

"Chadox1-S And Bbv152 Vaccines" - Effectiveness On Post-Vaccination And Covid-19 Outcomes.

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Abstract

Background: ChAdOx1-S (vaccine A) and BBV152 (vaccine B) vaccines are currently at the forefront of India's fight against the pandemic. The present study tests the hypothesis that both vaccines are equally efficacious.

Material and Methods: This cross-sectional study was conducted at MGM Hospital, Jaipur (Rajasthan, India). The study compared vaccine A and B recipients on post-vaccination events and COVID-19 related outcomes. Researchers collected data using questionnaires circulated through Google Forms. The association between attributes was tested using the chi-squared test. The significance level was considered at 5%.

Results: The vaccines A and B recipients were age and gender-matched [$p > 0.05$]. The vaccines did not differ significantly in vaccine events and adverse events after immunization ($p > 0.05$). A comparison of COVID-19 related outcomes between the two vaccines revealed no significant differences ($p > 0.05$). However, the severity of symptoms was higher in vaccine B recipients than in vaccine A recipients [$p = 0.027$].

Conclusion: The present study concludes that vaccines A and B were similar in efficacy. The most crucial factor revealed by the survey is that the reporting of adverse events was significantly less, and awareness is needed.

Keywords: AEFIs, BBV152, ChAdOx1-S, COVID-19 vaccine, Vaccine effectiveness, Vaccination

INTRODUCTION

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) outbreak started in Wuhan (Hubei province, China) on December 12, 2019. ^[1-2] On March 12, 2020, World Health Organization declared a pandemic based on the virus's global spread. ^[3] As of 14 April 2022, more than 500 million confirmed cases of COVID-19 and over 6 million deaths were reported. Over 11 billion vaccine doses have been administered all over the world. ^[4] The first case of SARS-CoV-2 in India was diagnosed on January 30, 2020. ^[5] Due to the large size of the country, COVID-19 dynamics of various states are in different phases and have varied disease transmission patterns. ^[6] The SARS CoV-2 virus spread through short or long-range aerosol and droplet transmission. ^[7] Immunization has a vital role in combating the coronavirus disease 2019 (COVID-19). The principle of vaccination is to induce protection against a pathogen by mimicking its natural interaction with the human immune system. The emergence of the SARS-CoV-2 vaccination was a significant public health intervention that helped flatten the evolving trajectories of COVID-19 cases and assisted in reducing patient flow in hospitals. ^[8-10] The COVID-19 vaccination program was introduced in India on January 16, 2021. ^[11] The Central Drugs Standard Control Organization (CDSCO) in India granted permission to use two vaccines for emergency use that is, ChAdOx1-S (AstraZeneca's vaccine manufactured by Serum Institute of India) and BBV152 (manufactured by Bharat Biotech Limited).^[12] It is a question of general curiosity "Which vaccine to prefer if both choices are available." Most studies compared the immunogenic and reactogenic efficacy of vaccines. ^[13-15] The present study compared two vaccines on adverse effects follow immunization (AEFIs) and COVID-19 related outcomes, including the incidence of COVID-19 post-immunization, symptoms, and their severity, hospital admissions, and CT findings.

MATERIAL AND METHOD:

This cross-sectional study was conducted in the Department of Physiology at Mahatma Gandhi Medical College, Jaipur (Rajasthan, India), after approval from the Institutional Ethics Committee. The study tested the hypothesis that vaccines A and B were equally effective. The vaccines' effectiveness was compared to post-vaccination outcomes and COVID-19 related outcomes. Researchers collected demographic, vaccination, and clinical data using questionnaires circulated using Google Forms (Google, Mountain View, CA, USA) from 29 April 2021 to 23 June 2021. The vaccination data include the type of vaccine inoculated, the number of doses of vaccines taken, adverse effects following immunization, and severity of symptoms. The COVID-19 related outcomes include the presence of COVID-19 after vaccination, symptoms and their severity, RTPCR positivity, presence of COVID-19 findings on chest CT, and chest CT score. The individuals aged 18 years or above and willing to participate in the study were enrolled. At the same time, those who had taken vaccines other than vaccines A and B or were critically ill were excluded from the study.

Statistical Analysis

The descriptive statistics for quantitative data were expressed as the median and interquartile range (IQR), and qualitative data were expressed as proportions. The association between attributes was tested using the chi-squared test. The significance level was considered at 5% ($\alpha = 0.05$). Researchers used MATLAB 2019a for graphics designing and JASP version 0.16.1.0 package for statistical analysis. [16-17]

RESULTS:

A total of 256 individuals took vaccination, with 90.6% and 90.6% were vaccinated with vaccine A and B respectively. The median age did not differ significantly between vaccine B [median = 35 years; IQR = 26.75 years] and vaccine A immunized [median = 31 years; IQR = 23 years] groups ($W = 3120.5$; $p = 0.389$) (Figure 1). Similarly, both groups were matched with respect to gender [$\chi^2 = 0.476$; $p = 0.490$] (Figure 2)

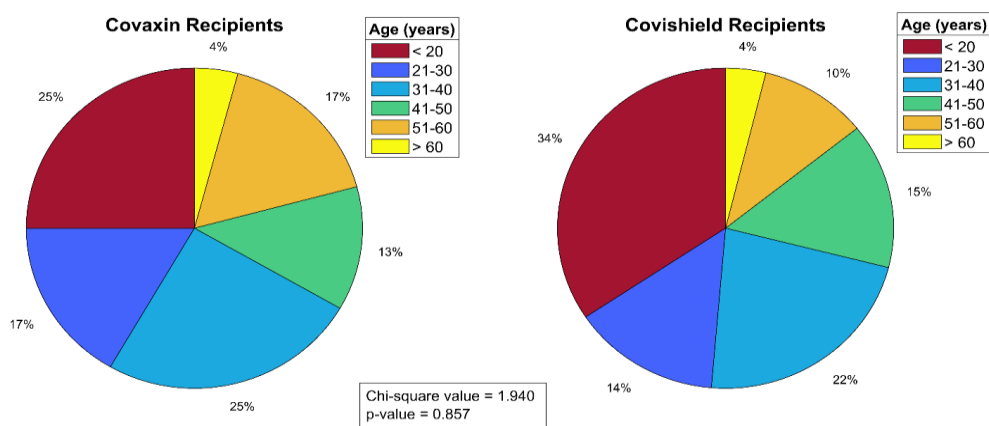


Figure 1. The pie chart shows the association between the type of vaccine recipients (vaccines A and B and age groups.

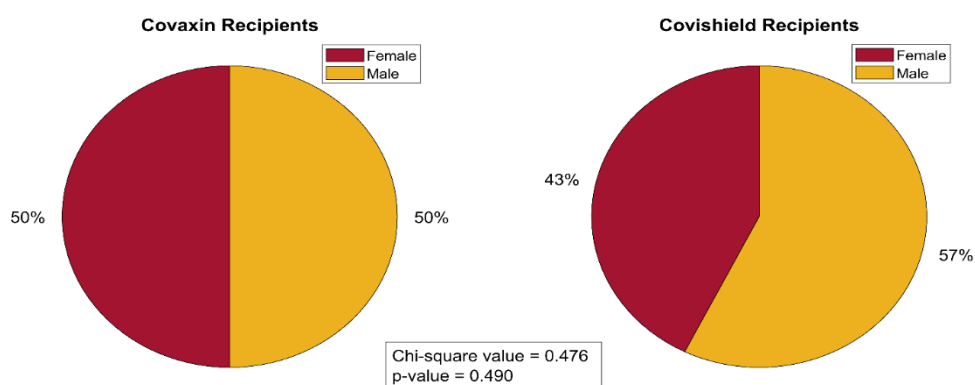


Figure 2. The pie chart shows the association between the type of vaccine recipients (vaccines A and B and gender.

The vaccine related outcomes in vaccine A and B recipients were not differed significantly in the total number of vaccine doses taken [$\chi^2 = 0.017$; $p = 0.896$], AEFIs such as body pain [$\chi^2 = 0.130$; $p = 0.718$], fever [$\chi^2 = 0.426$; $p = 0.514$], headache [$\chi^2 = 2.398$; $p = 0.122$], and severity of symptoms [$\chi^2 = 0.3.233$; $p = 0.199$]. No significant difference was found in the post -vaccination symptoms after first and second vaccine dose [$\chi^2 = 0.494$; $p = 0.781$] (Table 1)

Attribute	Levels	Type of Vaccine		c ² value	P
		Vaccine A	Vaccine B		
Total vaccine dosages taken	One	111(47.234)	11(45.833)	0.017	0.896
	Two	124(52.766)	13(54.167)		
Symptoms after vaccination	Absent	72(30.769)	11(45.833)	2.264	0.132
	Present	162(69.231)	13(54.167)		
Body Pain	Absent	64(35.359)	6(40)	0.13	0.718
	Present	117(64.641)	9(60)		
Fever	Absent	69(38.122)	7(46.667)	0.426	0.514
	Present	112(61.878)	8(53.333)		
Headache	Absent	122(67.403)	13(86.667)	2.398	0.122
	Present	59(32.597)	2(13.333)		
More symptomatic in which dose	dose one	92(74.797)	8(66.667)	0.494	0.781
	dose two	13(10.569)	2(16.667)		
	Similar	18(14.634)	2(16.667)		
Severity of Symptoms	Mild	110(59.14)	13(81.25)	3.233	0.199
	Moderate	62(33.333)	2(12.5)		
	Severe	14(7.527)	1(6.25)		

Table no. 1: Association between the type of vaccine recipients (vaccines A and B) and vaccination characteristics, including AEFIs.

Comparison of COVID related outcomes between two vaccines revealed no significant differences in incidence of COVID infection [$c^2 = 0.122$; $p = 0.727$], RTPCR positivity [$c^2 = 0.270$; $p = 0.603$], chest CT findings [$c^2 = 0.562$; $p = 0.453$], CT score [$c^2 = 3.438$; $p = 0.179$]. The symptomatic cases [$c^2 = 0.270$; $p = 0.603$], symptoms like fever [$c^2 = 0.617$; $p = 0.432$], cough [$c^2 = 1.507$; $p = 0.220$], and loss of smell and taste [$c^2 = 0.112$; $p = 0.738$] and hospital admissions did not differ significantly between two vaccine recipients [$c^2 = 0.130$; $p = 0.719$]. The severity of symptoms were higher in vaccine B recipients compared to vaccine A recipients [$c^2 = 7.222$; $p = 0.027$].(Table 2)

Attributes	Levels	Type of Vaccine		c ² value	p
		Vaccine A	Vaccine B		
COVID Infection	No	199(88.839)	19(86.364)	0.122	0.727
	Yes	25(11.161)	3(13.636)		
RT-PCR positivity	Negative	2(8.333)	0(0)	0.27	0.603
	Positive	22(91.667)	3(100)		
Chest CT finding	Covid finding absent	8(57.143)	1(33.333)	0.562	0.453
	Covid finding present	6(42.857)	2(66.667)		
CT Score	Less than 8	6(75)	2(66.667)	3.438	0.179
	9 to 15	2(25)	0(0)		
	More than 15	0(0)	1(33.333)		
Symptoms of COVID	Asymptomatic	2(8.333)	0(0)	0.27	0.603
	Symptomatic	22(91.667)	3(100)		
Fever in COVID	Absent	4(17.391)	0(0)	0.617	0.432
	Present	19(82.609)	3(100)		
Cough in COVID	Absent	8(34.783)	0(0)	1.507	0.22
	Present	15(65.217)	3(100)		
Loss of smell and taste in COVID	Absent	10(43.478)	1(33.333)	0.112	0.738
	Present	13(56.522)	2(66.667)		
Hospitalization	No	23(95.833)	3(100)	0.13	0.719
	Yes	1(4.167)	0(0)		
Severity of symptoms	Mild	11(47.826)	1(33.333)	7.222	0.027
	Moderate	10(43.478)	0(0)		
	Severe	2(8.696)	2(66.667)		

Table no. 2: Association between the type of vaccine recipients (vaccines A and B) and COVID-19 infection-related outcomes.

DISCUSSION

During the second pandemic wave, the evolution of COVID-19 cases leads to an acute crisis in hospital infrastructure. The primary cause of mortality was the unavailability of medical services and supplies. The optimized allocation of hospital resources using evidence-based decision-making and triage of patients based on mortality prediction were the only ways to curb the pandemic. [18][10] Vaccination was the only way to control the ongoing pandemic. However, the vaccine's effectiveness depends on multiple factors, including age, gender, ethnic inequality, drugs, diabetes, and blood groups. [19-22] Two vaccines were rolled out to curb the ongoing pandemic in India- ChAdOx1-S (vaccine A) and BBV152 (vaccine B). Vaccine A uses the Viral Vector Platform. It involves modifying a chimpanzee adenovirus to carry the Covid19 spike protein. [23] On the other hand, vaccine B is a whole virion inactivated (WVI) SARS-CoV-2 vaccine adjuvanted with aluminum hydroxide gel (Algel), or TLR7/8 agonist chemisorbed Algel. [24]

The effectiveness of the COVID-19 vaccines can be tested by measuring the immunogenic response of the body or clinical events, including post-immunization effects or COVID-19 related outcomes. However, there are no standardized methodologies available to test the effectiveness of vaccines. Yadav et al. discussed the requirement of a suitable antibody test measured in international units that can be used to check whether the vaccine has triggered a sufficient immune response. [25] The present study measured vaccine effectiveness using clinical outcomes, such as rate of COVID-19 infection after vaccination, presence, and severity of symptoms, and hospital admissions. The present

study compared vaccines A and B on post-vaccination events and COVID-19 related outcomes. However, no significant differences were found between the two vaccines. The present study also considered CT score an outcome as it has an independent role in diagnosing COVID-19. [26]

In a 24-week longitudinal cohort study on 614 health care workers who took the COVID-19 vaccine, Choudhary et al. investigated the persistence of the vaccine-induced immunoglobulin G (IgG) antibodies against SARS-CoV-2. Researchers found the production of vaccine-induced IgG antibodies is significantly higher ($p < 0.001$) in vaccine A recipients compared with vaccine B recipients. [15] Singh et al. studied humoral dynamics in the 3rd week, 3rd month, and 6th-month post-immunization on 481 participants. The anti-spike antibody's geometric mean titer (GMT) decreased by 56% at 6-months. In the case of vaccine A, a significantly raised titer was noted at all time points, but 44% showed a decline in titer at 6-month. However, in the case of vaccine B, the decrease in GMT was insignificant (8%) despite lower GMT at all time points. Both vaccines showed 5.6 fold decrease in seropositivity rate at 6-month. [27] Chakraborty et al. evaluated AEFEs in a study conducted over four months at a select apartment in Whitefield, Bangalore, India. Researchers found a significantly higher number of adverse effects after the first dose of vaccine A when compared with vaccine B ($p < 0.05$). [28] Houshmand et al., in a multicentric study, compared multiple covid vaccines, including Gam-COVID-Vac, ChAdOx1 nCoV-19, BBV152, or BBIBP-CorV. The symptoms' severity was measured on a 0-10 numerical scale. The severity of adverse effects was higher in ChAdOx1 nCoV-19 than in other vaccines. [29] However, the present study showed that both vaccines were equivalent when considering AEFIs. Elango et al., in an online-based survey, compared the efficacy of vaccines A and B. The adverse effects after the first dose were higher in the case of vaccine A (37.2%) compared to vaccine B (17.4%). However, adverse effects after the second dose were not significantly different. In addition, the coronavirus infection post-vaccination did not differ significantly ($p > 0.05$). [30] Rajpurohit et al. conducted a retrospective survey involving 75 fully vaccinated individuals. During the first dose, the percentage of AEFIs was higher for vaccine A (92.45%) than for vaccine B (77.27%). While in the second, it was 86.79% and 72.72% for vaccines A and B, respectively. However, 20% of vaccinated individuals were unaware of AEFI reporting. [31] The present study also had significantly fewer numbers reporting adverse effects post-immunization.

CONCLUSIONS:

The present study concludes that both the vaccines are equally effective in terms of the post-vaccination effects and COVID-19 related outcomes. COVID-19 immunization has a primary role in the prevention of the pandemic. Most of the adverse events reported were according to the product information. However, vaccine vigilance has a very crucial role in the future. The most important factor revealed by the survey is that the reporting of adverse events was significantly less. Awareness regarding the reporting of adverse outcomes is needed to make the vaccine safer and circumstances that lead to better health care outcomes.

LIMITATIONS OF THE STUDY:

Due to fewer reporting of adverse effects post-immunization, an analysis with a larger sample is required in the future. Secondly, the sample represents the views of people acquainted with filling out google forms. Studies involving more wider groups are needed in the future.

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