

COVID-19 Susceptibility: The Effects of Age and Gender

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Abstract: This extremely contagious coronavirus (SARS-CoV-2) caused a public health disaster in most of the world. Because of its unique nature and ambiguity, various sources of information and ideas have been produced to help people understand how it spreads and how to avoid infection. The population's understanding and attitudes concerning COVID-19 have been raised as a result of the active intervention initiatives. Gender is also a significant risk factor, with men nearly twice as likely as women to die from the coronavirus. Furthermore, disparities in mortality estimates for older age groups between nations imply that the risk of dying from coronavirus is linked to underlying health issues, health-care system capacity and whether the virus has spread among persons living in elderly-care facilities [1]. According to Indian government data, more than 80% of confirmed cases in India remain asymptomatic, [2] putting the people at risk of virus dissemination in the community. Although the pandemic appears to be centred in more affluent and industrialised districts [3], with millions of migrant workers from these areas returning to their home districts after the lockdown was lifted [4], the virus will soon spread to India's rural hinterlands. The question is whether or not these municipalities are prepared for the virus and its effects. COVID-19 is rapidly spreading throughout India and the rest of the world. It is necessary to develop a tool for district-level planning, prioritisation, and resource allocation. This study uses publicly accessible data to create a vulnerability index that may be used to identify vulnerable regions in India based on demographic and infrastructure features.

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I. Introduction

Covid-19 or Coronavirus-2 or severe acute respiratory syndrome coronavirus 2 (SARS-Cov-2) was first detected in Wuhan city, Hubei Province of China in December 2019 as a series of pneumonia cases caused by a new virus and was named coronavirus disease 19(COVID-19) on 11 February 2020. Since then, more than 480 million people have been affected by it. More than 6 million people have been reported death worldwide due to Covid-19. On January 30, 2020, India announced the first instance of the COVID-19 pandemic in India. India currently (i.e., 26 Mar 2022) has more than 43 million total reported cases of Covid-19. India has the second-largest number of reported covid-19 cases after the USA which has more than 81 million reported covid-19 cases. Death cases in India due to covid-19 till now is more than 0.5 million and has the third-highest total deaths amongst all with the USA having the most total deaths of more than a million, followed by Brazil with more than 650 thousand total deaths.

India has total recovered cases of more than 42 million. With active cases less than 17 thousand (i.e., 26 Mar 2022). India has the highest patient in serious/critical points (8944 cases). India has 371 deaths per million people due to Covid-19. The highest number of deaths per million people due to Covid-19 is seen in Peru with around 6280 deaths per million people. To date, India has conducted more than 785 million tests for Covid-19 which make India the second largest country in term of test conducted for Covid-19 with the USA being the first with more than 977 million tests conducted for Covid-19.

Identifying the population with a higher risk of infection and death, as well as implementing more effective monitoring and targeted therapies, can help to mitigate the epidemic's negative consequences and aid in the eventual control of COVID-19. Previous epidemiological research based on hospital data found that age and gender are two of the most critical characteristics that influence COVID-19 susceptibility and severity [5,6,7]. However, research is addressing country-specific issues. In this regard, an investigation into Indian contributions to COVID-19 research articles has been made.

II. Literature Review

The majority of COVID-19 patients were Mild/Moderate, with dyspnea occurring after 1 week. Acute respiratory distress syndrome (ARDS), acute respiratory failure, septic shock, coagulopathy, and metabolic acidosis were among the symptoms that developed quickly in severe patients. Early identification of risk factors for critical diseases is critical, not only to more precisely define the defining clinical and epidemiological

characteristics, but also to provide appropriate supportive care and, if necessary, quick access to the intensive care unit (ICU)[7]. Because of its large population, weak infrastructure, and complex socioeconomic structure, India's condition is even direr [8].

The immune system is critical in preventing infection from a variety of microbes, including viruses. The normal human immune system evolves from the foetal to infant stage, matures from adolescence to adult stage with variability throughout pregnancy, and then declines as approaching senescence [9].

Males (65.39%) had more COVID-19 cases than females (34.61%), and the average age of infected and recovered patients was 39.47 ± 17.59 years and 36.85 ± 18.51 years, respectively. Females had a much higher risk of infection in the younger age groups, which decreased as they got older. Females had considerably higher age-adjusted recovery odds (O.R. = 1.779), and recovery odds were highest in the 5– 17-year age group (O.R. = 88.286), regardless of gender [10].

The infection fatality ratio will be higher in countries with a higher prevalence of co-morbidities, such as diabetes, obesity, and heart disease. Countries with health-care systems that are better, are able to handle patients who are extremely ill with COVID-19, or where hospitals were not overburdened during the epidemic's peak, will have higher survival rates, according to a study [1]. Various researches conducted around the world have found that elderly guys are more susceptible to SARS-CoV-2 infection (>50 percent) [11].

A developing country's post-epidemic management strategy is policy-oriented, with post-epidemic management given higher emphasis than pre-epidemic management. As a result, improvements to public health infrastructure at a large scale are given less priority. Another issue is that pharmaceutical attempts to overcome the crisis ignore socio-economic issues such as poverty, educational illiteracy, and lack of knowledge. However, these socioeconomic factors have a significant impact on vulnerability; poor socioeconomic situations make it more difficult to tolerate the consequences of a hostile scenario [12].

The novel 2019 coronavirus causes considerable morbidity and mortality linked to multiorgan failure, particularly in the elderly. The review outlines the complications of Acute respiratory distress syndrome, acute kidney injury, acute liver injury, Acute cardiac injury, and shock when they are all combined. Being older increases the likelihood of COVID-19-related problems during hospitalisation. Because older people are more likely to develop complications and have a higher risk of death, health care practitioners should pay special attention to them [13]. Higher rates of smoking, lower handwashing rates, pre-existing respiratory illnesses, and biological differences between sexes are all factors that the researchers believe contribute to male infection and mortality [14].

SARS-CoV-2 infection susceptibility varies by age; therefore, children are less likely than adults to become infected after coming into contact with an infectious person. Immune cross-protection from other coronaviruses [15,16,17] or non-specific protection resulting from recent infection with other respiratory viruses [18], which children experience more frequently than adults [19,20], could cause decreased susceptibility. Direct evidence for decreased SARS-CoV-2 susceptibility in children has been mixed [21,22], but if true, could result in lesser transmission in the general population.

The covid-19 pandemic has shut down and affected the economy of most countries around the world. Not just the economy, the lifestyle of people has also seen drastic changes across the year. These forceful changes in lifestyle have affected people's behaviour toward health disasters. Like most countries around the world, India was also affected by Covid-19 both economically and emotionally. As India houses around one-sixth of the population of the world, Covid-19 like viruses that can transfer through the air and with contact, are a serious threat to a place that has a dense population such as India.

It has turned into a public health calamity in India, with the severity escalating all the time. Understanding the role of age in Covid-19 transmission and disease severity is crucial for calculating the predicted worldwide disease burden and determining the likely impact of social-distancing interventions on Covid-19 transmission, particularly those aimed at schools.

III. Methodology

3.1 Data Sources

The current research is based on secondary data taken from a well-known web-based portal (<https://api.covid19india.org/documentation/csv/>), which is an open-source portal/page of the COVID-19 tracking website (<https://www.covid19india.org/>). The portal preserves a real-time record of COVID-19 cases in India and lets users view raw (CVS) data in several categories such as the number of cases in the state, district, cities, even the condition of an infected person in the manner of hospitalised, discharged or deceased and age/gender. The information on the portal was based on official estimations and was obtained mostly from government websites and publications.

Raipur was selected as the geographical subject for the study. Data from Covid-19 patients was obtained by filtering the data collected from the above-mentioned link using Python.

3.2 Data analysis

It was hypothesised that reported cases follow the stationary distribution of cases attained in the early stages of an epidemic to deduce the age-specific clinical proportion and susceptibility from reported case distributions. The use of a dynamic model allowed for the modelling of any temporary emphasis in the case distribution related to the age of the persons that seeded illness in a certain region, but because the age of the genuine first cases is unknown, a stationary distribution was utilised instead. The subjects were divided into six age groups, 15-25 years, 26-35 years, 36-45 years, 46-55 years, 56-65 years, 66-75 years. Males and females were also divided based on age group. The mean, standard deviation, percentage, and count under various categories and subcategories were reported using descriptive statistics. Cases of recovered and deceased patients were not considered for this study. Chhattisgarh has reported more than 11.5 lakh cases of Covid-19 infection. Around 14 thousand deaths have been reported in Chhattisgarh, which is a tenth of the highest death state-wise.

3.3 Demographic Analysis

Because the nature of the COVID-19 pandemic is such that both the rate of transmission and infection-related mortality is dependent on population demographics, demography should be included in a vulnerability index. In the framework of COVID-19, we used the following three indicators to indicate a population's demographic composition: the proportion of the population aged 60 and older, the proportion of the population living in urban regions, and population density. Raipur has a population density of 750/km² (1900/sq mi) with a population of around 1.7 million (2022), whereas India has a population density of 464/km².

3.4 Eligibility of Included Studies

Criteria for selection of the studies were based such that it must report data on at least one of these variables, such as sex, and age. The sample size of studies must be greater than 1000, due to the increased effect on the size and statistical power due to the large number of studies published in the literature. It must be observational studies, either retrospective or prospective in nature.

IV. Results

Relation between the composition of age, gender and Covid-19 for the Raipur. Age groups were created with the difference of 10 years and show the male and female distribution among different age groups as shown in Table 1, lowest registered age is 15 years and the highest registered age is 75 years in both gender.

Table 1: Relation between the composition of age, gender and Covid-19 for the Raipur

Age	Gender	Frequency	Percentage(%)
15-25	Male	127	53.6
	Female	110	46.4
	Total	237	100
26-35	Male	194	52.0
	Female	179	48.0
	Total	373	100
36-45	Male	165	59.8
	Female	111	40.2
	Total	276	100
46-55	Male	87	61.3
	Female	55	38.7
	Total	142	100
56-65	Male	60	56.1
	Female	47	43.9
	Total	107	100
66-75	Male	10	43.5
	Female	13	56.5
	Total	23	100

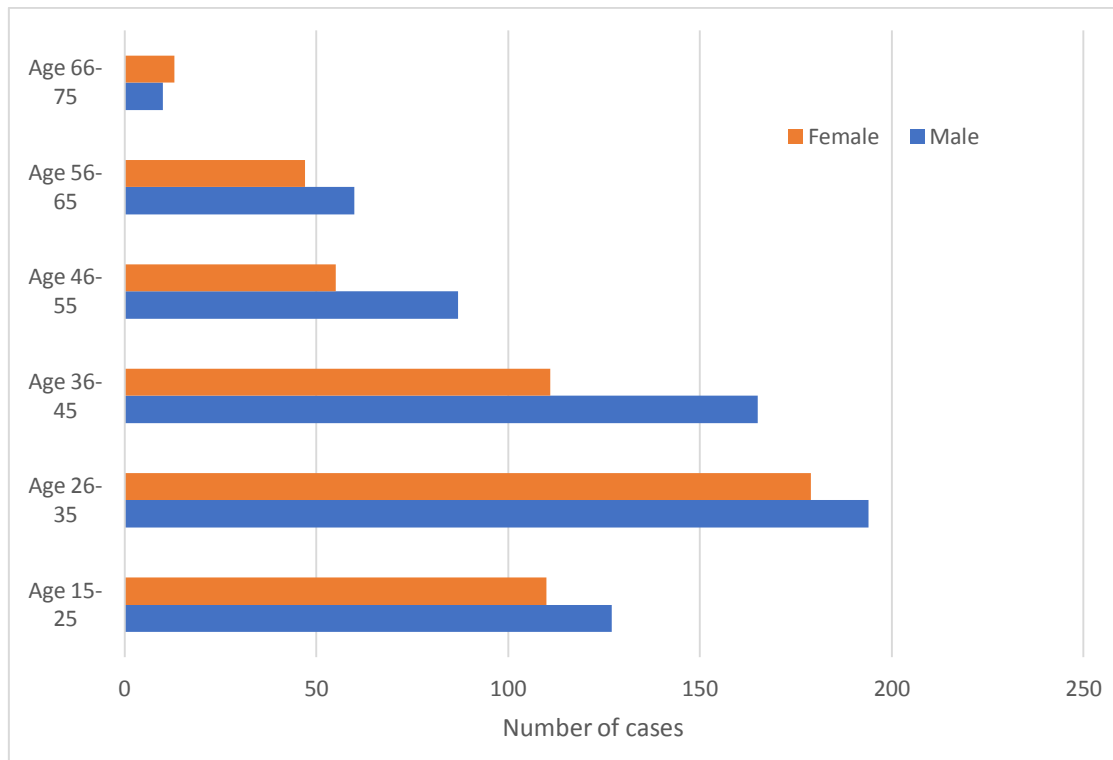


Figure 1: Graph of distribution of instances of Covid-19 concerning different age groups and gender.

Table 1 shows the relation between male and female in several age groups, in almost each age group males dominates the group in terms of the number of cases reported, except in the age group of 66-75, which shows an increase in females cases. Figure 1 shows that the age group at higher age has a larger difference in males and females in terms of the number of cases reported.

Table 2: Relation between the age, male and Covid-19 for the Raipur

Age	Males	Percentage(%)
15-25	127	19.7
26-35	194	30.2
36-45	165	25.7
46-55	87	13.5
56-65	60	9.3
66-75	10	1.5
Total	643	100

Table 2 shows the instances of Covid-19 found in males within several age categories. Maximum instances of Covid-19 was found in the age group of 26-35 at around 30.2 percent, followed by the age group 36-45 with 25.7 percent and lowest in the age group 66-75 with 1.5 percent.

Table 3: Relation between the age, females and Covid-19 for the Raipur

Age	Females	Percentage(%)
15-25	110	21.3
26-35	179	34.7
36-45	111	21.5
46-55	55	10.7
56-65	47	9.1
66-75	13	2.5
Total	515	100

Table 3 shows the instances of Covid-19 found in females within several age categories. Maximum instances of Covid-19 was found in the age group of 26-35 at around 34.7 percent, followed by the age group 36-45 with 21.5 percent and lowest at the age group 66-75 with 2.5 percent.

Table 4: Distribution of cases among different age groups

Age	Frequency	Percentage (%)
15-25	237	20.5
26-35	373	32.2
36-45	276	23.8
46-55	142	12.3
56-65	107	9.2
66-75	23	2.0
Total	1158	100

Table 4 reveals that young adults aged 26-35 years had the highest number of cases (373), followed by middle-aged people 36-45 years (276 instances), and teenagers aged 15-25 years (237 cases). The highest number of instances are seen in the younger age groups, as shown in this graph in figure 2.

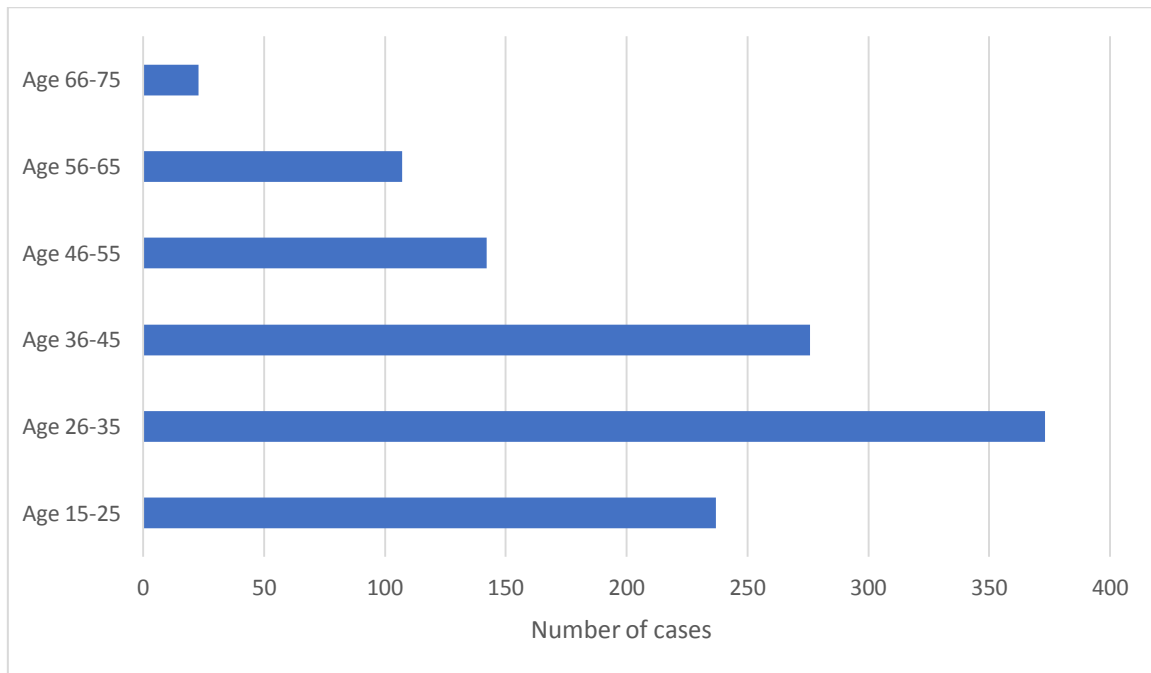


Figure 2: Graph of distribution of instances of Covid-19 with respect to different age groups.

Figure 2 and Table 4 illustrates that the young age group (i.e, age < 45), who are more at risk of exposure, has the highest number of cases, accounting for 76.5 percent of all cases. However, their distribution is nearly the same up to the age group <45, indicating that age may not be a factor in infection susceptibility.

Table 5 Distribution of cases among different gender

Gender	Frequency	Percentage (%)
Male	643	55.5
Female	515	44.5
Total	1158	100

In table 5, males account for an average of 55.5 percent of instances, while females account for an average of 44.5 percent. This suggests that guys may be at a somewhat higher risk of catching Covid-19.

V. Conclusion

In comparison to female patients with COVID-19, male patients had a considerably higher risk of catching Covid-19. Patients under the age of 55 had a much higher risk of catching Covid-19 than those above the age of 55. The highest number of cases were seen in the range of age 26-35 with 32.2 percent of the total cases reported, Also the highest number of cases for males and females was also seen in these group of age 25-36 which account for 30.2 percent and 34.7 percent of total males and females in study respectively. Adequate protection and therapies for COVID-19 patients in general, and in particular male patients under the age of 45 with comorbidities, could dramatically lower the risk of COVID-19-related mortality. Female at higher age (> 65) has shown a relative increase of instances of Covid -19 cases in comparison to male. Females in the lower age group (35 years) had a higher risk of being infected with COVID-19, which decreases with age. The

disparities in infection rates, chances of recovery, and mortality across age and gender could be explained by biological differences such as immunological and genetic variances, but more research is needed to confirm this, taking both social and biological aspects into account. The current findings can be used to establish strategies and initiatives and novel treatment options.

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