Original Article

DETECTION OF SEVERE ACUTE RESPIRATORY SYNDROME CORONAVIRUS 2 SPECIFIC IgG ANTIBODY IN STAFF OF KING EDWARD MEDICAL UNIVERSITY LAHORE

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ABSTRACT

Background: A new pandemic by Severe Acute Respiratory Syndrome Coronavirus 2 is severely affecting daily life. It has caused more than million deaths and billions of dollars of economic loss. Cases are still on the rise and fear of uncertainty is still prevailing among the masses and especially among healthcare workers (HCW). Healthcare workers are at greater risk of contracting the disease as they are continually being exposed to patients. This study was designed to know the seroprevalence of SARS CoV-2 IgG antibody in the healthcare staff of King Edward Medical University, Lahore.

Material and Methods: This prospective cross-sectional study was carried out from August 2020 to September 2020 at the Department of Pathology, King Edward Medical University Lahore. A total of 86 staff members were enrolled. Indirect ELISA was carried out to detect the SARS CoV-2 IgG antibody in serum samples of study participants. An interpretation was made according to manufacturer instruction as positive if the binding index was >1.1 and negative if it had a value of <0.9.

Result: Mean age of study participants was 41.1 ± 12.5 years. Doctors constituted 52 (61%) of total participants, 34 (39%) were non-doctors. A total of 28 (33%) participants were from clinical departments while 58 (67%) were from basic medical sciences departments. SRAS CoV-2 IgG antibodies were detected in 39 (45%) of total study participants. Only a small number of seropositive participants 12 (31%) developed symptoms related to COVID-19 and 7 (58%) symptomatic individuals were above 40 years of age.

Conclusion: The present study concludes that a higher number of healthcare staff was exposed to SARS CoV-2 but luckily the majority of them remain asymptomatic.

Key Words: Seroprevalence, Coronavirus, Healthcare workers

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INTRODUCTION

The coronavirus outbreak started in December 2019 as an unknown cause of pneumonia. The virus has been named SARS CoV-2 (Severe Acute Respiratory Syndrome Coronavirus 2) and has a phylogenetic similarity to the SARS CoV-1 causative agent of the 2002 SARS pandemic.[1] This form of respiratory disease has achieved pandemic spread and is characterized by rapid transmission from human to human. The resulting disease was named coronavirus disease-19 (COVID-19).[2]

The World Health Organization (WHO) announced the outbreak of COVID-19 to be the sixth public health emergency of international concern on January 30, 2020. And declared COVID-19 as a pandemic on March 11, 2020.[3] According to the WHO COVID-19 worldwide dashboard there were 46,430,652 confirmed cases of COVID-19, including 1,198,569 fatalities until November 2, 2020. The highest numbers of confirmed cases are from the American region with 20,616,596 cases, followed by the European and South-East Asian region.[4] The first case of COVID-19 in Pakistan was recorded from Karachi on February 26, 2020.[3] In Pakistan, the number of confirmed cases has reached 335,093 by 2nd November 2020, with 6835 fatalities and 315,016 recoveries. Just 707 of the active cases were

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in critical condition and needed hospitalization.[5]

SARS-CoV-2 spreads primarily through respiratory droplets. Asymptomatic, pre-symptomatic, and symptomatic subjects may spread the infection. The mean time from exposure to onset of symptoms is 5 days, and within 11.5 days, 97.5 percent of individuals experience symptoms.[6] Fever, dry cough, and shortness of breath are the most prevalent symptoms. Asymptomatic carriers and fulminant diseases characterized by sepsis and acute respiratory failure are also the manifestations of COVID-19.[7] Around 5% of COVID-19 patients, and 20% of those hospitalized, experience extreme symptoms that require intensive care. Overall, COVID-19 hospital mortality is approximately 15% to 20% and up to 40% among patients admitted in ICU.[8] However, mortality rates vary across countries, indicating variations in case detection and hospitalization thresholds. Hospital mortality varies from less than 5% in patients younger than 40 years to 35% in patients 70 to 79 years of age and more than 60% in patients 80 to 89 years of age.[9]

COVID-19 is a potentially preventable disease. Epidemiological data is evidence showing the relationship between the strength of public health intervention and the control of the transmission. However, since multiple infection control measures have been adopted by most countries, it is difficult to assess the relative benefits of each of the measures to control infections.[10,11] There is currently no human vaccine available for SARS CoV-2, but there are approximately 120 potential vaccines under development.[12] The challenges to the development of an effective vaccine include technological obstacles, availability of large-scale manufacturing, legislation regarding protection and efficacy, and legal barriers related to technology transfer and licensing agreements.[8]

The presence of immunity in the population in pandemics and outbreaks is a key and significant factor in reducing the spread of the disease. In the case of COVID-19, this is also relevant as it still has no standard treatment or vaccine.[13] Coronavirus infection gear Immune response consisting of IgM and IgG antibodies. Neutralizing activity has been associated with antibodies against the receptor-binding domain of the spike protein. Approximately 6 days after the onset of symptoms, neutralizing antibodies to these domains can be identified and increase steeply over the next 2 weeks, which is an optimal time for detection.[14] Antibody tests can be used to assess the true nature of an outbreak, map its geographical spread, and classify especially at-risk hotspots and populations. In turn, this information can be used to advise interventions and control strategies for public health.[15] Staff (Faculty and health care workers) of King Edward Medical University and are consistently being involved in taking care of patients with COVID-19 disease. So they are continuously being exposed to potential carriers of SARS CoV-2 coming to its affiliated hospital. Some of them also contracted the disease. The present study was carried out at the Department of Pathology King Edward Medical University (KEMU) Lahore, to detect the presence of SARS CoV-2 specific IgG antibodies in the staff of KEMU.

MATERIAL AND METHODS

This prospective cross-sectional study was carried out from August 2020 to September 2020 at the Department of Pathology, King Edward Medical University Lahore after approval from Institutional Review Board (IRB). Both male and female staff of KEMU of 18-60 years of age were included in this study. Any staff member with active COVID-19 disease or confirmed PCR positivity in the last 10 days was excluded. The sample size of 83 patients was estimated by using 95% confidence, 9.95% margin of error with expected percentage as 31% with the following formula: $N = Z^2 + p\,(1-p)/\in^2$ Where

N= Sample size
Z= Confidence level 95%= 1.96%
p = Prevalence level 31%
$\in$= Margin of error

Specimen collection and processing for ELISA testing

After informed consent, 2-3 ml of blood sample of each of the willing staff, working at KEMU faculty was collected in serum separation tube. The serum was separated stored at -20C for later testing. Indirect ELISA test kit supplied by Generic Assay Germany (Catalog #3920). This test was used to detect the SARS CoV-2 IgG antibody against spike glycoprotein. The test was performed in batches according to manufacturer instructions. For quality control purposes, known internal and external controls were run alongside assay. Cut-off value was calculated by adding a factor provided by the manufacturing company into the mean optical density of three negative controls. The binding index was calculated by dividing the optical density of the test by the cut-off value. An interpretation was made according to manufacturer instructions as positive if the binding index was >1.1 and negative if it has a value of <0.9.

Statistical analysis

Data was divided into continuous and categorical variables. Frequencies and percentages were calculated for demographic data by using SPSS version 27. The student t-test was applied to see the significance of difference.

RESULTS

Gender wise number of participants is shown in table 1. Table 2 shows the number of doctors and non-doctors in the participants. SARS CoV-2 IgG antibodies were detected in 39 (45%) of the total participants. Among 39 positive cases, 18 (46%) were doctors while 21 (54%) were non-doctors. Among positive cases, 19 (49%) were above 40 years of age. Male participants who developed IgG antibodies were higher in number 29 (74%) and the difference is statistically significant (*p-value* < 0.001) (Table 3). Participants from basic medical sciences departments were seropositive in 28 (72%) cases, while clinical departments constituted only 11 (28%) of total positive cases (Table 4). Only a small number of seropositive participants 12 (31%) developed symptoms related to COVID-19 and 7 (58%) symptomatic individuals were above 40 years of age.

Table-1: Gender of participants

Male	56	65%
Female	30	35%
Total	86	100%

Table-2: Doctors & Non-doctors Participants

Doctors	52	61%
Non-doctors	34	39%
Total	86	100%

Table-3: Development of IG antibody gender wise

Male	Female	p-value
29	10	0.001

Table-4: SARS CoV-2 IgG antibodies in participants from clinical and basic medical science departments

No of Clinical department subjects	No of Basic Medical Sciences department subjects	p-value
11	28	0.001

DISCUSSION

Seroprevalence data against SARS CoV-2 can be an important indicator to devise policies by healthcare authorities. Estimating SARS CoV-2 IgG antibodies can assess the immune response in individuals that have been exposed to COVID-19 patients. SARS CoV-2 IgG antibodies remain positive for at least 4 weeks after exposure and seroconversion are attained after 14 days of symptoms onset. However, in maximum patients, seroconversion for IgG antibody was attained at 3-6 weeks post-infection. So, these antibodies can be detected to know the previous exposure of individuals to SARS CoV-2. Health care staff is continually being exposed to potential carriers of SARS CoV-2. This study was designed to determine the SARS CoV-2 IgG antibody in the health care staff of Kind Edward Medical University Lahore.

The overall seroprevalence was found to be 39% among staff. A similar study conducted in a tertiary care hospital of Peshawar also showed such high seropositivity (31%) among HCWs.[16] Another study conducted in the National Institute of Blood Diseases Karachi, Pakistan showed 13% seroprevalence among HCWs.[17] A study conducted in different districts of Karachi showed a maximum of 15% seropositivity among the general population.[17] Chughtai Institute of Pathology Lahore reported 15% seropositivity among young special police squads performing duties in high-risk areas related to coronavirus. From these studies, it could be inferred that higher seropositivity is being reported among HCW by different setups in comparison to the community population and our findings supports also this narrative.

In our study, the male gender showed statistically significant higher seropositivity (74%). A survey conducted in Karachi Pakistan did not identify any difference in seroprevalence among males and females.[17] Another study in China also did not find any significant difference in seroprevalence among genders.[18] Another study conducted in Peshawar also second the later argument which is in contrast to our study.[16] This difference may be due to the participation bias as our study includes more male participants. In this study majority of the seropositive staff members (54%) were non-doctors (health care staff). Surprisingly staff of basic medical sciences departments who are not in direct contact with patients was seropositive in higher numbers (72%) in comparison to clinical departments. A study conducted in Peshawar also demonstrated that higher seroprevalence was detected in laboratory technicians followed by other paramedical staff.[16] Despite not bearing direct contact with patients these HCWs were having more exposure to potential carriers. This may be due to the difference in education or training or implementation of less stringent protocols by them.

Age-associated seroprevalence or symptomatic/asymptomatic status was not statistically significant among different groups of this study (*p-value* > 0.05). Differences in mortality and morbidity symptomatic or asymptomatic status among different ages distribution varies among regions. Some studies show a profound effect of age on morbidity and mortality while and others negate its significance.[19-24]

Our study showed that a larger number of staff (69%) remained asymptomatic while harboring the virus. A meta-analysis conducted in China demonstrated only 15% of asymptomatic individuals with confirmed PCR positivity.[24] The asymptomatic cases vary among different geographical distributions ranging from 18% to 81% however, the majority of studies reported <50% asymptomatic cases.[25] Asymptomatic HCW frequently interact with a vulnerable population and they may transmit the infection to others unknowingly. So HCW should be screened frequently and be quarantined urgently to halt the spread of disease.

CONCLUSION

The present study concludes that a higher number of staff was exposed to SARS CoV-2 but luckily the majority of them remain asymptomatic. However, such a high number of asymptomatic carriers may pose a risk to unexposed ones. So it is suggested that preventive measures should continue to hamper its spread.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR'S CONTRIBUTION

MA: Data Analysis and interpretation
RS: Collection and assembly of data
SA: Conception and design

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