E in Israel respectively [8,10]. A 6% of prevalence rate was there in study of Alshahrani MS et al., in Saudi Arabia [9]. In the study of Sabetian G et al., 5.6% prevalence rate was observed in Iran [11]. An 11% prevalence rate for SARS-CoV-2 infection among HCWs was observed out of 3711 participants in study of Mahajan NN et al., Mumbai, India [13]; in which majority of them (85%) were symptomatic. Also in observational study of Banerjee A et al., in eastern India, 274 symptomatic HCWs were tested among them 27% were found positive [14]. Among these positive isolates, 44% were front line workers and 56% were non front line workers. In case control study of Chatterjee P et al., there was higher chance of getting infected for those HCWs who were directly exposed to COVID-19 patients and performing endotracheal intubation [15]. However, in study of Jha S et al., in Delhi, there was no difference in positivity rate of COVID-19 infection among HCWs working in high and low risk area [16]. In our study, total 6 (1.68%) asymptotic HCWs were found positive by RT-PCR method in May, 2021. Also, in this study there was no significant difference in positivity rate among the participants in relation to job profile/designated working areas [Table/Fig-2-4] which is related to observation found in study of Jha S et al., in Delhi [16].

Probable clarification for low prevalence rate in this study might include different sampling time during pandemic wave, differences in the type of exposures, infection control policies, selection of participants, knowledge about self isolation and methods of using of Personal Protective Equipments (PPE). Infection rate among HCWs largely depends on how they follow infection control protocol during the duty. Also, vaccination did not prevent the infection but it minimised the severity of the illness and mortality which is seen in study of Tyagi K et al., and Muthukrishnan J et al., [17,18]. In this study, there was no significant difference noted in prevalence rate of SARS-CoV-2 infection in vaccinated and non vaccinated participants. Also, none of COVID-19 positive HCW were found seriously ill during the follow-up also. Still number of positive results were quite less so it is difficult to correlate the results with the vaccination status of the participants.

Various measures of infection control like hand hygiene, correct method of donning and doffing of PPE, use of N95 masks with tight seal around mouth and nose, face and eye protection including face shields and goggles, clothing which includes gowns, aprons, head covering, and shoe covers, etc., must be known to all the HCWs engaged in the day to day duty of designated COVID-19 hospitals. In our institute time to time training of HCWs regarding different infection control practices is being done regularly. Among six positive HCWs, two had positive contact history at home in last 10 days so there might be chances, infection could have been acquired from home also. In this study, there was no significant difference between positivity rate among the work area defined according to patient exposure, job profile and vaccination status [Table/Fig-2-4]. Fact was that less number of positive results was identified in this study. Another study might be needed on a large scale to detect significant correlation between these parameters and positivity rate.

Limitation(s)

Drawback in this study was RT-PCR testing of healthcare care workers gives COVID-19 status at particular point of time only, prevalence of asymptomatic infection among these individual might be different at other stages of COVID-19 pandemic. Also, there is a need for strict implementation of policy for screening/isolation of HCWs at regular time interval as they might be potential source of nosocomial infection to patients, co-workers and close contacts of their family but practically there might be certain limitations in terms of compliance for following instructions, lack of enough budget in peripheral area, unavailability/shortage of materials during the peak of pandemic etc.

CONCLUSION(S)

In summary, this study reveals low prevalence of asymptomatic infection among HCWs engaged in COVID-19 related duty in Nootan Medical College and Research Centre, Nootan General Hospital in Gujarat, India. As infection control policies at individual institution always have great impact in positivity rate among HCWs performing duties in COVID-19 designation centres, there should be mandatory implementation of it during renewal of permission to treat COVID-19 or other infectious diseases. As number of SARS-CoV-2 positive results among participants was less, another study at district/state level might be required to propose a significance between job profile work area and vaccination status and prevalence rate for SARS-CoV-2 disease.

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PARTICULARS OF CONTRIBUTORS:
1.   Assistant Professor, Department of Microbiology, Nootan Medical College and Research Centre, Sankalchand Patel Univeristy, Visnagar, Gujarat, India.
2.   Associate Professor, Department of Microbiology, Nootan Medical College and Research Centre, Sankalchand Patel Univeristy, Visnagar, Gujarat, India.
3.   Tutor, Department of Microbiology, Nootan Medical College and Research Centre, Sankalchand Patel Univeristy, Visnagar, Gujarat, India.
4.   Professor, Department of Microbiology, Nootan Medical College and Research Centre, Sankalchand Patel Univeristy, Visnagar, Gujarat, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Purav Patel,
Associate Professor, Department of Microbiology, Nootan Medical College and Research Centre, Sankalchand Patel Univeristy, Visnagar,
Mehsana-384315, Gujarat, India.
E-mail: DRPURAV84@REDIFFMAIL.COM

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