Seroprevalence of SARS Cov 2 Immunoglobulin among First Year Medical Students in a Tertiary Care Hospital of Odisha: A Cross-Sectional Study

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Abstract:

Introduction: COVID-19 caused by SARS coronavirus two has halted life across the globe since its emergence in December 2019. Most of the infected persons are asymptomatic or have mild symptoms. Serosurvey is vital for the estimation of the burden of infection. In this context, our study objective is to estimate the Seroprevalence of SARS CoV 2 IgG among the first-year medical students after the first wave in February 2021. **Method:** A cross-sectional study was conducted among the first-year medical students of Veer Surendra Sai Institute of Medical Sciences and Research. All the students were enrolled, and their data & serum sample was collected. Serum samples were tested for the presence of Anti-Spike IgG. Data were analyzed by using appropriate statistical tests. **Results:** The Seroprevalence of anti-SARS CoV 2 IgG was estimated to be 38.8 %. Most (82 %) of the students used the mask per recommendation. Use of mask, BMI, Contact history with COVID-19 patient, attending social gathering & previous COVID-19 were associated with Seropositivity. Regular mask use, BMI, and Previous COVID-19 were significant predictors for Seropositivity. **Conclusion:** The Seroprevalence of SARS Cov 2 after the first wave of the pandemic is less than 40 %. It calls for the proper implementation of a vaccination program with strict vigilance and surveillance to stop subsequent waves.

Keywords: COVID-19, Epidemiological Study, Medical Students, Serological Testing

Introduction:

COVID-19 is an infectious disease caused by the Novel Severe acute respiratory syndrome Coronavirus type 2 (SARS CoV2). Most patients infected with this virus are asymptomatic or experience mild flu-like symptoms.[1] In the initial phases of the epidemic, there were limited laboratories facilities and diagnostic tools available for COVID-19.[2] Also, as most of the cases were either asymptomatic [3,4] or had mild symptoms, they did not get themselves tested. Also, there were minimal testing facilities surveillance activities.[5] Considering all this, the numbers stated above seem significantly lower than the actual COVID-19 infections. Serosurvey is an essential tool to assess the prevalence of infection, coverage of immunization, or both. A well-designed serosurvey using sufficiently sensitive and specific assays can provide information on the proportion of the population with seroprotection and the susceptible proportion.[6]

Most estimates had placed the threshold at 60–70% of the population gaining herd immunity.[7]

Assessment of Seropositivity for COVID-19 in a population before vaccination indicates numbers of individuals naturally infected in the past and have acquired antibodies to the virus. It can supplement the knowledge of the cumulative disease incidence.[8] Also, the stated case fatality rate in India was low compared to developed nations, and serosurvey can decrease the Case Fatality Ration (CFR) further by indicating the actual proportions of infected people. Also, India has a relatively younger population with more than 65% people aged 35 or less, contributing to the low case fatality rate. [9]

In India, four rounds of national serosurveys have been completed by ICMR in collaboration with state governments & other partners on May-June, August-September, December- January, and 4th on June July 2021. Overall Sero-prevalence for immunoglobulin for SARS CoV 2 was 0.7 %, 6.6%, 24.1% and 67.6% respectively. [10-13] However, it is worth mentioning that the fourth round took place after the national COVID-19 vaccination program was launched, and so not a true indicator of Community infection. Most of these serosurveys in India and worldwide were undertaken at the community level. Limited studies are available in institutional groups or close settings. In this context, our study objective is to estimate the Seroprevalence of SARS CoV2 antibodies among the first-year MBBS students of Veer Surendra Sai Institute of Medical Sciences And Research, Burla, Just prior to the COVID-19 Vaccination schedule, which is likely to give the infection status among the student community.

Method:

This cross-sectional study was conducted among the first-year Medical students in Odisha in Veer Surendra Sai Institute of Medical Science And Research, Burla, Sambalpur. The study was conducted in February 2021. All the students of the First-year batch were enrolled as participants (n=200)

The data were recorded electronically using Epicollect-5. Socio-demographic variables include age, gender, religion, addictions, use of & type of masks, contact history with COVID-19 patients, history of attending social gatherings in the past year, previous history of COVID-19, Weight, Height, Blood group. The Anti-spike IgG titer of the participants was the outcome variable.

Use of mask- Using masks all the time during interaction with outsiders and while attending social gatherings was denoted as always. Rest all were categorized as intermittent users. Mask used predominantly during interaction were noted as N-95, Triple Layer, or Cloth mask. Contact was defined as interaction for more than 15 minutes at 2 meters or less/ inhabiting with a positive case in the same room.[14] Weight was measured with a standardized spring weighing machine. Stadiometerwas used for Height. BMI was calculated using the Quetelet index.

A three ml blood sample was collected using a 5 ml syringe by Laboratory technicians with venipuncture and transferred to vacutainers. The samples were then centrifuged at 3000 rpm & separated serum was transferred to a cryogenic vial (2ml) and was stored at -20 0Celcius. The samples were transported maintaining a cold chain (2-800c) to the serology laboratory for Antibody testing and analysis. The tests were carried out for quantitative detection for the presence of antibodies against spike protein of COVID-19 using Electro-chemiluminescence immunoassay (ECLIA) based technique, which is based on the principle of double-antigen sandwich assay and provides the result within 20 minutes.[15] The analyzer automatically calculates the cut-off based on ACOV2 Cal1 and ACOV2 Cal2. The sensitivity and specificity of this test are 98 % & 99%, respectively.[15]

Data were entered into Microsoft Excel and checked for completeness & were analyzed in SPSS

version 25 using appropriate statistical tests. The regression plot was done using Sigmaplot version 14. For central tendency & dispersion, mean and confidence intervals were used. Cross tab was performed to calculate the χ2, odds ratio, and p-value. Variable with p-value less than 0.2 were analyzed by Logistic regression by Enter method. There were no missing data.

Results:

A total of 200 students participated in the study, but the responses of 196 students were analyzed after checking for completeness of data. Out of all the students, 76(38.8%) had tested positive for anti-Spike Immunoglobulin.

Of all, 72(36.7%) were female, and 124(63.3%) were male. Among females, 25(34.7%) and Males 51(41.1%) were found to have positive Antibody titer against SARS Cov 2, which is not found significantly different. (x2- 0.788, p- 0.375)

Among the students, 45(22.9%), 9(4.6%), 77(39.3%), 65 (33.2%) belonged to Group A, AB, B, O blood groups, respectively. Eighteen, 3, 28, 27 with blood group A, AB, B, O blood groups were detected having antibodies against COVID-19, respectively, and were not found significantly different. (x^2 -0.624, p-0.891)

Out of 196 participants, 72(36.7%) were found to have attended social gatherings within the last year (i.e., after the occurrence of COVID-19 in India).

Among the students, 161 (82.1%) used masks regularly, and the rest used them intermittently. Out of the 56 (34.7%) regular users & 20 (57.1%) intermittent users were found to have positive antibody titer and were found to be significantly different. (x^2 -6.055, p-0.014). Of the students, 116, 40, 28 were using Cloth Mask, N95, and Triple layer masks, respectively. Out of the above 46(60.5%), 11(14.5%), 12(15.8%) were found to have positive antibody titer, and the difference was not significant. (x^2 – 4.244, p – 0.236) About 11 of the participants were diagnosed with COVID-19 last year with the RTPCR test. Eight of them had positive antibody titer, and three were non-reactive. Previous COVID-19 infection was significantly associated with Seropositivity. (x^2-5.659, p-0.017)

Out of 196 participants, 66(33.6%) were found to have some close contact with COVID-19 patients within the last year. Statistically significant (x^2-19.214, p-0.0001)30 (45.4%) association was found with contact history compared to students without any contact history.

Variables with a p-value less than 0.2 were analyzed using the stepwise logistic regression method. It was found that the use of mask was negatively associated with positive antibody titer, and the association was statistically significant with an Adjusted Odds Ratio of 0.375 and p-value of 0.014. Past COVID-19 infection was positively associated with seroconversion with statistically significant measures of association, AOR = 4.896 and p = 0.027. Higher BMI (=>25) was also significantly associated with positive antibody titer, AOR = 1.876, p = 0.049. Attending social gatherings and contact with COVID-19 patients was also positively associated with seroconversion; however, the association was insignificant.(Table 2)

Discussion:

The overall Seroprevalence of the COVID-19 antibody was 38.8 %. Out of the national serosurveys, the third round was done in December 2020 and the fourth in June-July 2021. Study results are in between these two estimates. However, the estimates are significantly lower than the findings of another serosurvey in Odisha.[16,17] The reason may be the transient nature of anti-COVID-19 antibodies, as postulated by Naushin et al.[18] that there is a presence in about 20% of the seropositive people decline of antibodies after five to six month. Also, the peak of the first wave in Odisha was in September, and it gradually declined to baseline in January 2021. [19]

In the present study, about 82.1 % were always using the mask as per recommendation, which is

Table 1: Characteristics of Participants (n = 196)

Sl. No	Parameter		Negative (%)	Positive (%)	Total (%)	Chi-square & p value
1	Gender	Female	47(65.3)	25(34.7)	72(36.7)	0.788, p=0.375
		Male	73(58.9)	51(41.1)	124(63.3)	
2	BMI	Underweight	9(60)	6(40)	15(7.7)	6.486, p=0.90
		Normal	76(67.3)	37(32.7)	113(57.8)	
		Overweight	31(55.4)	25(44.6)	56(28.4)	
		Obese	4(33.3)	8(66.6)	12(6.1)	
3	Residence during last one year	Only Home	76(59.8)	51(40.2)	127(64.8)	0.290, p=0.590
		Home & Hostel	44(63.8)	25(36.2)	69(35.2)	
4	Attending social gathering last One year	No	81(65.3)	43(34.7)	124(63.3)	2.388, p=0.122
		Yes	39(54.2)	33(45.8)	72(36.7)	
5	Use of Mask	Intermittent	15(42.9)	20(57.1)	35(17.9)	6.055, p=0.014
		Always	105(65.2)	56(34.8)	161(82.1)	
6	Type of Mask used	N-95	32(80)	8(20)	40(20.4)	7.588, p=0.055
		Surgical	15(53.6)	13(46.4)	28(14.3)	
		Cloth	66(56.9)	50(43.1)	116(59.2)	
		Mix	7(58.3)	5(41.7)	12(6.1)	
7	Contact with COVID-19 patients	No	84(64.6)	46(35.4)	130(66.3)	1.870, 0.171
		Yes	36(54.5)	30(45.5)	66(33.7)	
8	Whether suffered from COVID-19 in last one year	Yes	3(27.3)	8(72.7)	11(5.6)	5.659, p=0.017
		No	117(63.2)	68(36.8)	185(94.4)	
	Total		**120(61.2)**	**76(38.8)**	**196(100)**	

Table 2: Logistic Regression analysis of Risk factors and Positive Antibody status (n = 196)

Risk factor (% with positive antibody)	Unadjusted odds ratio (95% C.I)	Adjusted Odds ratio(95% C.I)	p-value
Use of mask Intermittent use (57.1%) Always use (34.8%)	0.40(0.19,0.842)	0.375 (0.171, 0.818)	0.014
COVID 19 infection last year No(36.85) Yes (72.7%)	4.588(1.177,17.879)	4.896 (1.198 , 20.010)	0.027
BMI <25(33.6%) ≥25 (48.5%)	1.864(1.022,3.398)	1.876 (1.003 , 3.508)	0.049
Attending social gathering No(34.7%) Yes (45.8%)	1.594(0.881,2.884)	1.205 (0.627 , 2.316)	0.576
Contact with COVID 19 patient No (35.4%) Yes (45.5%)	1.522(0.832,2.782)	1.431 (0.747 , 2.742)	0.280

Figure 1: Regression Plot Showing Association of Variables with Seropostivity
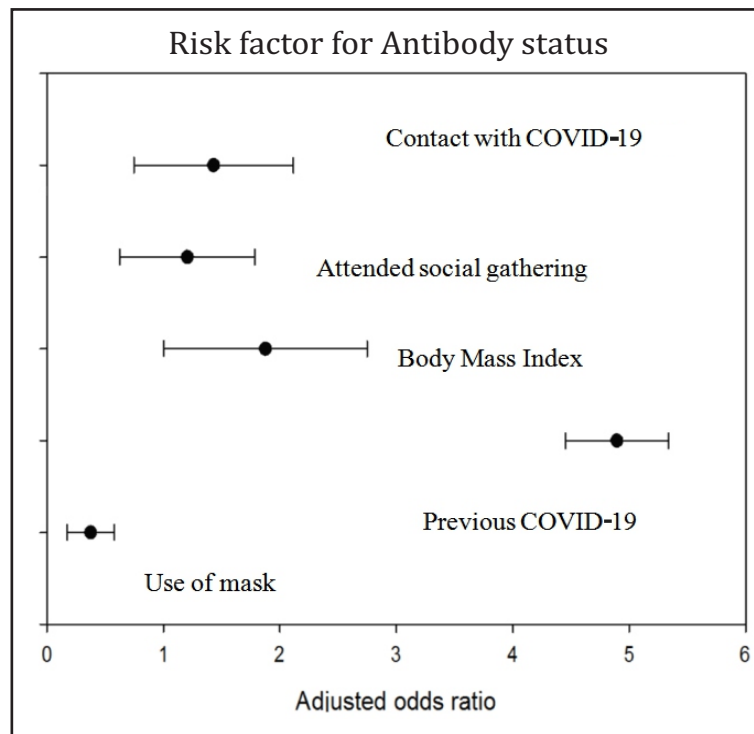
comparable with the findings of Mondal et al.[20] Most were wearing Cloth masks (58%) in our study, compared to N95 Mask in the findings by Mondal et al., which can be explained by the fact that our participants are students, and most may not afford N95 masks. Regular usage of the mask was negatively associated with Seropositivity, but the type of mask used was not significantly affecting Seropositivity. This finding calls for more focus on the regular use of masks irrespective of mask type.

In the present study, we found no difference in Seropositivity with the type of accommodation (home, hostel, both) in contrast to the study by Kartikeyan et al.[21] which found significantly higher infection rates among day scholars (residing in-home), which might be explained by the fact that our local district is relatively less affected in this COVID 19 pandemic. The authors did not find any significant association.

Some studies have indicated that males have a higher risk of infection.[10,18,22] However, the authors did not find any significant difference concerning the gender of the participants, and this is in line with the

other studies.[11,12,16,19,20] There was no significant difference in Seroprevalence among different Blood groups, which was in contrast to many studies. [19,24]

Nearly one-third of diagnosed cases did not have detectable antibodies, similar to Mondal et al.[20] ICMR third round serosurvey had found it to be 46 % and Kartikeyan et al. at 11%. [12,21] Nearly 46% with contact history with a confirmed COVID-19 patients had antibodies, and these results are higher than the results of other studies. [12,22]

On multivariate logistic regression, regular mask use, previous history of infection, and BMI were independent predictors for seroconversion. In high-risk settings, regular usage of masks is significantly protected against the acquisition of COVID 19 infection. Contact with COVID 19 patients was not a significant predictor, in contrast to the study by T Elizabeth et al. [24]

Conclusion:

About 38% of the students enrolled in our study had developed antibodies against SARS CoV 2, which is not at herd protection level but will soon reach there with the beginning of vaccination. Non-

responders indicate to transient nature of the antibody, and it might pave the way for successive waves of infection. Adherence to regular use of the mask is an invaluable tool in our fight against COVID-19 & most students are practicing it.

Limitation:

The small sample size is a limitation of our study. However, the 1st year students have been chosen as they have not been exposed to clinical duty, and the prevalence can give a generalized view of the student's community.

Declaration:

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Conflict of Interest : Nil

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