

DIFFERENT SOCIAL FACTORS AND MODULATORS OF COVID-19 MORBIDITY AND MORTALITY

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ABSTRACT

The data of COVID-19 pandemic when analysed with different probable modulators like affecting social structure like religion, blood group, the burden of other diseases, vaccination for other diseases and many more revealed that Rh -ve blood group, irrespective of ABO blood group may be an important predisposing factor for acquiring SARS-CoV-2 infection and serious disease leading to lethality. Among ABO blood groups, people with blood group A seem to be the most susceptible to COVID-19 followed by AB, O and B blood group. Among different religious groups, Muslim dominated nations had a smaller number of COVID-19 cases and deaths while those dominated by Christians had more devastating COVID-19. The BCG and to some extent Rotavirus vaccinations seem to protect the population from SARS-CoV-2 infection and deaths while other vaccinations like Polio, DPT, HepB, Measles, HiB appeared to support the SARS-CoV-2. The national burden of diseases like TB, HIV-AIDS, Malaria, cardiovascular disorders, natural calamities, fires, food deficiency and poor sanitation seems to protect against SARS-CoV-2 infections and COVID-19. However, the burden of neoplasms (cancers) was significantly increasing the risk of SARS-CoV-2 infections and lethal outcome of COVID-19. The emergence of Omicron variant of SARS-CoV-2 in last two weeks of the year 2021 also had an almost similar association with different disease modulators but gaining more momentum in nations with greater coverage of DPT, HiB, HepB, Polio vaccination and higher burden of neoplasms. This analysis may help in better planning for control of COVID-19 in different societies and nations with reasonable variation in pandemic control strategy instead of a blanket package of practice to curb the disease. The limitations of data-based analysis are also discussed.

Key words: COVID-19, SARS-CoV-2, pandemic, blood group



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INTRODUCTION

There have been about a million publications on COVID-19 in the last two and a half years of the COVID-19 pandemic; still the roadmap for its prevention and control is not lucid because of several reasons mainly due to ill-understood social and epidemiological predisposing factors and modulators of SARS-CoV-2 infection and its pathogenesis. In the present article, COVID-19 data retrieved on 3rd January 2022 has been analysed with other possible effectors of the disease.

Testing for SARS-CoV-2 infections: Though there are numerous screening and diagnostic tests available for a long with varying specificity and sensitivity, their use is limited by several factors including finances available, suitable human resources and infrastructure (Karthikeyan et al., 2020). The biggest modulator or determinant of all estimated disease burdens is always the efforts for the early and accurate diagnosis of disease. It is said that no diagnosis equals no disease, but it is a half-truth, people keep on suffering without knowing the cause of suffering. The same appeared true when the data of COVID-19 cases were compared among different nations reporting the disease. The nations conducting more tests per million people are also reporting a greater number of cases per million. In the last two years of the COVID-19 pandemic, data from 204 countries revealed a significant positive correlation ($r, 0.486$; $p < 0.00001$) of testing with the number of cases per million reported but the association was insignificant for the reported number of deaths per million people with COVID-19. However, for the last two weeks number of deaths too had a significant ($r, 0.148$; $p = 0.03$) association with numbers of tests per million people, which might be an effect of the emergence of Omicron, causing a milder disease thus getting ignored in many countries. The number of tests conducted for any disease is also related to the social and economic development, and education status of the country and it is a known fact that COVID-19 remained more devastating in more developed nations (Singh et al., 2020; Singh, 2020). Moreover, exceptions are everywhere, and limitations of analytical studies are also many depending on the quality of data provided by different nations. However, the limitations are almost the same for all purposes and data, thus it is considered that data speak if not the exact truth the acceptable truth. In the diagnostic data we used total number of tests conducted, the differential use of tests of different types has not been taken into account but it certainly affects the diagnostic sensitivity. The rapid antigen test, the most commonly used, is seen to yield negative results in symptomatically sick persons and repeated testing of the positive cases to declare them free of infection, all accounts for error in the analysis.

EFFECT OF BLOOD GROUP ON SUSCEPTIBILITY TO SARS COV-2 INFECTION AND DEATHS WITH COVID-19:

The data analysis for Covid-19 cases and deaths for the last two years and in the last two weeks for 123 nations (Table 1) revealed that blood group O+ and blood group B+ had reduced susceptibility not only to infection but also for the deaths; blood group AB+ also seemed to be associated with reduced risk to SARS-CoV-2 infection but no significant effect on mortality

rates. However, the Rh factor appears to be an important risk factor, irrespective of AOB blood groups nations having higher Rh -ve population had increased susceptibility to SARS CoV-2 infection and mortality associated with the COVID-19. Some studies (Ray et al., 2020; Goel et al., 2021) reported that blood group O may be associated with a lower risk of SARS-CoV-2 infection and blood group A may be associated with a higher risk of SARS-CoV-2 infection along with the severe disease outcome. In contrast to the lower risk of SARS-CoV-2 infection in nations with more blood group B population detected in the present analysis another study (Almadhi et al., 2021) reported, higher risk associated with blood group B. They found no association between blood group and the risk of a severe ICU-requiring infection. In an earlier study, Rh -ve status is predicted protective against SARS-CoV-2 infection (Ray et al., 2020). The present analysis is in contrast and revealed a positive correlation between Rh -ve status and SARS-CoV-2 infection and deaths due to COVID-19. The discrepancy in the different analyses may be due to different data sets used for the purpose and regionality in data. Unless we have data of blood group of all the people who suffered and died of COVID-19 a truthful conclusion can't be drawn. There may be a differential expression of receptors for the SARS-CoV-2 virus and effectors of pathogenesis in people with different blood groups (Goel et al., 2021).

Table. 1. Effect of population blood group distribution on susceptibility to SARS CoV-2 infection and deaths with COVID-19 based on data for 123 nations

Blood group	Pearson correlation coefficient (r)				Critical <i>p</i> value at significance level	
	In the last 14 days		In the last 2 years		0.05	0.01
	Cases /Million	Deaths/ Million	Cases/ Million	Deaths/ Million		
O+	-0.136	-0.361	-0.402	-0.200	0.175	0.23
A+	0.419	0.348	0.568	0.397	0.175	0.23
B+	-0.466	-0.205	-0.454	-0.436	0.175	0.23
AB+	-0.286	0.158	-0.059	-0.070	0.175	0.23
O-	0.515	0.314	0.579	0.395	0.175	0.23
A-	0.515	0.488	0.734	0.560	0.175	0.23
B-	0.219	0.449	0.540	0.426	0.175	0.23
AB-	0.291	0.454	0.561	0.400	0.175	0.23

The observations in the present study are based on population data not based on the patient data and may vary. As a nation with more Rh -ve blood group may be having a greater number of cases not due to Rh factor but may be other factors associated and the people suffering from COVID-19 may not be in real the patients. The observations suggested an urgent need to study the COVID-19 concerning blood groups of affected people.

EFFECT OF RELIGION ON SUSCEPTIBILITY TO SARS COV-2 INFECTION AND DEATHS WITH COVID-19:

Social structure of any nation is most affected by the religion followed by the people (religious structure) of the nation. Data for COVID cases and deaths in more than 200 nations (Table 2) for

proportions of the religion of their population indicated that countries dominated with Christians had more COVID-19 cases and deaths, but the opposite was true for nations with Muslim dominance. We are not here to discuss why, let the sociobiologist do the job. Similar observations were also reported based on the early observations on the pandemic data (Singh, 2020) and stability in observation indicated that there may be some substance in the observations to be explored further to find the reasons of the observed relationship. The effect of religion on SARS-CoV-2 infection might be associated with a difference in the distribution of blood groups in different religious populations as reported in North India (Hussain et al., 2013). In the study, the Muslim population had deviant blood group distribution among Muslims of different sects and a wide gap was evident from the national average; Rh –ve population in Muslims (15.33%) of North India was almost three times of national average (5.9%). Though, Rh –ve trait varied from 11.45% to 19.09% in Muslims of different sects and descent was always too higher to the national average. A similar difference is reported for ABO blood groups, among Muslims most frequent O group was followed by A, B and then AB while at the national level highest frequency of O is followed by B, A and then AB blood groups. In another study (Dave and Prakash, 1995) in Central India, in Hindu and Sikh communities, the frequencies of O group were followed by B and then blood group A while in Muslims, O group is followed by A and then blood group B. Though it is beyond scientific understanding how religion may affect your blood group, reasons for the observations of difference might be associated with the descent and lineage of human populations practising different.

Table. 2. Effect of religion on susceptibility to SARS CoV-2 infection and deaths with COVID-19

Religion	Pearson correlation coefficient (r)				Number of Countries compared	Critical <i>p</i> value at significance level	
	In the last 14 days		In the last 2 years			0.05	0.01
	Cases/ Million	Deaths/ Million	Cases/ Million	Deaths/ Million			
Christians	0.317	0.224	0.311	0.340	208	0.137	0.178
Muslims	-0.268	-0.220	-0.280	-0.278	204	0.138	0.179
Hindus	-0.092	-0.015	-0.096	-0.071	204	0.138	0.179
Buddhist	-0.137	-0.110	-0.175	-0.173	204	0.138	0.179
Nonreligion	0.112	0.078	0.164	0.062	203	0.138	0.179
Other Religions	-0.065	-0.019	-0.044	-0.068	204	0.138	0.179

IMPACT OF DIFFERENT VACCINATIONS ON SUSCEPTIBILITY TO SARS COV-2 INFECTION AND DEATHS WITH COVID-19:

Use of different vaccine in a society is affected by several social, educational and economic determinants. In the present analysis, impact of different vaccines' uses and COVID-19 morbidity and mortality were assessed. Significant negative correlation among use of BCG vaccination with the number of COVID-19 cases indicated that some non-specific immunity may be offered by BCG vaccination against SARS-CoV-2 infection and to some extent against mortality with COVID-19 (Table 3). In early 2020 several studies have indicated the protective role of BCG vaccination against SARS-CoV-2 infection (Singh et al., 2020; Singh and Gandharva, 2020). In the last two weeks, when the Omicron variant of SARS-CoV-2 is fulminating the most all over the world, protection against infection is still very much evident among nations using mandatory BCG vaccination. However, protection against the lethal effect of the infection is not a pronounced one and only future will reveal the final impact of BCG vaccination. However, about other the vaccinations data analysis is scarce.

Table. 3. Impact of different vaccinations on susceptibility to SARS CoV-2 infection and deaths with COVID-19

Type of vaccination	Pearson correlation coefficient (r)				Number of Countries compared	Critical <i>p</i> value at significance level	
	In the last 14 days		In the last 2 years			0.05	0.01
	Cases /Million	Deaths/ Million	Cases/ Million	Deaths/ Million			
% BCG in 2018	-0.585	-0.085	-0.438	-0.162	165	0.153	0.200
% BCG in 2017	-0.423	-0.096	-0.426	-0.181	206	0.137	0.177
DPT	0.151	0.169	0.379	0.223	177	0.149	0.195
HiB	0.158	0.138	0.346	0.200	174	0.149	0.195
Hepatitis B	0.078	0.133	0.320	0.170	169	0.150	0.200
Rota Virus	-0.160	-0.334	-0.182	-0.229	90	0.210	0.270
Polio Vaccination % 2018	0.167	0.174	0.390	0.234	178	0.147	0.192
Measles Vaccination MCV1	0.087	0.164	0.362	0.244	173	0.149	0.195
Measles Vaccination MCV2	0.187	0.202	0.357	0.176	152	0.160	0.210

The analysis indicated a significant positive correlation with national frequencies of DPT (diphtheria, pertussis, tetanus toxoid) and *Haemophilus influenza* type B, and most of the anti-viral disease vaccination including, hepatitis B, measles, and polio but *Rotavirus* vaccination was associated with reduced SARS-CoV-2 infection and COVID-19 deaths. Either the vaccines associated with increased infection or death risks from SARS-CoV-2 have some adverse effect on immune response to support SARS-CoV-2. Another big question is how *Rotavirus* vaccine offered some protection against SARS-CoV-2 infection? Why Rotavirus vaccine behaved in total contrast to other viral vaccines to SARS-CoV-2 infection, needs a systematic study to understand the phenomenon. It might be due to the fact that both SARS-CoV-2 and Rotavirus affect the endothelial cells and enterocytes, but how this simile might be interfering in spread of COVID-19 is not clear. Like negative correlation of BCG vaccination on SARS-CoV-2 infection, *Rotavirus* vaccination effect is seemingly veining towards SARS-CoV-2 infection in last two years, is there something else in the two vaccines having similar effects or Rotavirus and BCG vaccines induce a similar type of non-specific immunity. Though, it is not a simple task to criticize any vaccine and impact of vaccination (Singh, 2021a, 2022), the partial and disputed success of COVID-19 vaccination has created several unanswered questions due to spread of the disease in highly vaccinated nations and emergence of other health complications in vaccinated populations (Singh, 2021b).

IMPACT OF DISEASE BURDEN AND OTHER HEALTH HAZARDS ON SUSCEPTIBILITY TO SARS COV-2 INFECTION AND DEATHS WITH COVID-19 IN DIFFERENT NATIONS:

Several diseases precipitate in a society depending on its social, educational and hygienic practices followed which are often impacted by religions, and regions of the descent of people constituting a society. Except neoplasms (often associated with so many social factors), all other important disease burdens including those of tuberculosis (TB), HIV-AIDS, malaria, cardiovascular disorders (CVD) had a negative association with COVID-19 cases and deaths, and association is evidently getting negatively-stronger with the emergence of Omicron variant in last two weeks (Table 4). Similarly, no significant correlation was evident with diabetes burden in the analysis either with the number of infections or with deaths in different nations. Similarly, the burden of suicides, national per capita spending on sanitation and density of natural disasters had no significant association with the burden of COVID-19 cases and deaths in different countries. However, in earlier studies (Holman et al., 2020; Meyers et al., 2020; Lim et al., 2021) cardiovascular disease (CVD), obesity and/or type 1 diabetes mellitus (T1DM) or type 2 diabetes mellitus (T2DM) are shown to increase risk of serious illness and death and are considered important co-morbidities to decide the outcome of SARS-CoV-2 infection. The discrepancy in observation in earlier studies might be due to subsets of population data or patients' data of a certain regions analysed in earlier studies instead of global and national population data of disease burden.

The burden of road accidents, probably associated with poor road conditions (another sign of poverty), was negatively associated with an increase in both lethal and non-lethal SARS-CoV-2 infections. Poverty seems to be an important determinant of COVID-19 either due to lack of diagnosis or due to other factors in poorer nations; the food deficiency status was strongly correlated with a smaller number of the disease cases and deaths after SARS-CoV-2 infection in the ongoing COVID-19 pandemic probably higher importance given by national health agencies to other more lethal diseases often associated with poverty.

The positive correlation among number of SARS-CoV-2 infections and COVID-19 lethality in nations burdened with neoplastic diseases has become more intense with the emergence of Omicron. Though similar types of observations are reported earlier (Singh, 2020) but no systematic and targeted studies have been conducted to understand the positive and negative association of SARS-CoV-2 infection with other diseases. Cancer patients are often warned of the increased risk from SARS-CoV-2 infections (<https://www.cancer.gov/about-cancer/coronavirus/coronavirus-cancer-patient-information>) and this analysis affirmed the risk.

LIMITATIONS OF THE DATA ANALYSIS:

I often think, what may be the utility of garbage of data accumulated globally in future, it may misguide our generations and people may laugh on us if we analyse it today. Whenever there is an epidemic or pandemic population of the affected region goes down, but Covid-19 is an exception, in COVID-19 era world population kept on increasing as usual by 1.1% annually, it was 7.71 billion in 2019, 7.79 billion in 2020 and 7.91 billion in 2021, i.e., continuity in population growth. The annual deaths rate (7.6 per thousand) for all 3 years (2019 to 2021) remained largely unaffected, so where is the impact of COVID-19?

Table. 4. Impact of disease burden and other health hazards on susceptibility to SARS CoV-2 infection and deaths with COVID-19 in 175 nations.

Type of vaccination	Pearson correlation coefficient (r)				Critical <i>p</i> value at significance level	
	In the last 14 days		In the last 2 years			
	Cases /Million	Deaths/ Million	Cases/ Million	Deaths/ Million	0.05	0.01
TB	-0.167	-0.230	-0.472	-0.413	0.149	0.195
HIV-AIDS	-0.115	-0.138	-0.292	-0.224	0.149	0.195
Malaria	-0.155	-0.211	-0.394	-0.360	0.149	0.195
Cardiovascular Diseases	-0.335	0.064	-0.242	-0.086	0.149	0.195

Neoplasm	0.497	0.273	0.532	0.328	0.149	0.195
Diabetes	-0.085	0.001	0.060	0.046	0.149	0.195
Suicide	0.003	0.111	-0.025	-0.027	0.149	0.195
Road Accidents	-0.330	-0.249	-0.511	-0.381	0.149	0.195
Fire	-0.253	-0.167	-0.426	-0.371	0.149	0.195
Drowning	-0.280	-0.097	-0.353	-0.272	0.149	0.195
Natural accidents/ disasters	-0.093	-0.076	-0.138	-0.080	0.149	0.195
Smoking	0.010	0.244	0.174	0.222	0.149	0.195
Food deficiency	-0.179	-0.243	-0.461	-0.381	0.149	0.195
Water and Sanitation spending	-0.104	-0.036	-0.140	-0.124	0.177	0.232

In 1918-20, Spanish flu led to a 2.1% decrease in global population in two years but in the Covid-19 era global population increased by 2.2% in two years. The great and historical pandemic Covid-19 is getting stronger, so be careful it may lead to population explosion too.

Is COVID-19 a hoax? Certainly not, but seems to be a plandemic to create panic in favour of greedy pharmaceuticals, tyrant politicians, and much more. In comparison to 2019, in 2020 total excess deaths were 873633 (probably in proportion to the increase in population at the 0.76% death rate). Let us consider that the same number of deaths as in 2019 also occurred in 2020 and in 2021, and also consider that all excess deaths were due to COVID-19, still, the number of deaths attributed 1941762 to COVID19 are about 1.1 million in excess to the real excess death figures. That is people who were to die otherwise with different reasons were also added to the accounted for COVID-19, and this addition was 1.5 M in 2021, let us see in 2022? The statistics indicated that many of those who used to die with several other diseases earlier died with COVID-19 in 2020 and 2021. Is it a reality, if yes then COVID-19 is great and reducing the burden of other diseases? If not, then COVID-19 is a plandemic to create panic with the help of some ill-minded medicos, greedy pharmaceuticals, politicians, and media houses. We all have seen people suffering and dying due to Covid-19 and can't deny the tragedy we saw in the 2nd wave in India but data tells differently, this is the limitation of using data in public domain, it may mask truth, it may reveal a truth, it may misguide and also guide us. It is a mockery of our data system and epidemic management system which works with motives decided by tyrants, it rarely works for general people, who are always on the wrong end. The

distorted social values seems to be one of the important determinant to be studied in backdrop of COVID-19 and may be important to deal with pandemic or plandemics to be faced by the humanity.

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