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**A CROSS-SECTIONAL STUDY TO ASSESS THE PREVALENCE OF  
COVID-19 AMONG RECIPIENTS OF DIFFERENT REGIMEN OF  
COVID-19 VACCINATION**

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**ABSTRACT**

**Background:** The COVID-19 pandemic has posed a global health crisis, prompting the rapid development and deployment of multiple COVID-19 vaccination regimens. Understanding the effectiveness of these regimens in real-world settings is crucial for informed public health decisions.

**Aim:** The main aim of the study is to assess the prevalence of COVID-19 among recipients of different regimen of COVID-19 vaccination.

**Material and method:** The cross-sectional and explorative study examined the prevalence of COVID-19 among recipients of various COVID-19 vaccination regimens in Vadodara. Conducted from 20th April 2022 to 9th May 2022, the study employed a quantitative approach with a sample size of 1000, selected through nonprobability convenient sampling techniques.

The inclusion criteria comprised adults (18+) who received Covaxin, Covishield, or Sputnik vaccines and were willing to participate, while individuals with terminal illnesses or respiratory conditions were excluded. Data were collected using a self-structured questionnaire, focusing on demographic variables and survey inquiries. The tool demonstrated high reliability (reliability coefficient of 0.7) through the test-retest method. **Results:** Out of 1000 sample, total 455(45.5%) got infected from COVID-19 and 545(54.5%) were not infected. **Conclusion:** The findings contribute to ongoing efforts to optimize vaccination strategies, control the spread of the virus, and inform public health policies in the fight against the COVID-19 pandemic.

**Key words:** Prevalence, COVID -19, Vaccination, Covaxin, Covishield, Sputnik

## INTRODUCTION:

Since its inception in December 2019, the COVID-19 pandemic has rampaged throughout the globe. Over 390 million people have reported positive cases of COVID-19 in the world and 5.7 million have lost their lives worldwide, whereas in India over 42 million reported cases and have reported with 5 lakh confirmed bereavements. The COVID-19 pandemic has affected various aspects of the world and the repercussions have been huge. The virus had caused a total collapse of the healthcare system in many countries and brought the world economy on its knees [1, 2]. In order to reduce the outbreak WHO pushed various countries to develop vaccines. This saw various pharmaceutical companies in a race against time to make the first ever COVID-19 vaccine. Russian vaccine by the name of Sputnik was the first vaccine to receive regulatory approval from any country in the world. Since then, various other vaccines such as Novavax covovax (Novavax formulation), spilevax, Pfizer (Comirnaty), serum Institute of India (covi-shield), Bharat Biotech (covaxin), Sinopharm (covilo), Sinovac (coronovac) have been approved by the WHO [3].

On 16<sup>th</sup> January 2021, India began the largest vaccination drive till date and the first batch of vaccines was rolled out. Since then, in the population over the age of 18 years, more than 89 crore people have

received the first dose and over 71 crore people have received the second dose. Among the age group of 15-18 years, over 4.5 crore people have received the first dose and over 3.5 lakh have received the second dose. Covishield accounts for over 80% of all the doses administered so far. As of now, there are 7 vaccines that have been approved in India but currently only 3 out of those are in use. These are Covishield, Covaxin and Sputnik. Covaxin is India's first indigenous vaccine. Recently, Serum Institute of India's Covocax and Biological E's Corbevax received a nod for emergency use. As per the data released by respective manufacturers, they claim that Covishield has been found to have an efficacy of over 80% and Covaxin of around 78%. The emergence of new variant in the form of Omicron gave rise to the 3<sup>rd</sup> wave in India which saw the Government promoting the vaccination drive further by making the booster/precautionary dose available to healthcare professionals and senior citizens who had completed 9 months since their second dose of the vaccine. Till date over 1.25 crore people have received the precautionary dose with the vaccination drive still ongoing [4]. Some studies suggest a decrease in disease severity and fatalities among fully vaccinated individuals contracting COVID-19. However, many people, even after partial or complete vaccination, have still

caught the virus, causing concerns and doubts about the vaccines' effectiveness. Although it's believed that most fully vaccinated individuals who get infected don't experience severe illness, there's a need for solid data to support this claim. Therefore, our study aims to assess COVID-19 prevalence in vaccinated individuals, helping to understand the impact of different vaccine doses. With a limited focus on vaccine efficacy in existing literature, it's crucial to conduct more large-scale studies to evaluate the overall impact of vaccines.

#### **MATERIAL AND METHOD:**

This study utilizes a quantitative methodology, to examine the occurrence of COVID-19 among persons who have been administered different COVID-19 vaccinations in the Vadodara area. The research design is distinguished by its cross-sectional nature, whereby data is gathered from a particular population at a singular instance. The data used in this investigation was derived from individuals who had previously undergone COVID-19 vaccines. The researchers employed a nonprobability convenient sampling method to pick the participants for the study.

The estimated sample size for the study is

$$384.S = (Z\text{Score})^2 * P * (1-P) / (M)^2$$

$$S = (1.96)^2 * 0.5 * (1-0.05) / (0.05)^2$$

$$S = 5.8416 * 0.25 / 0.0025$$

S=384. The sample size we have selected for the present study is 1000. The original

concept for the research included a sample size of 384 persons, as determined by a formula. However, in practice, the study expanded to include a bigger sample of 1000 participants. This greater sample size has the potential to enhance the robustness of the study. The inclusion criteria include that the research cohort should consist of individuals who are of adult age, namely 18 years and older, who are currently resident within the Vadodara district. Additionally, these individuals must have received one of the three designated vaccines: Covaxin, Covishield, or Sputnik. Moreover, it was a prerequisite for the participants to demonstrate a willingness to participate in the research. In contrast, the exclusion criteria were formulated with the intention of excluding persons afflicted with terminal diseases or those with respiratory problems such as asthma or chronic obstructive pulmonary disease (COPD). The data gathering procedure was conducted between the dates of April 20, 2022, and May 9, 2022. Throughout this period, the research team effectively communicated the objective of the study to every participant and meticulously gathered data in a rigorous and uniform manner. The necessary permissions were acquired from the appropriate administrative bodies, and written consent was gained from each participant after providing them with comprehensive information about the

study's purpose and procedures. This was done to assure their voluntary participation and safeguard their confidentiality. The research used a survey instrument that included inquiries pertaining to demographic factors, participants' immunisation records, and survey questions designed to evaluate the incidence of COVID-19 infection among the participants. The assessment of the instrument's reliability, which pertains to the consistency and dependability of the data it gathers, was conducted using the Spearman-Brown prophecy formula. The obtained reliability value of 0.76 indicates a substantial degree of consistency and dependability in the measurements, implying that the instrument regularly yields stable and dependable outcomes upon repeated use. The researchers employed statistical analyses, including frequency percentages, to gain insights into the prevalence distribution of COVID-19 among the participants. Additionally, chi-square tests were utilised to investigate potential connections between COVID-19 infection and socio demographic factors such as age, gender, and vaccination regimen.

## **RESULTS:**

### **Section 1: Frequency and Percentage Distribution of Demographic Variables among recipient of different regimen of COVID-19 vaccinations**

The section 1 presents an analysis of the demographic characteristics and the outcomes of different COVID-19 vaccination regimens among a sample of 1000 recipients. The data reveals that the age distribution of recipients spans across all age groups, with the majority falling within the 21-30 years bracket. A significant gender imbalance is observed, with approximately 60.7% males and 39.1% females. Nearly all recipients (99.8%) received the COVID-19 vaccine, primarily with 822 individuals receiving the second dose. A substantial portion (54.3%) reported no history of infection, while the majority of infected individuals got infected before vaccination (26.3%) or after the first dose (16%). Covishield was the most commonly received vaccine (54.9%), followed by Covaxin (44.6%). The data also outlines the distribution of recipients based on blood group, living area (with an almost equal split between rural and urban residents), occupation (dominated by non-healthcare workers), and the presence of medical illnesses (with no prevalent specific illness). Lastly, the majority (70.3%) did not report any pre-existing medical conditions, with a smaller proportion reporting illnesses for durations ranging from 1-5 years, 6-10 years, and more than 10 years.

### **Section: 2 (Table 1) Prevalence rate of COVID-19 among recipient of different regimen of COVID-19 vaccinations**

**Table 1**, depicts the prevalence rate of COVID-19 among recipient of different regimen of COVID-19 vaccinations revealed that out of 1000 recipient

prevalence of 455(45.5%) were infected with COVID- 19 and 545(54.5%) were not infected.

**Table 1: Depicts the prevalence rate of COVID-19 among recipient of different regimen of COVID-19 vaccinations N=1000**

Have you got COVID infection?	Frequency	Percentage
Yes	455	45.5
No	545	54.3

### **Section: 3 Association between Prevalence of COVID-19 infection with selected demographic variables among the various regimen of covid-19 vaccination recipients.**

Section 3 examines the association between the prevalence of COVID-19 infection and various demographic variables among recipients of different COVID-19 vaccination regimens, based on a sample of 1000 individuals. The analysis indicates that there is a statistically significant association between the prevalence of COVID-19 infection and age groups ( $\chi^2 = 132.12$ ,  $df = 5$ ,  $p = 0.001^*$ ), number of vaccine doses received ( $\chi^2 = 19.91$ ,  $df = 3$ ,  $p = 0.001^*$ ), the number of times infected ( $\chi^2 = 60.12$ ,  $df = 2$ ,  $p = 0.001^*$ ), the timing of infection concerning vaccination doses ( $\chi^2 = 53.99$ ,  $df = 3$ ,  $p = 0.001^*$ ), the area of living ( $\chi^2 = 7.538$ ,  $df = 1$ ,  $p = 0.006^*$ ), the nature of work ( $\chi^2 = 5.551$ ,  $df = 1$ ,  $p = 0.018^*$ ), severity of infection ( $\chi^2 = 10.01$ ,  $df = 1$ ,  $p = 0.001^*$ ), the presence of medical illnesses ( $\chi^2 = 59.94$ ,  $df = 6$ ,  $p = 0.001^*$ ), and the duration

of illness ( $\chi^2 = 80.87$ ,  $df = 3$ ,  $p = 0.001^*$ ). However, no significant association was found between the prevalence of COVID-19 infection and other demographic factors such as gender, the type of vaccine received, name of the vaccination, blood group, and severity of infection after each vaccination dose. The significant associations found suggest that these demographic variables play a crucial role in influencing the prevalence of COVID-19 infection among individuals who have received different COVID-19 vaccination regimens.

### **Section 4: (Table 2) Association between the Blood group among the various regimen of covid-19 vaccination and prevalence of covid-19 infection**

The **Table 2**, investigates the association between different blood groups and the prevalence of COVID-19 infection among recipients of various COVID-19 vaccination regimens. The data suggests that there is no statistically significant association between blood groups and the prevalence of COVID-19 infection ( $\chi^2 = 15.19$ ,  $df = 7$ ,  $p =$

0.215NS). The prevalence of COVID-19 infection appears to be fairly consistent across different blood groups, with no particular blood group demonstrating a notably higher or lower risk of contracting the virus. This implies that, based on the current dataset, the various blood groups do

not significantly impact the susceptibility to COVID-19 among the recipients of different COVID-19 vaccination regimens. However, it is important to note that further research may be needed to confirm whether there is indeed no association or if other factors might be at play.

**Table 2: Association between the Blood group among the various regimen of covid-19 vaccination and prevalence of covid-19 infection**

Blood group	Prevalence		$\chi^2$ value	df	p value
	Yes	No			
O +	121	210	15.19	7	0.215 <sup>NS</sup>
O -	6	4			
A +	63	69			
A -	13	18			
B +	95	122			
B -	52	45			
AB +	59	67			
AB -	46	10			

### **Section 5: (Table 3) Comparison between vaccination after 1<sup>st</sup> dose and severity of infection.**

The **Table 3**, examines the relationship between the administration of the first dose of vaccination and the severity of COVID-19 infection. The data indicates a statistically significant association between the two variables ( $\chi^2 = 77.42$ ,  $df = 10$ ,  $p = 0.001^*$ ). Among those who contracted the virus after the first dose, the majority experienced mild symptoms, with some requiring hospitalization (14 individuals), while a larger proportion reported mild symptoms without the need for hospitalization (81 individuals). A smaller number faced moderate symptoms, with a few requiring hospitalization (40

individuals), and a minority experienced severe symptoms necessitating hospitalization (12 individuals). Notably, a considerable number reported no symptoms at all (268 individuals). This suggests that receiving the first dose of the vaccination may play a significant role in mitigating the severity of COVID-19 infections, as evidenced by a higher proportion of individuals experiencing milder symptoms, lower hospitalization rates, and a significantly lower incidence of severe symptoms compared to those who were unvaccinated. However, it is crucial to consider other variables and conduct further analysis to understand the complete impact of the first vaccine dose on the severity of COVID-19 infections.

Table 3: Comparison between vaccination after 1<sup>st</sup> dose and severity of infection

After 1 <sup>st</sup> dose	Severity of infection			$\chi^2$ value	Df	p value
	Mild	Moderate	Severe			
Mild with hospitalization	14	0	1	77.42	10	0.001*
Mild without hospitalization	81	10	5			
Moderate with hospitalization	40	4	4			
Moderate without hospitalization	19	0	0			
Severe with hospitalization	12	4	4			
Severe without hospitalization	--	--	--			
No	268	431	103			

**Section 6: (Table 4) Comparison between vaccination after 2<sup>nd</sup> dose and severity of infection.**

The **Table 4**, investigates the relationship between the administration of the second dose of vaccination and the severity of COVID-19 infection. The data shows a significant association between these variables ( $\chi^2 = 46.97$ ,  $df = 10$ ,  $p = 0.001^*$ ). Among individuals who contracted the virus after the second dose, the majority experienced mild symptoms, with some requiring hospitalization (5 individuals), while a larger proportion reported mild symptoms without the need for hospitalization (36 individuals). A small number faced moderate symptoms, with a few requiring hospitalizations (8

individuals), and a minority experienced severe symptoms necessitating hospitalization (1 individual). Notably, a significant number reported no symptoms at all (377 individuals). This suggests that receiving the second dose of the vaccination may play a significant role in reducing the severity of COVID-19 infections, as evidenced by a higher proportion of individuals experiencing milder symptoms, lower hospitalization rates, and a significantly lower incidence of severe symptoms compared to those who were unvaccinated. However, it is crucial to consider other variables and conduct further analysis to understand the complete impact of the second vaccine dose on the severity of COVID-19 infections.

Table 4: Comparison between vaccination after 2<sup>nd</sup> dose and severity of infection

After 2 <sup>nd</sup> dose	Severity of infection			$\chi^2$ value	df	p value
	Mild	Moderate	Severe			
Mild with hospitalization	5	0	0	46.97	10	0.001*
Mild without hospitalization	36	5	5			
Moderate with hospitalization	8	0	1			
Moderate without hospitalization	8	3	0			
Severe with hospitalization	--	--	--			
Severe without hospitalization	--	--	--			
No	377	441	111			

**Section 7: (Table 5) Comparison between vaccination after 3<sup>rd</sup> dose and severity of infection.**

The **Table 5**, examines the association between the administration of the third dose of vaccination and the severity of COVID-19 infection. The data indicates no significant association between these variables ( $\chi^2 = 2.614$ ,  $df = 2$ ,  $p = 0.271$ NS). Among individuals who contracted the virus after the third dose, only a small number experienced mild symptoms, with none requiring hospitalization, and no instances

of moderate or severe symptoms reported. A significant proportion reported no symptoms at all (432 individuals). This suggests that the third dose of the vaccination may not have a significant impact on the severity of COVID-19 infections, at least based on the current data. However, it is important to consider other potential variables and conduct further research to comprehensively understand the complete impact of the third vaccine dose on the severity of COVID-19 infections.

**Table 5: Comparison between vaccination after 3<sup>rd</sup> dose and severity of infection.**

After 3 <sup>rd</sup> dose	Severity of infection			$\chi^2$ value	Df	p value
	Mild	Moderate	Severe			
Mild with hospitalization	2	0	0	2.614	2	0.271 <sup>NS</sup>
Mild without hospitalization	--	--	--			
Moderate with hospitalization	--	--	--			
Moderate without hospitalization	--	--	--			
Severe with hospitalization	--	--	--			
Severe without hospitalization	--	--	--			
No	432	449	117			

**Section 8: (Table-6) Association between presence of infection and presence of medical illness.**

The **Table 6**, investigates the association between the presence of medical illnesses and the presence of COVID-19 infection. The data indicates a significant association between these variables ( $\chi^2 = 59.94$ ,  $df = 6$ ,  $p = 0.001^*$ ). Among those with medical conditions, a relatively high number had diabetes (71 individuals), followed by hypertension (35 individuals) and cardiac issues (14 individuals). Additionally, a small number reported other medical illnesses (2

individuals). In contrast, a substantial proportion of individuals with no reported medical illnesses also tested positive for COVID-19 (268 individuals). This suggests that the presence of underlying medical conditions may be linked to an increased likelihood of contracting COVID-19, highlighting the importance of considering these conditions as potential risk factors for infection. However, further investigation is needed to understand the specific impacts of individual medical illnesses on COVID-19 susceptibility and severity.

**Table 6: Association between presence of infection and presence of medical illness**

Presence of medical illness	Presence of infection		$\chi^2$ value	df	p value
	Yes	No			
Diabetes	71	37	59.94	6	0.001*
Hypertension	35	32			
Cardiac	14	4			
Others	2	1			
No	268	437			

**Section 9: (Table-7) Name of vaccine compared with how many times got infected.**

The **Table 7**, investigates the relationship between different COVID-19 vaccines and the frequency of COVID-19 infections. The data shows a significant association between these variables ( $\chi^2 = 13.82$ ,  $df = 6$ ,  $p = 0.032^*$ ). Among the vaccines, Covishield was associated with the highest frequency of infection, with 244 individuals reporting being infected once and 28 individuals reporting being infected twice. Covaxin was linked to a lower frequency of infection, with 153 individuals reporting being

infected once and 27 individuals reporting being infected twice. Sputnik was associated with the lowest frequency of infection, with only one individual reporting being infected once. Additionally, a substantial number of individuals who did not receive any vaccine reported no infections (266 individuals). This suggests that the type of vaccine received may play a role in the frequency of COVID-19 infections, indicating a need for further investigation into the efficacy of different vaccines in preventing COVID-19 infections and their potential to reduce infection frequency.

**Table 7: Name of vaccine compared with how many times got infected.**

Name of vaccine	How many times got infected			$\chi^2$ value	df	p value
	1	2	No			
Covaxin	153	27	266	13.82	6	0.032*
Covishield	244	28	277			
Sputnik	1	0	2			
No	2	0	0			

**Section 9: (Table 8) Association between when you have got an infection after vaccination.**

The **Table 8**, explores the relationship between the timing of COVID-19 infection in relation to vaccination and the type of vaccine received. The data demonstrates a significant association between these variables ( $\chi^2 = 24.20$ ,  $df = 9$ ,  $p = 0.004^*$ ).

Among the different vaccines, individuals who received Covaxin predominantly reported getting infected before vaccination (106 individuals), while fewer cases were reported after the first (68 individuals) and second (7 individuals) doses. Covishield recipients, however, reported a more balanced distribution of infection timings, with significant numbers reporting infection

before vaccination (154 individuals), after the first dose (90 individuals), and after the second dose (25 individuals). Sputnik recipients reported minimal cases of infection after any vaccination dose, with only one individual reporting infection before vaccination. A substantial number of individuals who did not receive any vaccine

reported no infections (265 individuals). This suggests that the timing of COVID-19 infection concerning the administration of vaccines may be influenced by the type of vaccine received, emphasizing the need for further research into the efficacy of different vaccines in preventing COVID-19 at various stages of the vaccination process.

**Table 8: Association between when you have got an infection after vaccination.**

When you have got an infection?	Name of vaccine				$\chi^2$ value	df	p value
	Covaxin	Covishield	Sputnik	No			
Before vaccination	106	154	1	2	24.20	9	0.004*
After 1 <sup>st</sup> dose	68	90	2	0			
After 2 <sup>nd</sup> dose	7	25	0	0			
After 3 <sup>rd</sup> dose	--	--	--	--			
No	265	280	0	0			

**DISCUSSION:**

The analysis of COVID-19 infection and vaccination regimens among 1000 recipients reveals that 45.5% were infected, and 54.5% remained uninfected. Further it highlights significant associations between infection prevalence and various demographic variables, such as age, the number of vaccine doses, timing of infection, area of residence, nature of work, severity of infection, medical illnesses, and illness duration, but no such associations were found with other demographic factors. Additionally, blood groups did not show a significant impact on susceptibility.

Present study suggest that the first and second vaccine doses may reduce infection severity, with higher proportions of individuals experiencing milder symptoms, lower hospitalization rates, and significantly fewer severe symptoms compared to the

unvaccinated. However, the third dose does not appear to significantly impact infection severity. Furthermore, the presence of medical illnesses increases the risk of infection, and the type of vaccine and timing of infection are associate. These findings provide valuable insights into the complex relationship between demographic variables, vaccine regimens, and COVID-19 infection, with implications for vaccination strategies and public health measures, though further research is needed for a comprehensive understanding of these relationships and their impact on public health strategies.

**CONCLUSION:**

Through a comprehensive analysis of infection rates among single-dose, two-dose, and booster recipients, this evaluation provides valuable insights for refining public health policies and vaccination

initiatives. These insights can facilitate the development of precise measures to control virus transmission and its variants.

**CONFLICT OF INTEREST:** The authors declare that there is no any conflict of interest.

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