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Estimating the prevalence of adverse effects following immunization (AEFI) with Covid-19 vaccination and to determine association of AEFI with blood grouping among population of south-west Delhi, India: A descriptive cross-sectional study

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ABSTRACT

Background: Vaccines against Covid-19 are new and developed through fast track process. The study has been conducted to know prevalence of adverse effects following immunization with Covid-19 vaccination and association between AEFI and blood grouping if any.
Methods: The self structured questionnaire based study was conducted over a period of 6 months (February 2021 to July 2021. Vaccine recipients who met inclusion criteria were invited to fill questionnaire using Google forms. Information including demographic characteristics, blood grouping (ABO-Rh type), vaccination, use of analgesics and adverse effects was sought within 3-4 weeks post vaccination. Data generated was analyzed using SPSS version 19 Chicago, USA.
Results: Of all the 315 majority participants receiving received Covishield™ (79.3%) followed by 9.3% Covaxin™ (9.3%) and others (11.4%). The predominant blood group among participants was B+ (38.3%) followed by O+ (27.5%). About 90% of participants experienced mild to moderate AEFIs following first dose of vaccine. Most common adverse effects were injection site pain 89.6% and 67.8% followed by myalgia 64.2% and 25.3%, fever 26.4% and 7.25%, headache 20% and 13% and sore throat 18.9% and 4%, dry mouth 35.8% and 41% following first and second dose of vaccine respectively. Only 0.5% had serious AEFI, requiring hospitalization. Not a single death was reported during study period.
Conclusion: All Covid-19 combating vaccines exhibit favorable safety profile with mild self limiting adverse effects, relieved by analgesic- anti-inflammatory drugs. No association of AEFI with ABO-Rh blood grouping was found in present study.

Keywords: Covid-19, AEFI, Covid Vaccination, ABO-Rh blood grouping

INTRODUCTION

Coronavirus (COVID-19) has unbelievably affected global health in an unrivalled manner. Vaccination against Covid-19 is the only way out to combat pandemic. Countries across the globe have developed vaccines against Covid-19 through fast track process in response to emergency of pandemic. [1] Therefore it is always imperative to monitor adverse effects of any newly developed vaccine post marketing, to establish safety and reactogenicity. [2]

In India, the first phase of Vaccine Campaign against Covid-19 started with roll out of Covishield™ for health care workers with effect from Jan 16, 2021 followed by front line workers. Latter during second phase of vaccination from March 2021, Covaxin™ , an indigenous vaccine against Covid-19 was rolled out. Meanwhile Government of India,

made available few imported vaccines from other countries. [3, 4]

Since all vaccines are developed using different biomedical technologies and have undergone through clinical trials on variable populations and races, there is a need to continuously monitor AEFI following Covid-19 Vaccination. Till date there has been seen variation in data regarding AEFI Covid-19 vaccines across the globe. [5,6]

As per WHO, an Adverse event following immunization (AEFI) is an untoward medical occurrence following immunization, which may not have a necessary causal relationship with the usage of a vaccine. An AEFI that is caused or precipitated by a vaccine due to one or more of the inherent properties of the vaccine product. An AEFI is considered serious if it is life-threatening, requires inpatient hospitalization or results in death. [7]

Data on adverse events following Covid-19 vaccines in Indian population is still inadequate keeping in view its large population size.

Present descriptive cross-sectional study has been conducted with an objective to establish the safety and to generate data on adverse effects following Covid-19 Vaccination. An attempt has been made to know the association between AEFI and ABO-Rh blood grouping among population residing in south-west Delhi, India.

SUBJECTS AND METHODS

It was a questionnaire based cross-sectional study approved by Institutional Ethical Committee of Jamia Millia Islamia University, Delhi. The study was conducted on population from south west Delhi, India between February 2021 to July 2021 (6 Months). The study was done using self-structured and validated questionnaire which was disseminated in the form of Google forms among known as well as unknown contacts through e-mails and Watsapp groups (Figure 1). The questionnaire was validated by doing a prior pilot study on 25 participants and necessary changes were done in questionnaire based on results of pilot study after discussion with co-investigators. Sample size was calculated based on pilot study findings, as 74% of participants experienced AEFI post Covid-19 vaccination. Taking prevalence of 74% and 95% confidence Interval, the sample size was calculated and found to be 315 using formula $N=Z^2p\ (1-p)d^2$, where Z= level of confidence (95%), p= expected prevalence, d=precision. The questionnaire link was dismantled once desired sample size was achieved. [8]

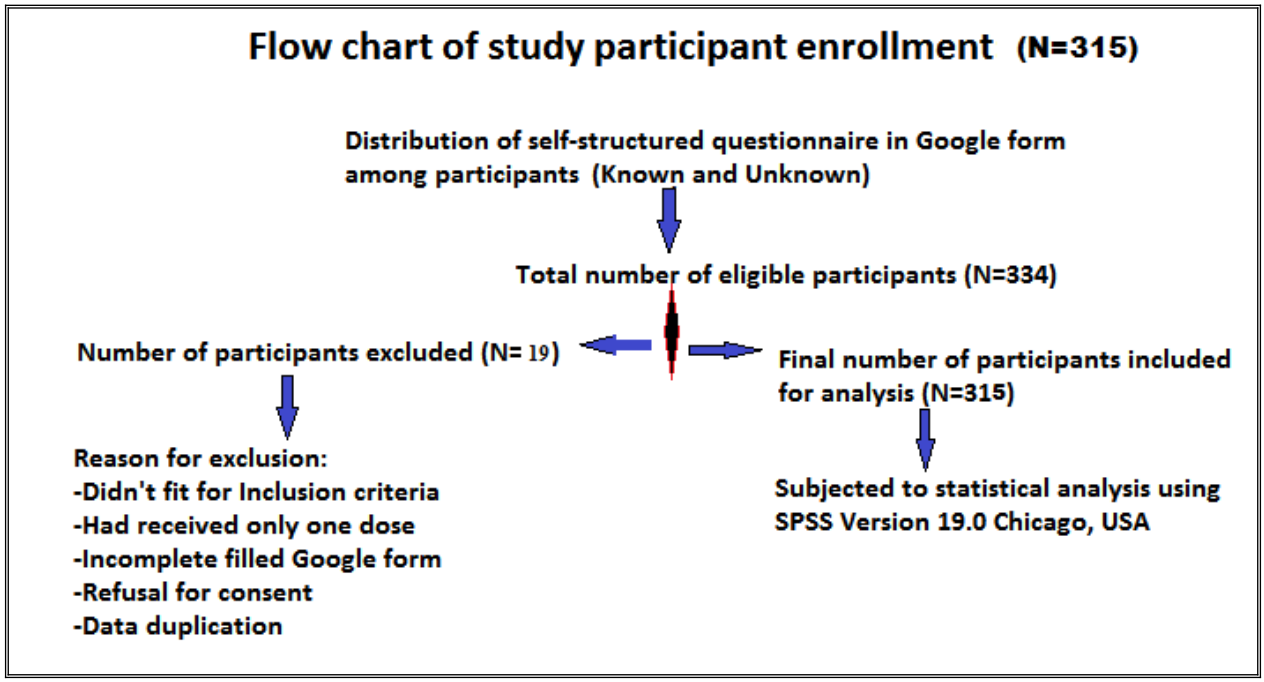

Fig 1: Flow diagram showing participant enrollment for study

Inclusion criteria consisted of participants who were willing to participate, including both male and females above 18 years, with or without any co-morbidity (diabetes, hypertension, thyroid disorders, cancers, respiratory problems, past history of hypersensitivity reaction), those who have received first and second dose of any available Covid-19. Those below 18 years, unwilling to participate, with only one dose, who had Covid-19 infection after first dose, with incomplete responses, with data duplication were excluded from study. The participant enrollment was done as shown in flow chart in Figure 1.

The first page of Google form Questionnaire had title, purpose of study, information for participant and option for informed consent. The second page included Demographic details of participants including blood groups and any co-morbid condition/risk factors prior to vaccination. We maintained anonymity of sample by not revealing identity of any participant in order to avoid bias. The subsequent pages asked the information regarding first and second dose, type of vaccine received and any AEFIs experienced over 3-4 weeks following vaccine. Although option was open to report any self experienced AEFI, other than asked in questionnaire. We also sought the any data pertaining to use

of any analgesic-antipyretic drug for relieving post vaccine pain and inflammation.

Data collection and Analysis

Data were collected over a period of 6 months (February 2021-July 2021). Baseline data were analyzed using descriptive statistic and summarized as frequencies and percentages depicted in the form of tables and graph. SPSS Version 19.0 Chicago, USA was used for finding any association between variables.

Ethical Clearance

Study was approved by Institutional Ethical Committee, JMI University, Delhi.

RESULTS

Observations were recorded in the form of tables and graph.

Table 1: Demographic and vaccine related details

Demographic variables	Observations and outcome	N= 315 (Percentage%)
Gender	Male	113 (36%)
	Female	199 (63.2%)
	Transgender	0 (0%)
Age	20-35 years	183 (58%)
	36-50 years	114 (36.3%)
	51-65 years	15 (4.7
	>65 years	3 (1%)
Blood Group	A+	54 (17.1%)
	B+	121 (38.3%)
	AB+	36 (11.4%)
	O+	87 (27.5%)
	A-	2 (0.5%)
	B-	15 (4.7%)
	AB-	2 (0.5%)
	O-	0 (0%)
Already existing Co-morbid conditions	No existing Co-morbid condition	290 (92.2%)
	Hypertension	9 (2.8%)
	Diabetes	5 (1.5%)
	History of allergy	2 (0.6%)
	Respiratory problems including asthma	4 (1.26%)
	Neurological, cancers/tumors, renal, obesity, thyroid problems	5 (1.58%) One for each
Profession	Health Care Workers (HCWs)*	162 (51.3%)
	Front line workers (FLWs)**	20 (6.2%)
	General population (not directly working close to exposed or positive patient)	133 (42.5%)
Covid-19 status before vaccination	No Covid-19 infection	138 (43.8%)
	Recovered from Covid-19	177 (56.2%)
Type of vaccine received	Covishield ™	249 (79.3%)
	Covaxin ™	30 (9.3%)
	Others (Sputnik™ v, Pfizer, Moderna™)	36 (11.4%)
Use of Analgesics after Covid-19 vaccination	After First dose	After second dose
	154 (49.2%)	57 (18.1%)

* Health Care Workers(HCWs): Employees working very close to Covid-19 positive /exposed people in a Hospital/clinic set up e.g Doctors, Nurses and other paramedical personnel.**Front line Workers (FLWs): Employees involved in essential services who need to be present physically for their assigned job e.g. Police, firemen, maintenance workers, milk suppliers, grocery workers, drivers etc.

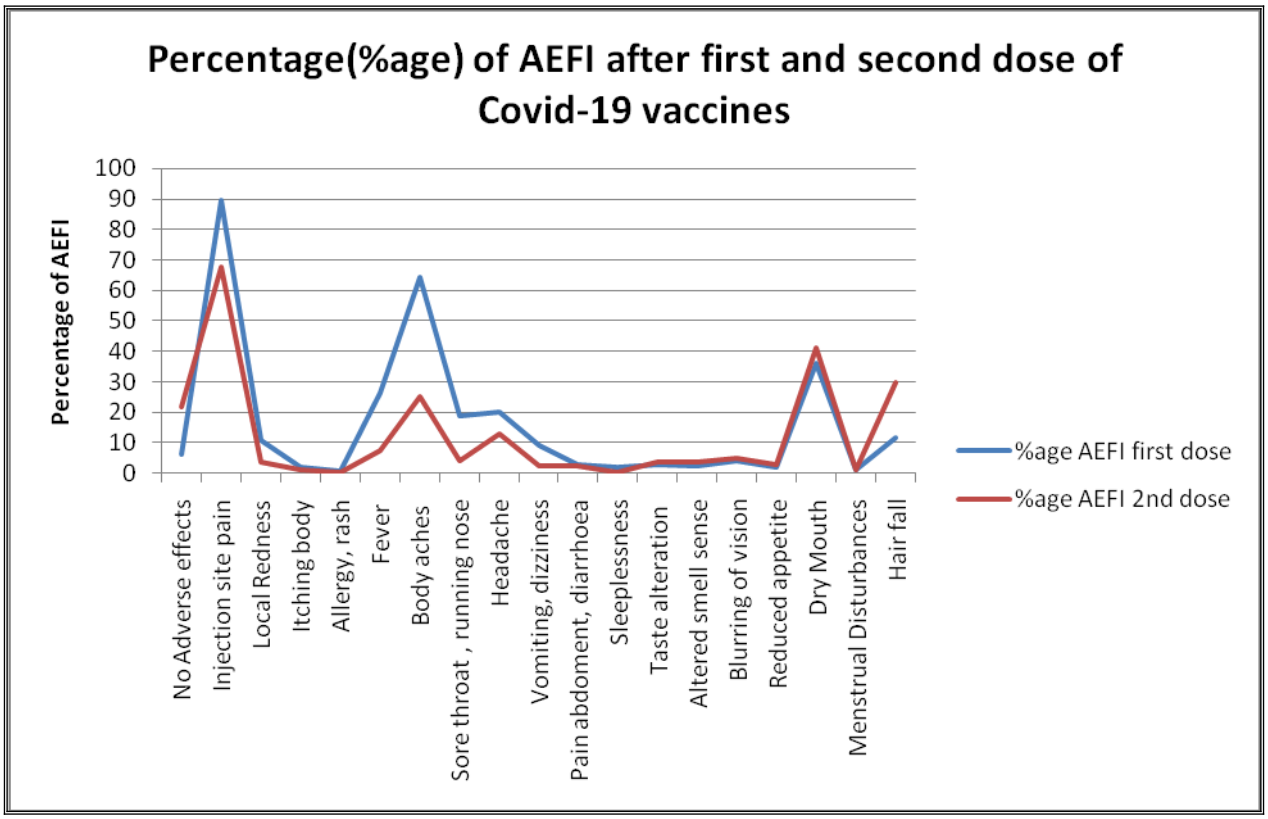

Fig 2: Prevalence of Adverse events after receiving first and second dose of Covid-19 vaccine

Table 2: Relation between ABO blood grouping and AEFIs following Covid-19 vaccines on Indian Population.

	Local AEFIs Observed cell value (expected cell value) [p-value]	**Systemic AEFIs Observed cell value (expected cell value) [p-value]**	***Marginal Row Totals***
AB	113 (115.98) [0.08]	146 (143.02) [0.06]	259
O	50 (47.02) [0.19]	55 (57.98) [0.15]	105
Marginal Column Totals	163	201	364 (Grand Total)
The Chi-square statistic is 0.4809. The p-value is .487998. Not significant at <0.05. The Chi-square statistic with Yates Correction is 0.3331. The p-value is 0.563826. Not significant at <0.05.			

Table 3: Relation between Rhesus type of blood grouping and AEFIs following Covid-19 vaccines on Indian Population.

	Local AEFIs Observed cell value (expected cell value) [p-value]	**Systemic AEFIs Observed cell value (expected cell value) [p-value]**	***Marginal Row Totals***
Rh+	152 (155.39) [0.07]	195 (191.61) [0.06]	347
Rh-	11 (7.61) [1.51]	6 (9.39) [1.22]	17
Marginal Column Totals	163	201	364 (Grand Total)
The Chi-square statistic is 2.8633. The p-value is .090622. Not significant at <0.05. The Chi-square statistic with Yates Correction is 2.0804. The p-value is .149202. Not significant at <0.05.			

Chi square test followed by Yates correction using SPSS version 19, Chicago, USA was applied to find any association between AEFI and ABO-Rh blood grouping.

DISCUSSION

Demographic characteristics (Table 1)

The total number of participants in the study was 315. The demographic characteristics are presented in Table 1. Out of 315 participants, 199 (63.2%) were females in contrast to males 113 (36%). Profession wise, predominant sample was constituted by Health care workers (HCWs)51.3% (162) followed by general population (indirectly exposed to Covid-19) 42.5% (133) and front line workers (FLWs) 6.2% (20) respectively. Almost 58% participants were between the age group of 20-35 years. About 8% (25) of the study participants had already existing co morbid conditions. 56.2% (177) participants had already recovered

from Covid-19 before first shot of vaccine. Those who acquired Covid-19 infection after first dose were excluded from study. B+ was predominant group followed by O+ in study sample. Of the participants, 79.3% (249) received Covishield™ , 9.3% (30) received Covaxin™ and 11.4% (36) received other vaccines (Sputnik™ v, Pfizer, Moderna™). Analgesic-anti-inflammatory drugs were used by 154 (49.2%) and 57 (18.1%) following first and second dose respectively.

Adverse effects following Immunization (AEFI) with Covid-19 vaccines (Figure 2)

Overall, 81% (255) participants experienced AEFI following first dose and 31% (98) experienced AEFI following second dose of vaccine. Of them, immediate reactions within 30 minutes of the vaccine were reported by 1% (2) and rare AEFI encountered was immediate hypersensitivity reactions in the form of skin rash 0.3% (1) and allergy requiring hospitilization0.3% (1) . The second dose of vaccine was skipped by one participant due to severe allergy during first dose, which may be related to immunization stress related response (ISRR). [9] Overall, AEFI observed were less during second dose compared to first dose. injection site pain was the most common adverse effect seen to the extent of 89.6% (282) and 67.8% (213) following first and second dose of vaccine respectively. Redness and swelling at local site of injection was experienced by 11% (34) and 3.8% (12) following first and second dose of vaccine respectively. Among the asked systemic effects after first dose of vaccine, predominant reaction was generalized body aches and malaise 64.2 (202) followed by fever (with or without chills) 26.4% (83), headache 20% (63), sore throat and running nose 18.95 (59). Rare first dose AEFI included dizziness 5% (15), nausea and vomiting 4.7% (14), pain abdomen 1.9% (6) and diarrhea 0.6% (2). Adverse effects were relatively fewer following second dose of vaccine. The notable AEFI following second dose were generalized body aches and malaise 25.3% (79), headache 13% (41) and fever 7.25% (23). Not a single participant reported diarrhea following second dose of vaccine. Few, yet important adverse effects self reported by participants over 3-4 weeks following first/second dose of vaccine respectively include hair fall 11.4% (36)/ 30% (94), dry mouth and excessive thirst 35.8% (113)/41% (129), altered taste 2.8% (9)/ 3.8% (12) and smell sensation 2.2% (7)/ 3.4% (11), sleeplessness 2% (9)/0.3% (1), blurring of vision 3.8% (12)/ 4.8% (15), reduced appetite 2% (6)/2.8% (9) and menstrual irregularities 1% (3)/1.3% (4). Not a single death was reported during study period.

Previous study by Kamal et al has shown the non-serious AEFI rate as 57% and serious adverse events reported as 0.2%, after the first dose of vaccination. Common adverse events included feeling tiredness (20.6%), headache (18.4%), fever (13.04%), and fatigue (14.27%) after the first dose. No serious AEFI were reported after 2nd dose of vaccine. There was no gender association but significant association was seen with age ($p < 0.01$). The incidence of adverse events reporting was relatively more in the older population above years. [10] Parida et al in their study have documented 29.8% AEFI following Covaxin™ among beneficiaries. AEFI were found to be higher among the beneficiaries who received first dose (38.1%) compared to those who received second dose (26.4%). [11]

In a study conducted by Pandit et al, the side effects following the COVID-19 vaccine found to be very common, mild but self limiting in nature. The post COVID 19 vaccine AEFI prevalence was 69.7%. Covaxin™ showed lesser adverse effects compared to Covishield™. [12]

Goldlin et al concluded that mild to moderate AEFI were reported by 67.5% of vaccine recipients. Only one severe AEFI was reported. The study concluded Covishield™ as a very safe vaccine despite being surrounded by misconception and misinformation. Authors of study suggested vaccination to break the chain of Covid-19 infection. [13]

Montaltia et al claimed in preliminary studies on Sputnik V to be safe and tolerable in the elderly population aged more than 60 years in terms of short-term AEFI. [14]

Association between AEFI and blood grouping

No association was observed between AEFI and blood grouping ($p>0.05$) as results were not significant, in the present study. The results have been depicted in Table 2 and 3.

Although ABO blood type appears to be associated with COVID-19 disease severity. Study by Barnkob et al identifies ABO blood group as a risk factor for SARS-CoV-2 infection. [15]

Zietz et al in their study found evidence for association between ABO and Rh blood groups and COVID-19 infection severity. Prevalence of infection was more among non-O blood types and among Rh-positive individuals. Risk of Intubation was higher among AB and B types and Rh positive types. Risk of death was relatively less among types A, B, and Rh-negative types. [16]

Till date, very limited work has been done to determine relationship between blood grouping and severity of AEFIs. Study by Allan et al has shown no connection between ABO blood type and vaccine reactogenicity with mRNA vaccines.[17]

In a study conducted by Pandit et al, no statistical association was observed between ABO- Rh blood grouping and AEFI. Even a small group of COVID19 disease also had no association with ABO or Rh blood group. [11,17]

The study conducted by Alessa et al, the AEFI was reported to the extent of 3/4th of the total number of participants, affecting the work performance of 41% of participants. There was no statistically significant relationship between the appearance of symptoms and age, gender, blood group, number of doses, and past history of Covid-19 infection. However, there was a significant relationship between the severity of side effects and gender and type of vaccination. [18]

Limitations of study

The study was done in the initial phase of Covid-19 vaccination campaign in India, and the results are based on narrow time frame and small sample size. More studies need to be conducted using wider sample and multiple variables for elaborative research for finding any association.

Conclusion and recommendations

All presently available Covid-19 vaccines have mild self limiting adverse effects following immunization, posing no threat or harm. Long term adverse effects require follow up

studies including risk groups and special groups such as pregnancy and children. Future large-scale studies are recommended to further evaluate the implication of ABO blood type on Covid-19. Overall mild adverse effects are tolerable requiring nothing to only mild analgesics- anti-inflammatory drugs. Very rare adverse effects include hypersensitivity reactions from mild to severe and life threatening requiring hospitalization. No association has been observed statistically between AEFI and blood grouping in the present study. Prior history of allergy reaction may prove useful before vaccinating vulnerable population. The data may be useful guide for policy makers to understand risks and to frame strategies for effective vaccination against Covid-19.

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REFERENCES

1. Kaur SP, Gupta V. COVID-19 Vaccine: A comprehensive status report. Virus Res. 2020 Oct 15;288:198114. doi: 10.1016/j.virusres.2020.198114, PMID 32800805.
2. World Health Organization. COVID-19 vaccines: safety surveillance manual. World Health Organization; 2020. Available from: https://apps.who.int/iris/handle/10665/338400.
3. Kumar S, Saurabh MK, Maharshi V. Efficacy and safety of potential vaccine candidates against coronavirus disease 2019: A systematic review. J Adv Pharm Technol Res. 2021 Jul-Sep;12(3):215-21. doi: 10.4103/japtr.JAPTR_229_20, PMID 34345597.
4. Raina SK, Kumar R. 'Covishield and Covaxin' – India's contribution to global COVID-19 pandemic. J Fam Med Prim Care. Jul 2021;10(7):2433-5. doi: 10.4103/jfmpc.jfmpc_174_21, PMID 34568116.
5. Kashte S, Gulbake A, El-Amin III SF, Gupta A. COVID-19 vaccines: rapid development, implications, challenges and future prospects. Hum Cell. 2021;34(3):711-33. doi: 10.1007/s13577-021-00512-4, PMID 33677814.
6. Frederickson R, Herzog RW. RNA-based vaccines and innate immune activation: not too hot and not too cold. Mol Ther. 2021 Apr 7;29(4):1365-6. doi: 10.1016/j.ymthe.2021.03.005, PMID 33705707.
7. Jeon M, Kim J, Oh CE, Lee JY. Adverse events following immunization associated with coronavirus disease 2019 vaccination reported in the mobile vaccine adverse events reporting system. J Korean Med Sci. 2021 May 3;36(17):e114. doi: 10.3346/jkms.2021.36.e114, PMID 33942578.
8. Charan J, Biswas T. How to calculate sample size for different study designs in medical research? Indian J Psychol Med. 2013 Apr;35(2):121-6. doi: 10.4103/0253-7176.116232, PMID 24049221.
9. McMurtry CM. Managing immunization stress-related response: A contributor to sustaining trust in vaccines. Can Commun Dis Rep. 2020 Jun 4;46(6):210-8. doi: 10.4745/ccdr.v46i06a10, PMID 32673376.
10. Kamal D, Thakur V, Nath N, Malhotra T, Gupta A, Batlish R. Adverse events following ChAdOx1 nCoV-19 Vaccine (COVISHIELD) amongst health care workers: A prospective observational study. Med J Armed Forces India. 2021 Jul;77;Suppl 2:S283-8. doi: 10.1016/j.mjafi.2021.06.014, PMID 34334895.
11. Parida SP, Sahu DP, Singh AK, Alekhya G, Subba SH, Mishra A et al. Adverse events following immunization of COVID-19 (Covaxin) vaccine at a tertiary care center of India. J Med Virol. 2022 Jun;94(6):2453-9. doi: 10.1002/jmv.27655, PMID 35149993.
12. Pandit N, Patel N. Adverse event following immunization and relation with blood group following COVID19 Vaccination among Indian community: A cross-sectional study. J Integr Health Sci. 2021;9:60-4.
13. Goldlin TJA, Kalyanaraman S, Ravichandran M, Ramya JE. A pharmacovigilance study of covishield in a tertiary care teaching hospital in Tamil Nadu. J Pharmacol Pharmacother. 2021;12(3):131-6. doi: 10.4103/jpp.jpp_63_21.
14. Montalti M, Soldà G, Di Valerio ZD, Salussolia A, Lenzi J, Forcellini M et al. ROCCA observational study: early results on safety of Sputnik V vaccine (Gam-COVID-Vac) in the Republic of San Marino using active surveillance. EClinicalmedicine. 2021;38:101027. doi: 10.1016/j.eclinm.2021.101027, PMID 34505029.
15. Barnkob MB, Pottegård A, Støvring H, Haunstrup TM, Homburg K, Larsen R et al. Reduced prevalence of SARS-CoV-2 infection in ABO blood group O. Blood. Blood Adv. 2020;4(20):4990-3. doi: 10.1182/bloodadvances.2020002657, PMID 33057631.
16. Zietz M, Zucker J, Tatonetti NP. Testing the association between blood type and COVID-19 infection, intubation, and death [preprint]. Nat Commun. 2020 Sep 10;11(1):5761(v) 13. doi: 10.1101/2020.04.08.20058073. Update in. PMID 32511586, PMCID PMC7276013.
17. Allan JD, McMillan D, Levi ML. COVID-19 mRNA vaccination, ABO blood type and the severity of self-reported reactogenicity in a large healthcare system: A brief report of a cross-sectional study. Cureus. 2021 Dec 29;13(12):e20810. doi: 10.7759/cureus.20810, PMID 35141068.
18. Alessa MY, Aledili FJ, Alnasser AA, Aldharman SS, Al Dehailan AMA, Abuseer HO et al. The side effects of COVID-19 vaccines and its association with ABO blood type among the general surgeons in Saudi Arabia. Cureus. 2022 Mar 29;14(3):e23628. doi: 10.7759/cureus.23628, PMID 35494934.