ORIGINAL RESEARCH

Evaluation of effect of co-morbidities associated with development of IgG antibody post COVID-19 infection

[1]Dr. Anita Mutha, [2]Dr. Ankita Podar, [3]Dr. Nishat Khan

[1]Professor & Head, MGMMC, Indore, Madhya Pradesh, India
[2]PG Resident, MGMMC, Indore, Madhya Pradesh, India
[3]Associate Programmer**,** MGMMC, Indore**,** Madhya Pradesh, India

Corresponding Author
Dr. Anita Mutha
Professor & Head, MGMMC, Indore, Madhya Pradesh, India

Received: 02 July, 2023 **Accepted:** 10 July, 2023 **Published:** 20 July, 2023

ABSTRACT
SARS COV-2 outbreak was over but individualsare suffering from internal damage caused by Virus during outbreak period. It is an enveloped, positive-strand RNA virus.There is very less information available about immune response developed after COVID infection.In this study we have analysed samples from individuals who have suffered fromCOVID-19 infection in recent past for evaluating various Co-morbid factor associated with IgG antibody production. We have found a significant observation of development ofIgG among person without Co-morbidity as compared to individualswith Co-morbidity.
COVID-19 is caused by the SARS-CoV-2 virus and it was identified ed after an outbreak of Pneumonia in Wuhan, China in December 2019. Several risk factors are associated with the complications of COVID-19. The Immune system produces IgM, IgG, and Neutralizing antibodies which can block the virus from entering cells. Long term humoral response post COVID-19 infection is still not clearly known. Studies related to complete course of IgG antibody in COVID-19 infection are very sparse. The present study was therefore conducted to evaluate SARS COVID-19 antibody status of individuals in post COVID-19 OPD in Central India's population at our tertiary care hospital.
Keywords:COVID-19, Comorbidity

Introduction

COVID-19 is caused by the SARS-CoV-2 virus and it was first identified after an outbreak of pneumonia in Wuhan, China in December 2019.Since then, no country has escaped the ensuing pandemic[1].Several risk factors are associated with the complications of COVID-19,and these include older age (>65), Chronic respiratory diseases,Cardiovascular diseases, Hypertension, Diabetes, and Obesity.The Immune system produces and circulates antibodies following an infection. This is referred as seroconversion, and it indicates that are covery or convalescent phase of disease has begun. Once seroconversion occurs, antibodies can be detected in the blood by antibody tests, or serological assays. The Immune system produces IgM, IgG, and neutralizing antibodies which can block the virus from entering cells Serologic data derived from antibody subclass and titre provides ahistory of infection and can be used to determine the nature of aninfection, monitor population-based prevalence of disease, assess disease stage, guide vaccine development and identify an infectious agent suchas a virus.This can be assessed through measuring titres of specific antibodies for different antigens and Ig classes over time using serological assays.A positive antibody test tells us that.

- **If IgM positive:** recent infection with SARS-COV 2
- **If IgG Positive:** it means person has been infected in the past withSARS-COV-2.

Long term humoral response post COVID-19 infection is still not clearly known.Researchis needed to study the long terms humoral response as it could protect a person against reinfection IgG antibody is related to long time humoral response. Studies related to complete course of IgG antibody in COVID-19 infection are very sparse.So there is a need to study the complete course of IgG antibody in postCOVID-19 infection.
The present study was therefore conducted to evaluate comorbidity and SARS COV-2COVID-19 antibody

status of individuals in post COVID-19 era fromtertiary care hospital.

Aim

This study aim to evaluate comorbidity present in relation to development of IgG antibody among individual attending Post COVID-19OPD of a tertiary care centre.

Methodology

This was a retrospective study conducted in Department of Microbiology. Data from serology lab was collected for a period of 1 year from August 2021 to July 2022.Samples result from all individual who have suffered from COVID-19 infection during COVID-19 outbreak and visit post COVID-19 follow up OPD were collected.Result and Demographic data from all individuals who were investigated for estimation of IgG was collected.

Study subjects: Data of IgG ELISA testing were collected from lab record of those subjects who had COVID-19 infection in the recent past and who had recovered from it.

Study design: This was a Hospital based retrospective study.

Ethical consideration: Study was approved by the Institutional Ethics committee.

Sample Size: Clinico-demographic data from150 IgG positive and 150 IgG negativeindividuals wascollected for analysis.

Table 1: Co-morbidities present in the association with IgG test result

Comorbidity	No of IgG Positive cases (n=150)	% of co-morbidities among IgGPositive cases	No of IgG Negative cases (n=150)	% of co-morbidities among IgG Negative cases
Asthma	8	5.33%	11	7.33%
Coronary Artery Disease	4	2.67%	9	6.00%
Hypertension	40	26.67%	9	6.00%
Hypothyroidism	15	10.00%	10	6.67%
Diabetes Mellitus	10	6.67%	73	48.67%
No Co-morbidity	73	48.67%	38	25.33%
	150		150	

Discussion

Data of300 samples: 150 from IgG positive and 150 from IgG Negative test were collected and analyzed for detection of associated comorbidities.

In our study of total 150 positive cases, 77 (51.33%) cases had co-morbidity while in 73 (48.67%) cases there was no co-morbidity.In our study of 77 cases with comorbidity,IgG antibody was detected in the following comorbidities; 40 (26.7%) cases of Hypertension, 15 (10%) cases of Hypothyroidism, 10(6.67%) cases of Diabetes Mellitus, 08 (5.33%) cases of Asthma and 04 (2.67%) cases of Coronary Artery Diseases.

Percentage of IgG development among 48.67% of diabetic individuals was not occurred as compared to 6.67 individuals whose having development of antibody. In this study of total 150 negative IgG antibody cases; 112 (74.7%) cases had co-morbidity while in 38 (25.33%) cases there was no co-morbidity.In our study of 112 cases with comorbidities, IgG antibody was not detected in the following comorbidities;73(48.7%) cases of Diabetes Mellitus,11(7.33%) cases of Asthma,10(6.67%) cases of Hypothyroidism, 09 (6%) cases of Hypertension, 09 (6%) cases of Coronary Artery Disease.

An important observation of our study was that development of IgG antibody was higher among individuals who had no comorbidity i.e. 48.67% v/s 25.33% (Table-1). We have also noticed that Diabetes mellitus is havingsignificant impact on development of IgG antibody.

Several risk factors are associated with the complications of COVID-19, and these include older age (>65), Chronic Respiratory Diseases, Cardiovascular diseases, Hypertension, Diabetes, and Obesity[2,3].Qu *et al.*[4] demonstrated that critically ill patients in China produce higher titre of IgM and IgG antibodies to S and N proteins, and kinetically observed that IgM levels peaked later in disease course in COVID-19 patients who were critically ill versus patients with mild to moderate disease.Zhao *et al.*[5] observed higher IgM and IgGtitres in critically ill COVID-19 patients. However, this increase in serum antibodies did not coincide with a reduction in viral RNAs within nasopharyngeal samples of these critically ill patients. Moreover, disease burden in this case was not associated with the levels of SARS-CoV-2 IgM antibodies produced to the S protein or IgG antibodies produced to the N protein, suggesting that only certain antibodies may be associated with disease burden.In contrast, Long *et al.*[6] found no association between IgG antibody production and clinical attributes of patients in China, and Wölfel*et al.*[7] demonstrate that in a small cohort of COVID-19 patients in Germany, the production of neutralizing antibodies in serum may not correlate well with clinical disease course. This result is in conflict with

that of Ni *et al.*[8] who discovered that COVID-19 patients recently discharged from a hospital setting produced significant titre of virus neutralizing antibodies against the receptor binding domain (RBD) of the S protein, which was associated with production of virally targeted lymphocytes.

Long *et al*.[6] noted IgG and IgM titres in the severe group were higher than those in the non-severe group, although a significant difference was only observed in IgG titre in the 2-week post-symptom onset group.Huanle Luo *et al*.[9]reported antigen-specific IgG1 and IgG3 in serum were associated with disease severity and were negatively correlated with viral load in nasopharyngeal swab. The advancing age and comorbidities exhibited more obvious effect on IgG subclasses than total IgG, while biological sex had no effect on the IgG subclasses.Peter Chen *et al*.[10]they found that virus-neutralizing monoclonal antibodies are predicted to reduce viral load, ameliorate symptoms, and prevent hospitalization.Bruna Lo Sasso *et al*.[11] found that overall, anti-RBD IgG levels were higher in subjects with symptoms after vaccination than asymptomatic ones.Studies related to specific comorbidities that are associated with positive IgG and negative IgG test sare not found by the reviewer of presentstudy.Our present study highlights the various comorbidities that can impact IgG results both in positive and negative ways. This could be a very crucial aspect in studying the COVID-19 infection in targeted susceptible groups.

Conclusion

Significant impact of Comorbidity was found in development of Antibody to COVID-19.Development of Antibody significantly lowered among individuals with Comorbidiy.More detail study is needed to find out association of comorbidity and development of other antibodies.

References

1. Anna Brischetto and Jenny Robson. Testing for COVID-19. 15 October2020 atnps.org.au/australian-prescriber. https://doi.org/10.18773/ austprescr.2020.067.
2. Gandhi,R.T.; Lynch,J.B.; Del Rio,C.Mild orModerateCOVID-19.N. Engl. J. Med. 2020.
3. Fu, L.; Wang, B.; Yuan, T.; Chen, X.; Ao, Y.; Fitzpatrick, T.; Li, P.; Zhou, Y.; Lin, Y.-F.; Duan, Q.; *et al*. Clinical characteristics of coronavirus disease 2019 (COVID-19) in China: A systematic review and meta-analysis. J. Infect. 2020, 80, 656–665.
4. Qu, J.*et al*. (2020) Profile of IgG and IgM antibodies against severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).*Clin Infect Dis*, doi:10.1093/cid/ciaa489.
5. Zhao, J.*et al*. (2020) Antibody responses to SARS-CoV-2 in patients of novel coronavirus disease 2019. *Clinical Infectious Diseases*, doi:10.1093/cid/ciaa344.
6. Long, Q.-X.*et al*. (2020) Antibody responses to SARS-CoV-2 in patients with COVID-19.*Nature Medicine*, doi:10.1038/s41591-020- 0897-1.
7. Wölfel,R.*etal*.(2020)Virologicalassessmentofhospitalized patients with COVID-2019. *Nature* 581, 465-469, doi:10.1038/s41586-020-2196-x.
8. Ni, L.*et al.* (2020) Detection of SARS-CoV-2-Specific Humoral and Cellular Immunity in COVID-19 Convalescent Individuals.*Immunity*, doi:10.1016/j.immuni.2020.04.023.
9. Huanle Luo, Tingting Jia,Jiamin Chen, Shike Zeng, Zengzhao Qiu, ShuWu,XuLi,YuxuanLei,XinWang,WeihuaWu,Renli Zhang,XuanZou,TiejianFeng,RuxiaDing,YueZhang,Yao-QingChen,Caijun Sun,Tian Wang,Shisong Fang,andYuelong Shu. The Characterization of Disease Severity Associated IgG Subclasses Response in COVID-19 Patients. Front Immunol. 2021; 12: 632814.
10. Peter Chen, Ajay Nirula, Barry Heller, Robert L. Gottlieb, Joseph Boscia, Jason Morris, Gregory Huhn, Jose Cardona, Bharat Mocherla, Valentina Stosor, Imad Shawa, Andrew C. Adams, Jacob Van Naarden, Kenneth L. Custer, Lei Shen, Michael Durante, Gerard Oakley, Andrew E. Schade, Janelle Sabo, Dipak R. Patel, Paul Klekotka and Daniel M. Skovronsky. SARS-CoV-2 Neutralizing Antibody LY-CoV555 in Outpatients with COVID-19. The New England journal of medicine.
11. Bruna Lo Sasso *et al*.Evaluation of Anti-SARS-Cov-2 S-RBD IgG Antibodies after COVID-19 mRNA BNT162b2 VaccineDiagnostics (Basel). 2021 Jul; 11(7): 1135.doi: 10.3390/diagnostics11071135