International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Survey Report on Effectiveness of Vaccine Against Covid-19

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ABSTRACT

The ongoing COVID-19 pandemic, as a result of the SARS-CoV-2 virus, since December 2019, is a major health problem and concern worldwide. The pandemic has impacted various fields, from the social to the development of health science and technology. The virus has been mutating and thus producing several new variants, rushing research in the field of molecular biology to develop rapidly to overcome the problems that occur. Vaccine clinical studies are developing promptly with the aim of obtaining vaccines that are effective in suppressing the spread of the virus; however, the development of viral mutations raises concerns about the decreasing effectiveness of the resulting vaccine, which also results in the need for more in-depth studies. There have been 330 vaccines developed, including 136 clinical developments and 194 pre-clinical developments. The SARS-CoV-2 variant continues to evolve today, and it poses a challenge in testing the effectiveness of existing vaccines. This is a narrative review describing the emergence of the COVID-19 pandemic, development of vaccine platforms, identification of concerning mutations and virus variants in various countries of the world, and real-world monitoring of post-vaccination effectiveness and surveillance.

Keywords: COVID-19, mutated SARS-CoV-2 virus, vaccine, post-vaccine surveillance

INTRODUCTION

Since December 2020, several coronavirus variants have been identified and are under investigation. Each new variant raises questions: Are people more at risk of getting sick? Will the COVID-19 vaccines still work? Are there new or different things you should do now to stay safe?

As of April 2021, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the causative agent of COVID-19, accounted for more than 143 million infections and more than three million deaths worldwide[1]. Virus genomic sequences are being generated and shared at an unprecedented rate, with more than one million SARS-CoV-2 sequences available via the Global Initiative on Sharing All Influenza Data (GISAID), permitting near real-time surveillance of the unfolding pandemic[2]. The use of pathogen genomes on this scale to track the spread of the virus internationally, study local outbreaks, and inform public health policy signifies a new age in virus genomic investigations[3]. Further to understanding epidemiology, sequencing enables the identification of emerging SARS-CoV-2 variants and sets of mutations potentially linked to changes in viral properties.

As highly deleterious mutations are rapidly purged, most mutations observed in genomes sampled from circulating SARS-CoV-2 virions are expected to be either neutral or mildly deleterious. This is because although high-effect mutations that contribute to virus adaption and fitness do occur, they tend to be in the minority compared with tolerated low-effect or no-effect 'neutral' amino acid changes[4]. A small minority of mutations are expected to impact virus phenotype in a way that confers a fitness advantage, in at least some contexts. Such mutations may alter various aspects of virus biology, such as pathogenicity, infectivity, transmissibility, and/orantigenicity[5,6]

The extent to which mutations affecting the antigenic phenotype of SARS-CoV-2 will enable variants to circumvent immunity conferred by natural infection or vaccination remains to be determined. However, there is growing evidence that mutations that change the antigenic phenotype of SARS-CoV-2 are circulating and affect immune recognition to a degree that requires immediate attention importance. As with other coronaviruses, the entry of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) into host cells is mediated by the transmembrane spike glycoprotein. The SARS-CoV-2 spike protein is highly glycosylated, with 66potential N-glycosylation sites per trimer[7,8].

VE(Vaccine Efficacy) is defined as the disease risk in the participants who received the vaccine relative to the risk of disease for unvaccinated individuals in a controlled study[9]. The 0% efficacy indicates that the vaccine is ineffective. If vaccine efficacy is 50%, it means half of the people have a risk of infection. Because the studies were conducted with diverse populations, locations, and viral types, comparing the efficacy of the various vaccinations is difficult [10].

The rate of evolution of SARS-CoV-2 from December 2019 to October 2020 was consistent with the virus acquiring approximately two mutations per month in the global population. Although our understanding of the functional consequences of spike mutations is rapidly expanding, much of this knowledge involves the reactive investigation of amino acid changes identified as rapidly increasing in frequency or being associated with unusual epidemiological characteristics. Following the emergence of D614G, an amino acid substitution within the receptor-binding motif (RBM), N439K, was noted as increasing in frequency in Scotland in March 2020[40]. Whereas this first lineage with N439K (designated B.1.141 with the Pango nomenclature

system) quickly became extinct, another lineage that independently acquired N439K (B.1.258) emerged and circulated widely in many European countries[41,42]. N439K is noteworthy as it enhances the binding affinity for the ACE2 receptor and reduces the neutralizing activity of some monoclonal antibodies (mAbs) and polyclonal antibodies present in sera from people who have recovered from infection. Another RBM amino acid change, Y453F — associated with increased ACE2-binding affinity— received considerable attention following its identification in sequences associated with infections in humans and mink; most notably one lineage identified in Denmark and initially named 'cluster 5' (now B.1.1.298). As of 5 November 2020, 214 humans infected with SARS-CoV-2 related to mink were all carrying the mutation Y453F. The B.1.1.298 lineage also has Δ69–70, an amino-terminal domain (NTD) deletion that has emerged several times across the global SARS-CoV-2 population, including in the second N439K lineage, B.1.258. Δ69–70 is predicted to alter the conformation of an exposed NTD loop and has been reported to be associated with increased infectivity[43,44].

Genomic analyses indicate a change in the host environment and signatures of increased selective pressures acting upon immunologically important SARS-CoV-2 genes sampled from around November 2020.

What is a variant of concern?

Coronavirus variants are classified into different categories by organizations such as the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC).

A variant of interest is a coronavirus variant that, compared with earlier forms of the virus, has genetic characteristics that predict greater transmissibility, evasion of immunity or diagnostic testing, or more severe disease[48].

Figure no. 3 - 4 COVID - 19 Variants of Concern that worry the world.

EFFECTIVENESS OF VACCINES

COVID-19 vaccines have proven to be safe, effective, and life-saving. Like all vaccines, they do not fully protect everyone who is vaccinated, and we do not yet know how well they can prevent people from transmitting the virus to others. So as well as getting vaccinated, we must also continue with other measures to fight the pandemic[49].

Vaccine efficacy and effectiveness

All COVID-19 vaccines approved by WHO for emergency use listing have been through randomized clinical trials to test their quality, safety, and efficacy. To be approved, vaccines are required to have a high efficacy rate of 50% or above. After approval, they continue to be monitored for ongoing safety and effectiveness. But what is the difference between efficacy and effectiveness?

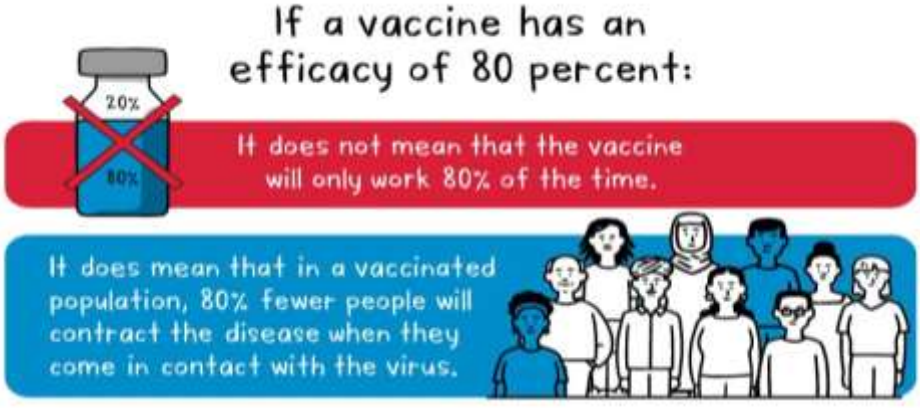


Figure no. 4 - Diagram showing the meaning of 80% efficacy of the vaccine.

Vaccine effectiveness is a measure of how well vaccines work in the real world. Clinical trials include a wide range of people – a broad age range, both sexes, different ethnicities, and those with known medical conditions – but they cannot be a perfect representation of the whole population. The efficacy seen in clinical trials applies to specific outcomes in a clinical trial. Effectiveness is measured by observing how well the vaccines work to protect communities as a whole. Effectiveness in the real world can differ from the efficacy measured in a trial because we can't predict exactly how effective vaccination will be for a much bigger and more variable population getting vaccinated in more real-life conditions[51].

Figure.05. - Why vaccination is important?

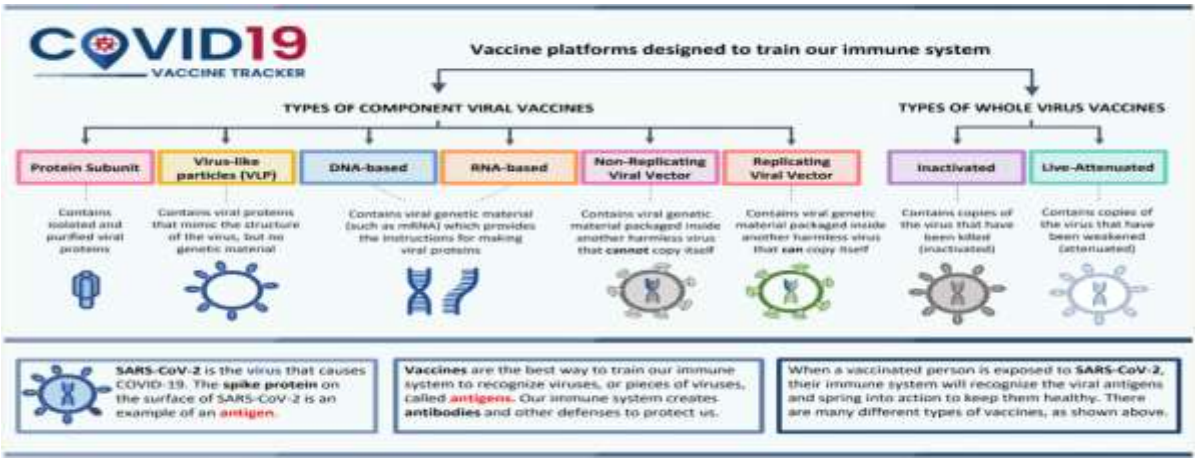


Figure. No.06. Types of viral vaccines

Covid-19 Vaccine Effectiveness against the Omicron (B.1.1.529) Variant

Between November 27, 2021, and January 12, 2022, a total of 886,774 eligible persons infected with the omicron variant, 204,154 eligible persons infected with the delta variant, and 1,572,621 eligible test-negative controls were identified[52]. At all time points investigated and for all combinations of primary course and booster vaccines, vaccine effectiveness against the symptomatic disease was higher for the delta variant than for the omicron variant. No effect against the omicron variant was noted from 20 weeks after two ChAdOx1 nCoV-19 doses, whereas vaccine effectiveness after two BNT162b2 doses was 65.5% (95% confidence interval [CI], 63.9 to 67.0) at 2 to 4 weeks, dropping to 8.8% (95% CI, 7.0 to 10.5) at 25 or more weeks. Among ChAdOx1 nCoV-19 primary course recipients, vaccine effectiveness increased to 62.4% (95% CI, 61.8 to 63.0) at 2 to 4 weeks after a BNT162b2 booster before decreasing to 39.6% (95% CI, 38.0 to 41.1) at 10 or more weeks. Among BNT162b2 primary course recipients, vaccine effectiveness increased to 67.2% (95% CI, 66.5 to 67.8) at 2 to 4 weeks after a BNT162b2 booster before declining to 45.7% (95% CI, 44.7 to 46.7) at 10 or more weeks. Vaccine effectiveness after a ChAdOx1 nCoV-19 primary course increased to 70.1% (95% CI, 69.5 to 70.7) at 2 to 4 weeks after an mRNA-1273 booster and decreased to 60.9% (95% CI, 59.7 to 62.1) at 5 to 9 weeks. After a BNT162b2 primary course, the mRNA-1273 booster increased vaccine effectiveness to 73.9% (95% CI, 73.1 to 74.6) at 2 to 4 weeks; vaccine effectiveness fell to 64.4% (95% CI, 62.6 to 66.1) at 5 to 9 weeks[53].

Effectiveness of Covid-19 Vaccines against the B.1.617.2 (Delta) Variant

Effectiveness after one dose of vaccine (BNT162b2 or ChAdOx1 Nov-19) was notably lower among persons with the delta variant (30.7%; 95% confidence interval [CI], 25.2 to 35.7) than among those with the alpha variant (48.7%; 95% CI, 45.5 to 51.7); the results were similar for both vaccines[54]. With the BNT162b2 vaccine, the effectiveness of two doses was 93.7% (95% CI, 91.6 to 95.3) among persons with the alpha variant and 88.0% among those with the Delta variant. With the ChAdOx1 nCoV-19 vaccine, the effectiveness of two doses was 74.5% among persons with the alpha variant and 67.0% (95% CI, 61.3 to 71.8) among those with the Delta variant[55].

India's "Covaxin" vaccine shows high efficacy against COVID-19 infections in phase 3 trial

The Phase 3 trial involved 25,800 participants in India aged 18 to 98. Of these, 2,433 were over 60 years old, and 4,500 had pre-existing medical conditions (co-morbidities) such as cardiovascular disease, diabetes, or obesity[56].

The study found that Covaxin had an efficacy of 93.4% against severe COVID-19 disease, and overall vaccine efficacy of 77.8% against symptomatic infections confirmed by PCR tests. Against asymptomatic COVID-19, the efficacy was 63.6%. The vaccine also conferred 65.2% protection against symptomatic infection with the Delta variant, at least two weeks after the second dose[57].

As a rough comparison, recent figures from Public Health Scotland suggested that at least two weeks after the second dose, the Pfizer-BioNTech vaccine was 79% effective against the Delta variant, while the Oxford-AstraZeneca was 60% effective[58,59]. However, different trial methodologies make it impossible to directly compare the relative efficacies of the various vaccines. ls and regulatory approval there.

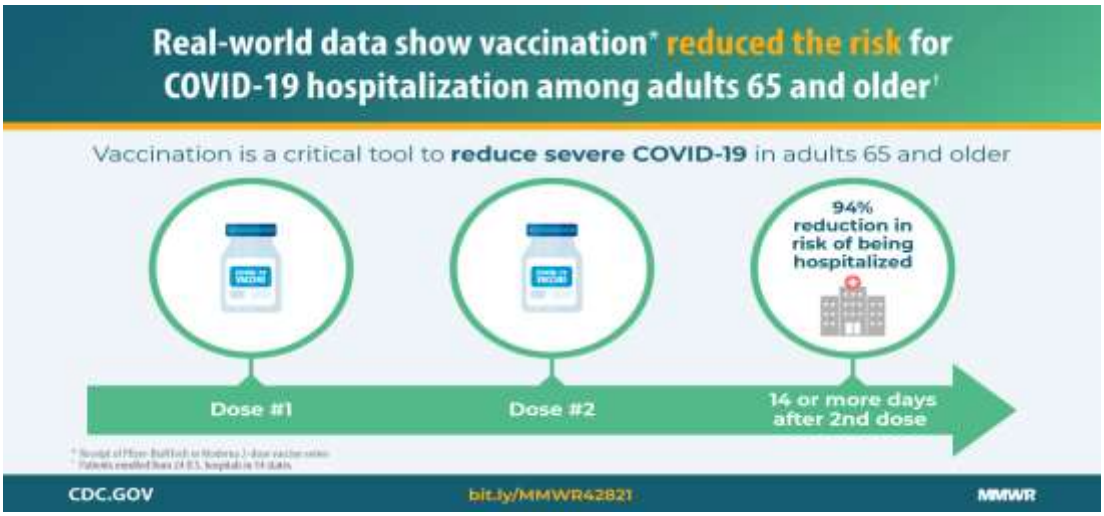


Figure no. 7 - Data showing vaccination reduced the risk for COVID-19 hospitalization among adults 65 and older.

SURVEY METHODOLOGY

The study accessed the effectiveness of vaccines against the coronavirus on the basis of the results of this survey report.

QUESTIONNAIRE

The questionnaire consisted of 27 multiple choice questions having 3 or more than 3 options, out of which only 1 suitable option was to be locked by the subject.

Methods

The study employed a descriptive cross-sectional design. A pretested questionnaire was self-administered to 92 students of the university and to 28 people in the age group 23-30.

The self-administered, pretested questionnaires were made available online in the form of google form were self-administered. The purpose of the study was explained to the respondents and their written consent to participate in the study was sought and obtained before the questionaries were administered. The confidentiality of the participant was guaranteed and they informed that the data will be analyzed at a group level in order to identify participants. Data were analyzed and summarized using descriptive and inferential statistics and results.

Overall we got the response of 120 people(92 students and 28 people in the 25-30 age group). In the results, we find different percentages of options, which shows that the vaccine is effective in people. The results showed that those who had received the vaccine had fewer symptoms of covid-19 and did not reach the hospital.

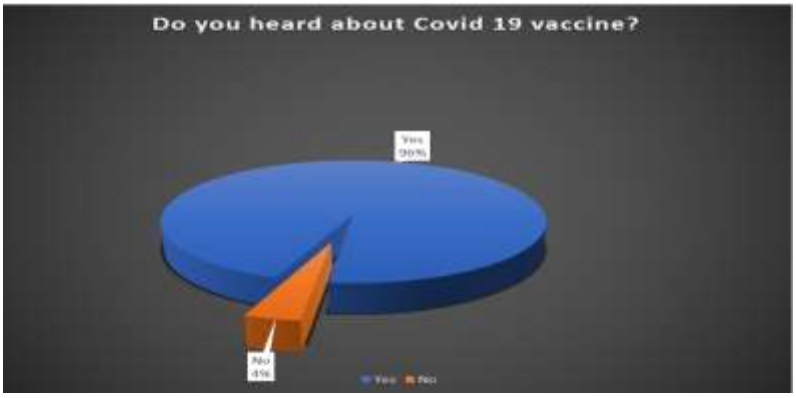
QUESTIONNAIRE

S.NO.	QUESTION	OPTIONS	ADULT
1.	Do you hear about the Covid-19 vaccine?	Yes No	96 4

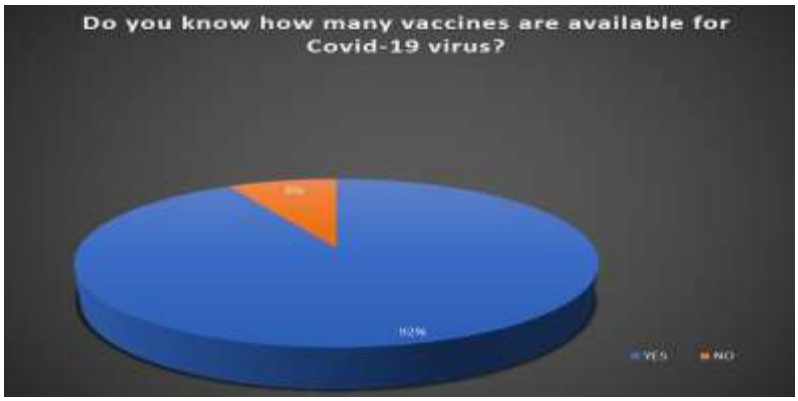
2.	Do you know how many vaccines are available for the Covid-19 virus?	Yes No	92 8
3.	Your knowledge of the Covid-19 Vaccine?	Good Poor	95 5
4.	Which of these vaccines do you know about?	Oxford-AstraZeneca Johnson & Johnson Pfizer Moderna Inovio Sputnik V CoronaVac/Sinovac Covaxin	21 22 30 18 5 39 27 83
5.	Do you think the current vaccine is effective against Covid-19?	Yes No May Be May Not Be	57 0 34 0
6.	Which vaccine you have been66 given?	Covishield Covaxin SputnikV Pfizer	61 37 0 0
7.	How many doses of vaccine you have taken?	First Dose Second Dose Both Both and Booster Dose None	13 0 78 0 0
8.	Have you noticed any side effects of the vaccine?	Yes No	52 48
9.	If yes then which of the following?	Fever Headache Body ache Rashes Vomiting Weakness Hair fall Face acne	57 26 26 1 5 29 1 1
10.	Do you have taken any medicine for the side effects?	Yes No May Be	35 61 0
11.	Do you have been infected with Covid-19 during the pandemic?	Yes No	26 74
12.	If yes then please mention	Before Vaccination After Vaccination Both Never	22 10 9 58
13.	In how many days do you get back to normal?	4 to 7 Days 7 to 14 Days 14 to 20 Days More than 20	65 10 18 0
14.	Were you hospitalized or not?	Yes No	5 92
15.	What were the symptoms of Covid-19?	Asymptomatic Mild Critical	13 51 18
16.	Is it affected your lungs?	Yes No	23 77
17.	What are the symptoms of Covid-19(Before vaccination)?	Asymptomatic Mild Critical	35 49 16

18.	What are the symptoms of Covid-19(After vaccination)?	Asymptomatic Mild Critical	38 58 6
20.	How did you convince your family members for taking the vaccine?	For the safety of an individual and others, Save you from going to hospital They convinced me	82 14 1 1 2
21.	Are you aware of the booster dose?	Yes No	85 14
22.	Have you taken a booster dose?	Yes No	86 4
23.	Do you know about different types of variants of viruses?	Yes No	84 6
24.	Which of the variant is more dangerous?	Alpha Beta Gamma Delta Omicron	12 3 2 46 37
25.	Which variant cause more death?	Alpha Beta Gamma Delta Omicron	29 12 5 4 49
26.	Do you think the current vaccine is effective against the new variant of Covid-19?	Yes No May Be	37 9 58
27.	Do you think you should take the vaccine on priority?	Yes No Definitely	54 7 38

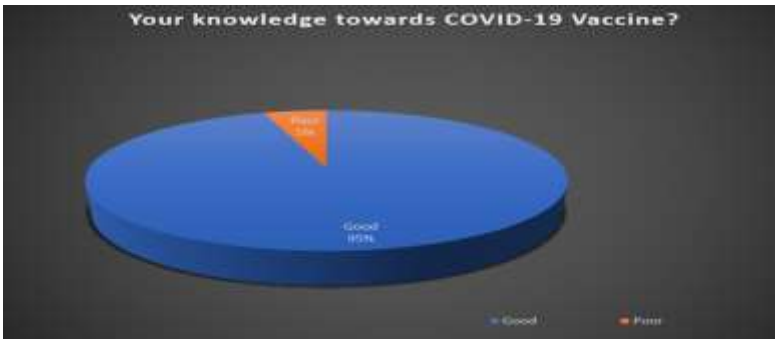
RESULTS ON PIECHARTS:



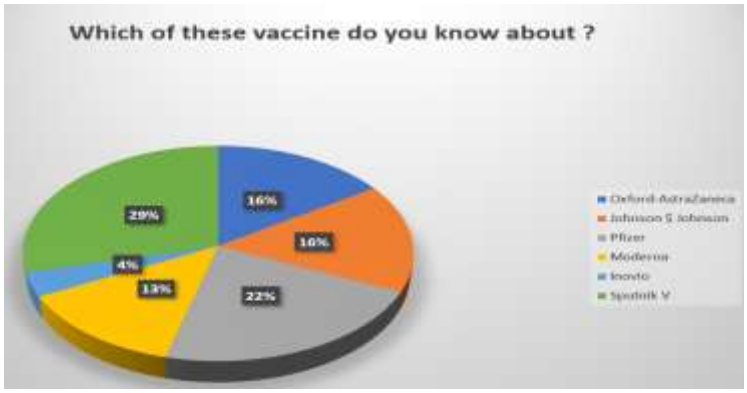
1. This data shows that more than 95% of people know about the COVID-19 Vaccine.



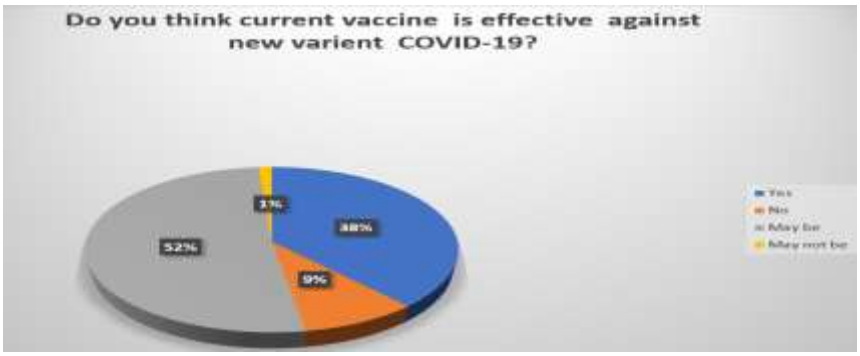
2. This data shows that 92% of people are aware of the number of vaccines available for COVID-19.



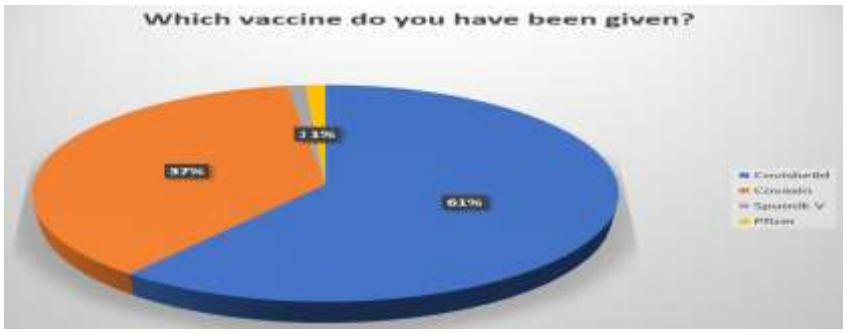
3. This data shows more than 95% of people know about the COVID-19 vaccine very well.



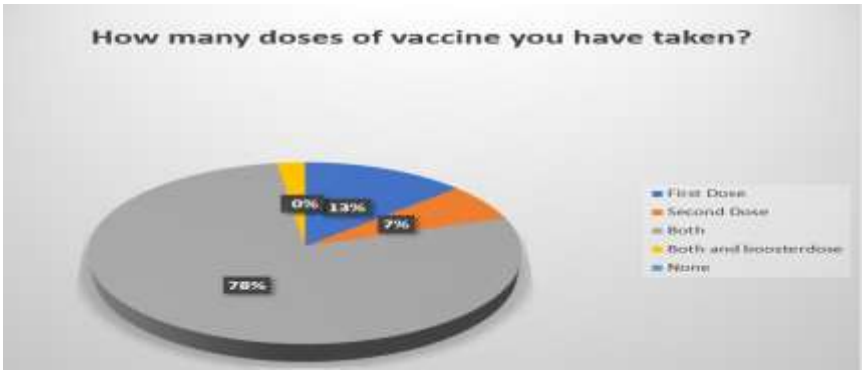
4. According to this data, 16% of people know about Oxford AstraZeneca, 16% of people know about Johnson & Johnson, and 22% of people know about Pfizer. All over, almost all are aware of the different vaccines available for COVID-19.



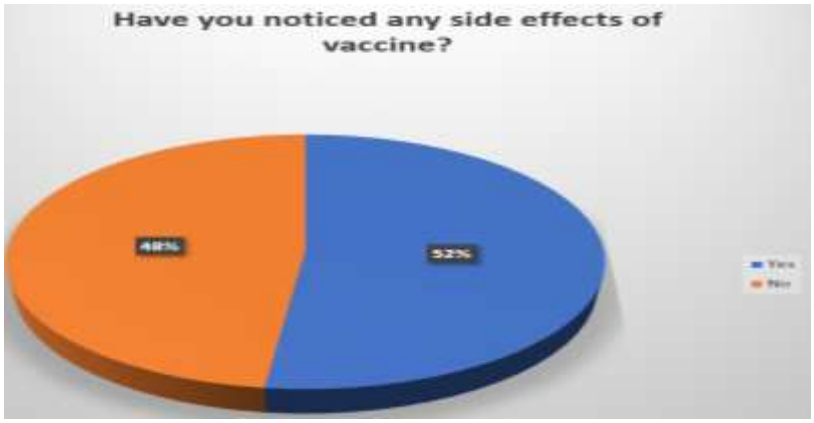
5. This data shows, that 52% of people are confused about the effectiveness of the vaccine COVID-19 virus. 38% of people say that the vaccine is effective against the COVID-19 virus. 9% of people are saying that vaccine is not effective against the COVID-19 virus.



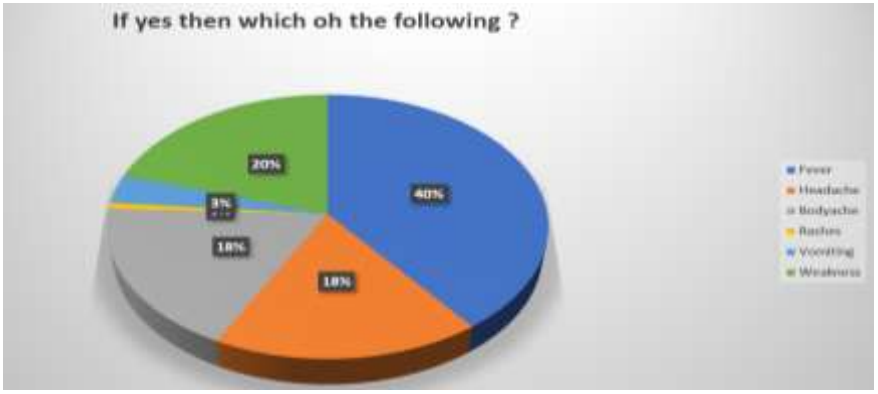
6. 61% of people are taken Covishield, and 37% of people are taken Covaxin. Less percentage of people there who have taken sputnik-V.



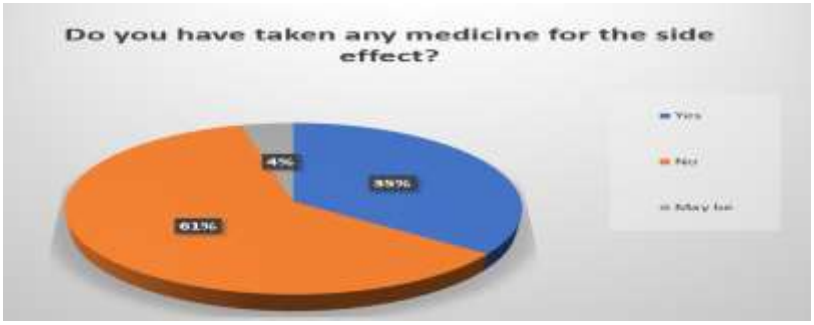
7. This data shows that 78% of people are vaccinated with both doses. 13% of people are vaccinated with the first dose only.



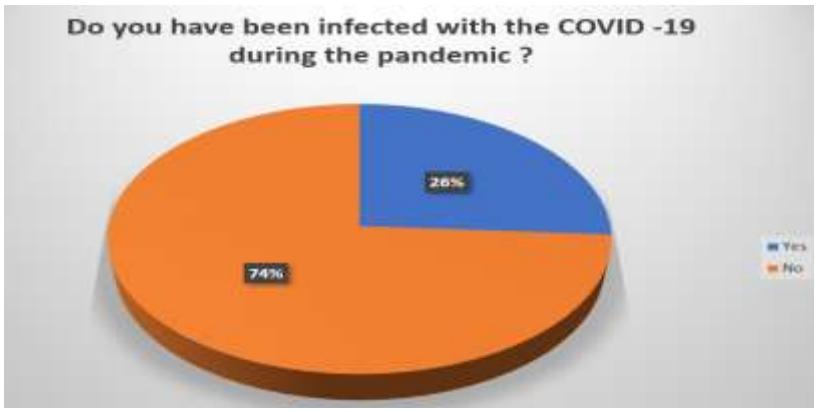
8. This data shows that 52% of people have confirmed the side effects of vaccines. And 48% of people have no side effects.



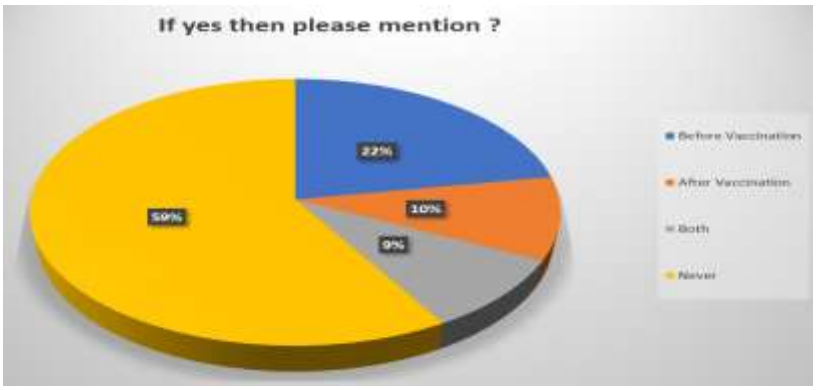
9. This data shows that 40% of people have been through fever, 18% of people have been through headaches, 18% of people have been through body aches, 20% of people have been through weakness, and only 1% of people have seen rashes.



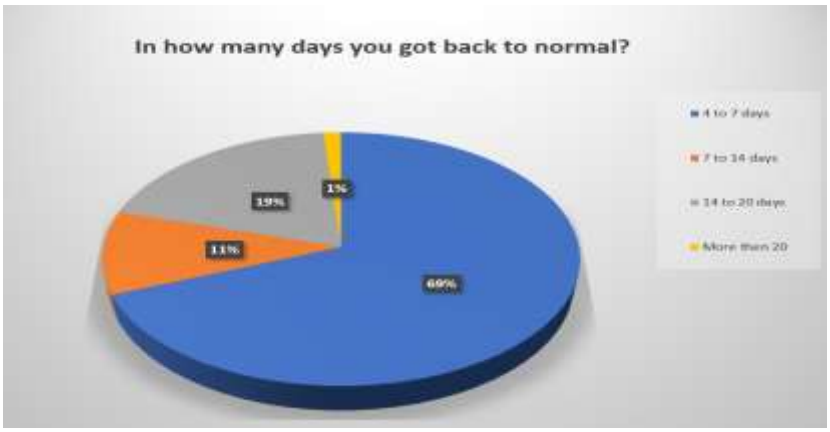
10. This data shows that 35% of people have taken medicines for the side effects to overcome the side effects of vaccines.



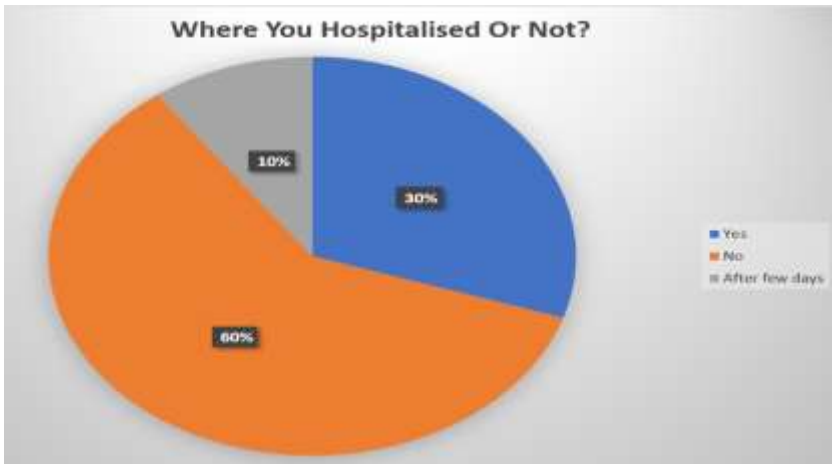
11. According to this data, 26% of people have been infected with COVID-19 during the pandemic. This survey is mainly on people 15 to 25 years of age.



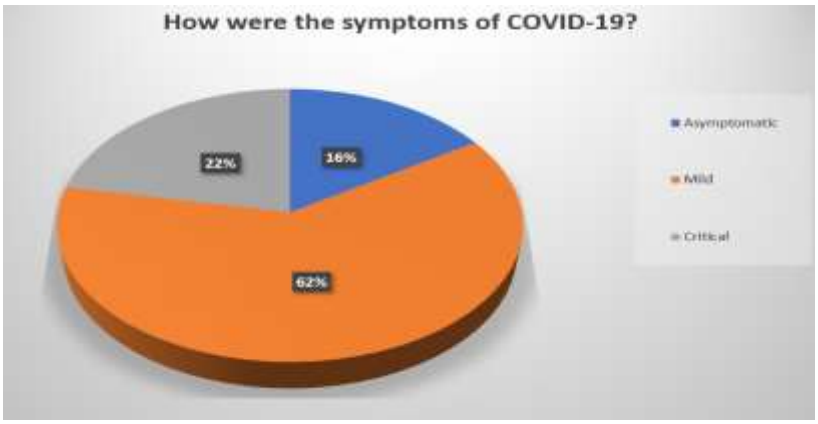
12. According to this data, About 22% of people got COVID-19 before vaccination, 10% of people got COVID-19 after vaccination, and 9% of people got COVID-19 before and after vaccination.



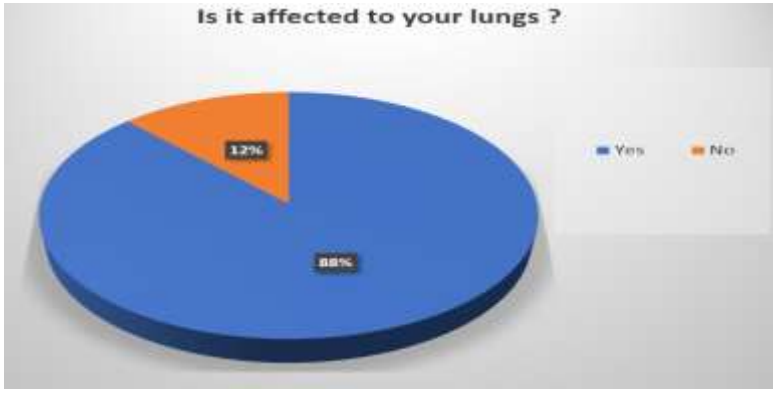
13. According to this data, 69% of people got back to normal within 4 to 7 days. 11% of people got back to normal within 7 to 14 days.



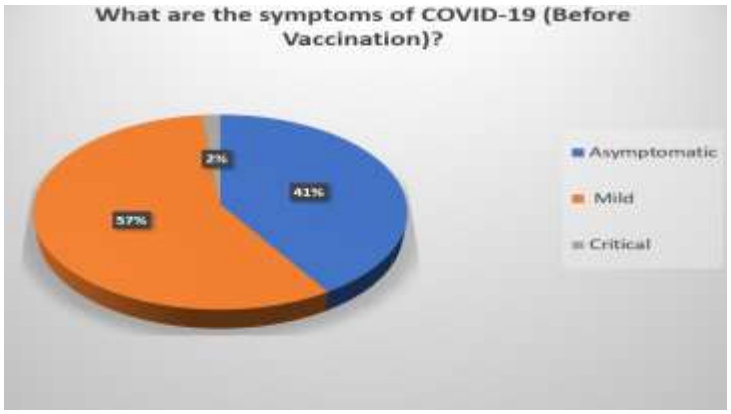
14. According to this data, 30% of people were hospitalized in hospital, and 10% of people got hospitalized after a few days.



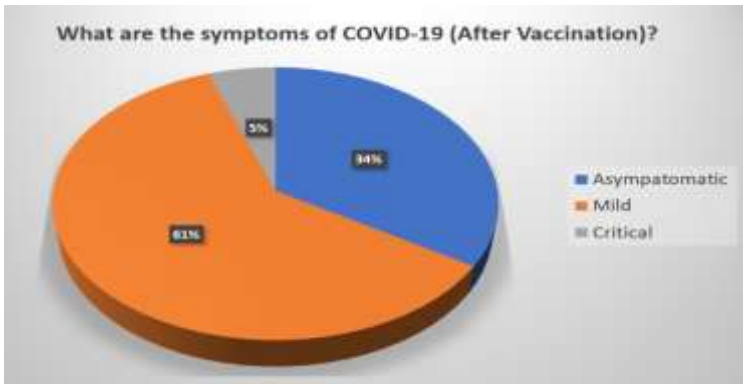
15. According to this data, 22% of people were critically affected by COVID-19, 16% of people were asymptomatic and 62% of people suffered from mild symptoms.



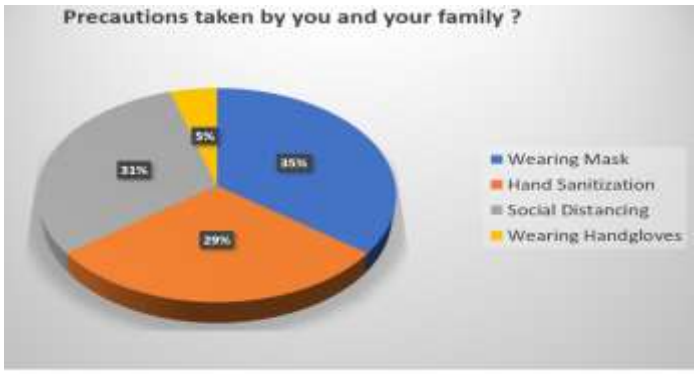
16. According to this data, 88% of people say that it affects their lungs and 12% of people were not get that serious.



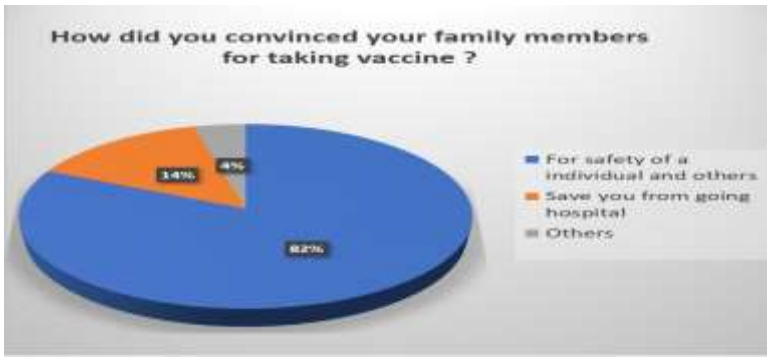
17. According to this data, 41% of people were Asymptomatic, and 57% of people suffered from mild symptoms. This data shows results before vaccination.



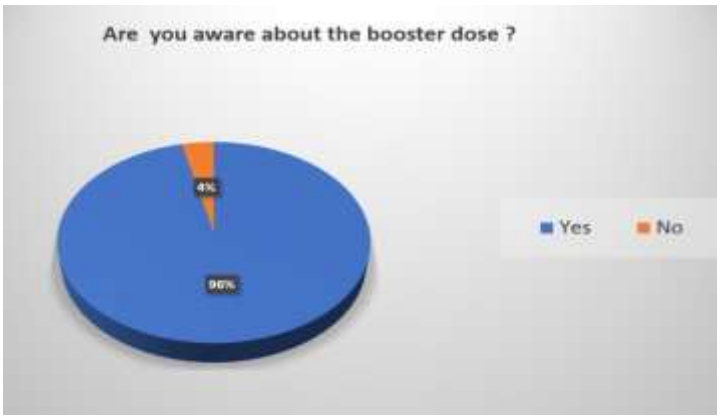
18. This data shows, that 61% of people suffered from mild symptoms, and 34% of people were asymptomatic.



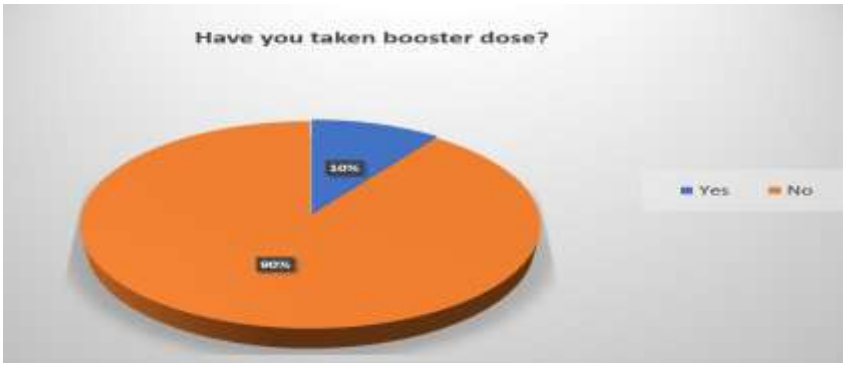
19. This data shows that everyone follows the law and taken precautions by wearing masks, sanitizing hands, maintaining social distancing, etc.



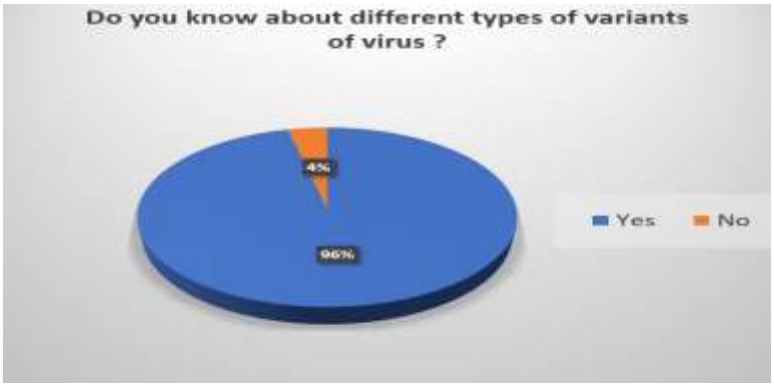
20. After the deadly wave of coronavirus, so many people were already ready to take vaccines because they want to be safe. So many people convinced their family members with reasons like safety and s it is lifesaving.



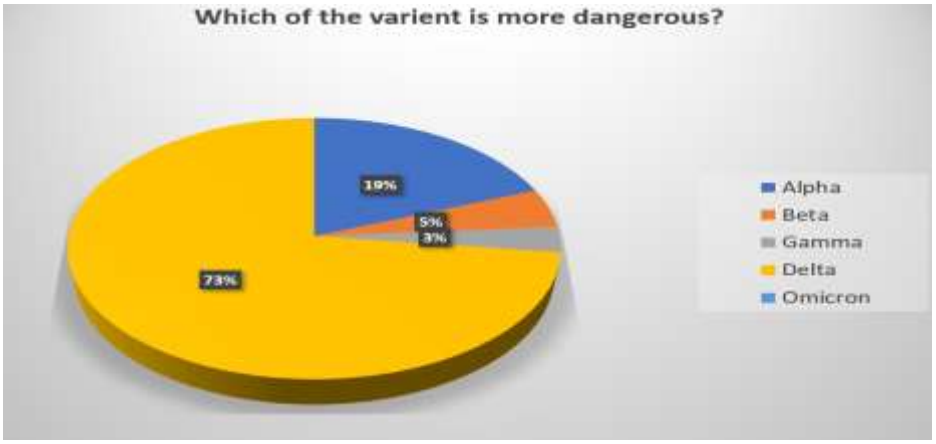
21. According to this data, 96% of people know about booster doses.



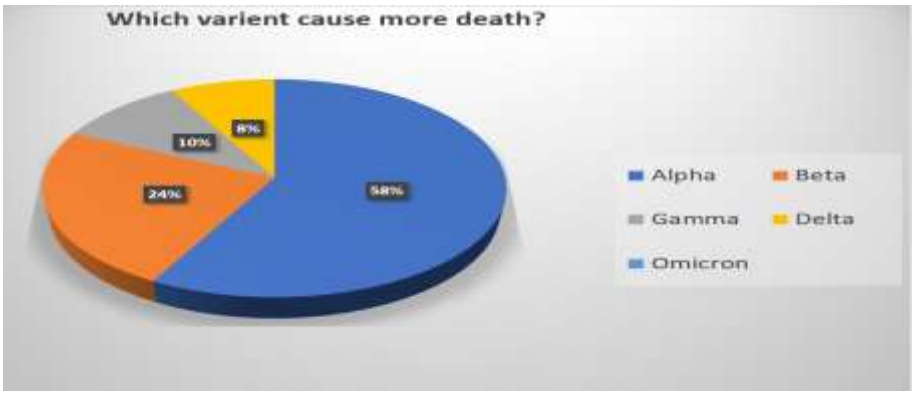
22. According to this data, only 10% of people took the booster dose. As this survey is on between 15 to 25-year-old people.



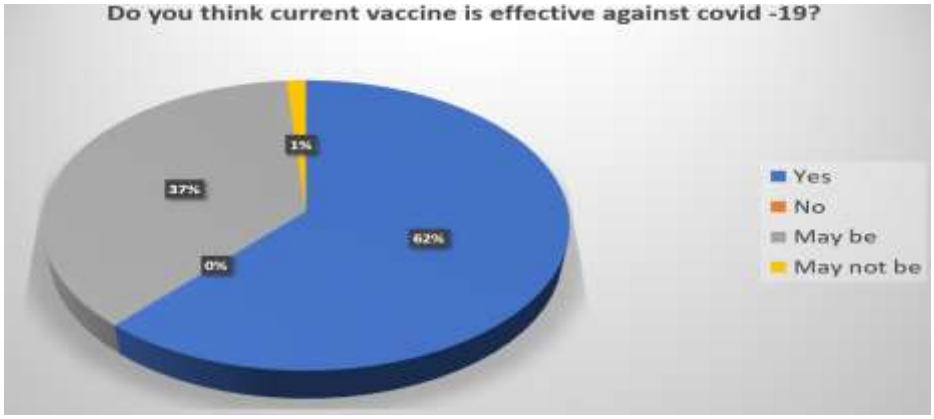
23. According to this data, 96% of people know about the different types of variants of viruses.



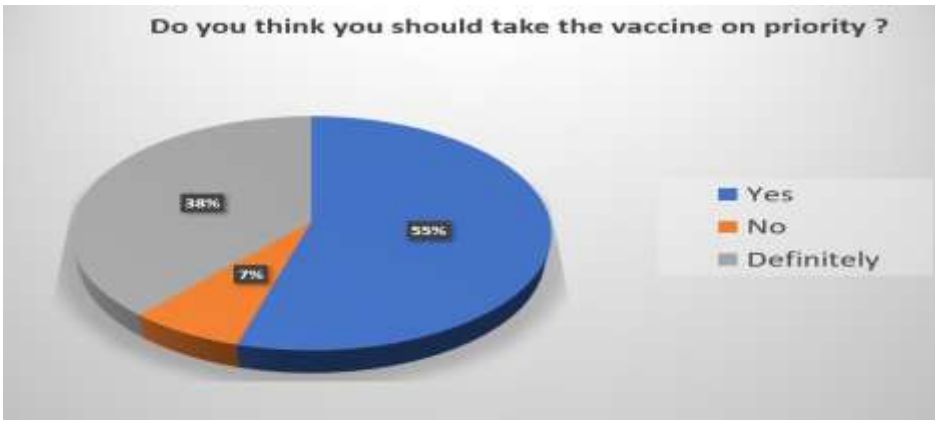
24. According to this data, 73% of people think that Delta is more dangerous.



25. According to this data, 58% of people think that Alpha causes more death. Whereas according to WHO Delta is the one who causes more death.



26. According to this data, 62% of people think that the current vaccine is effective against COVID-19.



27. According to this data, 55% of people think that they should take vaccines on priority.

CONCLUSION

By all the above data and surveys of more than 100 people, there are some points of conclusion:

1. Primary immunization with two doses of ChAdOx1 nCoV-19 or BNT162b2 vaccine provided limited protection against symptomatic disease caused by the omicron variant. A BNT162b2 or mRNA-1273 booster after either the ChAdOx1 nCoV-19 or BNT162b2 primary course substantially increased protection.
2. Only modest differences in vaccine effectiveness were noted with the delta variant compared with the alpha variant after the receipt of two vaccine doses. Vaccine effectiveness was more marked after the receipt of the first dose. This finding would support efforts to maximize vaccine uptake with two doses among vulnerable populations. (Funded by Public Health England.)
3. Two other vaccines have also been given emergency approval - Corbevax for children aged five-12; and Zydus's two-dose jab for children above 12. Corbevax is also currently being administered to children in the 12-14 age group.

4. According to the data of the survey, 15.9% were critically affected by the coronavirus and 49.2% suffered mild symptoms but after vaccination, the percentage of critically affected people got reduced to 6.7%. After vaccination, only 6.7 % of people were critically affected by the virus.
5. This data also proves that the vaccine is also effective on the new variants of the coronavirus [Omicron (B.1.1.529) Variant]. As the increasing number of COVID-19 positive patients is decreasing with an increased number of people who are vaccinated.
6. According to the data, Covaxin is 80% effective as after vaccination only 23.2% got a serious infection that affected their lungs.

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