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Brief Communication

Are hospitals epicentres of COVID19 transmission? Findings of serial serosurveys among healthcare workers from a tertiary hospital in South India

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ABSTRACT

We conducted a serial cross-sectional study and used blood bank donors serosurvey and the ICMR serosurvey reports for comparison. Seroprevalence was 0% among HCWs (n-211) and blood bank donors (n-210) during the first phase while ICMR serosurvey reported 0.5% among general population in the district at the same time. In phase 2, we estimated a seroprevalence of 9.2% as compared to 18.8% among general population. Seroprevalence among HCWs was comparable to that of the general population during both phases. We postulate that good infection control policies and practice can provide safe working environment without additional risk to HCWs.

1. Introduction

In the fight against COVID 19, healthcare institutions played a critical but complex role holding the dual moral responsibility of serving the sick population and the safety of their workforce. It was assumed that the hospitals were epicentres of transmission and increased risk of Health care workers (HCW) to the disease. We designed a study to estimate the period seroprevalence of COVID-19 in two-time points among HCW and to compare this with the seroprevalence of the general population at the same time.

2. Materials and methods

Serial seroepidemiological surveys were conducted among HCW of a 340-bed tertiary care hospital. We assumed 15% seroprevalence and calculated a sample size of 204 with 5% absolute precision. Apparently, healthy HCW and tested negative for SARS CoV2 in the past were recruited between May–June 2020 (phase 1) and from September to November 2020 (phase 2) after informed consent. We excluded HCW with a history of SARS CoV2 positivity in the past. We administered a questionnaire before collecting 4 ml of blood. We used delinked samples collected from blood bank donors from May to June 2020 as a proxy for the general population during phase 1.

The samples were tested for high-affinity antibodies against the nucleocapsid (N) protein of SARS-CoV-2 using the qualitative Elecsys Anti SARS CoV2 assay (Roche Diagnostics, Switzerland) [1]. This electro chemiluminescent assay (ECLIA) employs a cut-off index for reporting positive ($\geq$1.0) and negative ($<$1.0) results and has a sensitivity of 97.2% and specificity of 99.8% [2]. The data were analysed using Statistical Package for Social Sciences (SPSS) version 20. Sero-prevalence was calculated and reported with 95% CIs. The study was approved by Institutional Review Board of Bangalore Baptist Hospital.

3. Results

We recruited 211 HCW with a mean age of 35.3 (SD-9.3) years in phase-1; 66.4% were females (66.4%), and 38.4% were doctors. All HCW were seronegative during the first phase. (Table .1). All 210 (100%) delinked blood bank donor plasma samples collected during the same period tested negative.

Among 206 who participated in Phase-2, 60% (123) had participated in both surveys. The mean age was 35.04 (SD-9.58) years and similar to the age distribution in phase 1. There was a relatively larger proportion of clinical staff as compared to the first survey. The seroconversion rate was 10.5% (13/123). We estimated a seroprevalence of 9.2% (95% CI: 8.6–9.4) (Table 2). in the phase 2. Seroprevalence was comparable among age groups, gender and job profile ($p > 0.05$).

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Table 1
Demographic characters of the study population.

Demography		Phase one (N-211)		Phase two (N-206)	
Category	Variables	Frequency	Percentage	Frequency	Percentage
Gender	Male	71	33.6	79	38.3
	Female	140	66.4	127	61.7
Age in years	18–30	89	42.2	98	47.6
	31–40	59	28.0	45	21.8
	41–50	49	23.2	49	23.8
	51–60	13	6.2	13	6.3
	>60	1	0.5	1	0.5
Job profile	Doctor	82	38.9	112	54.4
	Nurse	47	42.3	30	14.6
	Clinical aid	11	5.2	6	2.9
	Allied health	16	7.6	19	9.2
	Field outreach personnel	6	2.8	6	2.9
	Admin/ Finance Billing	49	23.2	33	16.1

4. Discussion

Our study showed that the exposure to COVID 19 infection was minimal among HCW during the initial phase of the pandemic. ICMR reported a seroprevalence (May–June 2020) of 0.73% (national) and 0.5% among the general population in Bangalore Urban District (BUD) [3]. We also did not detect antibodies in any of our blood bank samples tested. All these reports imply a low exposure to COVID 19 infection during May–June, and the HCW had the same risk or maybe even lower risk compared to the community.

During phase 2, we reported a seroprevalence of 9.2%, while it was 18.8% and 22% as reported by the ICMR and Babu GR et al. respectively, among the general population in BUD (Aug–Sep 2020) [4,5]. This clearly shows an increased exposure of COVID-19 infection as compared to the earlier months. The seroprevalence among HCW was almost a half compared to that of the general population (9.2% vs 18.8%).

The seroprevalence among HCW was similar across age groups, gender and job profile. All clinical staff were placed on rotation in COVID care wards and fever clinics during this period and hence have not been analysed department-wise. This result contrasts with other studies from India, which reported a higher seroprevalence among non-clinical staff [6,7]. This might be attributed to the universalisation of reusable personal protective equipment (PPE) across clinical and non-clinical staff in our setting since April 2020.

There are only a handful of studies from India which have reported seroprevalence among HCW, and none among them comparing it to the community seroprevalence in Karnataka. Studies have reported 4–7% (June), 11–17% (July–Oct) initially, and 46.2% (Feb 2021) during the later part of the first wave [6–9]. The seroprevalence among HCW also followed the community's infection rate, explaining the higher percentage in the latter months. Studies from other countries among HCW showed a seroprevalence as low as 0% in Malaysia to as high as 26% in the United Kingdom from April to June 2020 [10,11]. These prevalence rates cannot be compared directly to our study as the inferences may vary depending on the period of study, the pandemic spread, the prevalence in the local community during the serosurvey period.

Table 2
Unadjusted seroprevalence of Health care workers (Phase-2).

Category	Number	Prevalence (%)	95% CI
Gender			
Male	79	9.11	8.26–9.64
Female	127	9.06	8.41–9.50
Age			
≤40 years	143	10.5	6.0–16.7
>40 years	63	9.37	8.45–9.82
Job Profile			
Clinical	167	8.4	4.7–13.7
Non-clinical[a]	39	8.72	7.26–9.57

[a] Non-clinical- Administration, finance, counter personnel and community outreach personnel.

Among 1377 staff, 238 tested COVID19 positive (antigen/RT-PCR test) until November 2020 and were not included in the survey. When we included a 17.3% infection rate among our staff, an estimated 26.5% of the HCW in the hospital had evidence of an active or recent COVID19 infection. This is lower than the estimate of 27.3% by the Government of Karnataka among the general population.5 Hunter et al. also reported that the hospital infection rate was lower than that of the State (1.6% vs 2.8%) [12].

Though the study had an adequate sample size and captured seroprevalence at two-time points before the vaccine roll out, we also had few limitations. Firstly, the convenience sampling would have introduced selection bias and the profile of HCW in the first and second surveys was slightly different. However, we do not expect a difference in the prevalence, as seroprevalence was similar among clinical and non-clinical staff. The sample collection period was not uniform, mainly due to the overwhelming workload during the later pandemic. Finally, the testing kit detected all high-affinity antibodies which may not be precisely comparable to tests that detect only IgG.

5. Conclusion

Hospitals are not epicentres of COVID 19 infection transmission as HCW possessed no additional risk than the general population. In the presence of a good infection control policy and practice, the HCW can safely work without the fear of the heightened risk of COVID 19 infection.

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Authors' contributions

SC contributed to the conception and design of work, data acquisition, supervision and validation of the blood analysis, and was the primary contributor to the draft paper and revisions. CEG contributed to the conception, study design, developed the study tool, supervised data collection, participated in analysis and interpretation, contributed to the writing of the article. LRI contributed to the conception, statistical analysis, interpretation of the data and contributed to the writing of the manuscript. All authors revised the work for important intellectual content and agreed to be accountable for all aspects of the work. All authors read and approved the final manuscript.

Ethics approval and consent to participate

The study was approved by the Ethics Committee of Bangalore Baptist Hospital. Written Informed consent was taken from all the participants before data collection.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

CRediT authorship contribution statement

Sindhulina Chandrasingh: Conceptualization, Methodology, Validation, Supervision, Investigation, Writing – original draft. **Carolin Elizabeth George:** Conceptualization, Data curation, Writing – original draft. **Leeberk Raja Inbaraj:** Methodology, Formal analysis, Writing – review & editing.

Declaration of competing interest

SC, CEG, LR declare no conflict of interest.

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