

Impact of COVID-19 Pandemic on General Population: Vaccination, Age group analysis

¹S P Devakrishnan and ²Anju Asokan

¹Student, Department of Mathematics, Amrita School of Arts and Science, Amrita Vishwa Vidyapeetham, Amritapuri Campus, Kollam

²Asst. Professor, Department of Mathematics, Amrita School of Arts and Science, Amrita Vishwa Vidyapeetham, Amritapuri Campus, Kollam

Abstract - Coronavirus disease 2019 (COVID-19) is a disease caused by severe acute respiratory syndrome coronavirus 2 (SARS CoV-2). It was confirmed on March 11, 2020, by the World Health Organization as pandemic disease. Regrettably, the spread of the virus and mortality due to COVID-19 has continued increasing daily. Hence, it is essential to rectify the spread of the disease extremely using nonpharmacological protocols such as quarantine, isolation, and public health education. A vaccine provides the favorable hope for a permanent antidote to controlling the pandemic. Considering the instantaneous need for global vaccination, the currently distributed vaccines have been generated with a quick period of testing and hence is a circumstance of concern among the society. Thus, this analysis was conducted to analyze the safety and effectiveness of vaccinations in the Indian state of Kerala. The study was a detailed questionnaire-based survey completed online by focusing on individuals aged ≥ 18 years. This work studied the effect of these different vaccines over different age groups under the Bayes theorem.

Index Terms - Age Group, COVID-19, SARS CoV-2, Vaccination.

INTRODUCTION

The COVID-19 pandemic, or coronavirus pandemic, is an ongoing pandemic of novel coronavirus disease 2019 (COVID-19) that spreads globally. The virus was first identified in Wuhan, China, in the last of 2019. They failed to maintain the outbreak and results in the rapid spread of the virus, countries around the globe went to lockdown. The first case of COVID-19, which was also the first case in all of India was recorded at Thrissur on 30 January 2020. By the time the first case was reported, the coronavirus had begun to spread completely. When the situation had become worse all around, the lockdown was announced in Kerala on 23 March and the rest of the country on 25 March. Health workers worked a day in and out to ensure that to do not allow coronavirus crises to go out of hand. The COVID-19 has built multiple situations on several fronts: health, travel, economy, finance, production and output, employment and unemployment, prices, emigration, etc.

Discovering an effective and safe vaccine for the COVID-19 infection has become a requirement for every health care on the earth. Clinical examinations were the most essential step in the development of a vaccine. By conducting these multiple examinations, we can understand the safety, potential, and efficiency of this vaccine that delays its takeoff. The vaccine should be tested in all categories of the population especially individuals such as the elderly, pregnant women, and people with immunodeficiencies.

The distribution of the vaccine for COVID-19 in India started on January 16 with a focus on India's healthcare and frontline workers. The distribution of the vaccine for COVID-19 in India started on January 16 with a focus on India's healthcare and frontline workers. Later in a phased way, the vaccination campaign continued to senior citizens over 45 years of age with comorbidities. Later in a phased way, the vaccination campaign continued to senior citizens over 45 years of age with comorbidities. From May 1, 2021, people over the age of 18 were eligible to be vaccinated. There are currently three vaccines administering in India. One was generated by AstraZeneca with Oxford University named **Covishield** and one by the Indian firm Bharat Biotech named **Covaxin**, both of which were accepted in January 2021. The third vaccine is Russia's **Sputnik V** which was approved in April 2021.

It usually takes years of effort to get an effective and safe vaccine developed. But given the seriousness and urgency of the matter, the current vaccines have been developed within a quick period of testing. Therefore, we need to comprehend how the safety and effectiveness of such vaccines are reflected in others.

Based on the data collected it indicates the reality that most of our adult population is vaccinated with two doses but still, they are prone to risk and from our outcomes, it is evident that the COVID-19 vaccines are not incredibly effective so breakthrough infection can happen.

SIGNIFICANCE

Vaccines save millions of lives each year. Vaccines work by preparing the body's immune system to identify and fight off the viruses they target. Even though this remains a fact we are forced to believe about this survey that even after vaccination if the body is exposed to those disease-causing germs, the body is not instantly ready to destroy them and prevent illness. Various safe and effective vaccines prevent people from getting extremely ill or dying from COVID-19. But none of these vaccines play a

crucial part in managing COVID -19 virus from entering into our immune system and preventing us from getting infected with the coronavirus.

OBJECTIVE OF THE STUDY

- To assess whether the individuals who have received the first dose vaccine have been affected by COVID-19.
- To assess whether the individuals who have received complete vaccine have been affected by COVID-19.
- To monitor whether the individuals of which age group are most affected by COVID-19 after vaccination.
- To assess the possible side effects, arise after getting the COVID-19 vaccine.

METHODOLOGY

The data collection was done at September,2021. The survey was completed among individuals aged above 18 years, of whom 334 were partially vaccinated, 220 were fully vaccinated. The data were obtained through online mode using Google forms and a convenient survey strategy was used.

Appropriate statistical analysis was conducted on the data attained, and the results were examined. Based on the objectives, the data we attained through the survey were categorized tabulated, and then the information is analyzed under the Bayes theorem.

Bayes' Theorem is one of the most significant concepts in statistics. It is a mathematical formula for specifying conditional probability. Conditional probability is the probability of an outcome occurring, based on a prior outcome occurring. Bayes' theorem gives a way to revise existing predictions or assumptions (update probabilities) given new or additional evidence.

RESULTS AND DISCUSSION

The collected data is classified and tabulated according to the objectives and analysis is done.

Table 1. SARS-CoV-2 infections among 1st dose vaccinated individuals

	Number of Individuals (%)
Get infected	176 (52.7%)
Not infected	158 (47.3%)
TOTAL	334

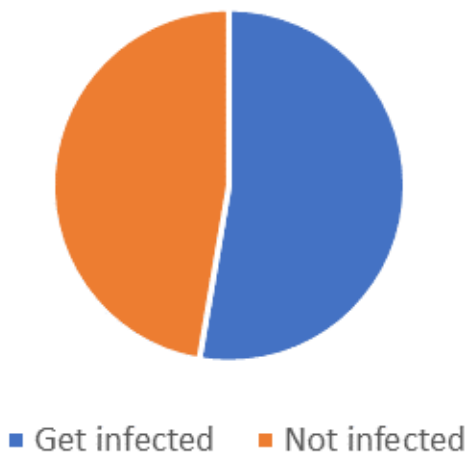


Fig 1. Infectious individuals after 1st dose of vaccination.

From Table 1: It is clear that those who took the first dose of the vaccine also have a better chance of becoming infected with the virus. More than half of the people surveyed were tested positive for COVID-19. Of the 334 participants, 176 were infected, that is about 52% of the people surveyed.

These figures will increase again. People need to change their mindset to get rid of COVID-19 completely just by taking the first dose of the vaccine. The vaccine will take a while to generate adequate antibodies to protect us. Although people who took the first dose of the vaccine must continue with COVID-19 appropriate behavior.

Table 2. SARS-CoV-2 infections among completely vaccinated individuals

	Number of individuals (%)
Get infected	73 (33.2%)
Not infected	147 (66.8%)
TOTAL	220

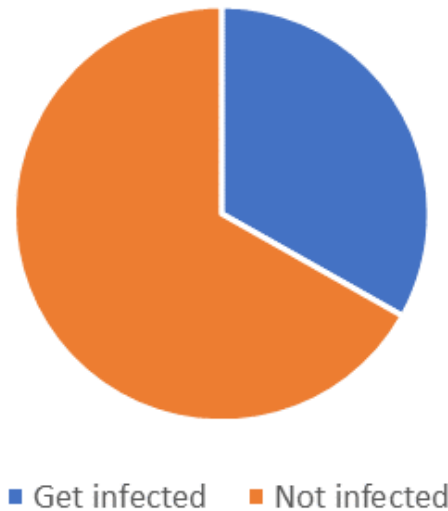


Fig 2. Infectious individuals after complete vaccination.

From Table 2: It is clear that among the participants they are also more likely to be tested positive even after receiving the second dose of vaccination or complete vaccination. Of the 220 participants, 73 were again confirmed to be COVID positive. (33.2% of the people surveyed)

Relating the positivity rate of those who received the first dose of the vaccine, their figures for complete vaccination are very low. Yet we have to fear these small figures.

By Baye's theorem,

Define the notation of probabilities,

$$P(A_0)$$

– The probability of individuals not vaccinated

$$P(A_1)$$

– The probability of individuals who received only the 1st dose of vaccine

$$P(A_2)$$

– The probability of individuals who received complete vaccination

$$P(B/A_0)$$

– The probability of individuals testing positive for COVID-19 who does not receive any vaccine

$$P(B/A_1)$$

– The probability of individuals testing positive for COVID-19 after getting 1st dose of vaccine

$$P(B/A_2)$$

– The probability of individuals testing positive for COVID-19 after complete vaccination

$$P(B^c/A_2)$$

– The probability of individuals who have not been infected by COVID-19 after complete vaccination

The chance that a randomly selected individual, who was infected by COVID-19 after complete vaccination is

$$P(A_2/B) = \frac{P(B/A_2)P(A_2)}{P(B)}$$

$$= \frac{P(B/A_2)P(A_2)}{P(B/A_0)P(A_0)+P(B/A_1)P(A_1)+P(B/A_2)P(A_2)} = 0.5755$$

The chance that a randomly selected individual, whom known to have not been infected by COVID-19, have taken complete vaccination is

$$P(A_2/B^c) = \frac{P(B^c/A_2)+P(A_2)}{P(B^c)} = 0.4648$$

From the above result, it is particularly evident that the probability of a selected individual who was infected by COVID-19 after taking complete vaccination is greater than the probability that an individual has not been infected.

Table 3. Number of COVID-19 cases after 1st dose vaccination, age group analysis.

Age Group	Number of individuals (%)
18 to 44	88 (50%)
45 to 60	64 (36.3%)
60 above	24 (13.7%)
TOTAL	176

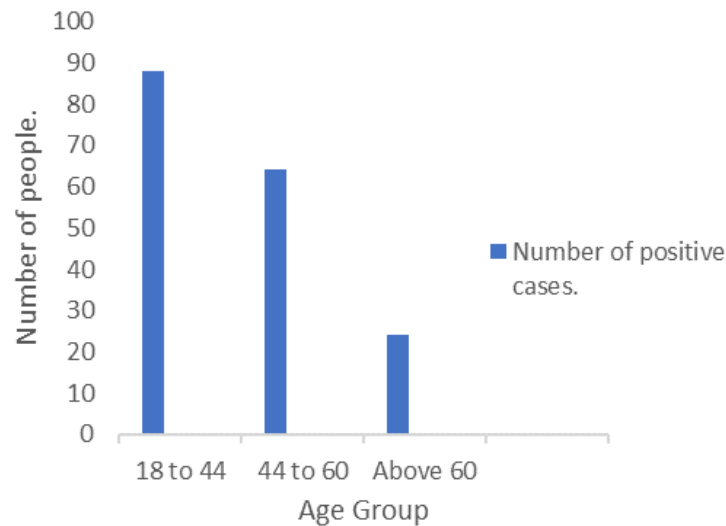


Fig 3. Age group analysis of infectious individuals after 1st dose vaccination.

Table 4. Number of COVID-19 cases after complete vaccination, age group analysis.

Age Group	Number of individuals infected (%)
18 to 44	40 (54.8%)
45 to 60	18 (24.6%)
60 above	15 (20.6%)
TOTAL	73

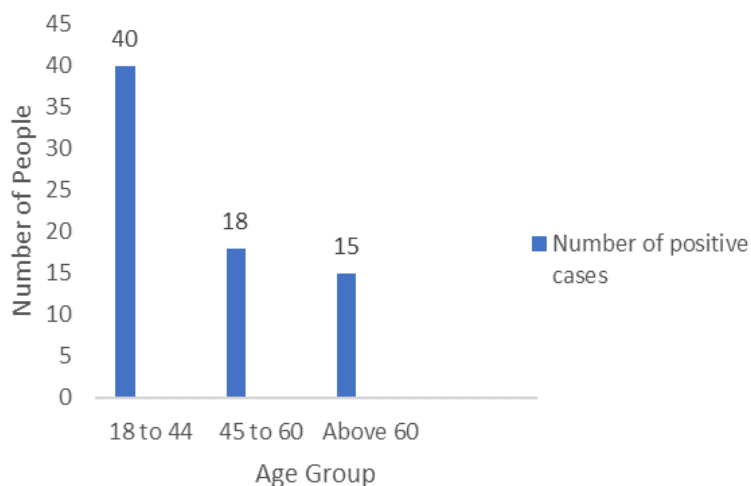


Fig 4. Age group analysis of infectious individuals after complete vaccination.

Population groups of 18-44 years of age and 44 – 60 years were highly vulnerable to infection. Perhaps, 18-44 years of age group was most affected. The rate of infection in people over the age of 60 is relatively low as compared to other age groups. Most people between the ages of 18 and 60 are employed and fully involved in work-related matters. Therefore, we need to comprehend from this statistic that this is likely to be the reason why people in this age group mostly get infected.

Table 5. Possible side effects arise after getting the COVID-19 vaccine.

Possible side effects	After 1 st dose vaccination	After complete vaccination
Fever	171 (51.2%)	87 (39.5%)
Fatigue	59 (17.7%)	28 (12.7%)
Muscle pain	211 (63.2%)	118 (53.6%)
Headache	153 (45.8%)	71 (32.3%)
Pain at injection site	199 (59.6%)	136 (61.8%)
None	35 (10.5%)	36 (16.4%)
TOTAL	334	220

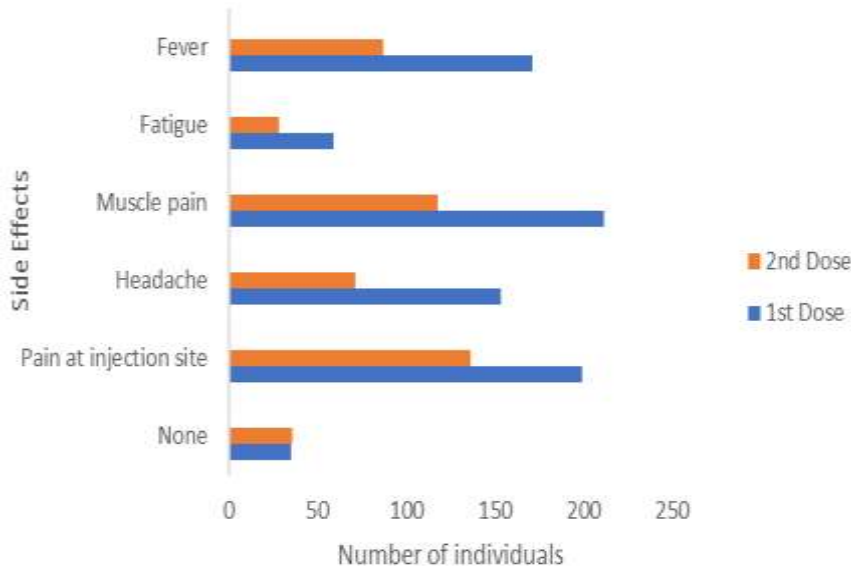


Fig 5. Side effects after getting a COVID-19 vaccine.

From Table 5: On Summarizing the reported side effects of vaccines, the majority of participants reported that there are post-vaccination side effects of both doses.

The most repeatedly reported symptoms after first dose vaccination were fever (n = 171, 51.2%), headache (n = 153, 45.8%), muscle pain (n = 211, 63.2%), and especially pain at the injection site (n= 199, 59.6%). Some of the participants reported fatigue (n = 59, 17.7%), and surprisingly very few participants are reporting that there are no post-vaccination side effects (n = 35, 10.5%).

Concerning the onset of side effects following the first vs second doses of COVID-19 vaccines, most participants reported pain at the injection site (n= 136, 61.8%), muscle pain (n = 118, 53.6%), fever (n= 87, 39.5%), headache (n= 71, 32.3%) and fatigue (n= 28, 12.7%). As earlier, quite a few participants reported that there are no side effects (n= 36, 16.4%) after the second dose of vaccine.

Notably, most of the side effects appeared mostly for 24 hours after injection.

CONCLUSION

Based on the data collected and from our findings it is clear that the COVID-19 vaccines are not incredibly effective up to the mark. After recent studies indicate that the number of progressive COVID-19 cases is increasing among those who have been fully vaccinated, they have expressed some concerns about the effectiveness of vaccines. It shows that completely vaccinated individuals are not still safeguarded from severe infections. It is attributed to the fact that most of our adult population is vaccinated with two doses but still, they are prone to risk.

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