RESEARCH

EFFECT OF TREATMENT STRATEGIES ON IgG ANTIBODY AGAINST SARS-COV-2 AMONG COVID-19 INFECTED HEALTH CARE WORKERS IN A TERTIARY CARE CENTER

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Abstract

Background: In India, laboratory diagnosis of SARS – CoV- 2 infection has been mostly based on real- time reverse transcriptase- polymerase chain reaction (RT- PCR). Studies have shown that IgG antibodies may be detected usually 10-18 days after the onset of covid-19 infection, persist after 4 weeks till few months but may decline later. In the neutralization of SARS-CoV-2, B-cell response and the production of IgG antibodies play an important role. The aim of the present study is to describe the antibody kinetics in relation to treatment in health care workers with RT-qPCR-confirmed COVID-19, and analyse antibody response by using IgG antibody Merilisa kit. **Materials and Methods:** The present study enrolled 120 health care workers who were working in COVID wards (aged between 20–60 years) with laboratory confirmed COVID-19, from whom sera were analyzed on 10th day and 3 months after COVID-19 diagnosis. **Result:** Out of the study population which included 120 health care workers, only 46.6% remained positive for IgG antibodies after 3 months post infection of COVID-19. This study showed that presence of IgG antibodies against SARS-CoV-2 was higher among HCWs who were only on Antibiotics (60%) followed by those only on Antivirals (53.3%) as treatment modality. **Conclusion:** Compared to the IgG detected during treatment or hospitalization, the difference in IgG positivity after 3months was significant. It also shows that administration of steroids results in early weaning of antibodies suggesting re-infection could be more in such cases. Our findings may be of significance in interpreting anti-SARS-CoV-2 antibody test results and in understanding humoral immune response patterns for SARS-CoV-2 infection with respect to treatment strategies in current and potential future COVID-19 outbreak scenarios.

INTRODUCTION

Human corona viruses (HCoVs) were firstly detected in 1965 by David A. J. Tyrrell and Bynoe and may induce common colds, but also the severe acute respiratory syndrome (SARS) or the middle-east respiratory syndrome (MERS).[1] SARS begin with flu-like symptoms, such as coughing, rhinitis, headaches, muscle and joint pains and diarrhea. A few days later, patients may suffer from fever and respiratory distress.[2,3]

An infection by SARS-CoV-2 may induce COVID-19 (Corona virus disease 2019), which in most cases proceeds without- or only slight flu-like symptoms.

World Health Organization (WHO) declared pandemic on 11th of March 2020.[4]

The clinical presentation of SARS-CoV-2 infection varied from asymptomatic and mild to severe and critical. Early diagnosis of the disease is crucial for appropriate treatment and limiting viral spreading. The main diagnostic clinical samples are nasopharyngeal and/or oropharyngeal swabs, and in severe cases sputum, endotracheal, or bronchoalveolar aspirate.[5] Molecular diagnostics is the mainstay of SARS-CoV-2 diagnosis. COVID-19 should be confirmed by the positive reverse transcriptase quantitative polymerase chain reaction (RT-qPCR) nucleic acid test for SARS-CoV-2.[6]

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The covid-19 pandemic caused a major burden to healthcare providers such as hospitals, nursing homes. Treating physicians and other health care workers are concerned about the risk of infection with SARS-CoV-2 in contact with patients. Knowing the immunity status to the virus could alleviate their fears.

The immunoglobulin G (IgG) antibodies may be detected after a median of 14 days (usually 10–18 days) after onset of disease symptoms.[7] In the neutralization of SARS-CoV-2, B-cell response and the production of IgG antibodies play an important role.[8] An IgG response therefore indicates an (possibly inapparent) infection as well as potential immunity.[9]

MATERIALS AND METHODS

Study Design: Prospective Observational study
Study Setting: The study included 120 health Care Workers of the Osmania Medical College and General Hospital.
Study Duration: The study was carried out from November 2020 to January 2021.

Inclusion Criteria:
- Health care workers who gave consent and aged between 20-60years.
- Health care workers that fit into the specified required 4 group categories.
- Health care workers who were working in Covid-19 wards were included in the study.

Exclusion Criteria:
- Health care workers who did not give consent.
- Health care workers who had co-morbidities.
- Health care workers who were not working in Covid-19 wards.
- Health care workers who did not meet the inclusion criteria.

All 120 post covid HCWs (on 10th day after detection by RT PCR) were categorized into 4 groups on the basis of treatment strategies they used as follows:
1st group (30) - on combination of Antiviral and Steroid therapy
2nd group (30) - only on Steroids
3rd group (30) - only on Antivirals
4th group (30) - only on Antibiotics (asymptomatic)
Venous blood samples were collected in vacutainers. IgG antibodies against SARS-CoV-2 in serum were analyzed using enzyme linked immunosorbent assay (ELISA) (ICMR-NIV Anti-SARS CoV-2 Human IgG ELISA COVID KAVACH – MERILISA) carried out by trained personnel. COVID KAVACH – MERILISA has an excellent accuracy of 100% Specificity and 93.3% sensitivity as per the manufacturer.

Statistical Analysis:
The SPSS 22 software was used for statistical analysis. The data was presented in the form of means and percentages.

RESULTS

A total of 120 health care workers were selected in the study, venous blood sample was drawn in all on 10th day post RT-PCR test positive confirmation. IgG antibodies were found in all the four categories. After 3 months, only 56 (46.6%) cases continued to be positive. Compared to the IgG detected during treatment or hospitalization, the difference in IgG positive rate was significant.
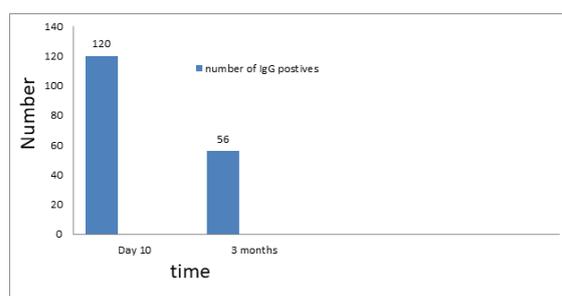

Figure 1: Comparision between IgG positivity in Health care workers at day 10 and at 3 months post COVID-19

Table 1: Number of participants in each category and percentage of IgG antibody positivity in each group 3 months post COVID -19 infection

	ANTIVIRALS + STEROIDS	STEROIDS only	ANTIVIRALS only	ANTIBIOTICS only
POST COVID HCWs	30	30	30	30
HCWs with IgG ANTIBODIES PRESENT at 3months	13 (43.3%)	9 (30%)	16 (53.3%)	18 (60%)

IgG antibodies against SARS-CoV-2 was higher among HCWs who were only on Antibiotics (60%) followed by those only on Antivirals (53.3%) as treatment modality.
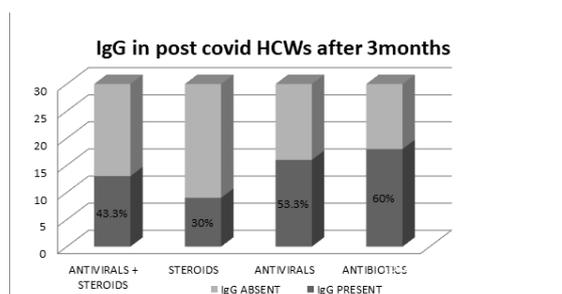

Figure 2: Graph showing the four treatment group categories each with 30 HCW and the IgG positivity 3 months post COVID-19 infection

DISCUSSION

In the present study, the prevalence of IgG was 46.6% 3 months post covid-19 treatment. It was reasonable to speculate that the IgG antibodies might have disappeared over the course of time. This loss of IgG antibodies has implications in immune strategy. According to Zhang et al. a higher titre of antibody was independently associated with worsening illness.[10] But study conducted by Yuen et al. and Gu et al. concluded that serum antibody did not correlate with the severity of illness.[11] Long et al. study showed significant difference only in the first 2 week post symptom onset in the severe group.[12] The findings of Suthar et al. strongly indicated that a robust humoral immune response occurred early during severe ormoderate COVID-19 infections.[13] Various study showed disparity in their conclusions may be due to differences in their time period at which they analyzed serum IgG antibodies. Early antibody response along with high viral load contributed to the inflammatory response related to severity of illness and poor prognosis.[14] IgG usually develops in 10-18 days and become high affinity protective antibody responses at a late stages.[15]

Previously published literature indicates that the IgG antibodies against SARSCoV- 2 infection start appearing by the end of first week after the onset of symptoms and inalmost all cases IgG is positive by the end of second week, and thus shall be positive by the end of third week or during the fourth week after exposure to the virus.[16]

Neutralizing antibody response was observed in 100% in early stage, but the protective IgG antibody may shed overtime. It can be inferred that IgG plays a protective role only in the late stage not in the earlier stage.[17] Long term existence of the virus points to disease progression rather than recovery as the antibodies decline overtime. Wang et al. also observed positive correlation between NAbtitres and SARS-CoV-2 specific IgG antibodies.[18] Humoral immunity is important in clearing the viruses and prevent re-infection.[19]

Limitations

Our study has certain limitations. We included only health care workers who were at high risk and only from a single hospital which could not represent overall population around the world. Wider analysis with respect to geographic area and the study population was needed. Additional studies are needed to explore the changes in the antibodies in other high-risk groups or even the general population.

CONCLUSION

This study showed that presence of IgG antibodies against SARS-CoV-2 was higher among HCWs who were only on Antibiotics (60%) followed by those only on Antivirals (53.3%) as treatment modality.It also shows that administration of steroids results in early weaning of antibodies suggesting re-infection could be more in such cases.Our findings may be of significance in interpreting anti-SARS-CoV-2 antibody test results and in understanding humoral immune response patterns for SARS-CoV-2 infection with respect to treatment strategies in current and potential future COVID-19 outbreak scenarios.

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