



A Comparative Analysis Of Covid-19 Outbreak On Mortality Among ABO Blood Group And Different Genders Of Population Pan India

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Abstract

Introduction- Coronavirus disease 2019 (COVID-19) is an emergent respiratory infection caused by the most recently discovered severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and it was first detected in December 2019 in Wuhan, China. India accounts for 11th highest share of 2.24% in global burden of COVID-19. India also reports over 3400 COVID-19 deaths and accounts for 1.05% of the COVID-19 deaths worldwide. There is no study done in the country to correlate between COVID-19, mortality among different gender and the population's blood group types, therefore, in this study, we have investigated the possible correlation between blood groups, and the acquisition of COVID-19.

Method- Cross-sectional online survey was conducted and was distributed in form of Google forms to 4521 volunteers all over India, who in turn were asked to collect information from their family members thus increasing the total sample size to 9054. The generated link was shared to public on social media. The link was also shared personally to the contact list of investigators. Information about gender, age, blood group, COVID-19 symptoms and complications were collected through the questionnaire. The questionnaire consisted of 19 questions in English language.

Conclusion- Significant gender-related differences are present in the occurrence of COVID-19 in the state i.e. mortality due to Covid-19 among males is a striking 62% as compared to females, where mortality was found to be only 38%. Highest mortality rate was seen in B- blood group (12.7%), followed by B+ blood group (10%) and least was seen in AB+ blood group (1.3%) and AB- blood group (0%).

Key words- Pan India, ABO blood group, mortality, Covid-19, complications, gender.

Introduction

Coronavirus disease 2019 (COVID-19) is an emergent respiratory infection caused by the most recently discovered severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and it was first detected in December 2019 in Wuhan, China.¹ The World Health Organization (WHO) declared the SARS-CoV-2 outbreak as a pandemic on March 11, 2020, due to its alarming levels of spread across the globe.

As of this time point (14th September, 2021, 09:44 AM) of writing, SARS-CoV-2 had extended to 216 countries altogether, resulting in 24,929,306 confirmed cases and 599,738 deaths. The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and resultant coronavirus disease 2019 (COVID-19) have evolved into a pandemic, requiring persons around the world to attend to rapidly changing messages about public health and take immediate actions to minimize their risk for infection and the spread of the virus. Older adults and those with underlying health conditions are at greatest risk for severe infection and death due to COVID-19.² In India, the first case of coronavirus disease 2019 (COVID-19) was detected on Jan 30, 2020. Until Mar 1, 2020, India had only three confirmed cases but ever since the contagious infection has grown exponentially. As of May 21, 2020, with over 112,000 cases.³ India accounts for 11th highest share of 2.24% in global burden of COVID-19. India also reports over 3400 COVID-19 deaths and accounts for 1.05% of the COVID-19 deaths worldwide. Meanwhile, the policy response to COVID-19 has revolved around an all-encompassing nationwide lockdown that helped curb the COVID-19 outbreak in the initial phases. But, sooner rather than later, lockdown would be relaxed leading to greater exposure to the virus.

Association of human ABO blood group types with many diseases is known from as early as 1950.⁴ It was recently reviewed by Liunbruno and Franchini.⁵ Several studies have also reported close associations between ABO blood types and susceptibility to malaria contraction. Individuals with blood group “A” are highly susceptible to *P. falciparum* infection whereas blood group “O” is providing protection against severe malaria, the mechanism of this protection is based on the rosette formation phenomenon. The same noticeable selectivity of the malaria parasite with the ABO blood group system is proved to apply to SARS-COV-2. In which “O” blood people were with the least susceptibility to the virus infection whereas “A” blood type is with the highest risk.^{6,7}

Our article is motivated by the need for such kind of study and focuses on the variation of age and sex in COVID-19 occurrence in various countries. In addition the analysis of infection and death scenarios is included.

So far, there is no study done in the country to correlate between COVID-19, mortality among different gender and the population’s blood group types, therefore, in this study, we have investigated the possible correlation between blood groups, and the acquisition of COVID-19. In addition, factors such as the previous infection with HIV, Hepatitis B virus (HBV), Hepatitis C virus(HCV), Tuberculosis (TB), hypertension, diabetes, chronic kidney disease, cancer, cardiovascular disease, asthma, chronic obstructive pulmonary disease,

depression, alcohol or substance use disorder, other mental health condition and other chronic condition were also studied. To the best of the author's knowledge, this is the first study in India, to correlate between ABO blood system, COVID-19 contraction and mortality among different genders.

Methods:

Study Design and Setting: Cross-sectional online survey was conducted and was distributed in form of Google forms to 4521 volunteers all over India between 4th September 2021 to 31st December 2021. The volunteers in turn were asked to collect information from their family members, thus increasing the total sample size to 9054. The generated link was shared to public on social media (i.e., Facebook, WhatsApp, Instagram, Twitter, and LinkedIn). The link was also shared personally to the contact list of investigators. Information about gender, age, blood group, COVID-19 symptoms, & chronic disease were collected through the questionnaire. The questionnaire consisted of 19 questions in English language. The study protocol, survey tool, and informed consent procedure was approved by the institutional review board before the start of the survey.

We analyzed the number of infected cases, complications and deaths of 10 different age groups (0-5 years, 6-12 years, 13-18 years, 19-29 years, 30-39 years, 40-49 years, 50-59 years, 60-69 years, 70-79 years and 80+ years of age) in India. We have analyzed the COVID-19 infection and related death in relation to blood group and gender in Indian states, to gain an understanding of the national situation of a developing country.

Inclusion criteria- Indian nationals, people who can understand English, people who were willing to participate in the survey and having internet access.

Exclusion criteria- Presence of a severe and uncorrectable cognitive, visual, or hearing impairment that would preclude a participant's ability to complete interviews.

Statistical Analysis

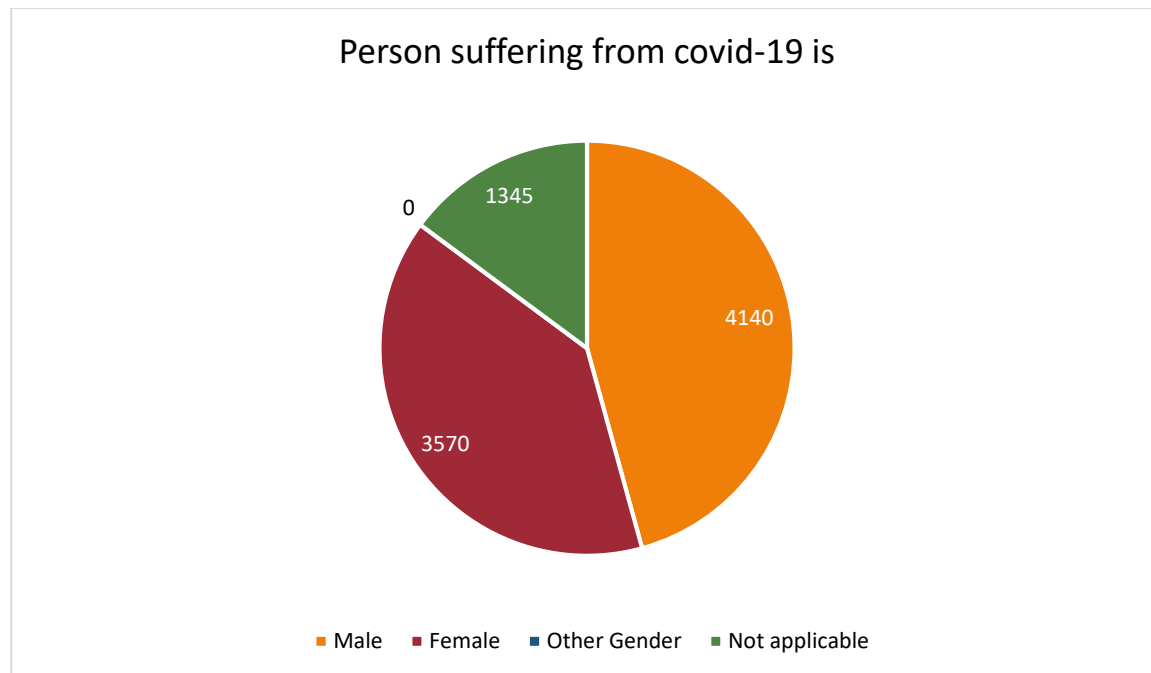
The data was statistically analyzed using Statistical Packaged for Social Science (SPSS) Version-20. The significance of the results was investigated using Pearson correlation with significance level $p=0.01$.⁸

Ethical consideration

All patients who participated in this questionnaire were informed about the aim and objectives of the study and they agreed to participate in the study. The ethical approval was obtained from the ethical committee of Institute of Dental Sciences, Bareilly.

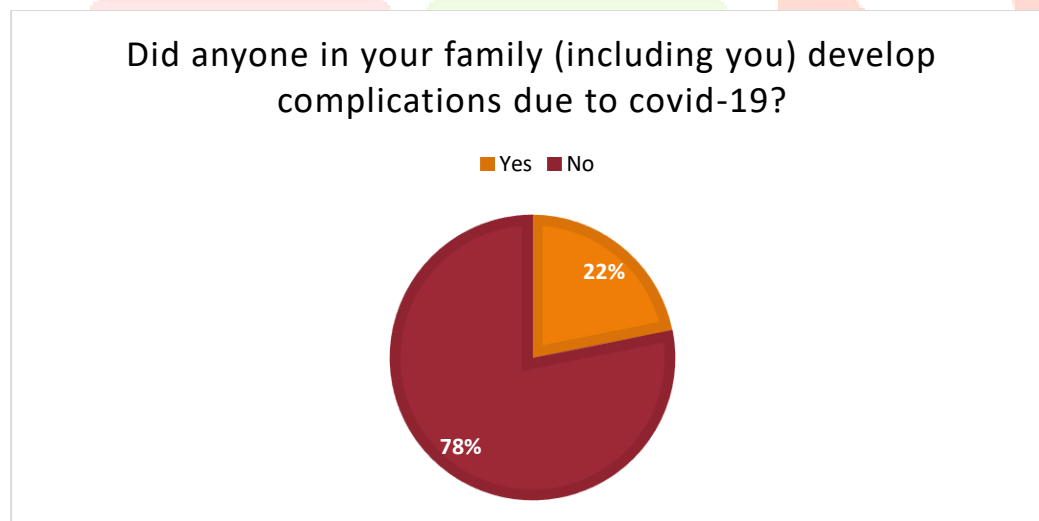
Results

fig 1



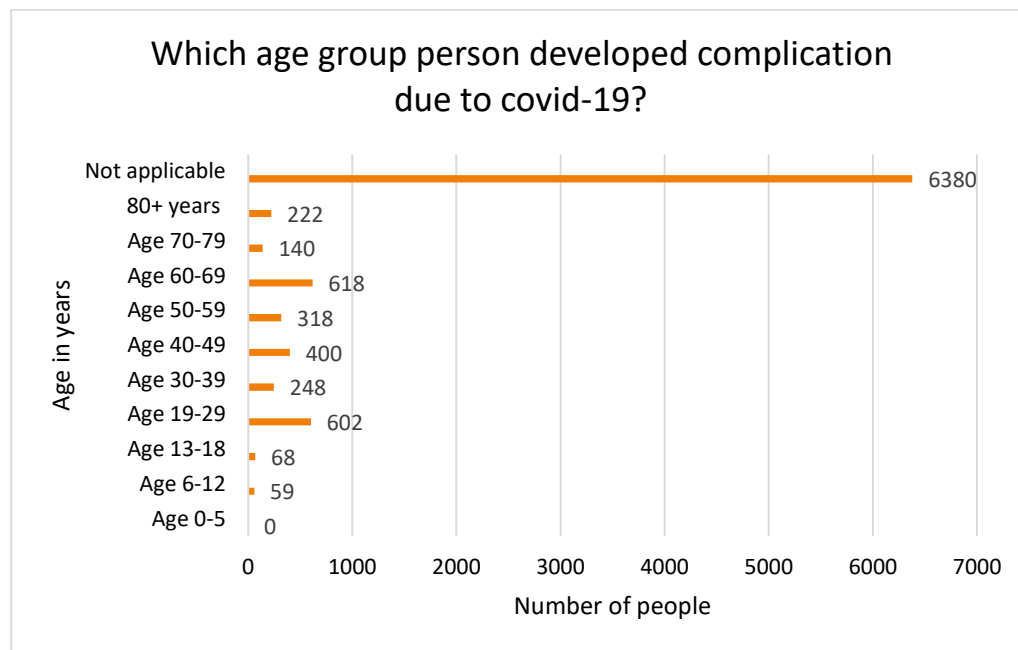
The above pie-chart shows that 4140 males and 3570 females suffered from Covid-19 in first and second wave of the pandemic, whereas 1345 remained free of the diseases

fig 2



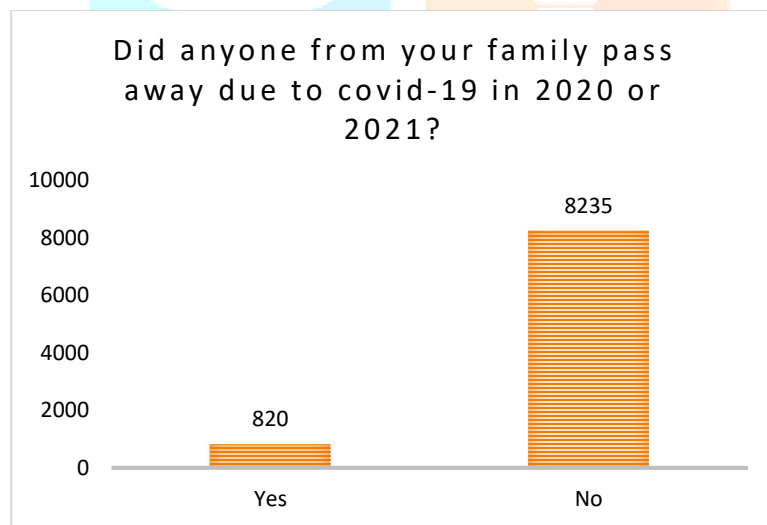
The above pie-diagram depicts that only 22% of the total affected persons developed complications due to Covid-19 whereas, 78% remained free from any Covid-19 complications.

fig 3



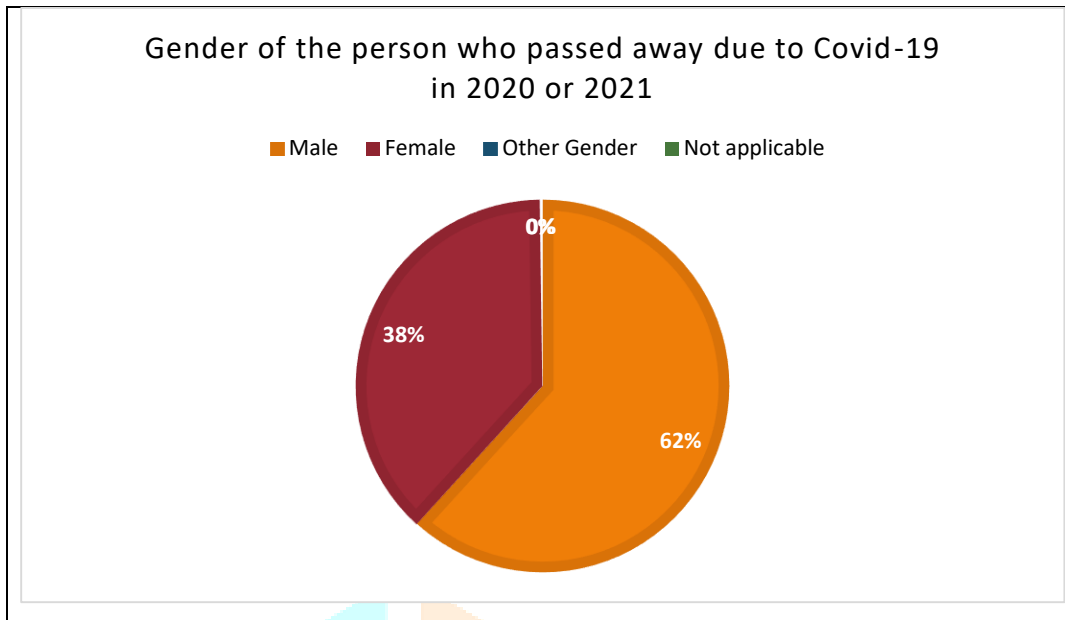
Out of all the persons who developed complications, age group 60-69 and age group 19-29 had maximum number of persons developing complications; this number being 618 and 602 respectively.

fig 4



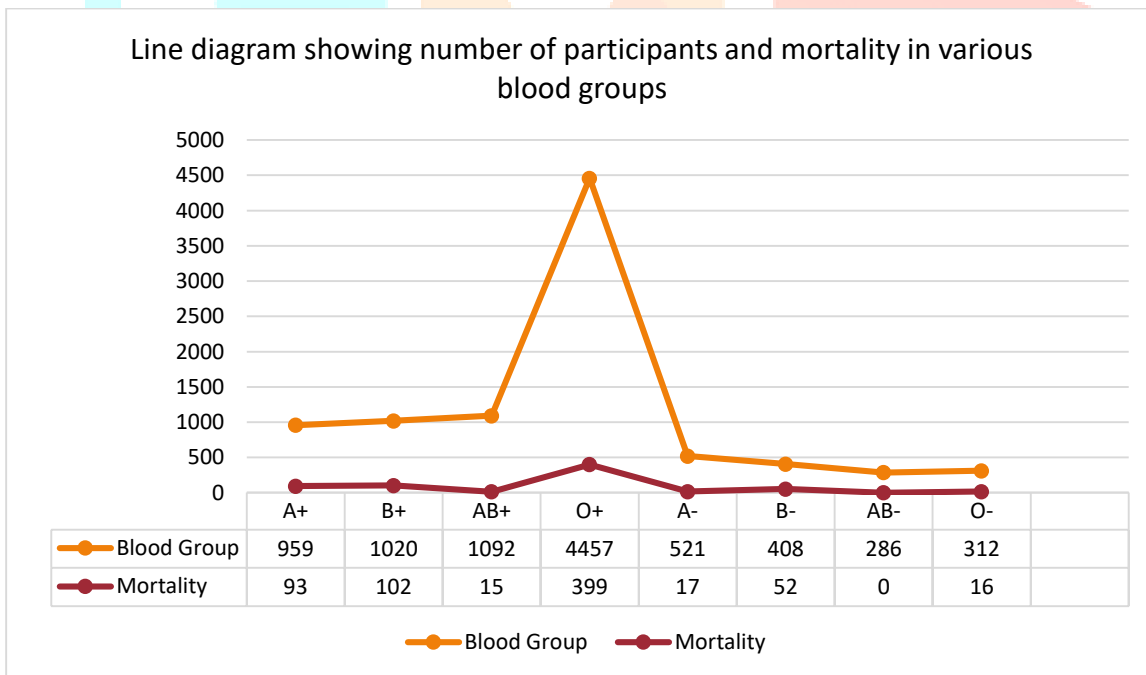
The above bar graph shows that, out of total 9055 participants, 820 agreed that someone in their family passed away between 2020 and 2021 due to Covid-19, while 8235 disagreed to the same. Hence the observed mortality rate was 9.05%.

fig 5



It is seen in the above pie-chart that the mortality due to Covid-19 among males is a striking 62% as compared to females, where mortality was found to be only 38%.

fig 6



From the above line diagram we can conclude that highest mortality rate was seen in B- blood group (12.7%), followed by B+ blood group (10%) and least was seen in AB+ blood group (1.3%) and AB- blood group (0%).

Table1- Depicting total number of persons suffering from Covid-19 in various blood groups that developed complications

Blood Group	Total	Developed complications
A+	959	191
B+	1020	344
AB+	1092	24
O+	4457	383
A-	521	06
B-	408	26
AB-	286	03
O-	312	06

Table2 - Showing correlation between gender, blood group and death

	Pearson Correlation	p value
Gender	1.00	0.00
Blood Group	0.049**	0.001
Deaths	0.454**	0.00

**Correlation is significant at the 0.01 level.

The above table shows comparison between gender, blood group and death by Pearson Chi-square test and shows highly significant association between blood group and death due to Covid-19.

On comparing gender with the complications cause due to Covid-19 using Pearson correlation was found to be 0.064.

Discussion

The present study attempted to explore the category wise (age, gender, complications and blood group) chances of getting infected and developing complications or deaths among Indian population.

Harman S et al in 2016 Harman S, 2016 argued that lower rates of female cases and deaths could be due to lower employment rates and limited interactions with the outside world.⁹ However, as the experience from other pandemics has shown, women are more likely to be infected due to their assumed roles as caregivers within families and as front-line healthcare workers. The results of our study were in contrast with that of Harman et al, as it was found that out of 9055 participants, males suffering from Covid-19 were 45.8% and females were 39.4% and 14.7% people remained free from the disease.

The data showed that the highest number of confirmed cases that developed complications were in the age group 60-69 and age group 19-29. Guan WJ et al (2020) in their study suggest that the 50 years-above population is more prone to infection than other age groups due to compromised immunity and prevalent health ailments. The study also indicates that people above 50 years residing in facilities like nursing homes are at a higher risk due to congregate living. The 19-29 years old age group is more exposed to the virus

because many of them serve in the society compared to other age groups, who stay at home. Children are less vulnerable to SARS-CoV-2 due to the reduced expression of angiotensin-converting enzyme 2 (ACE-2) in their nasal epithelium.¹⁰

A significant association of blood type A with susceptibility to COVID-19 infection and mortality has been reported in Chinese patients enrolled in Wuhan Jinyintan Hospital in a study done by Zhao J et al in 2020.¹¹ In the present study the incidence of mortality rate was highest in B- blood group (12.7%), followed by B+ (10.3%), A+ (9.6%), O+ (8.9%), O- (5%), A- (3.2%), AB+ (1.4%) and AB- was the only blood group in which no deaths were seen.

Strengths

The major strength of this study lies in its large sample size from all the regions of India. Secondly, no study is done comparing complications developed due to Covid-19 among different gender, age groups and ABO blood groups together to the best of author's knowledge. Also, this study used an online-based survey method to avoid possible transmission of Covid-19.

Limitations

This study has several limitations. First, this study followed a cross-sectional study design. Therefore, causal inferences may not be established. Second, compared with face-to-face interviews, self-reporting has limitations including multiple biases. Third and fourth, this study used an online-based survey method and the questionnaire was only published only in English language, thereby it was restricted to only those with internet access and knowledge of English language. Therefore, it is unlikely to represent an accurate reflection of the whole Indian population.

Conclusion

Significant gender-related differences are present in the occurrence of COVID-19 in the state. Besides a wide range of factors that may influence the outcome, gender should be one criterion for selecting the appropriate measures. Indeed, given the differences in lethality between the two genders, we believe that studying gender differences will help find suitable interventions for all patients and help policymakers frame better policies to reduce the spread of COVID-19. The present epidemiological report highlighted a possible role of blood groups with COVID-19 infection and mortality rate. As India's epidemiological demography is different from other countries, it becomes imperative to estimate further disease progression to enable a robust combat avenue.

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