

## Original Research Article

# A sero epidemiological study of SARS-CoV-2 among nursing and paramedical staff in government general hospital, Kurnool

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**Received:** 15 November 2020

**Revised:** 28 December 2020

**Accepted:** 05 January 2021

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## ABSTRACT

**Background:** Nurses and paramedical staff face a high risk of infection due to excessive COVID-19 exposure. In this study, SARS-CoV-2 antibodies were measured among nurses and paramedical staff, with an aim to determine the seroprevalence of SARS-CoV-2 and the characteristics associated with it.

**Methods:** After obtaining IEC Clearance and informed consent from the study subjects, a cross sectional study was conducted from August to September, 2020. Data was collected from 127 nurses and paramedical staff, Government general hospital, Kurnool, selected by simple random sampling, using a semi-structured questionnaire and chemiluminescence immunoassay test for which IgM antibodies cut off value was 10 AU/ml. Test results and participant characteristics were recorded and data was analysed by MS Excel 13.

**Results:** Among the study participants, seroprevalence was found to be 2.4%. Majority were females (66.9%). Most of them were aged 20-29 (24.4%) followed by 40-49 (19.7%) and 50-59 (10.2%) years. 56.7% were working in COVID wards. 42.5% worked in 3-6 hour shifts.

**Conclusions:** The present study did show a low prevalence of IgM among nurses and paramedical staff. This might be an indicator that the personal protection measures were effective. Further it can provide an overview of the current seroprevalence of the health care workers.

**Keywords:** SARS-CoV-2, Paramedical staff, Nurses, IgM, CLIA

## INTRODUCTION

The novel coronavirus SARS-CoV-2 is associated with a severe respiratory manifestation, COVID-19, and presents a challenge for healthcare systems worldwide. Human-to-human transmission via droplets, contaminated hands or surfaces has been described.<sup>1</sup> Health care workers who care for patients with COVID-19 are at risk for exposure and infection.<sup>2</sup> The incubation period can range from 2 to 14 days.<sup>3</sup> Once infected, they can spread SARS-CoV-2 to patients, coworkers, and others in the community.<sup>4</sup> Serological testing can indirectly detect the presence of

infection. Serological testing is increasingly recognized as a useful tool for management of the coronavirus disease-2019 (COVID-19) pandemic.<sup>5</sup> To maximize sensitivity, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) seroprevalence could be defined as positivity of any antibody isotype (IgG, IgM, or IgA), as detected by chemiluminescent immunoassays (CLIA).<sup>6</sup> In patients infected with SARS-CoV-2, IgM antibodies are detectable around 7 days of post infection.<sup>7</sup> IgM is usually the first antibody produced by the immune system when a virus attacks. A positive IgM test indicates that you may have been infected and that your immune system has started responding to the virus. Early diagnosis,

quarantine, and supportive treatments are essential to cure patients.<sup>8</sup> In the present study, nurses and paramedical staff were taken as study participants because they play a vital role between patient and rest of health care system. The aim of this study was to determine the sero prevalence of SARS-CoV-2 by chemiluminescent immunoassays among Nursing and Paramedical staff and to describe the characteristics associated with sero positive results.

**METHODS**

Current study was a cross sectional study conducted at Government general hospital, Kurnool during August to September 2020. The sample size arrived at was 100, by using the formula;

$$4pq/l^2$$

Where prevalence (p) was assumed as 50 percent and allowable error (l) as 20 percent of p. In view of COVID-19 pandemic, our Hospital administration offered screening test for health care workers. Around 600 health care workers accepted the screening test. Out of these, 127 nurses and paramedical staff who fulfilled inclusion criteria (at least one year of work experience as a health care professional in our institute, who gave consent for the study and came for sample collection on the specified days at our institute) were selected as study subjects by simple random sampling. Those who were absent during the specified days of sample collection were excluded. Anti-SARS-CoV-2 IgM antibodies were detected in sera using CLIA test. Cut off value proposed by manufacturer was 10 AU/mL for IgM antibodies.<sup>9</sup> Hence samples with IgM concentration more than equal to 10 AU/ml were considered positive (reactive). A semi structured questionnaire was prepared and validated. Study subjects were explained about questionnaire in local language. The questionnaire consists of basic information, such as age, gender, professional information (occupation, hospital department, shift timing, duty hours) and significant past history, quarantine history, travel history, prior COVID-19 testing status. Test results and participant characteristics were recorded.

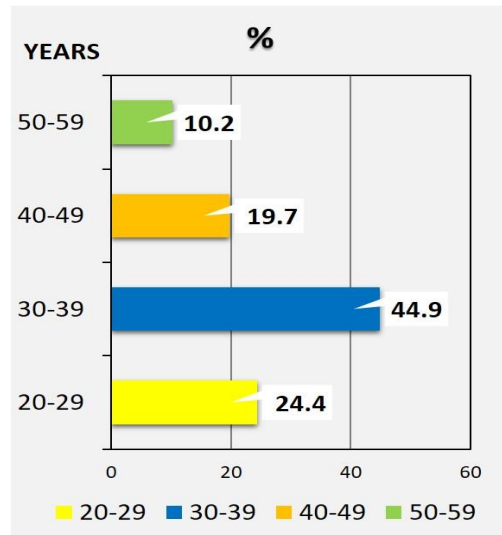
**Statistical analysis**

The collected data was analysed using Microsoft excel sheet (version-13). Graphs and tables were generated using Microsoft word and excel. All proportions have been expressed as percentages and results were interpreted.

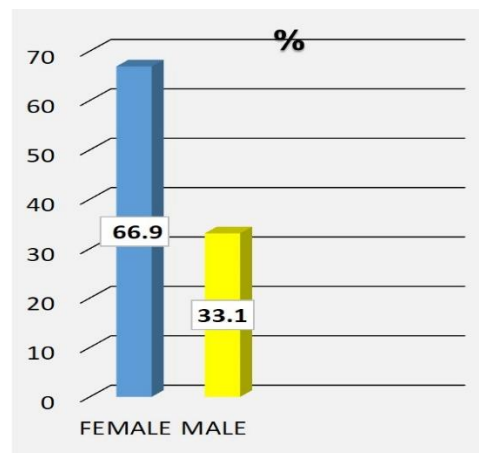
**RESULTS**

Out of 127 study participants, 59 (46.5%) were nurses and 68 (53.5%) were paramedical staffs. Paramedical staff includes lab technicians, female nursing organiser, male nursing organiser, physician's assistants, emergency medical technicians and sweepers. 57 (44.9%) belongs to

age group 30-39 years (Figure 1). 85 (66.9%) were females (Figure 2). Only 3 (2.4%) were reactive to IgM by CLIA test. Majority of them 125 (98.4%) were asymptomatic. 116 (91.4%) had no comorbidities 74 (58.3%) worked in COVID-19 wards and labs. 54 (42.5%) worked in 3-6 hours shifts. Most of study subjects 93 (73.2%) were not tested previously for COVID-19 test.



**Figure 1: Age distribution of study population.**



**Figure 2: Gender distribution of study population.**

The study subjects who were reactive to IgM, belongs to age groups of 20-29, 40-49 and 50-59 years (Table 1). 1.6% females were reactive to IgM (Table 2). 1.6% staff nurses were reactive to IgM (Table 3). 1.6% study subjects who were reactive to IgM antibodies, were not tested previously for COVID-19 (Table 4). 1.6% staff nurses, who worked in COVID-19 wards were reactive to IgM (Table 5). 1.6% staff nurses, who worked for 3-6 hours shifts were reactive to IgM (Table 6). 2.4% study subjects who were reactive to IgM antibodies, were asymptomatic (Table 7). 2.4% study subjects who were reactive to IgM antibodies, had no comorbidities (Table 8).

**Table 1: Seroprevalence of IgM antibodies according to age distribution.**

Age (years)	Report N (%)		Total N (%)
	Non reactive	Reactive	
20-29	30 (23.6)	1 (0.8)	31 (24.4)
30-39	57 (44.9)	0	57 (44.9)
40-49	24 (18.9)	1 (0.8)	25 (19.7)
50-59	12 (9.4)	1 (0.8)	13 (10.2)
60-69	1 (0.8)	0	01 (0.8)
<b>Total</b>	124 (97.6)	3 (2.4)	127 (100)

\*Seroprevalence to IgM were found in the age groups of 20-29, 40-49 and 50-59 years.

**Table 2: Seroprevalence of IgM antibodies according to gender distribution.**

Gender	Report N (%)		Total N (%)
	Non reactive	Reactive	
Female	83 (65.3)	2 (1.6)	85 (66.9)
Male	41 (32.3)	1 (0.8)	42 (33.1)
<b>Total</b>	124 (97.6)	3 (2.4)	127 (100)

\*1.6% females were reactive to IgM.

**Table 3: Seroprevalence of IgM antibodies according to occupation.**

Occupation	Report N (%)		Total N (%)
	Non reactive	Reactive	
Paramedical staff	67 (52.7)	1 (0.8)	68 (53.5)
Staff nurse	57 (44.9)	2 (1.6)	59 (46.5)
<b>Total</b>	124 (97.6)	3 (2.4)	127 (100)

\*1.6% staff nurses were reactive to IgM.

**Table 4: Seroprevalence of IgM antibodies according to prior COVID-19 test.**

Prior COVID-19 test	Report N (%)		Total N (%)
	Non reactive	Reactive	
Negative	30 (23.6)	1 (0.8)	31 (24.4)
Positive	3 (2.4)	0	3 (2.4)
Not tested	91 (71.6)	2 (1.6)	93 (73.2)
<b>Total</b>	124 (97.6)	3 (2.4)	127 (100)

\*1.6% study subjects who were reactive to IgM antibodies, were not tested previously for COVID-19.

## DISCUSSION

COVID-19 has brought into sharp focus the need for every nation to invest the nurses and midwives as part of their commitment to achieve Universal health coverage. Understanding the prevalence of and factors associated with SARS-CoV-2 infection among health care workers who care for COVID-19 patients are important for planning effective strategies for minimizing SARS-CoV-

2 spread in health care settings and associated communities. In the present study, seroprevalence was found to be lower (2.4%) among nursing and paramedical staff, which could be explained by sufficient availability of personal protective equipment, proper donning and doffing by health care workers because of effective training before duties, coupled with timely case identification and effective contact tracing and quarantines for those who worked in COVID-19 wards and labs. This study is similar to a cross-sectional study conducted among 100 health care workers in Rajasthan, where the prevalence of IgM was found to be 8% among health care workers.<sup>10</sup>

**Table 5: Seroprevalence of IgM antibodies according to COVID-19 exposure.**

COVID related duty	Report N (%)		Total N (%)
	Non reactive	Reactive	
Yes	72 (56.7)	2 (1.6)	74 (58.3)
No	52 (40.9)	1 (0.8)	53 (41.7)
<b>Total</b>	124 (97.6)	3 (2.4)	127 (100)

\*1.6% staff nurses, who worked in COVID-19 wards were reactive to IgM.

**Table 6: Seroprevalence of IgM antibodies according to duration of work.**

Duration of work (hours)	Report N (%)		Total N (%)
	Non reactive	Reactive	
3-6	52 (40.9)	2 (1.6)	54 (42.5)
7-9	49 (38.6)	0	49 (38.6)
>10	23 (18.1)	1 (0.8)	24 (18.9)
<b>Total</b>	124 (97.6)	3 (2.4)	127 (100)

\*1.6% staff nurses, who worked for 3-6 hours shifts were reactive to IgM.

**Table 7: Seroprevalence of IgM antibodies according to symptoms.**

Symptoms	Report N (%)		Total N (%)
	Non reactive	Reactive	
Cough	1 (0.8)	0	1 (0.8)
Sore throat	1 (0.8)	0	1 (0.8)
No symptoms	122 (96.1)	3 (2.4)	125 (98.4)
<b>Total</b>	124 (97.6)	3 (2.4)	127 (100)

\*2.4% study subjects who were reactive to IgM antibodies, were asymptomatic.

The presence of IgM in the serum is potentially associated with an acute phase of infection. The timing of the blood collection and the variable early immune response can affect the interpretation of the serological results. In a study conducted by Sotgiu, males showed higher prevalence of IgM compared to females (24.3%

vs. 9.1%) whereas in the present study, there is high prevalence of serum IgM in females compared to males.<sup>11</sup> 2.4% who were reactive to SARS-CoV-2 IgM antibodies were asymptomatic. Therefore testing only in symptomatic individuals can lead to underestimation of SARS-CoV-2 seroprevalence. As 73.2% of study subjects were not tested previously for COVID-19, improving surveillance in health care workers during the COVID-19 pandemic can prevent the spread.

**Table 8: Seroprevalence of IgM antibodies according to comorbidity.**

Comorbidity	Report N (%)		Total N (%)
	Non reactive	Reactive	
Diabetes mellitus	5 (3.9)	0	5 (3.9)
Hypertension	6 (4.7)	0	6 (4.7)
No comorbidity	113 (89.0)	3 (2.4)	116 (91.4)
<b>Total</b>	<b>124 (97.6)</b>	<b>3 (2.4)</b>	<b>127 (100)</b>

\*2.4% study subjects who were reactive to IgM antibodies, had no comorbidities.

The health regulatory bodies should start with training and education of medical and supporting staff including nurses, technicians, paramedics, receptionists and cleaners through online mandatory courses according to the updated protocols as issued by the WHO and Centre for disease control (CDC) in order to protect HCWs from hospital-acquired COVID-19 infection.<sup>12,13</sup> Awareness for COVID-19 infections is crucial even in non COVID-19 wards.

### Limitations

The main limitation of current study was that results obtained cannot be generalised to general population. Because, only those who were present during sample collection were included.

### CONCLUSION

Low seroprevalence was observed in this study in view of personal protective equipment usage and infection control training. Enhanced screening, including frequent testing of health care workers, and adherence to strict local hygiene standards in hospitals could reduce SARS-CoV-2 transmission. Ensure the health and safety of health care workers, both at work and in the community.

### ACKNOWLEDGEMENTS

Authors are thankful to, Dr. P. Chandrasekhar, for his kind support in study, all faculty and seniors of department of community medicine for their support and encouragement and the study participants for their co-operation.

*Funding: No funding sources*

*Conflict of interest: None declared*

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

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**Cite this article as:** Keerthana M, Pushpalatha S, ShanthiKumari S, Savolu CS, Sreedevi A. A sero epidemiological study of SARS-CoV-2 among nursing and paramedical staff in government general hospital, Kurnool. *Int J Community Med Public Health* 2021;8:727-31.