Library Progress International
Vol.44 No. 3, Jul-Dec 2024: P.9478-9488

Print version ISSN 0970 1052
Online version ISSN 2320 317X

Original Article

Available online at www.bpasjournals.com

'A Comparative Study To Assess The Effectiveness Of Covaxin And Covishield To Control Covid 19 Among The Adults Residing In Selected Urban Area'.

Ashlesha Moon[1] , Jacinth Dhaya[2]

[1] Lecturer, Godavari College of Nursing, Jalgaon
[2] Professor, Godavari College of Nursing, Jalgaon

How to cite this article: Ashlesha Moon, Jacinth Dhaya (2024) 'A Comparative Study To Assess The Effectiveness Of Covaxin And Covishield To Control Covid 19 Among The Adults Residing In Selected Urban Area'.. *Library Progress International,* 44(3), 9478-9488.

Abstract
This study compares the effectiveness of Covaxin and Covishield vaccines in preventing COVID-19 among adults in a specific urban area. It assesses how each vaccine controls infections and their side effects, while also exploring the relationship between vaccine complications and demographic factors. Objectives include evaluating the vaccines' effectiveness and testing hypotheses on significant differences between them and their demographic associations. A non-experimental survey design involving 200 adults was used, with data collected and analyzed statistically. Results showed Covaxin's effectiveness at 0.98 and Covishield's at 0.99, with a Z-test showing no significant difference in RT-PCR negative cases ($p = 0.56$). Covaxin had an average side effect score of 16.44, while Covishield had 13.07. Significant associations were found between vaccine-related complications and age, family type, and marital status, but not with sex, religion, or education.

Keywords : Covaxin, Covishield, & covid 19

Introduction

The coronavirus disease 2019 (COVID-19) pandemic continues to unfold. The situation varies greatly from country to country. COVID-19 pandemic has caused unprecedented human health and economic consequences. Almost all countries have been affected. The spread of this novel virus severe acute respiratory syndrome coronavirus 2 (SARS CoV 2) continues relentlessly. COVID 19 pandemic, and previous pandemics during this millennium, have demonstrated that the current state of global preparedness is inadequate for an effective response and to prevent local outbreaks from becoming international health emergencies.[1]

The world health organization defines the Corona virus disease (covid 19) is an infectious disease which is caused by a newly discovered corona virus. It was formerly known as severe acute respiratory syndrome coronavirus 2 (SARS CoV 2). The world health organization named the disease COVID 19. Covid 19 is an acronym of CO mean corona, VI means virus, D means disease and 19 mean 2019. It is zoonotic disease which means that it was first transmitted from animal to human. The disease was first started in the Wuhan city of China at the end of 2019. "There were a series of pneumonia cases of unknown cause emerged in Wuhan (Hubei, China). When in January 2020, deep sequencing analysis from lower respiratory tract samples identified a novel virus severe acute respiratory syndrome coronavirus 2 (SARS CoV 2) as causative agent for that observed pneumonia cluster. On February 11th, 2020, the World Health Organization (WHO) Director General, Dr. Tedros Adhanom Ghebreyesus, named the disease caused by the SARSCoV2 as "COVID 19". The corona virus disease has adopted a pandemic state now and has spread to the whole world. It has affected almost every country. It has also affected the health care professional who are fighting as a front-line worker against the pandemic disease of corona virus.[2]

OBJECTIVES

1.To assess the effectiveness of covaxin and covishield vaccines in preventing covid 19 infection among adults residing in selected urban area.
2.To determine which vaccine provide better protection against covid 19 in this residing in selected urban area.
3.To determine the side effect of covaxin and covishield among the vaccinated adults residing in selected urban area.
4.To determine the association between complication with selected demographic variables.

RESEARCH METHODOLOGY

Research Approach : Quantitative research approach
Research design : non - experimental descriptive survey design.
Setting of the study : at selected urban area.
Population : adult who are present in selected urban area.
Sample : adults in selected urban area.
Sample size : 200
Sample technique : convenient sampling technique

Sample criteria

Inclusion criteria

Adults who were –
1. 20 years and above.
2. Residing in selected urban area
3. Received both doses of either covaxin or covishield at least 14 days prior to the study
4. Provided written informed consent to participant in the study.
5. Symptomatic or asymptomatic during the time of data collection.
6. Willing and able to comply with the study to protocol and be available for follow up.

Exclusion criteria

Adults who were-
1. Not taken other covid-19 vaccines except covaxin or covishield.
2. Pregnant or breastfeeding at the time of the study.
3. Tested positive for covid 19 prior to vaccination or between doses of vaccination.
4. known immunocompromised.

DATA INTERPRETATION AND ANALYSIS

SECTION I : Description of Subject With Regards To Demographic Variables in the study According to age of the adults residing in selected urban area who received Covaxin, 30% of them from age group 20-24 years, 14% from 25-28 years, 25% adults from 29-31 years and 31% of age 32 & above years. According to age of the adults residing in selected urban area who received Covishield, 39% of them from age group 20-24 years, 16% from 25-28 years, 20% adults from 29-31 years and 25% of age 32 & above years. according to gender of the adults residing in selected urban area who received Covaxin, 57% of them were males, 42% females and 1% of transgender. According to gender of the adults residing in selected urban area who received Covishield, 46% of them were males, 43% females and 1% of transgender. According to religion of the adults residing in selected urban area who received Covaxin, 47% of them from Hindu religion, 15% from Muslim religion, 23% adults from Buddhist, 11% from Christian and 4% from other religions. According to religion of the adults residing in selected urban area who received Covishield, 53% of them from Hindu religion, 18% from Muslim religion, 17% adults from Buddhist, 9% from Christian and 3% from other religion. according to type of family of the adults residing in selected urban area who received Covaxin, 43% of them from joint family, 42% from nuclear families, 11% adults from extended families and 4% adults were alone. According to type of family of the adults residing in

selected urban area who received Covishield, 34% of them from joint family, 51% from nuclear families, 12% adults from extended families and 3% adults were alone. According to marital status of the adults residing in selected urban area who received Covaxin, 62% of them were married, 34% unmarried, 3% from divorce group and 1% were widow. According to marital status of the adults residing in selected urban area who received Covishield, 54% of them were married, 41% unmarried, 4% from divorce group and 1% were widow. According to educational status of the adults residing in selected urban area who received Covaxin, 4% of them were educated up to primary, 53% up to secondary, 39% were graduates and 4% adults were Post graduate and above. According to educational status of the adults residing in selected urban area who received Covishield, 3% of them were educated up to primary, 55% up to secondary, 41% were graduates and 1% adults were Post graduate and above. According to occupation of the adults residing in selected urban area who received Covaxin, 23% of them were self-employed, 67% in private job, 8% were in government job and 2% adults were health professionals. According to occupation of the adults residing in selected urban area who received Covishield, 31% of them were self-employed, 62% in private job, 4% were in government job and 3% adults were health professionals. according to income of the adults residing in selected urban area who received Covaxin, 23% of them answered as below 10,000, 29% had income in Rs 10001-15000, 35% in Rs 15001-20000 and 13% adults answered as above Rs 20000.

According to income of the adults residing in selected urban area who received Covishield, 34% of them answered as below 10,000, 34% had income in Rs 10001-15000, 26% in Rs 15001-20000 and 6% adults answered as above Rs 20000.

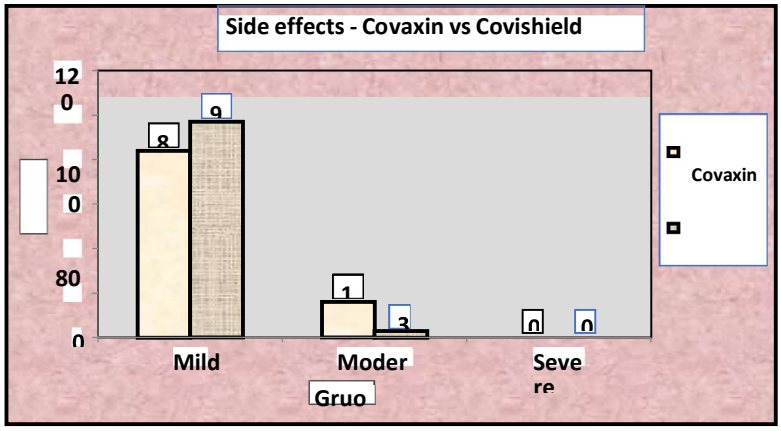
Section II : GENERAL ASSESSMENTS OF SIDE EFFECT OF COVAXIN AND COVISHIELD AMONG VACCINATED ADULTS

The assessment side effect of Covaxin among the vaccinated adults residing in selected urban area showed that, 84% of them had mild, 16% adults had moderate and no one of them had severe side effects. Average side effect score of Covaxin was 16.44 with standard deviation of 4.85. The minimum score of side effect of Covaxin was 3 with maximum of 31. The assessment side effect of Covishield among the vaccinated adults residing in selected urban area showed that, 97% of them had mild, 3% adults had moderate and no one of them had severe side effects. Average side effect score of Covishield was 13.07 with standard deviation of 3.45. The minimum score of side effect of Covishield was 5 with maximum of 25.

Table 1: General assessments of side effect of Covaxin and Covishield

Variable	Groups	Score	Covaxin		Covishield	
			Frequency	Percentage	Frequency	Percentage
Side effects	Mild	0-20	84	84.00	97	97.00
	Moderate	21-40	16	16.00	3	3.00
	Severe	41-60	0	0.00	0	0.00
Side effects	Minimum		3		5	
	Maximum		31		25	
	Average (SD)		16.44 (4.85)		13.07 (3.45)	

Figure No-1: General assessments of side effect of Covaxin and Covishield

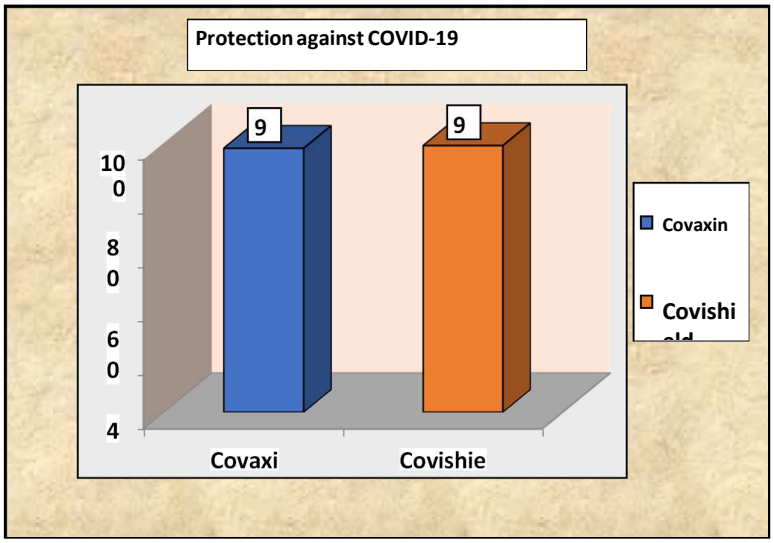


Section III : Deals with analysis of data related to the effectiveness of Covaxin and Covishield vaccines in preventing covid-19 infection among adults residing in selected urban area.

Table 2: Effectiveness of Covaxin and Covishield vaccines in preventing covid-19 infection (paired t test)

Group	Frequency	RTPCR Negative	Proportion	Z value	P value
Covaxin	100	98	0.98	0.58	0.56
Covishield	100	99	0.99		

Figure 2: Effectiveness of Covaxin and Covishield vaccines in preventing covid 19



The comparisons of RTPCR negative proportions among adults residing in selected urban area after use of Covaxin and Covishield vaccines were done by Z test. The test was conducted at 5% level of significance.
The proportion of RTPCR negative individuals after use of Covaxin in preventing covid-19 infection was 0.98.
The proportion of RTPCR negative individuals after use of Covishield in preventing covid-19 infection was 0.99.
The test statistics value of Z test was 0.58 with p value 0.56. The p value more than 0.05, hence accept null hypothesis that means there is no significant difference in proportion of RTPCR negative individuals.
Shows that, there was no significant difference in the RTPCR negative proportions among adults residing in selected urban area after use of Covaxin and Covishield vaccines.
SECTION IV: Deals with analysis of data related to the association between complications score after use of Covaxin and Covishield vaccine among the vaccinated adults in selected urban area with their selected demographic variables.

Table 3: Association of complications score with demographic variable

Variable	Groups	COMPLICATIONS		Chi Square	d.f.	p value	Significance
		below Md	Above Md				
Age (in years)	20-24	48	21	14.42	3	**0.002**	**Significant**
	25-28	20	10				
	29-31	21	24				
	32 & above	22	34				
Sex	Male	59	54	3.24	3	0.36	Not Significant
	Female	51	34				
	Transgender	1	1				
Religion	Hindu	54	46	0.76	4	0.94	Not Significant
	Muslim	20	13				
	Buddhist	23	17				
	Christian	10	10				
	Other	4	3				

Type of family	Joint family	36	41	9.76	3	**0.021**	**Significant**
	Nuclear family	55	38				
	Extended family	18	5				
	Alone	2	5				
Marital Status	Married	55	61	8.62	3	**0.035**	**Significant**
	Unmarried	49	26				
	Divorce	6	1				
	Widow	1	1				
Education	Primary	2	5	2.71	3	0.44	Not Significant
	Secondary	61	47				
	Graduate	46	34				
	Post graduate and above	2	3				
Occupation	Self employed	35	19	2.96	3	0.40	Not Significant
	Private job	66	63				
	Government job	7	5				
	Health professional	3	2				
	Below 10,000	38	19				

Income	10001 - 15000	36	27	6.61	3	0.085	Not Significant
	15001 - 20000	30	31				
	above 20000	7	12				

MAJOR FINDINGS OF THE STUDY

Section –I: Demographic Variables

1. According to age of the adults residing in selected urban area who received Covaxin, 30% of them from age group 20-24 years, 14% from 25-28 years, 25% adults from 29-31 years and 31% of age 32 & above years. According to age of the adults residing in selected urban area who received Covishield, 39% of them from age group 20-24 years, 16% from 25-28 years,
   20% adults from 29-31 years and 25% of age 32 & above years.
2. In the study, according to gender of the adults residing in selected urban area who received Covaxin, 57% of them were males, 42% females and 1% of transgender. According to gender of the adults residing in selected urban area who received Covishield, 46% of them were males, 43% females and 1% of transgender.
3. According to religion of the adults residing in selected urban area who received Covaxin, 47% of them from Hindu religion, 15% from Muslim religion, 23% adults from Buddhist, 11% from Christian and 4% from other religions. According to religion of the adults residing in selected urban area who received Covishield, 53% of them from Hindu religion, 18% from Muslim religion, 17% adults from Buddhist, 9% from Christian and 3% from other religions.
4. In the study, according to type of family of the adults residing in selected urban area who received Covaxin, 43% of them from joint family, 42% from nuclear families, 11% adults from extended families and 4% adults were alone.According to type of family of the adults residing in selected urban area who received Covishield, 34% of them from joint family, 51% from nuclear families, 12% adults from extended families and 3% adults were alone.
5. According to marital status of the adults residing in selected urban area who received Covaxin, 62% of them were married, 34% unmarried, 3% from divorce group and 1% were widow. According to marital status of the adults residing in selected urban area who received Covishield, 54% of them were married, 41% unmarried, 4% from divorce group and 1% were widow.
6. According to educational status of the adults residing in selected urban area who received Covaxin, 4% of them were educated up to primary, 53% up to secondary, 39% were graduates and 4% adults were Post graduate and above.According to educational status of the adults residing in selected urban area who received Covishield, 3% of them were educated up to primary, 55% up to secondary, 41% were graduates and 1% adults were Post graduate and above.
7. According to occupation of the adults residing in selected urban area who received Covaxin, 23% of them were self-employed, 67% in private job, 8% were in government job and 2% adults were health professionals. According to occupation of the adults residing in selected urban area who received Covishield, 31% of them were self-employed, 62% in private job, 4% were in government job and 3% adults were health professionals.
8. In the study, according to income of the adults residing in selected urban area who received Covaxin, 23% of them answered as below 10,000, 29% had income in Rs 10001-15000, 35% in Rs 15001-20000 and 13% adults answered as above Rs 20000. According to income of the adults residing in selected

urban area who received Covishield, 34% of them answered as below 10,000, 34% had income in Rs 10001-15000, 26% in Rs 15001-20000 and 6% adults answered as above Rs 20000.

SECTION-II : GENERAL ASSESSMENTS OF SIDE EFFECT OF COVAXIN AND COVISHIELD AMONG VACCINATED ADULTS

SIDE EFFECTS - COVAXIN:

The assessment side effect of Covaxin among the vaccinated adults residing in selected urban area showed that, 84% of them had mild, 16% adults had moderate and no one of them had severe side effects.

Average side effect score of Covaxin was 16.44 with standard deviation of 4.85. The minimum score of side effect of Covaxin was 3 with maximum of 31

SIDE EFFECTS - COVISHIELD:

The assessment side effect of Covishield among the vaccinated adults residing in selected urban area showed that, 97% of them had mild, 3% adults had moderate and no one of them had severe side effects.

Average side effect score of Covishield was 13.07 with standard deviation of

3.45. The minimum score of side effect of Covishield was 5 with maximum of 25.

SECTION-III : COMPARISON OF COVAXIN AND COVISHIELD VACCINES IN PREVENTING COVID-19 INFECTION

The comparisons of RTPCR negative proportions among adults residing in selected urban area after use of Covaxin and Covishield vaccines were done by Z test for equality of two proportions.

The test was conducted at 5% level of significance.

The proportion of RTPCR negative individuals after use of Covaxin in preventing covid-19 infection was 0.98.

The proportion of RTPCR negative individuals after use of Covishield in preventing covid-19 infection was 0.99.

The test statistics value of Z test was 0.58 with p value 0.56. The p value more than 0.05, hence null hypothesis was accepted that means there was no significant difference in proportion of RTPCR negative individuals.

Shows that, there was no significant difference in the RTPCR negative proportions among adults residing in selected urban area after use of Covaxin and Covishield vaccines.

SECTION IV : ASSOCIATION OF COMPLICATIONS SCORE IN RELATION TO DEMOGRAPHIC VARIABLES

The chi square test was used to see association between complications score after use of Covaxin and Covishield vaccine among the vaccinated adults in selected urban area with their selected demographic variables. The test was conducted at 5% level of significance.

Significant Association:

For the demographic variables age, type of family and marital status, the p value of association test with complications score was less than 0.05. That means, complications after use of Covaxin and Covishield vaccine among vaccinated adults in selected urban area was associated with these demographic variables.

Concludes that, there was significant association of these demographic variables with the complications.

No Significant Association:

For the demographic variables sex, religion, education etc., the p value of association test with complications score was more than 0.05. That means, complications after use of Covaxin and Covishield vaccine among vaccinated adults in selected urban area was not associated with these demographic variables.

Concludes that, there was no significant association of these demographic variables with the complications.

Recommendation

- A similar study can be conducted in subject on large population.
- A study to assess the effectiveness of health education program on knowledge regarding covid-19 pandemic among the adults in selected urban area.
- Experimental studies can be conducted with recommendation.
- A study can be conducted on different setting like hospital, rural area and city.
- A study can conduct to assess the knowledge, attitude, practice of covid-19.
- A study can be done with association between various demographic which were significant on large sample.

BIBLIOGRAPHY

1. Sundus Hameed Ahmed, "introduction to COVID-19, history, impact, symptoms and prevention", Pakistan Journal of Medical and Health Sciences 14(2):1528-1534 june 2020 https://www.researchgate.net/publication/345431952

2. Imran Uddin, " A Brief Introduction to Covid 19 (Corona Virus Disease)", Journal of Medicine and Healthcare, august 20, 2022 A_Brief_Introduction_to_Covid 19_Corona_Virus_Dise.pdf

3. Abinaya Elango, "Comparative Evaluation of Short-term Clinical Safety and Efficacy of COVID-19 Vaccines - Covishield and Covaxin", Journal of Communicable Diseases Special Issue - COVID-19 & Other Communicable Diseases,2022 Pg. No. 41-48. 855-Article Text-5374-1-10-20220315 (1).pdf

4. Thiagarajan K. What do we know about India's Covaxin vaccine? BMJ: British Medical Journal (Online). 2021 Apr 20;373. 10.1136/bmj.n99 https://www.bmj.com/content/373/bmj.n997

5. Zhang N, "Current development of COVID-19 diagnostics, vaccines and therapeutics". Microbes Infect. 2020;22(6–7):231–235. doi:10.1016/j.micinf.2020.05.001. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7200352/

6. Gharate JS, "Approved covid 19 vaccines: a review". World J Pharm Res. 2021;10(10):523542. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8861611/

7. Liang Z, "Adjuvants for coronavirus vaccines Front Immunol".2020;11:2896. doi:10.3389/fimmu.2020.589833, https://www.frontiersin.org/articles/10.3389/fimmu.2020.589833/full

8. Bhattacharjee K, "Antibody response after first and second-dose of ChAdOx1-nCOV (CovishieldTM®) and BBV-152 (CovaxinTM®) among health care workers in India: the final results of cross-sectional coronavirus vaccine-induced antibody titre (COVAT) study". Vaccine. 2021;39(44):6492– 6509. doi: 10.1016/j.vaccine.2021.09.055. https://pubmed.ncbi.nlm.nih.gov/34600747/

9. Swarnali das, "Immunogenic and reactogenic efficacy of Covaxin and Covishield: a comparative review, immunological research volume 70, pages289 315 (2022) https://link.springer.com/article/10.1007/s12026 02209265 0

10. Sunil kumar(2021) "Covishield and Covaxin" India's contribution to global COVID 19 pandemic, Journal of Family Medicine and Primary Care 10(7):p 2433 2435, July 2021 https://journals.lww.com/jfmpc/Fulltext/2021/10070/

11. Hari Ram Choudhary, Debaprasad Parai, Persistence of Antibodies Against Spike Glycoprotein of SARS CoV 2 in Healthcare Workers Post Double Dose of BBV 152 and AZD1222 Vaccines, Volume 8 2021 | https://doi.org/10.3389/fmed.2021.7781292.

12. Girish C. Dash, Breakthrough SARS CoV 2 infections among BBV 152 (COVAXIN®) and AZD1222 (COVISHIELDTM) recipients: Report from the eastern state of India, journal of medical virology, Volume 95, Issue 5 May 2023 https://onlinelibrary.wiley.com/journal/10969071

13. Ruchi Agrawal, "Effectiveness of coronavirus disease 19 vaccination on disease transmission, hospitalization, and clinical outcomes in adults in North India", Year : 2023 | Volume : 9 | Issue : 1 | Page : 18 24 https://www.ijamweb.org/article.asp?issn=2455 5568;year=2023;volume=9;issue=1;spage=18;epage=24;aulast=Agrawal

14. Neha Kumari, "Comparison of HRCT chest findings among vaccinated and non vaccinated COVID 19 patients", International Journal of Research in Medical Sciences Kumari N et al. Int J Res Med Sci. 2022 Dec;10(12):2911- 2915 https://www.msjonline.org/index.php/ijrms/article/view/11323

15. Rajesh kumar , "A Study to Assess the Knowledge of COVID 19 and Acceptance of COVID 19 Vaccine among Adults", International Journal of Health Sciences and Research Vol.12; Issue: 6; June 2022 https://www.ijhsr.org/IJHSR_Vol.12_Issue.6_June2022/IJHSR08.pdf

16. Shazia gurgani, "A STUDY TO ASSESS THE EFFECTIVENESS OF STRUCTURED TEACHINGPROGRAMME ON KNOWLEDGE REGARDING COVID 19 AMONGNURSING STUDENTS", international Journal of Research Publication and Reviews, Vol 3, no 4, pp1171 1178, April 2022 https://doi.org/10.55248/gengpi.2022.3.4.19.

17. Rakesh sharma a comparative study of attitudes towords covid 19 vaccination in the rural and urban population of Uttarakhand, india VOL 1, 2021 DEC 8, 2021 CEST https://joghep.scholasticahq.com/article/29948

18. Priyamadhaba behera, Arvind kumar singh, "Effectiveness of COVID 19 vaccine (Covaxin) against breakthrough SARS CoV 2 infection in India", 2022 Dec 31;18(1):2034456. doi: 10.1080/21645515.2022.2034456. Epub 2022 Mar 23. https://pubmed.ncbi.nlm.nih.gov/35321625/

19. Hadis Rezapour, "Analysis and comparison of anti RBD neutralizing antibodies from AZD 1222, Sputnik V, Sinopharm and Covaxin vaccines and its relationship with gender among health care workers", 19, Article number: 47 (2022) https://immunityageing.biomedcentral.com/articles/10.1186/s12979 02200303 x

20. Dhanajayan Govindan, "Effectiveness of Covishield vaccine in preventing Covid 19 A test negative case control study," 2022 May 26; 40(24): 32943297. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8825308/

21. Hamed zare, "Prevalence of COVID 19 vaccines (Sputnik V, AZD 1222, and Covaxin) side effects among healthcare workers in Birjand city, Iran", International Immunopharmacology Volume 101, Part B, December 2021, 108351 https://www.sciencedirect.com/science/article/pii/S1567576921009875

22. shah Kshitij darshan, "Effectiveness of coronavirus disease 19 vaccination on disease transmission, hospitalization, and clinical outcomes in adults in North India", 2021, vol. 50, br. 3 4, str. 21 26 https://scindeks.ceon.rs/article.aspx?

23. Tresa Rani Sarraf, "Immune Response to COVID 19 in India through Vaccination and Natural Infection", 09 July 2022; Accepted: 15 July 2022; Published: 29 July 2022 https://fortuneonline.org/articles/immune-response-to-covid19-in-india-through-vaccination-and-natural-infection.html

24. Mittal Amit, "Adverse effects after first and second dose of covishield and covaxin: A longitudinal study", Journal of Family Medicine and Primary Care 11(11):p73397345, November 2022

https://journals.lww.com/jfmpc/Fulltext/2022/11000/

25. Sarika p. Patil, "A study to determine adverse event following immunization using COVISHIELD vaccine for prevention of COVID 19 infection in a field practice area of urban health center", Asian Journal of Medical Sciences | Jun 2022 | Vol 13 | Issue 6 https://www.academia.edu/92082689/

26. Porus Rajpurohit, "Retrospective observational survey of adverse events following immunization comparing tolerability of covishield and covaxin vaccines in the real world", Journal of Pharmacovigilance and Drug Research, 2021;2(3):2126 https://www.researchgate.net/profile/PorusRajpurohit/publication/354272036

27. J Akram, "COVID 19 vaccines: comparison of biological, pharmacological characteristics and adverse effects of Pfizer/BioNTech and Moder Vaccines," 2021 Feb;25(3):1663 1669. https://pubmed.ncbi.nlm.nih.gov/33629336/

28. Tarun Bhatnagar, "Effectiveness of BBV152/Covaxin and AZD1222/Covishield vaccines against severe COVID 19 and B.1.617.2/Delta variant in India, 2021", International journal of infectious diseases Volume 122, September 2022, Pages 693 702 https://www.sciencedirect.com/science/article/pii/S1201971222004271

29. Shashikala Shivaprakash, Effectiveness of Covid-19 vaccines (CovishieldTM and Covaxin ®) in healthcare workers in Mumbai, India: A retrospective cohort analysis, Published: October 27, 2022 https://doi.org/10.1371/journal.pone.0276759, https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0276759

30. Veerapu, Nagapraveen 2021, Effectiveness of COVID-19 Vaccines against SARS-CoV-2 Infection among Persons Attending the RT-PCR center at a Medical College Hospital in Telangana A Case- Control Study Indian Journal of Community Medicine 47(4):p587-590, Oct–Dec 2022. |DOI: 10.4103/ijcm.ijcm_273_22, https://journals.lww.com/ijcm/fulltext/2022/47040/effectiveness_of_covid_19_vaccines_against.24.aspx

31. Arunkumar Radhakrishnan (2022) Comparative Evaluation of Short-term Clinical Safety and Efficacy of COVID-19 Vaccines - Covishield and Covaxin, Special Issue - COVID-19 & Other Communicable Diseases, Pg. No. 41-48 855-Article Text-5374-1-10-20220315.pdf

32. Abhijita Talukder 2021, A comparative analysis on the safety and efficacy of Covaxin versus other vaccines against COVID-19: a review, Published by De Gruyter March 2, 2022, From the journal Zeitschrift für Naturforschung C https://doi.org/10.1515/znc-2021-0301 https://www.degruyter.com/document/doi/10.1515/znc 20210301/html?lang=en