

Original Research Article

SARS-CoV-2 specific antibody prevalence in health care personnel in a tertiary care teaching hospital treating COVID-19 patients

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ABSTRACT

Background: Serosurvey is a salient method for estimating infection rates and monitoring the progression of a pandemic. This study was done to determine the extent of seroprevalence of SARS-COV-2 antibodies among health care personnel of a tertiary care hospital.

Methods: Serum samples of 532 participants working in a teaching hospital which provides tertiary care services to the poor were tested for SARS-CoV-2-IgG antibodies. A questionnaire was used to collect demographic details and hygiene practices.

Results: 160 (30%) out of the 532 participants had IgG levels above the positive cut off value. The seroprevalence was higher in the nurses when compared to other class of staff working in the hospital.

Conclusions: The present study shows that the overall seroprevalence of SARS-CoV-2 in healthcare workers of a tertiary hospital in Bengaluru is high. This indicates that there is a need for the health care workers to take better precautions while treating COVID patients and emphasis should be given in training them to adhere to more stringent hygienic practices.

Keywords: COVID-19, IgG antibody, Health care personnel

INTRODUCTION

The disease caused by novel corona virus, COVID-19 termed SARS-CoV-2 was declared as pandemic on 11 March 2020 by the WHO. Till date more than 74 million cases are reported leading to 1.64 million deaths all over the world.¹ From India the first case of COVID-19 was reported on 30 January 2020. As on 15 December 2020, 9.9 million laboratory confirmed cases and 1.44 million deaths are reported in India.² The city of Bengaluru, the IT capital of India has witnessed a high number of cases compared to other cities of the country.³

Studies done all over the world to estimate the seroprevalence in health care workers have reported values ranging from 0 to 24%.^{4,5} In India, few studies have been conducted to determine the seroprevalence of IgG antibodies among the Indian population and its health care professionals.

The present work was done to find out the extent of seroprevalence of SARS-CoV-2 antibodies among health care personnel in Bengaluru city.

METHODS

This is an observational study conducted in Kempegowda institute of medical sciences hospital, Bangalore, a teaching hospital which provides tertiary care services to poor and low income sections of the society. Presently, during the COVID pandemic the hospital is converted to a full-fledged COVID hospital. The study was conducted for a period of one week in the first week of November 2020. The study was approved by institutional ethics committee. A total of 532 participants working in the hospital in various departments agreed to be a part of the study (Table 1). Sample size was calculated with 95% confidence interval. The participants included doctors, nurses, lab personnel, paramedics and ancillary staff. Ancillary staff included clerks, computer operators, security personnel and other supporting staff. A written informed consent was obtained from participants. A questionnaire with demographic details, hand hygiene practices, use of PPEs, masks, face shields and gloves was recorded. The details regarding participant’s exposure to COVID patients, duration of exposure, history of COVID like symptoms and RT-PCR results if tested within 90 days prior to the study were obtained.

2 ml of venous blood was collected from the participants with strict aseptic precautions. The blood samples were later centrifuged to obtain the sera. The serum sample obtained was stored at -20 degrees celsius until analysis. Serological analysis of IgG was performed using the IgG ELISA COVID kavach-merilisa kit.

Statistical analysis

The data was analysed statistically by calculating descriptive statistics in terms of frequency and percentages and inferential statistics was done through application of chi square test. The results are considered statistically significant whenever $p \leq 0.05$.

RESULTS

A total of 532 health care personnel were recruited in the study (Table 2). 180 participants gave a history that they had got their RT-PCR testing done within 90 days prior to the study. Of the 87 who had symptoms of COVID and 93 who were asymptomatic, 41 and 22 tested positive for RT-PCR, respectively.

A total of 272 participants were posted inside the COVID ward for a maximum of one week duration per posting. 116 participants who were posted in the COVID ward got their RT-PCR testing done a week after their postings. Of them, 33 tested RT-PCR positive and 83 tested negative. 23 of them were posted more than 2 times with a time gap of 3 weeks between the postings, 3 tested positive. Remaining 260 participants were not posted inside the COVID ward but were working in the hospital. 63 participants working in non-COVID wards had their RT-PCR testing done of which 27 tested positive. Covid

positivity was highest in doctors and least in laboratory personnel (Table 3). The association between occupation was found to be statistically significant ($p=0.038$).

Table 1: Demographic data of participants.

Participants	N
Gender	532
Male	186
Female	346
Age group (in years)	
20-29	189
30-39	140
40-49	111
50-59	92
Profession	
Doctors	261
Nurses	109
Paramedics	56
Lab personnel	57
Ancillary staff	49

Table 2: Covid and IgG positivity of health care workers stratified by age.

Age group (in years)	N (532)	Covid positive (%)	IgG seropositive (%)
20-29	189	28 (14.81)	58 (30.69)
30-39	140	14 (10)	38 (27.14)
40-49	111	09 (8.11)	34 (30.63)
50-59	92	12 (13.04)	30 (32.61)

Of the 532 participants 160 tested positive for IgG antibody (females=111, males=49). 50 had symptoms of COVID (COVID positive, n=27) and 110 were asymptomatic (COVID positive, n=11). Seropositivity was highest in nurses and least in laboratory personnel (Table 4). 25 participants who had tested positive for COVID did not have significant titers of antibody. 6 participants who had tested negative in RT-PCR tested positive for IgG antibody. The association between occupation was found to be statistically non-significant ($p=0.354$).

The seropositivity was high in those posted to COVID ward when compared to those not posted in the COVID wards (Table 5).

70% of the participants always followed the recommended hand hygiene practices. 25% of them followed it most of the time. Only 5% of them rarely followed the recommended practices. Regarding PPE usage according to risk assessment, 63% of them strictly followed the standard recommendations and 19% of them followed it most of the time. Participants who rarely used the PPE kits constituted 18%.

Table 3: Covid positivity of health care workers stratified by profession.

Occupations	Positive (%)	Negative (%)	Total	Chi-square	P value
Doctor	42 (16.1)	219 (83.9)	261	10.117	0.038
Nurse	11 (10.1)	98 (89.9)	109		
Lab technician	4 (7)	53 (93)	57		
Paramedics	4 (7.1)	52 (92.9)	56		
Ancillary staff	2 (4.1)	47 (95.9)	49		
Total	63 (11.9)	469 (88.1)	532		

Table 4: Seroprevalence of health care workers stratified by profession.

Occupations	Positive (%)	Negative (%)	Total	Chi-square	P value
Doctor	79 (30.3)	182 (69.7)	261	4.402	0.354
Nurse	38 (34.9)	71 (65.1)	109		
Lab technician	11(19.3)	46 (80.7)	57		
Paramedics	17 (30.3)	39 (69.7)	56		
Ancillary staff	14 (28.5)	35 (71.5)	49		
Total	159 (29.9)	373 (70.1)	532		

Table 5: Covid positivity and seroprevalence of health care workers stratified by exposure to COVID ward.

	N	RT-PCR positive (%)	IgG seropositive (%)
Covid posted	272	37 (13.6); Asymptomatic=15; Symptomatic=22	85 (31.25)
Not posted	253	26 (10.28) Asymptomatic=7; Symptomatic=19	74 (29.25)

DISCUSSION

Present study showed 30% of the participants had IgG levels above the positive cutoff value. In health personnel posted to COVID ward seroprevalence was 31.25% compared to 29.25% in those who were not posted inside the COVID ward. Further there was no increase in the infectivity rate among those posted multiple times inside the COVID ward. The seropositivity obtained in the present study is higher when compared to other studies done in other hospitals.^{6,7,8} A large multi centric study done by ICMR in May 2020 showed a seropositivity of 0.73% indicating that a large population is still vulnerable to this infection.⁹ A second survey by ICMR in October 2020 showed a seropositivity of 7% in the general population showing a 10 fold increase in 5 months.¹⁰ A seropositivity of 54.1% in the slums and 16.1% in the non-slum areas of Mumbai city was found in a study done in November.¹¹ A public health survey conducted by Indian institute of public health in November showed that 16.4% of the population had developed IgG antibodies in the state of Karnataka.¹²

A meta-analysis done in November which included 1,27,480 health care workers showed seroprevalence varying from 4% in Asia to 12.7% in north America.¹³ This is lower when compared to our study. This may be due to the fact that the meta-analysis study has considered publications from the beginning of COVID outbreak during which the seroprevalence was low or even zero.^{14,15} Another reason for low seroprevalence is that IgG antibody levels increase 3-4 weeks after the infection.¹⁶ Study done in Denmark in April 2020 has shown a seroprevalence of 4% among health care workers.⁵ However in a study done at New York hospital in May 2020 among 500 healthcare workers a seropositivity of 27% was noted.⁸ Study conducted during April to June at 13 hospitals across US showed a seropositivity of 24.4%.¹⁷ Similar study done in Kolkata in September has shown overall hospital seroprevalence of 11.94% and COVID ward seroprevalence of 19.85%.¹⁴ In our study the seropositivity was high in those posted to the COVID ward when compared to those not posted in the COVID wards. This was similar to studies where seroprevalence was is high in staff of hospitals treating COVID patients as compared to hospitals treating non-COVID patients.^{14,15} The seroprevalence is high in our

study as the study was conducted in November, a month after the COVID infection reached its peak in Bangalore city.¹⁸ Also the high prevalence could be due to large number of patients, limited and overburdened staff, inadequate protection equipment and minor breaches in infection control practices.

Though 70% of the health care personnel followed the recommended infection prevention control protocol, a significant number of them (25%) did not follow it strictly and a small number of them (5%) rarely followed the protocol. This may be a significant factor adding to the increased seropositivity found in the present study. Earlier studies have shown that strict adherence to hand hygiene practices and rational use of PPE kits are critical in protecting the health care workers against COVID infection.^{19,20}

Present study shows a slight but significant female preponderance in the seroconversion (female=32.08%, male=26.34%) which is in contrast to the nationwide study done by ICMR which showed a clear male preponderance.⁹ In the present study 100% of the nurses were females and they had highest seropositivity among professions. Nurses are more likely to get infected as they come in contact with patients more frequently and they spend more time inside the COVID ward compared to other health professionals.

The result of our study highlights increased COVID infection in healthcare workers coming in direct contact with patients thereby calling for stricter hygiene and safety protocols to be followed by health care personnel. It also emphasizes a need for continuous training of medical personnel in handling such infections.

Limitations

This study did not cover the entire hospital staff and therefore the results does not accurately represent the antibody prevalence.

CONCLUSION

Health care workers are at extremely higher risk in contracting COVID-19 infection and there is urgent need to increase the safety standards and training of health care workers in a hospital setup.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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