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Seroprevalence of SARS-CoV2 Antibodies among Patients and Healthy Individuals of Lahore

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ABSTRACT

Objective: To determine the seroprevalence of SARS-CoV2 antibodies in patients and healthy individuals presenting to a tertiary care hospital in Lahore.

***Study Design*:** Cross-sectional study

Place and Duration of Study: Pathology Department of Surayya Azeem Hospital, Lahore Pakistan, from May to Jul 2020.

Methodology: The study included clinically suspected patients of COVID-19 referred by clinicians and healthy individuals presenting to the hospital for the SARS-CoV-2 antibody test, irrespective of age and gender.

Results: The SARS-CoV-2 antibody positivity was 704(59.4%) in our study. Out of 1184 individuals tested, 690 patients had a positive clinical history of COVID-19 infection, and 517(74.9%) were positive for COVID-19 antibodies. Out of 494 asymptomatic healthy individuals, positivity for COVID-19 antibodies was 187(37.8%). It was observed that positivity was significantly higher 169(44.0%) in contacts of COVID-19 infection patients compared to asymptomatic healthy individuals 18(16.3%).

Conclusion: Our study shows that the seroprevalence of SARS-CoV-2 antibodies in the general public in Pakistan has greatly increased.

Keywords: COVID-19 infection, SARS-CoV-2 antibodies, Seroprevalence.

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INTRODUCTION

The conventional SARS-CoV-2 diagnostic technique is real-time RT-PCR, but access to this diagnostic modality has been very challenging in many countries. Serological surveys utilizing antibody testing methods can help in the study of a current epidemic as well as the retrospective evaluation of an outbreak's attack rate or scope of an outbreak.[1,2] Serological methods are aimed at detecting serum antibodies (IgM, IgG) against S-proteins from the coronavirus spike and nucleocapsid proteins (N).[3]

As the number of asymptomatic or mild infections is high, data based on laboratory-confirmed cases do not accurately represent the true magnitude of viral burden, its transmission, and the case fatality ratio.[4,5] With a novel coronavirus, initial seroprevalence in the population is presumed negligible due to the virus being novel in origin.[6] Consequently, the WHO advises seroconversion surveillance in a population to make conclusions about the burden of infection and cumulative incidence of infection in the population.[7,8] Therefore, a seroepidemiological survey is essential to timely estimate COVID-19 virus infection rates, as the good progression of the epidemic in the community will eventually help the policymakers institute effective health measures.[9,10]

Given Pakistan's limited testing capability focusing solely on symptom-based PCR tests, seroprevalence studies are required to identify the real scope of the illness and how far we have progressed in attaining herd immunity. Therefore, we undertook this study to estimate the seroprevalence of SARS-CoV2 antibodies in patients and healthy individuals presenting to a tertiary care hospital in Lahore.

METHODOLOGY

The cross-sectional study was conducted at the Pathology Department of Surraya Azeem Teaching Hospital, Lahore Pakistan, from May to July 2020, following approval from the Institutional Review Board (Approval No. 4401/ERC/CMH/LMC). Sample size was calculated using the formula $n=(Z2P\ (1-P)/e^2$, taking prevalence=54%.[11] Non-probability convenient sampling was employed.

Inclusion Criteria: Clinically suspected patients of COVID-19 referred by clinicians and healthy individuals presenting` to the hospital for the SARS-CoV-2 antibody test, irrespective of age and gender were included in the study.

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Exclusion Criteria: Samples from patients admitted to the hospital, and critically ill patients were excluded from the study.

After informed consent, a blood sample was withdrawn from the study participants aseptically and transferred in a vial for serum separation. The COVID antibody testing was performed on Cobas e-411 fully automated ELISA system using Elecsys Anti-SARS CoV-2 immunoassay kits manufactured by Roche Diagnostics, Switzerland. These kits are based on the Electrochemiluminescence immunoassay (ECLIA) technique that uses a recombinant protein representing the nucleocapsid (N) antigen in a double antigen sandwich assay format targeting both IgG and IgM antibodies against SARS CoV-2. A cut of an Index of ≥ 1.0 was taken as reactive, and a cut of ≤ 1.0 was taken as non-reactive.[12]

Data were analyzed using Statistical Package for Social Sciences (SPSS) version 23.00. For categorical variables like seropositivity, age, and gender frequencies and percentages were calculated. The Chi-Square test was applied to determine the statistical significance among various groups of subjects. The *p*-value of ≤0.05 was considered statistically significant.

RESULTS

A total of 1184 samples were tested during the study period. Of these 1184, 792(66.8%) were males, whereas 392(33.2%) were females. COVID-19 antibody was positive in 704(59.4%) individuals (Figure-1).

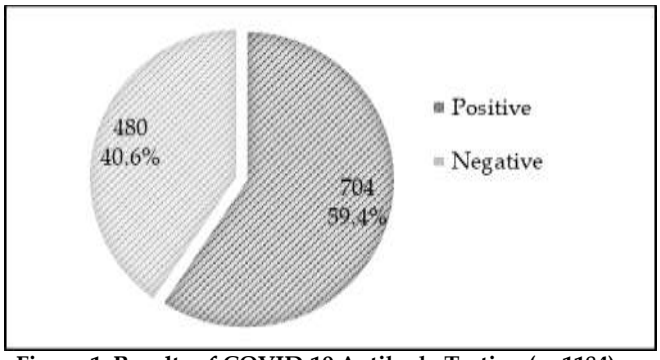

Figure-1: Results of COVID-19 Antibody Testing (n=1184)

It was observed that COVID antibody positivity was mainly seen in the age group 21-30 years (29.4%), followed by 31-40 years (23.8%), being the lowest in the age group of up to 10 years (1.5%) (Figure-2).

Of 690 patients with a positive clinical history of COVID-19 infection, 517(74.9%) were positive for COVID-19 antibodies.

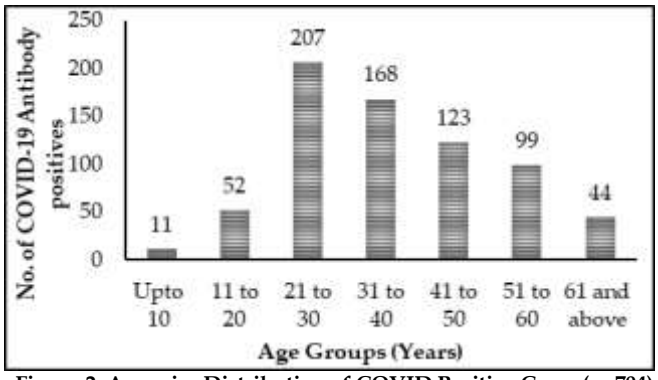

Figure-2: Age-wise Distribution of COVID Positive Cases (n=704)

Out of 494 asymptomatic healthy individuals, 169(44.0%) positive individuals had a history of contact with a COVID-19 patient, whereas 18(16.3%) positive individuals had no history of contact with a COVID-19 patient. It was observed that positivity was significantly higher in contacts of COVID-19 infection patients compared to asymptomatic healthy individuals (*p*-value <0.001) (Table).

Table: Comparison of COVID-19 Positivity Amongst Contacts of COVID-19 Patients and Healthy Individuals with no History of Contact with a COVID-19 Patient (n=494)

Category of Cases n=494	Positive for Covid-19 Antibodies n(%)	Negative for Covid-19 Antibodies n(%)	*p*-value
Asymptomatic Cases with History of Contact with a COVID-19 Patient			
(n=384)	169(44.0)	215(55.9)	<0.001
Asymptomatic Cases with no History of Contact with a COVID-19 Patient			
(n=110)	18(16.3)	92(83.6%)	<0.001

DISCUSSION

In the current study, the seroprevalence of SARS-CoV-2 antibodies in the general population was noted to be 59.4%, which is higher than other studies in this region. A study conducted by Haq *et al.* in July 2020, where the seroprevalence of SARS-CoV2 was 42.4%, with the highest in the province of Punjab, Pakistan.[10]

Recently in Karachi, two serial cross-sectional surveys were done in April and June 2020 in the general population. Seroprevalence in June was 8.7% and 15.1% in low and high transmission areas, respectively.[11] Sood *et al.* noted a seroprevalence of around 4.6% in California.[12] Similarly, the evaluation of SARS-CoV-2 antibodies in blood donors in Italy showed 23% positivity.[13]

However, in a study done in India comparing the seroprevalence of SARS-CoV-2 in slums and non-slums, the seropositivity was 54.1% and 16.1%,

respectively.[14] Another study in Karachi noted the percentage positivity for industrial employees to be 50.3% compared to 13.2% for healthcare workers.[15]

These studies show that seroprevalence can vary according to regions and populations, such as healthcare professionals and blood donors. One possible explanation for high seroprevalence in our study could be the need for more public awareness, low literacy rates, and a general lack of commitment towards implementing risk mitigation measures like social distancing and population commitment to follow health care protocols regarding COVID-19. Another reason is the better and upgraded serological detection of specific antibodies against SARS-CoV-2 that can help assess a real number of infections.

The age-wise distribution shows the maximum number of COVID-19-positive cases in the range of 21-40 years. Studies conducted in Pakistan by Abid *et al.* and Sharif *et al.* also showed the most commonly affected age group to be 20-39 years and 16-45 years, respectively.[5,16] In India, the most common age group affected was 21-40 years which conforms with our findings.[17]

The COVID-19 pandemic is revealing the disparity of gender in COVID-19 vulnerability, emphasizing the need to understand better the impact of gender on the incidence and case fatality of the disease. The present study shows males to be more prone to COVID-19 (67.4%) than females (32.6%). A study conducted in the Punjab province showed similar findings.[16] A study by Shi *et al.* in China also reported more male cases (53.2%) than females (46.8%).[18]

The current study shows positivity of 74.9% among patients with a clinical history of Covid-19 infection, 44% positivity among asymptomatic cases with a history of contact with Covid-19 patients, and 16.3% in asymptomatic cases with no history of exposure. Thus, a total of 26.6% of positive cases were asymptomatic carriers.

A study done in metropoles across Pakistan showed that 90% of the population who tested COVID-19 positive were asymptomatic carriers of the disease.[19] White *et al.* noted 40.6% of cases to be asymptomatic, and 40.3% were symptomatic at presentation.[20]

This shows that although the number of confirmed cases and deaths helps elucidate the disease progression and prognosis in a particular population, the actual proportion of the population affected is not reflected. Seroprevalence studies like the current study can identify asymptomatic cases and those who did not get tested despite having symptoms of COVID-19. Population-based testing can further deepen the understanding of the stage of the pandemic in our population. In addition, these surveys can help the government formulate strategies regarding the disease burden and transmission rate, thus protecting the general population.

STUDY LIMITATION

The study was restricted to patients referred by clinicians and healthy individuals visiting a tertiary care hospital for the SARS-CoV-2 antibody test. Large-scale population studies are needed, as they can be reflective of the actual burden of the disease.

CONCLUSION

Our study shows that the seroprevalence of SARS-CoV-2 antibodies in the general population in Pakistan has greatly increased as several positive cases were asymptomatic and thus are easily missed in the projected numbers. Serological surveys can therefore help assess the actual number of cases of Covid-19 in Pakistan.

Conflict of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

KHC & MSA: Study design, drafting the manuscript, data interpretation, critical review, approval of the final version to be published.

FH & MR: Data acquisition, data analysis, data interpretation, concept, approval of the final version to be published.

AS & MDI: Critical review, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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