International Journal of Clinical and Diagnostic Pathology

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Detection of SARS-CoV-2- specific antibodies in asymptomatic healthcare workers in a tertiary care hospital in NCR

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Abstract
Covid 19 caused by SARS-Cov-2 is often asymptomatic in presentation and therefore poses a major health hazard and is even more dangerous in healthcare workers who are giving care to patients. The only means of diagnosis in such cases is by antibody detection – IgM or IgG – which can reflect upon immune status of person and simultaneously it also reflects upon maintenance of covid hygiene etiquettes by the HCWs. The present study is aimed at detection of IgG antibody in HCWs in a tertiary care teaching hospital in NCR by ELISA and the HCWs were divided into high, intermediate and low risk category based on their posting in covid wards. The overall positivity for IgG including all categories was 28.9% whereas in high risk group 33% were IgG positive, in intermediate risk 24% were IgG positive while in low risk category 32% were positive.

Keywords: Covid19, healthcare workers, asymptomatic, RTPCR, ELISA

Introduction

Covid 19 caused by SARS-CoV-2 started in the Wuhan province of China in December 2019 and rapidly spread worldwide. Even after almost one year of its existence, large number of new cases are still being detected everyday, definitive treatment is yet to make presence and newer strains with mutations are evolving [1]. Till date 104 million people have been infected worldwide [2] and 2.27 million people succumbed to this new deadly virus [3].USA, UK, Italy, Brazil and India are a few of the countries who bore a major brunt of it in terms of death, morbidity and economic losses. The WHO declared it as a global pandemic on March 10, 2020 [4].

Covid 19 has brought in to foray many new diagnostic and treatment dilemmas. Since the beginning of the pandemic the main emphasis of authorities has been on test, track and treat as this is a highly infectious disease which spreads rapidly from one person to other. So to limit its spread early diagnosis and isolation of cases and suspects has been very important. Though RTPCR has been the mainstay of covid diagnosis, the importance of serological diagnostic procedures cannot be underestimated. Combining RTPCR with serological assays increases the sensitivity of diagnosing Covid19 many fold [6] which can be helpful in setting various protocols. Whereas RTPCR detects the viral genome in patients sample and clearly tells about the presence or absence of disease, serological detection of IgG, IgM or IgA tells about past or present infection and immune status of patient against Covid. Seroconversion usually takes place around 5-7 days in case of IgM and 7-10 days in case of IgG [7]

Asymptomatic presentation of covid [8] has been a serious concern since the beginning as during this phase transmission can occur but the patient himself is symptom free and ignorant about the disease and can unknowingly spread the disease. Keeping this in mind knowing the levels of IgG, IgM, IgA antibodies against SARS CoV-2 antigens in serum [9] of all HCWs working in a facility can help in estimation of their immune status for the purpose of early diagnosis, treatment and plasma donation to needy people. At the same time presence of IgG and IgM antibodies in HCWs indicate that they have been infected by SARS-CoV-2 either very recently (IgM) or a few days ago (IgG) which indirectly indicate failure of maintenance of optimum hygiene practices viz. wearing mask, PPE (when required), hand washing and maintaining social distancing.

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By knowing exactly which group of HCWs was maximally infected and which areas in hospital are harboring the maximum risk of infection we can take corrective and preventive measures so as to minimize the risk of spread of infection and improve our hygiene practices.

HCWs are at the forefront in both fighting the Covid19 infection by treating patients and also receiving covid infection for the same reason [%%]. Worldwide a large number of HCWs have been infected with covid while discharging their duties and even succumbed to it. So in health care settings it is very sensible to know the immune status of HCWs by serological assays and subsequently maximizing their effective utilization at various stations in hospital.

The major serological techniques available for covid19 antibodies detection estimation are CLIA (chemiluminiscence assay), ELISA (enzyme linked immunosorbent assay , neutralizing assays and LFT(lateral flow technique). Of all these techniques, neutralizing assays require elaborate expensive setup with high biosafety levels and expertise. Therefore they are not routinely done. CLIA is a fully automated technique of antibody detection whereas ELISA is a semiautomated colorimetric method in which readings are taken by OD values. Lateral flow techniques are rapid kit based tests which are used as point of care testing and can be performed easily. The above 3 tests viz. CLIA, ELISA and LFTs can detect IgG, IgM or IgA either alone or in combination and their levels are an indirect evidence levels of neutralizing antibodies which are supposed to be real defense in fighting covid [14]

MATERIALS AND METHOD : This is a retrospective, point prevalence, monocentric study in which 180 HCWs working in a teaching hospital in NCR were studied for knowing their individual immune status against SARS-CoV-2 virus. The entire HCWs team who were actively doing their duties during the pandemic were grouped into various categories and their IgG levels were estimated by ELISA. The ELISA kit used is by J mitra and Co. [15] and the ELISA reader and washer are by Robonik. The kit detects IgG serum samples and sensitivity of the kit is 96.33% and specificity of the kit is 100%. All serum samples were collected in one go and were divided into following categories 1.High risk category – doctors and other staff in direct contact with covid patients or their samples, 2.Intermediate risk category – doctors and other staff not involved in active covid duty but doing other hospital work and 3.Low risk category – doctors and other staff involved in non clinical/administrative works. Only asymptomatic HCWs were included in the study while all confirmed or suspected covid cases were excluded from the study to know the risk of asymptomatic transmission in covid. Informed consent was taken from all the participants.

RESULTS – Out of 180 total HCWs, 54 were females and 126 were males. The percentage positivity for IgG was 11.11% in females and 20% in males. The overall positivity for IgG including all categories was 28.9% whereas in high risk group 33% were IgG positive, in intermediate risk 24% were IgG positive while in low risk category 32% were positive.

The age wise breakup of HCWs showed following findings

Age group	Total no of HCWs	IgG positive	% positive for IgG
<20 years	10	4	36.3%
21-30 years	58	12	20.3%
31-40 years	64	30	46.1%
41-50 years	24	6	24%
51-60 years	6	-	-
61-70 years	14	-	-

Thus it is evident from above findings that maximum number of HCWs tested were in the 31-40 year age group and maximum percentage (46.9%) of HCWs having antibodies were also from the same age group. Next age group to have antibodies lesser than maximum group is HCWs in less than 20 years age which predominantly involved young paramedics whose immune system is supposed to be good. 40-50 year group showed 25% positivity whereas 21-30 year group showed 20.7% positivity for antibodies. Notably in HCWs above 51 years covid antibodies were not detected which means they are yet noninfected and also at the same time their hygiene practices are excellent.

DISCUSSION – As per the findings in our study the seropositivity rate for all HCWs irrespective of their age or risk categorization is 28.9% which is quite high as compared to findings in other studies [16, 17]. This high positive rate is a pointer towards 2 things – one – presence of covid antibodies and hence protection from Covid albeit for a short span of time as these antibodies are a surrogate marker for neutralizing antibodies. On a dangerous note it indicates high rates of transmission of asmptomatic covid in HCWs which in turn reflect poor adherence to safety protocols for covid.

Maximum antibody positivity has been seen in 31-40 years age group and this was also the age group having maximum number of HCWs. Being highly productive and dynamically active age group with youth on their side, this group is actively involved in covid care and hence more prone for infection.

In age groups more than 51 years. Antibody titres were nil which indicates no protection from covid yet and it also reflects upon their meticulous upkeep of hygiene practices [18].

Of all the serologically positive HCWs , only 2 went for RTPCR testing while rest did not undergo covid molecular testing and hence the correlation between antibody presence and viral genome presence could not be established. The 2 HCWs who underwent RTPCR testing were found to be positive for SARS-CoV-2 genome.

Seeing above results it can be said that HCWs in close contact with covid patients (high risk category) are definitely at high risk of acquiring covid infection inspite of taking all possible measures to prevent the spread of virus. Since asymptomatic infection is quiet rampant in HCWs [19, 20] and probably community too which leads to increased transmission of virus from infected people to uninfected ones, high rates of IgG positivity was seen in low

risk category. Sensitivity of covid testing can be increased by performing RTPCR in seropositive patients so that quick isolation protocols can be put into practice.eg

References

1. Sci Rep 14004 2020, 10 https://doi.org/10.1038/s41598-020-70812-6
2. WHO Coronavirus disease (covid19) dashboard
3. So Yat Wu, Hoi Shan Yau, Man Yee Yu, Hin Fung Tsang, Lawrence Wing Chi Chan, William Chi Shing Cho *et al*. The diagnostic methods in the COVID-19 pandemic, today and in the future, Expert Review of Molecular Diagnostics 2020;20(9):985-993, DOI:
4. Am J Clin Pathol September 2020;154:293-304
5. DOI: 10.1093/AJCP/AQAA112
6. 1080/14737159.2020.1816171 To link to this article: https://doi.org/10.1080/14737159.2020.1816171
7. Am J Clin Pathol September 2020;154:293-304
8. DOI: 10.1093/AJCP/AQAA112
9. Jiang C, Wang Y, Hu M, Wen L, Wen C, Wang Y *et al*. Antibody seroconversion in asymptomatic and symptomatic patients infected with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Clin. Transl. Immunol 2020;9:e1182. https://doi.org/10.1002/cti2.1182
10. Pollock Allyson M, Lancaster James. Asymptomatic transmission of covid-19 BMJ 2020;371:m4851
11. Hou H, Wang T, Zhang B *et al*. Detection of IgM and IgG antibodies in patients with coronavirus disease 2019. Clin Transl Immunology 2020;9(5):e01136. Published 2020 May 6. doi:10.1002/cti2.1136
12. Diagnostics **2020;**10:453 doi:10.3390/diagnostics10070453 www.mdpi.com/journal/diagnostics
13. https://doi.org/10.1016/j.ijid.2020.03.065
14. Covid kawach IgG Microelisa by J Mitra & Co. Pvt Ltd.www.jmitra.co.in
15. doi: https://doi.org/10.1101/2020.04.27.20082289
16. https://dx.doi.org/10.1016%2Fj.jcv.2020.104437
17. WHO corona virus disease - advice for the public.
18. https://dx.doi.org/10.1016/j.jcv.2020.104575
19. doi:10.1001/jamanetworkopen.2020.35057
20. Koh D. Occupational risks for COVID-19 infection. Occup Med (Lond). 2020;70(1):3-5. doi:10.1093/occmed/kqaa036