



Original Article

Sero Surveillance Study to Monitor the Trends of SARS COV2 Infection in the Pediatric Population of the Goa State

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Abstract

Background: As there are concerns raised of anticipated 3rd wave of Covid- 19 to hit the state of Goa around August-October 2021 wherein pediatric population is likely to be affected, conducting pediatric population based sero-surveillance will help to estimate and monitor the trends of infection that will guide the strategy for making further decisions.

Materials and Methods: The sero -epidemiological investigation for COVID 19 infection is a pediatric population based cross-sectional study (5-11years and 12-17 years). The sample size was calculated for each of the age group and strata (District).480 samples were analysed by serological test to determine SARS COV2 antibodies (quantitative spike proteins).

Results: 480 children were considered for the study as per the survey design. 319 were tested positive for SARS COV2 antibody .The overall seroprevalence of SARS- COV2 antibody in children (5-17 years) of Goa state is 66.40% with North district (68.33%) and South district (64.58%). 54% were females and 46% were males. 57% of children were in the age group of 5-11 years whereas 43% were in the age group of 12-17 years. 13% of children presented with mild to moderate symptoms while 87% of children were asymptomatic. The seroprevalence was similar in rural and urban areas of Goa. Betki(North District) had positivity of only 29.17% and Canacona and Ponda (South District) had positivity of 37.5%.

Conclusion: SARS COV2 seropositivity in children 5-17 years is higher in Goa state. Vaccine priority can be given age group of 11-17 years. There is heterogeneity in distribution of cases indicating possibility of further waves.

Keywords: SARS-COV Antibody, EFLA, spike-protein (IgM) Antibody.

Introduction

Severe acute respiratory syndrome Corona virus 2 (SARS -COV2) was first reported in China in

2019 and has emerged as a pandemic which has spread to more than 200 countries¹. SARS COV 2 has been reported in all age groups². However,

there have been far fewer confirmed reported cases of Covid 19 in pediatric population³. The infection of SARS COV2 appears to have milder course in children than adults. Most infected children presented with mild symptoms or were asymptomatic. However, MIS-C (Multi -system Inflammatory Syndrome in Children) may present weeks after a child is infected with SARS -COV2 where the child may be asymptomatic or may have been infected from an asymptomatic contact or care giver and is unaware about the infection status⁴.

As there are concerns raised of anticipated 3rd wave of Covid- 19 to hit the state of Goa around August-October 2021 wherein pediatric population is likely to be affected, conducting pediatric population based sero-surveillance will help to estimate and monitor the trends of infection that will guide the strategy for making further decisions.

Many of the Covid -19 pandemic affected countries have initiated community based sero -surveillance screening strategies done on large scale to quantify the burden of Covid -19 by using serological tests to detect Covid- 19 antibodies by ELISA and CLIA methodology and rapid tests (Lateral Flow Immunoassays). Most of the studies are targeting adult population^{5,6}. In a study conducted in Delhi, the sero-survey of SARS-COV-2 infection among the pediatric population was 55.7%⁷. A separate study conducted in pediatric population of Mumbai seroprevalence was 51.18%⁸. Very less data is available with regard to sero-prevalence in pediatric population of Goa.

The surveillance program will give a baseline prevalence of seropositivity in paediatric population in Goa. It will help to take decisions with regards to 1) vaccination of this group .2) opening up of schools 3)guide the state to build up its capacity 4) customize to design and implement appropriate measures.

Aims and Objectives

1. To Study the prevalence of SARSCoV2 seropositivity in pediatric population of Goa
2. To study an overview of epidemiological parameters along with proportion of symptomatic v/s asymptomatic children showing seropositivity

Material and Method

Study Design: The sero -epidemiological investigation for COVID 19 infection is a pediatric population based cross-sectional study (5-11years and 12-17 years). This study was approved by the institutional Ethics Committee of the Directorate of Health Services, Government of Goa.

Study Population (Methodology)

The proposed study is a pediatric population based cross sectional study. Serological investigation to determine SARS COV2 antibodies was carried out in age group of 5-11years and 12-17 years in Goa state. The sample size was calculated for each of the age group and strata (District) separately (table 01) The required sample size for each stratum (District) was 460, based on the sero-prevalence of 50%, with a desired precision of 6.5%, with 90% confidence.

Design effect of 2 and 10% non response rate was calculated. 2024 households visited in each district. Goa has two districts, with 25 PHC, 4 UHC, and 6 CHCs. The PHC, CHC, and UHC are considered as clusters (primary sampling units). From each district, 7 PHCs, 2 CHCs and 1 UHC was selected according to systematic probability proportional to population size. From the selected each of the clusters 202 households will be visited. The household list of each PHC, CHC, and UHC are available. Each of the age group has the same sample size. (Table 02)

Table no: 01 showing the study design of the SARS -COV2 Antibody Sero-Surveillance study

A.	Effective Number Of Strata	A	1
B.	Effective Sample Size (ESS)	B	230
C.	Design Effect	C	2
D.	Number Of Households To Find An Eligible Respondent	D	4
E.	Inflation Factor For Non-Response	E	1.1
m.	Target number of complete response per cluster	m	46
	Total completed interviews needed $N-CS = A*B*C$		460
	Total number of household to visit= $N-CS*D*E = A*B*C*D*E$		2024
	Household sample size per stratum= $B*C*D*E$		2024
	Number of cluster per stratum= $B*C/m$		10
	Number of households per cluster= $D*E*m$		202
	Total number of clusters=number of clusters per stratum*A=		10

Table: 02 showing the study group as per study design for SARS -COV2 Antibody testing.

Sr. No	NORTH GOA	Population size	5-11 years	12-17 years
A,	COMMUNITY HEALTH CENTRE			
1.	COMMUNITY HEALTH CENTRE SANKHALI	62636	12	12
2.	COMMUNITY HEALTH CENTRE VALPOI	43903	12	12
B.	URBAN HEALTH CENTRE			
1.	URBAN HEALTH CENTRE PANAJI	40017	12	12
C.	PRIMARY HEALTH CENTRE			
1.	PRIMARY HEALTH CENTRE BETKI	34506	12	12
2.	PRIMARY HEALTH CENTRE CANDOLIM	57314	12	12
3.	PRIMARY HEALTH CENTRE COLVALE	40121	12	12
4.	PRIMARY HEALTH CENTRE CHIMBEL	71119	12	12
5.	PRIMARY HEALTH CENTRE PORVORIM	43287	12	12
6.	PRIMARY HEALTH CENTRE SIOLIM	46227	12	12
7.	PRIMARY HEALTH CENTRE MAYEM	26123	12	12
Sr. No	SOUTH GOA	Population size	5-11 years	12-17 years
A.	COMMUNITY HEALTH CENTRE			
1.	COMMUNITY HEALTH CENTRE CURCHOREM	48585	12	12
2.	COMMUNITY HEALTH CENTRE CANACONA	50139	12	12
B.	URBAN HEALTH CENTRE			
1.	URBAN HEALTH CENTRE VASCO	95369	12	12
C.	PRIMARY HEALTH CENTRE			
1.	PRIMARY HEALTH CENTRE CANSAULIM	50425	12	12
2.	PRIMARY HEALTH CENTRE CORTALIM	68500	12	12
3.	PRIMARY HEALTH CENTRE CURTORIM	53936	12	12
4.	PRIMARY HEALTH CENTRE LOUTOLIM	34232	12	12
5.	PRIMARY HEALTH CENTRE PONDA	77258	12	12
6.	PRIMARY HEALTH CENTRE QUEPEM	38765	12	12
7.	PRIMARY HEALTH CENTRE SHIRODA	28741	12	12
	TOTAL		240	240

Eligibility Criteria: All children representing age group from (5-11) years and (12-17) years.

Exclusion criteria: 1) Refusal to give informed consent or contraindication to venepuncture.

Data Collection: Each participant recruited into investigation filled the complete questionnaire. Data on socio-demographic variables, exposure

history with confirmed/suspected case, symptom profile in last 30 days, geographic location, travel and testing history, history of co-morbid conditions, self/family immunization status was collected in a structured tool by a trained field investigator who conducted the participant’s interview. Open data kit based electronic data

capture tool was utilized for this purpose. Written informed consent was taken from the participants of the study.

Specimen Collection: Following all aseptic precautions 2- 3ml blood sample (Serum) was collected by a trained phlebotomist.

Specimen Transport: The sample was transported maintaining cold chain (2-8⁰c) to serology Laboratory, North District Hospital, Mapusa, Goa. All involved in the collection and transportation of specimens were trained in safe collection, sample handling, storage, and transportation and decontamination procedures.

Confidentiality: Participant confidentiality was maintained throughout the investigation. Each participant was assigned a study identification number for labeling questionnaire and specimen. All personal data is kept confidential and was processed anonymously.

Laboratory Evaluation: Laboratory procedures involving sample manipulation was carried out in the Bio-safety cabinet.

Validation and Quality Control: SOPs were followed of the Laboratory

Serological Testing: Enzyme –linked Immunofluorescence Assay technology for the quantitative determination of Spike protein (anti-S) specific IgG antibodies to SARS-COV-2 in human serum samples by using Fully Automated Vidas^R of Biomerieux Clinical Diagnostics. The assay is intended as an aid in the diagnosis of CoVID-19 and to support the study of the immune status of infected patient by providing an indication of the presence of neutralizing IgG antibodies against SARS-COV-2. Simultaneous comparison will be done by using lateral flow assays.

Results

A prospective study was carried out to determine the seroprevalence of SARS COV2 antibody in children (5-11 years and 12-17 years) in both the districts of Goa at Pathology Department, North Goa District Hospital, Mapusa. A total of 520 children from age group of (5-17) years participated of which 480 were considered for the study as per the survey design. Refer Table 3,4 and 5 for results. Of the total 480 children 319 were tested positive for SARS COV2 antibody .The overall seroprevalence of SARS- COV2 antibody in children (5-17 years) of Goa state is 66.40%. The North district of Goa has a higher seroprevalence of 68.33% as compared to South district of Goa which has a seroprevalence of 64.58%. 54% were females and 46% were males. Out of the total positives, 57% of children were in the age group of 5-11 years whereas 43% were in the age group of 12-17 years. Out of the total positives, only 13% of children presented with mild to moderate symptoms of flu , nausea, vague abdominal pain, throat ache and headache. 87% of children who tested positive for antibodies were asymptomatic.21% of children enrolled for the study gave history of exposure with positive person(parents and contacts). 7% of children enrolled for the study gave history of COVID positivity and had no history of any hospital stay. In North district of Goa the samples representing from Betki had positivity of only 29.17% and in South Goa district Canacona and Ponda had positivity of 37.5%. The seroprevalence was similar in rural and urban areas of Goa.

Table 03: Overall distribution of SARS COV2 antibody seroprevalence in children of Goa.(5-17 years)

Total children enrolled for the study	SARS COV2 antibody Positive	SARS COV2 antibody Negative
480	319	161
Percentage	66.40%	33.60%

Table 04: Overall distribution of SARS COV2 antibody seroprevalence in children of Goa.(5-17 years) as per district.

District	Total Positives	Total Samples tested	Positivity Rate
North Goa	164	240	68.33%
South Goa	155	240	64.58%

Table no: 05 Distribution of SARS COV2 antibody Seroprevalence in clusters of North and South District of Goa.

District	Population Size	Total	Female	Male	Positive 5-11 years		Positive 12-17 years		Total Positive	Positivity Rate	Total Negative	Negativity Rate
					Female	Male	Female	Male				
NORTH GOA												
CHC Sankhali	62636	24	13	11	8	6	3	4	21	88%	3	12.00%
CHC Valpoi	43903	24	7	17	4	8	3	3	18	75%	6	25%
UHC Panaji	40017	24	10	14	2	8	7	3	20	83.33%	4	16.67%
PHC Betki	34506	24	13	11	2	1	3	1	7	29.17%	17	70.83%
PHC Candolim	57314	24	10	14	3	4	4	6	17	70.83%	7	29.17%
PHC Colvale	40121	24	9	15	4	5	2	4	15	62.50%	9	37.50%
PHC Chimbhel	71119	24	15	9	5	3	4	3	15	62.50%	9	37.14%
PHC Porvorim	43287	24	14	10	12	4	1	1	18	75.00%	6	25.00%
PHC Siolim	46227	24	20	4	7	1	5	0	13	54.17%	11	45.83%
PHC Mayem	26123	24	11	13	5	8	4	3	20	83.33%	4	16.67%
SOUTH GOA												
CHC Curchorem	48585	24	11	13	6	9	3	1	19	79.17%	5	20.00%
CHC Canacona	50139	24	10	14	2	4	1	2	9	37.50%	15	62.06%
UHC Vasco	95369	24	17	7	5	4	6	2	17	70.83%	7	29.17%
PHC Cansaulim	50425	24	8	16	4	6	3	2	15	62.00%	9	38%
PHC Cortalim	68500	24	17	7	4	3	6	4	17	70.83%	7	29.17%
PHC Curtorim	53936	24	14	10	2	3	7	5	17	70.83%	7	29.17%
PHC Loutolim	34232	24	15	9	3	3	7	4	17	70.83%	7	29.17%
PHC Ponda	77258	24	13	11	4	1	1	3	9	37.50%	15	62.50%
PHC Quepem	38765	24	11	13	5	3	4	6	18	75.00%	6	25.00%
PHC Shiroda	28741	24	19	5	7	4	4	2	17	70.00%	7	30.00%
Total		480	257	223	94	88	78	59	319	66.40%	161	33.60%

Discussion

The overall seroprevalence of SARS- COV2 antibody in children (5-17 years) of Goa state is 66.40% which was higher as compared to the study done in Delhi showing a positivity of 55.7%⁷ and study done in Mumbai children who had a positivity of 51.18%.⁸ The North district of Goa has a higher seroprevalence of 68.33% as compared to South district of Goa which has a seroprevalence of 64.58%. This shows that a

higher percentage of pediatric population is exposed to the virus in both the districts of Goa with a preponderance in North District. There is a slightly higher SARS COV2 antibody positivity rate among female children (54%) as compared to male children (46%). Our observations are similar to findings by Puneet et al⁹. However meta-analysis has shown higher prevalence in men.¹⁰ A higher seropositivity was observed in children with age group 5-11years (57%) as compared to

children of age group of 12-17 years (43%) which is in contrast to the study done by Puneet et al⁹. The observation shows that most of the children irrespective of their age have developed antibodies and children in age group of 12-17 years may be prioritized for vaccination whenever it resumes. In our study only 13% of children presented with mild to moderate symptoms like flu, nausea, vague abdominal pain, throat ache and headache remaining (87%) were asymptomatic which is in concordance with the reported literature's. Out of 319 SARS COV2 antibody positive children only 21% of children gave history of exposure with positive person (parents and contacts) which shows that children are exposed to the virus unknowingly from asymptomatic individual (super spreaders). None of the children previously infected with Covid (7%) had any hospital stay showing that most were asymptomatic or had mild symptoms. The seroprevalence was similar in rural and urban areas of Goa. There is a heterogeneity in distribution of seroprevalence in the state where positivity is higher in most of the places except Betki (29.17%) in North District of Goa and Canacona (37.5%) and Ponda (37.5%) in South Goa indicating possibility of future waves of infection to initiate in this area and hence vaccine prioritization to be done in this part of Goa state.

Short Comings

High seroprevalence which appears soothing may have its own short comings as sero-survey results are calculated projections of small sample to huge population. Hence large population based study is needed at repeated interval and the present study may be used as a baseline for the same.

Conclusion

- 1) 66.40% of children in age group (5-17) years have developed SARS -COV 2 antibody. 33.60% of children did not have antibodies and are still vulnerable.
- 2) The seroprevalence was similar in rural and urban areas. However there is a

heterogeneity of distribution in the state indicating possibility of future waves of infection.

- 3) There is a ray of hope with regards to developments of Herd immunity in pediatric population however there is no room for complacency with regards to maintenance of COVID appropriate behavior and stressing on proper mask practices.
- 4) Social, public, religious and political gatherings to be avoided.

Conflict of Interest: There was no conflict of interest between authors.

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