ORIGINAL ARTICLE

Seroprevalence of Anti-SARS-Cov-2 IgG Antibodies in Tertiary Care Hospital

Rajendra Surpam[1], Pooja Taiwade[1], Bhausaheb Munde[1] and Virendra Kolhe[1]
[1]Department of Microbiology, Government Medical College and Hospital, Chandrapur - 442402, Maharashtra, India.

Abstract:
Background: Seroprevalence of anti-SARS-CoV-2 IgG antibodies not only provides information for tracing the missing cases but also help in implying proper measures against the infection. We estimated the seroprevalence of SARS-CoV-2 specific IgG antibodies in Chandrapur, Maharashtra. *Material and Methods:* Blood samples were collected randomly from 6012 individuals who were SARS-CoV-2 RT-PCR negative across Chandrapur, Maharashtra. The serum samples were tested for SARS-CoV-2 IgG antibodies using Enzyme linked Immunosorbent Assay (ELISA) method. *Results:* Anti-SARS-CoV-2 IgG antibodies were found in 32.97% samples with slightly more prevalence amongst males than females. Also, urban population and individuals in 21-40 age group showed higher positivity. *Conclusion:* This study implies the importance of anti-SARS-CoV-2 IgG antibody serosurveillance amongst RT-PCR negative individuals. This will help in interrupting the -spread of infection and making protocols in prevention of infection.

Keywords: Anti-SARS-CoV-2 IgG antibodies, Coronavirus, ELISA, RT-PCR, seroprevalence.

Introduction:

Since the first case detected in Wuhan, China on 31st December 2019, the entire globe has been affected by the severe acute respiratory syndrome–associated coronavirus-2 (SARS-CoV-2) pandemic with over 17.6 crore cases and 38.1 lakhs deaths reported. Detection of viral RNA in respiratory tract samples is the gold standard for the diagnosis of SARS-CoV-2. However, even though the sensitivity of nucleic acid amplification techniques is high, false negatives can occur, due to difficulty in sampling or in patients with low viral loads (especially in patients who present at day 8 or later) and in mild cases [1]. Thus, it's very important to screen and interrupt undetected chains of disease transmission. Retrospective surveillance becomes very important key to track SARS-CoV-2 amongst mild and asymptomatic cases of SARS-CoV-2 infection [2].

A peptide-based enzyme-linked immunosorbent assay (ELISA) can be used for retrospective serosurveillance of SARS-CoV-2 [2]. The sensitive, quantitative measurements of ELISA make it suitable to assess dynamic changes in viral-specific antibodies [3]. Antibody tests can provide epidemiological information about the number of affected individuals and can guide control measures taken by governments [4, 5]. SARS-CoV-2 specific immunoglobulin G (IgG) antibodies have been considered to provide protective immunity and its immunoassays have been widely used for serosurveillance [6]. Serological assays can help determine the immune status of individuals and estimate herd immunity [7, 8]. In the current study, authors have studied the seroprevalence of the anti-SARS-CoV-2 IgG antibodies amongst known SARS-CoV-2 RT-PCR negative individuals to find out missing, undetected cases in the area.

Material and Methods:

The observational study was conducted from October 2020 to April 2021 at Viral Research Diagnostic Laboratory (VRDL), Department of Microbiology, Government Medical College and Hospital, Chandrapur, Maharashtra. The samples were collected from the Chandrapur city as well as rural and suburbs of Chandrapur District. Study protocol was approved by Ethics Committee and informed consent was obtained for sample collection.

A total of 6012 blood samples were collected randomly

from the individuals who were SARS-CoV-2 RT-PCR negative. The serum was separated and tested for SARS-CoV-2 specific IgG antibodies using ErbaLisa COVID-19 IgG (ELISA) Kit as per the manufacturer's instruction. The serum samples were stored at 4˚C till performance of ELISA test. The IgG ELISA Kit is a two-step solid phase enzyme immunoassay for index value based on semi-quantitative detection of anti-SARS-CoV-2 IgG. The kit utilizes recombinant proteins of SARS-CoV-2 i.e., Spike 2 and Nucleoprotein for detection of anti-SARS-CoV-2 antibodies. The study aimed to find out the percentage of cases with anti-SARS-CoV-2 IgG antibodies even after testing negative by SARS-CoV-2 RTPCR to find out missing, undetected cases in the area.

Results:

A total of 6012 samples were collected and tested for anti-SARS-CoV-2 IgG antibodies.

Out of 6012 samples, 1982 (32.97%) were positive for IgG antibodies. (Table 1). A total of 2928 males and 3084 females were included in the study. Amongst 2928 males, 1002 (33.6%) and 980 (31.78%)out of 3028 females were positive for anti-SARS-CoV-2 IgG antibodies. The prevalence was slightly higher in males than in females. (Table 2).

In our study, a total of 29 (23.02%) amongst 1-20 years of age group, 1077 (41.8%) amongst 21-40 years of age group, 687 (32.89%) amongst 41-60 years of age group, 169 (15.94%) amongst 61-80 years of age group and 20 (12.42%) amongst >80 years of age group were seropositive for SARS-CoV-2 IgG antibodies. Maximum positivity was found amongst 21-40 years of age group. (Table 3).

Out of 6012 individuals, 3002 individuals were from rural region while 3010 were from urban areas. Amongst rural individuals, 819 (27.28%) and amongst urban individuals 1163 (38.64%) were found positive for anti-SARS-CoV-2 IgG antibodies. (Table 4).

Table No. 1: Prevalence of anti-SARS-CoV-2 IgG antibodies out of total tested samples

Total Tested	Positive	Negative
6012	1982 (32.97%)	4030 (67.03%)

Table No. 2: Gender wise Seropositivity

	Total	Positive	Negative
Male	2928	1002 (33.6%)	1926
Female	3084	980 (31.78%)	2104
Total	6012	1982	4030

Table No. 3: Age wise Sero Positivity

Age (In Years)	Total	Positive
1-20	126	29 (23.02%)
21-40	2576	1077 (41.8%)
41-60	2089	687 (32.89%)
61-80	1060	169 (15.94%)
>81	161	20 (12.42%)
Total	6012	1982

Table No. 4: Area wise Seropositivity

Area	Positive	Total
Rural	819 (27.28%)	3002
Urban	1163 (38.64%)	3010
Total	1982	6012

Discussion:

In this study, we report the seroprevalence of anti-SARS-CoV-2 IgG antibodies in Chandrapur district and surrounding areas and demographic factors. The IgG ELISA Kit used in our study is a two-step solid phase enzyme immunoassay for index value based on semi-quantitative detection of anti-SARS-CoV-2 IgG antibodies. The kit utilizes recombinant proteins of SARS-CoV-2 i.e., Spike 2 and Nucleoprotein for detection of anti-SARS-CoV-2 antibodies. The sensitivity and specificity of the kit reported by manufacturer is 99.12% and 99.33% respectively.

Amongst a total of 6012 blood samples collected from the RT-PCR negative individuals from all over Chandrapur district, 1982 (32.97%) samples were positive for anti-SARS-CoV-2 IgG antibodies. A previous study reported 12% positivity amongst RT-PCR negative individuals [9]. while another study reported 4.7% positivity [10].

In our study, there were 2928 males and 3084 females. Amongst 2928 males, 1002 (33.6%) and980 (31.78%) out of 3028 females were positive for anti-SARS-CoV-2 IgG antibodies. We found the prevalence was found slightly more in males as compared to females probably due to lesser exposure amongst females. A study has reported more positivity amongst females [11]; however few have reported no difference [9,12].

Maximum number of positivity was found amongst the age group 21-40 years. Our findings matched with the study from Ahmedabad and Srinagar [9,13]. However, a study from Ahmedabad has reported seropositivity higher amongst children and elderly [14].

We found higher seropositivity amongst urban population (38.64%) as compared to rural (27.28%). A nationwide study also reported higher seroprevalencein urban areas than in rural [14]. Overcrowding leading to overexposure might be the reason for higher seroprevalence in urban areas.

The antibody-based tests are cheaper and faster as compare to nucleic acid amplification-based tests. Also, there is lesser chance of infection while sampling as compared to respiratory specimen. Also, blood samples show reduced heterogeneity compared to respiratory specimens [8,13]. This adds to the advantage of doing serosurveillance.

IgG antibody indicates past infection. In our study, we found out that there were 32.97% known RT-PCR negative individuals who must have had infection and recovered owing to their immunity. However, we cannot rely on this immunity as its longevity is still under research. We should also focus on the remaining 67.03% who don't have any antibody which makes them very vulnerable to the infection and preventive measures implication becomes a must in such cases.

Conclusion:

This study reports the seroprevalence of anti-SARS-CoV-2 IgG antibodies amongst the known RT-PCR negative individuals. This IgG positivity shows number the missing cases in the past which had mild or no symptoms. Also, IgG negativity indicates the group which is vulnerable to infection. This implies the importance of serosurvey which not only will help in interruption of the disease chain but also help the government authority in implying the measures like vaccination, social distancing and mask compulsion to prevent the spread. We need more research studies because as of now, there are very few studies done on this topic.

Conflict of Interest - Nil
Sources of Support - Nil

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Address for correspondence: *Dr. Pooja Taiwade, Assistant Professor, Department of Microbiology, Government Medical College and Hospital, Chandrapur - 442402, Maharashtra, India.*
Email: pooja.2209@gmail.com,
Mobile: +91 7350330889.

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