SARS-CoV-2 specific IgG antibodies among participants presenting to a voluntary testing facility in Srinagar, Kashmir

Rafiya Kousar, Iram Sabah, Tanzeela B. Qazi, Inaamul Haq, Mariya A. Qurieshi, Shahzada Muhammad Salim Khan

Department of Community Medicine, Government Medical College Srinagar, Jammu and Kashmir, India

ABSTRACT

Background: The tide of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic has scoured the global community with India, from 30 January 2020 to 30 September 2021, reporting 33,739,980 confirmed cases and over 448,090 deaths from coronavirus disease (COVID-19). Serologic testing for SARS-CoV-2 infection among the general public will provide essential information regarding the risk of infection. So, the present study was conducted to provide relevant information on the proportion of people who had experienced either a recent or past infection. Methodology: A cross-sectional study was conducted among adults >18 years in the Department of Community Medicine, Government medical college, Srinagar. Blood samples of the participants were tested for the presence of SARS-CoV-2-specific IgG antibodies using a chemiluminescent microparticle immunoassay-based serologic test. Results: A total of 2,107 participants took part in the study. The overall unadjusted seroprevalence of IgG antibodies against SARS-CoV-2 in our study was 49%. The age-adjusted seroprevalence was 52%. Conclusion: The findings of the study suggested that not only a large proportion (49%) of the participants had been infected with COVID-19 infection but many were also susceptible to infection. Therefore, infection control measures still need to be followed properly.

Keywords: COVID-19, IgG antibodies, Srinagar, voluntary testing

Introduction

The tide of severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) pandemic has scoured the global community with India, from 30 January 2020 to 30 September 2021 reporting 33,739,980 confirmed cases and over 4,48,090 deaths from coronavirus disease-2019 (COVID-19).[2] As of 31st August, 2021, the cumulative number of cases reported globally was nearly 216 million, and the cumulative number of deaths was just under 4.5 million.[2]

Address for correspondence: Dr. Tanzeela B. Qazi, Department of Community Medicine, Government Medical College Srinagar, Jammu and Kashmir, India. E-mail: qazitanzee@gmail.com

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research on antibody responses to SARS-CoV-2, both in terms of prophylaxis and treatment.

Seroprevalence surveys can provide an estimate of the proportion of the population that has developed antibodies against SARS-CoV-2, an indication of infection. Mild and asymptomatic infections, which may not have received reverse transcription-polymerase chain reaction (RT-PCR) testing can be detected. Besides assuming that antibodies provide partial or total immunity, seroprevalence surveys give an estimation of the proportion of the population still susceptible to the infection, the knowledge of which is vital at all levels of health, especially as a primary care physician. Antibody response to this virus, on the other hand, is still a source of debate and must be carefully addressed. Many issues of contention surrounding antibody responses to SARS-CoV-2 include vaccine effectiveness studies, the likelihood of antibody-dependent enhancement (ADE), and convalescent plasma therapy, and lots more research remains to be done in some of these disciplines. The extensive body of evidence that has surfaced, on the other hand, sheds light on many facets of the humoral immune response to the new coronavirus. Owing to the social stigma around people infected with COVID infection, many patients with mild symptoms avoided testing. A facility for testing for SARS-CoV-2-specific IgG antibodies among the general population, reporting voluntarily was set up for estimating seroprevalence. We offer an overview of the current findings on the nature of the antibody response to SARS-CoV-2, with a focus on seroprevalence in the general population including health care workers of district Srinagar, Jammu and Kashmir.

**Methodology**

It was a cross-sectional study conducted in the Department of Community Medicine, Government medical college (GMC), Srinagar from 3rd September 2020 to 21 January 2021. Study participants were adults >18 years of age who had visited department of community medicine, GMC, Srinagar.

**Sampling technique**

Convenience sampling.

**Procedure**

A cross-sectional study was conducted to find out the presence of IgG antibodies against SARS-CoV-2 among adults who had visited the department of community medicine, GMC, Srinagar. All the participants who visited the department voluntarily during the time period were included in the study. The participants were informed about the study purpose and procedure. A written informed consent was obtained from all the participants. A face-to-face interview was conducted with the participants using a mobile-based application “Epicollect 5.” The application was used to collect information about demographic variables, history of any past COVID symptoms, history of contact with a known COVID-19 case, history of contact with a patient having influenza-like illness (ILI) symptoms, history of a COVID test [(RT-PCR/rapid antigen test (RAT)] for SARS-CoV-2 infection, and the result of such a test if done. Each participant was assigned a specific identification code using the mobile application. Following the interview, 3–5 mL of venous blood was collected by a trained laboratory technician under standard aseptic precautions and was then immediately transferred to a red top serum tube. The samples were left to stand for at least 30 min intervals and were then transported in vaccine carriers to the central laboratory of GMC, Srinagar, for further processing.

The test was performed using chemiluminescent microparticle immunoassay (CMIA) procedure with a fully automated analyzer by Abbott. The test has 100% sensitivity and specificity (over 99.6%) for the detection of SARS-CoV-2 specific IgG antibodies. The test result with an index value ≥1.40 was considered positive for SARS-CoV-2 Ig G.

**Statistical analysis**

The data were entered into a Microsoft excel sheet and analyzed using STATA 13 software. The variables were summarized as frequency and percentages. Overall unadjusted seroprevalence was calculated and expressed as a percentage. Age-standardised seroprevalence was calculated to minimize the presence of any bias. Chi-square test was used for comparison of seroprevalence between groups.

**Results**

During the period of the study, a total of 2,107 participants took part in the study. Information and blood samples were obtained from these 2,107 participants, and analysis was performed. The overall unadjusted seroprevalence of IgG antibodies against SARS-CoV-2 in our study was 49%. The age-adjusted seroprevalence was 52%. The majority of the participants were in the age group of 20–39 years with higher seroprevalence in ≥60-year-age group. Among the participants, there was a slight predominance of the males over females [Table 1].

A significantly higher seropositivity rate was found among those who had past COVID symptoms, history of contact with a

| Table 1: Seroprevalence of SARS-CoV-2-specific IgG Antibodies by Age and sex |
|---------------------------------------------|-----------|-------------|
| Characteristics | No of participants | Seropositive individuals | Seroprevalence |
| Overall | 2107 | 1031 | 49% |
| Age (years) | | | <0.001 |
| <20 | 87 | 54 | 62.07% |
| 20-39 | 1115 | 477 | 42.78% |
| 40-59 | 742 | 387 | 52.16% |
| ≥60 | 163 | 113 | 69.33% |
| Gender | | | 0.863 |
| Male | 1349 | 662 | 49.07% |
| Female | 758 | 369 | 48.68% |

*Test used- chi square test*
Known COVID-19 case, and history of contact with a patient having ILI symptoms. Also, a significantly higher seroprevalence was found among those who had been tested positive for SARS-CoV-2 IgG by either RTPCR or RAT. [Table 2]

Furthermore, stratification of the participants who had undergone COVID-19 test was done on the basis of the past COVID symptoms as depicted in Figure 1. High seroprevalence (84.98%) of IgG antibodies against SARS-CoV-2 was reported among those participants with a history of past COVID-19 symptoms and positive COVID-19 tests. Among those with no history of past COVID-19 symptoms, the seroprevalence of IgG in positive COVID patients was 24.20%.

**Discussion**

This study aimed to estimate the seroprevalence of SARS-CoV-2 infection among volunteers in different districts of Kashmir, India. Our study population consisted of both the general population and health care workers. The overall seroprevalence was found to be 49% with little difference across gender. The reason for the high seroprevalence in this study could be the study population being the volunteers who might be aware of their status and thus volunteered for the study. Unlike our study, a study done in Spain during the same time period showed a lower seroprevalence. [8] A study done among the residents of district Srinagar showed a seroprevalence of 3.6%. [9] Another study which was done among the health workers across the Kashmir valley showed a seroprevalence of 2.5%. [9] Seroprevalence studies done across the world have revealed a result ranging from <0.1% to more than 20% and could increase with time. [7]

The current study revealed a higher seroprevalence among the elderly population aged >60 years, which shows the increased susceptibility of the elderly population to the virus which is contradictory to a study done in a South Indian district. [9]

We found no differences in seroprevalence between females and males similar to a study done in Spain. [4] However, the nationwide survey showed males were significantly associated with seropositivity than females. [9]

Patients with past COVID symptoms, history of contact with a known COVID 19 case, history of contact with a patient having ILI were found to be significantly associated with increased seropositivity. However, 34% seroprevalence was found among the patients without past COVID symptoms which suggests the transmission of infection within communities was several times higher as most of the asymptomatic cases were not screened using molecular tests. This finding supports the evidence from the serosurvey reports in Switzerland, the USA, and Canada. [8,10,11] and reinforces the importance of rapid identification and isolation of people with confirmed SARS-CoV-2 infection and their contacts to prevent the spread of the deadly disease. A study done among the asymptomatic workforce at Wright-Patterson Air Force Base (WPAFB) in Dayton showed an overall seroprevalence of 3.09%. [12] This

**Figure 1:** Flowchart showing seroprevalence of IgG against SARS-CoV-2 among those tested for COVID-19 based on past covid symptoms.
finding is of utmost public health importance as transmissibility is the critical factor in determining the public health impact of an epidemic and reinforces the importance of rapid identification, and isolation of people with confirmed SARS-CoV-2 infection and their contacts to prevent the spread of the deadly disease. Primary care physicians can play an important role by providing testing facilities to people with respiratory symptoms and making an early diagnosis of the disease. They can also provide the patients with supportive and effective management at the primary care level thus reducing the demand for hospital services. Generation awareness regarding the disease and its preventive measures can be done at the primary care level which in turn will help in the confinement of disease. We also found that those with no history of contact with the COVID-19 case showed a seroprevalence of 44%. A substantial number of antibodies were found among those who had no signs and symptoms of the disease suggesting high rates of asymptomatic or undiagnosed COVID-19 cases. In addition, among 471 individuals who had no previous symptoms and were negative for RTPCR, 114 individuals were picked up as positive for IgG antibodies. A higher seroprevalence (52.84%) was found among the contacts of patients living with ILI symptoms, which shows the higher incidence of transmission among the symptomatic individuals.

Conclusion

The present study was conducted to determine the proportion of people who have experienced COVID-19 infection either in the past or recently. The findings of the study suggested that a large proportion (49%) of the participants had been infected with COVID-19 infection, but many were also susceptible to infection. However, the selection of study participants was not random, the participants reported voluntarily for the testing. Furthermore, more public health measures are to be adopted in order to ensure good and effective control of COVID19 infection.

Table 2: Seroprevalence of SARS-CoV-2-specific IgG Antibodies by specific risk factors

| Characteristics                                   | No of participants n | Seropositive individuals | Seroprevalence | P*   |
|---------------------------------------------------|----------------------|--------------------------|----------------|------|
| Past COVID symptoms                               |                      |                          |                |      |
| No                                                | 1265                 | 435                      | 34.39          | <0.001|
| Yes                                               | 842                  | 596                      | 70.78          |      |
| History of contact with a known COVID-19 case     |                      |                          |                |      |
| No                                                | 993                  | 439                      | 44.21          | <0.001|
| Yes                                               | 1114                 | 592                      | 53.14          |      |
| History of contact with a patient having ILI symptoms |                    |                          |                |      |
| No                                                | 1049                 | 472                      | 45.00          | <0.001|
| Yes                                               | 1058                 | 559                      | 52.84          |      |
| Ever been tested**                                |                      |                          |                |      |
| No                                                | 841                  | 351                      | 41.74          | <0.001|
| Yes                                               | 1266                 | 680                      | 53.71          |      |
| RTPCR/RAT test result***                          |                      |                          |                | <0.001|
| Negative                                          | 657                  | 200                      | 30.44          |      |
| Positive                                          | 553                  | 459                      | 83.00          |      |

**RTPCR/RAT ***56 missing reports


Summary

• It was a cross-sectional study conducted among adults >18 years whose blood samples were tested for the presence of SARS-CoV-2-specific IgG antibodies.
• A total of 2,107 participants took part in the study
• A total of 49% of the participants in our study were found to be infected with COVID-19 infection.
• The age-adjusted seroprevalence of IgG antibodies against SARS-CoV 2 was found to be 52%.
• A significantly higher seropositivity rate was found among those who had past COVID-19 symptoms, history of contact with a known COVID-19 case, and history of contact with a patient having ILI symptoms.

Take home message

Many of us are still susceptible to COVID-19 infection, therefore stringent public health measures and standard operating procedures are to be adopted in order to ensure effective control of COVID-19 infection.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patients have given their consent for all the clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity.

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Conflicts of interest

There are no conflicts of interest.
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