

Analyzing the Prevalence of COVID-19 Among the Population of Garhwal Region using Rapid Antigen Test

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Abstract

The presented study put forward a data figures picture of Covid-19 infection rate from the hilly areas of Uttarakhand state, India. The samples were collected from the patients visiting the VCSGM&H and rapid antigen testing was performed. The data thus collected between August and October 2020 was further analyzed to gain a clear picture of positivity rate and further understanding the prevalence of Covid-19. The positivity rate was found on lower side a mere 6% of the total samples were tested positive most of them being in the age group of 31 to 50 and 11 to 30. Males were found to have more compromise to the Covid-19 infection as compared to females. This low positivity rate may be attributed to the natural higher immunity levels of hilly people as well as the sparsely distributed population thereby making a natural social distancing.

Keywords: COvid-19; prevalence; Garhwal; Uttarakhand; Rapid antigen test.

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Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) have hit whole world with a high intensity. Health infrastructure around the world came under question considering the speed of virus spread and minimal methods for its faster detection in a community (Sohrabia et al., 2020; WHO, 2020). PCR based diagnosis has been backbone for COVID testing but in a larger population the rapid testing to check the spread of virus in communities can't be possible with PCR test (Ravichandran et al., 2020; Asselah et al., 2020). Antibody tests check for an antigen response to SARS-CoV-2 infection and are used to determine infection and case fatality rates, or potential immunity in recovered patients and in vaccine studies (Pavlova et al., 2020; Theel et al., 2020). Effective laboratory SARS-CoV-2 antigen technologies have been developed and some were validated by the FDA to have Sensitivity (Se) and Specificity (Sp) as high as 99–100%. Soon after detection of spread of SARS-CoV-2 in India, focus was on developing molecular nucleic acid detection tests (real-time reverse transcriptase polymerase chain reaction [RT-PCR]) for early diagnosis of infection in symptomatic patients, patients with known exposure, and patients who are at risk (Younes et al., 2020; Ernst et al., 2020; Rahimi et al., 2020). Further, Scientist kept on developing cheaper and newer techniques for detection of Corona virus spread. One of all such diagnosis tests is the Rapid antigen testing, though is doesn't give any idea of real-time progression of virus in the community but it helps the healthcare workers to understand the spread of virus in the community (Cooperman, 2020). COVID-19 antigen testing, also known as serology testing, is a blood test that's done to find out if you've had a past infection with SARS-CoV-2, the virus that causes coronavirus disease 2019 (COVID-19) (Veerdonk et al., 2020;).

Antibodies are proteins produced by your immune system in response to an infection. Your immune system — which involves a complex network of cells, organs and tissues — identifies foreign substances in your body and helps fight infections and diseases. After infection with the COVID-19 virus, it can take two to three weeks to develop enough

antibodies to be detected in an antigen test, so it's important that you're not tested too soon (Cruvinel et al., 2010; Saroj et al., 2012; Cao et al., 2020; Jacofsky et al., 2020). Antibodies may be detected in your blood for several months or more after you recover from COVID-19 (Xiang et al., 2020; Weissleder et al., 2020; Guo et al., 2020). Although these antibodies probably provide some immunity to the COVID-19 virus, there's currently not enough evidence to know how long the antibodies last or to what extent past infection with the virus helps protect you from getting another infection. Though rare, there are some confirmed and suspected cases of reinfection. Studies on COVID-19 antibodies as well as other components of the immune system are ongoing to learn more about immunity (Long et al., 2020).

An IgG two-step ELISA test measures IgG responses to the recombinant receptor binding domain (RBD) of the SARS-CoV-2 spike protein (Eslande et al., 2020; Yu et al., 2020; Staines et al., 2020). Positive samples are confirmed in a second step that measures IgG response to the whole spike protein, resulting in a 100% Sp (with 92.5%) (Pieri et al., 2020). Rapid (minutes vs. hours) and instrument-free SARS-CoV-2 assays are commercially available, and some are already being used in surveillance studies. During past outbreaks, the lack of a rapid and simple serological test limited past infection tracing and assessment of overall health impacts (Augustine et al., 2020). A reliable immunoglobulin (antigen)-based surveillance plan that can detect even past and non-active infections can help understand community spread dynamics and the level of susceptibility in a specific population or region. Moreover, antigen-based diagnostic tests at mass scale can help gather epidemiological data on infected cases, and track them for possible COVID-19 associated complications such as cardiovascular, neurological, and other unknown pathophysiological conditions (Augustine et al., 2020).

The first case of Covid-19 in Uttarakhand was recorded on 15th March 2020 (www.indiatoday.in), it's since then the state government working hard to contain the virus spread by tracing and testing strategy. The hilly state has a weak healthcare infrastructure and hence government required to put harder restrictions to contain the virus spread. Thus, this work was designed to understand the spreading nature and prevalence of Covid-19 in the Hilly areas of Uttarakhand State.

Material and Methods

Antibody testing for SARS-CoV-2 antigen in 2, 928 adults and children visiting to the VCSG Medical College and Hospital from the entire Garhwal region was done with STANDARDTM Q COVID-19 Ag Test (SD Biosensor, South Korea). Here the sampling procedure, specimen collection, antigen testing procedure and statistical methods. The protocol we followed as per the directions given by manufacturer in line with the World Health Organization guidelines. These tests were conducted in cooperation with the trained health professionals of the VCSG Medical College and Department of Public Health.

Test Kit Performance

The test kit performance characteristics were available with the prescribed instructions and guidelines. Performance of test kit was further tested by comparing the results against positive samples tested by RT-PCR.

Sample Collection and Testing

Nasopharyngeal swab specimen from the posterior nasopharynx by a gentle rotation of pre-sterile swab was taken. The specimen containing swab was put into extraction buffer soon after it was taken out of nostril. The sample can either be stored for at least 8-12hrs (2-8 °C) or tested straightaway. The appearance of purple line on the top of result window suggested a

valid test while if a similar line appears (even a faint line) on the lower part (test section) suggest a positive test and otherwise negative.

Statistical Analysis

The data gathered during the entire testing duration was tabulated and analyzed in Microsoft Excel 2016.

Ethical Clearance

No ethical clearance required(retrospective study).

Results

A total of 2928 samples were tested in a period of months from August to October 2020 in the VCSG Medical College and Hospital's Covid-19 Testing facility, the data thus generated has been used to produce the results and their outcomes as well as understanding from the data.

Table 1: Total no of sample tested under different age groups

Age Group	Total Sample	Positive		Negative	
		M	F	M	F
	2928	118	77	1419	1314
0 to 10	69	1	1	47	20
11 to 30	1359	36	34	621	668
31 to 50	1003	56	23	484	440
51 and Above	497	25	19	292	161

[Table 1] shows the total no of sample tested and their distribution under the age groups as well as gender category. Out of total 2928, a mere 195 were tested positive while the remaining 2733 were found negative, clearly indicating that a large chunk of the tested sample was negative. This clearly suggests that even the First wave of Covid-19 not let the hilly population get affected. Of the total samples 1537 were male and 1391 were female.

The results suggests a quite a low positivity rate as of the total samples only 7% were tested positive [Figure 1]. A low positivity rate in the hilly areas may be due to rarer village colonies, low populated hilly areas. A high influx of migrants back into the state during the first wave may have risen the cases sharply in this region and state but the restrictions put up by state government and equally responded by the citizens led to a low positivity rate.

Further, looking at the Table 1 suggests that of the total positive tested sample a large chunk was males while females were significantly behind them in terms of positivity rate. Of the total sample 4% were Male while 3% were female [Figure 2], looking only at positive and negative tested samples female contributed 2% of it with males having a higher contribution of 4% [Figure 4].

Talking about the age groups, a very low number of (2 only) were found positive in the age groups of 0 to 10 making one from each male and female [Table 1] and it was less than 1% of the total sample tested. The highest number of positive tested samples were in the age group of 31 to 50 suggesting it as a vulnerable age group to Covid-19 contributing almost 40% of the positively tested samples followed by the age group of 11 to 30 that contributes nearly 36% of the positive tested samples, the remaining 23% were from the age group of 51 and above [Table 1,Figure 3]. Among all age groups males were found more susceptible as compared to females having higher number of positive tests in all age groups except he 0 to 10 age group where only 2 were tested positive one of each gender [Table 1, Figure 1-4].

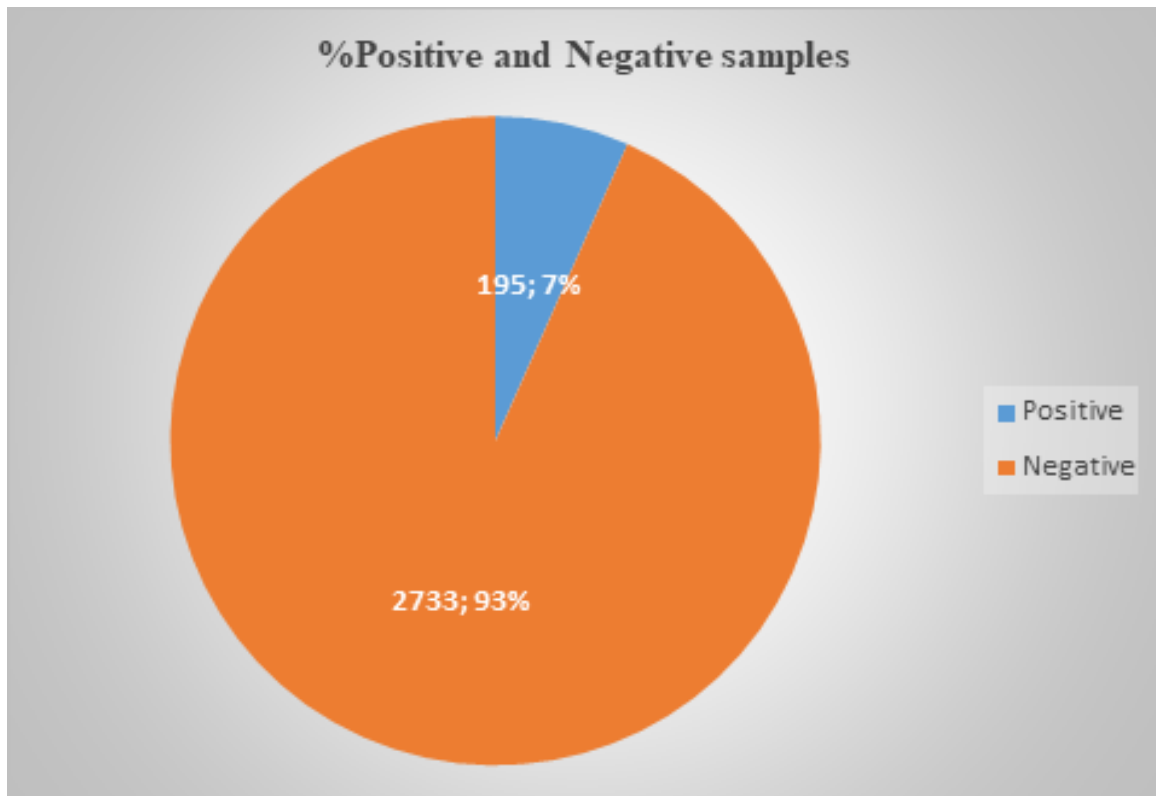


Figure 1: Pie Chart showing % of Positive and Negative Covid-19 Tests

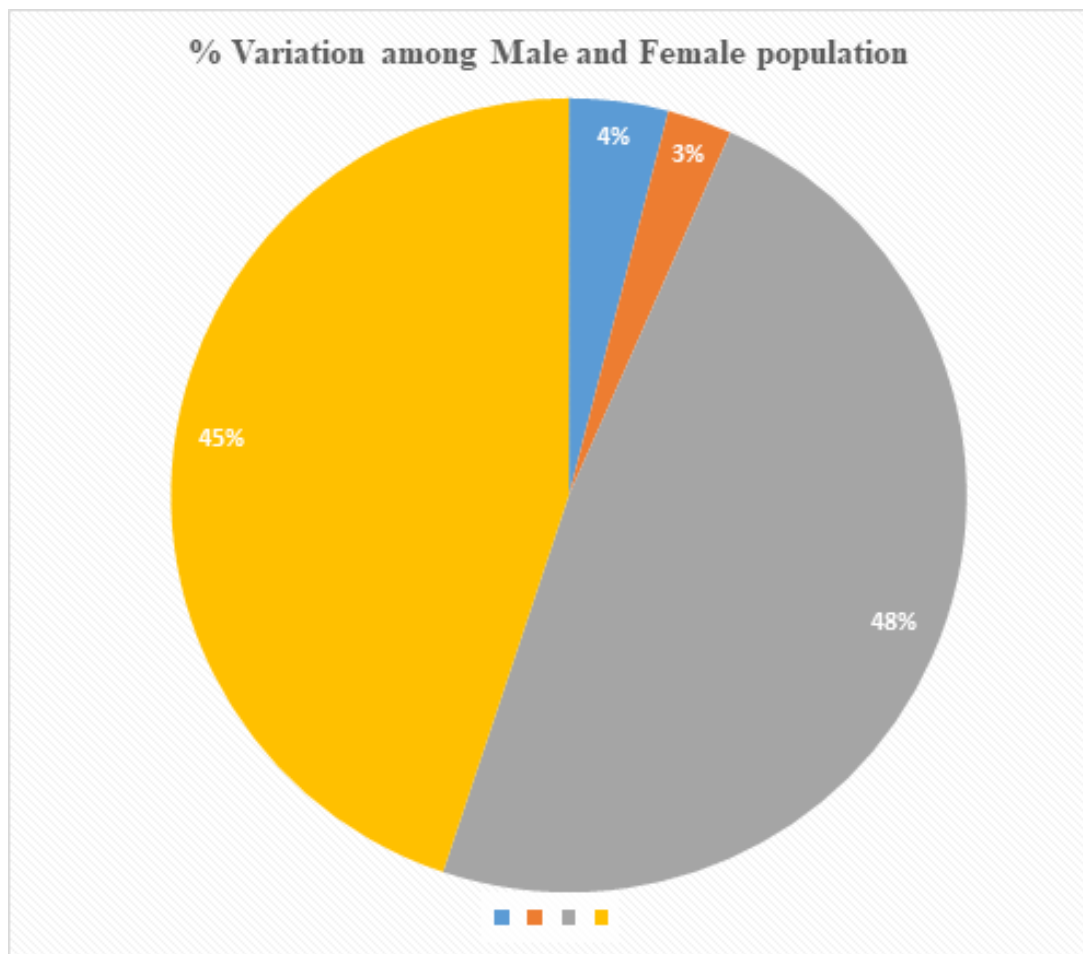


Fig 2. Pie chart showing gender wise variation for all tested samples

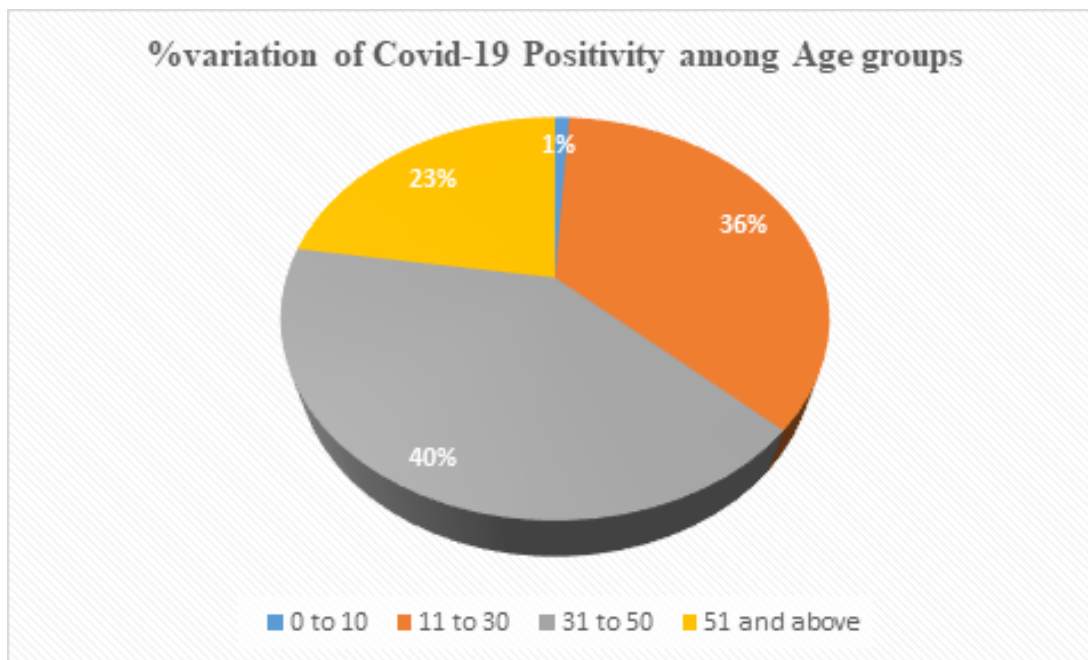


Figure 3: Variation in Positive COVID-19 tests among the Age groups

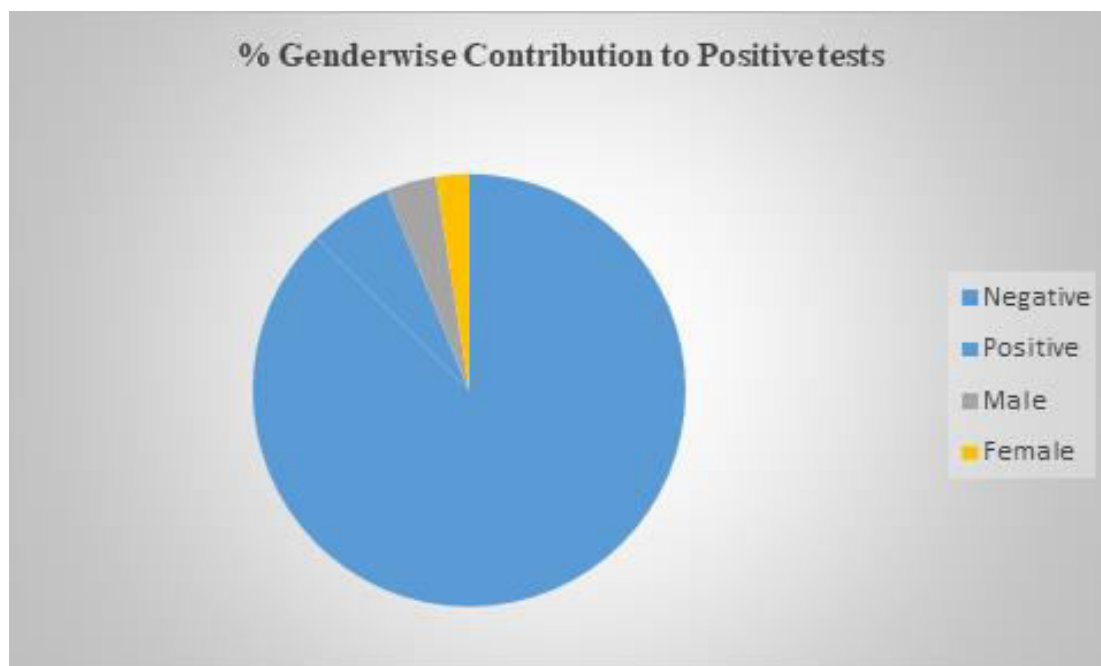


Figure 4: % Gender wise Contribution to Positive tests

These results indicate a low prevalence of COVID-19 in hilly areas, which can be attributed to the sparsely distributed population as well as the immunity level of people in hilly areas, thought to be doing good for them in these epidemic conditions (Arias-Reyes et al., 2020). On the other hand, males seem to be more vulnerable to the virus irrespective of age groups; they have a higher number of positivity rates as compared to their female counterparts (Peckhem et al., 2020; Wedderburn et al., 2020). Looking at age as a factor, it was evident from the studied data that persons belonging to the age group of 31 to 50 are far more vulnerable to COVID-19 as compared to any other age group (Monod et al., 2021; Undurraga et al., 2021). The data presented in this study clearly suggest a low positivity rate in Uttarakhand during the first wave of COVID-19 (Srivastava et al., 2020; COVID19 India dashboard). Most of the

positive tested samples were in the age group of 31 to 50 and 11 to 30 and that too with male forming the larger chunk of positive cases. Children were the lowest affected groups while the elderly peoples shows a 23% of positive cases among all found positive but the overall prevalence was a mere 1.5%.

Conclusion

As discussed with the results section of current study it concludes that the hilly area of Uttarakhand was less affected of the Covid 19 infection during the first wave with a prevalence of mere 5-6%. Among all the age groups the younger population is highly prone to get positive of Covid 19 while children were the least affected group followed by elderly peoples. Males were found more vulnerable to get infected as compared to female in all age groups. The data presented here can help in formulating the guidelines to restrict further spread of virus and can also help in maintaining the less medically facilitated hilly population safe and uninfected.

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