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Determination Of COVID-19 Vaccine Acceptance And Encountered AEFI Among Vaccinated People In Andhra Pradesh

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Abstract:
This study aims to determine the acceptance of COVID-19 vaccine, factors influencing vaccine acceptance and considering AEFI encountered among immunised participants in Andhra Pradesh. A cross-sectional survey conducted online on 427 adult participants. Statistical analysis includes descriptive statistics, chi square test and binary logistic regression analysis. 86% of the participants are willing to get vaccinated. Place of living is having significant association with vaccine acceptance. The major reason behind accepting vaccination is vaccine protects against infectious disease(49%). 32.6% stated AEFI as the major cause of hesitating vaccine. 81.8% of participants were already vaccinated. 80.2% of the participants experienced AEFI. 81.4% of the participants were willing to vaccinate their children. Religion and education qualification are having significant association with vaccine acceptance. The socio-demographic variable Place of living and belief of vaccine protects against infectious disease is having significant association with vaccine acceptance. Participants of 18-45 age groups are having less vaccination rate. These outcomes will play important role in implementing various vaccination campaigns. This data helps the government to prevent the upcoming COVID-19 waves of different variants of COVID-19 virus.

Keywords: COVID-19, vaccine acceptance, Immunisation, Adverse events following immunisation (AEFI), barriers of vaccine hesitancy.

Introduction:

COVID-19 disease is a respiratory infection caused by severe acute respiratory syndrome corona virus 2 (SARS-COV2)[1]. WHO has announced COVID-19 as pandemic on 11 March,2020[2].COVID-19 infections became a global threat, first emerged in Wuhan City, China in December 2019[3]. It is manifested mostly with respiratory symptoms[4], fever and body aches, conjunctivitis[5], & skin reactions[6].In India, third COVID-19 wave started during midNovember 2021 and worsened by January 2022(7). The most common symptoms reported during COVID-19 third wave are cough, cold, shortness of breath and fever. During third COVID-19 wave the mortality rate was low when compared to first twoCOVID-19 waves. Government took preventive measures to decrease the spread of COVID-19 infection by implementing curfews, physical

distance; making face masks mandatory and restricting public gatherings[8]. In India by March 9 2022; 4,29,75,883 COVID-19 cases were reported among them 5,15,355 were dead(*MoHFW | Home*, n.d.)]. By March 9, 2022 in Andhra Pradesh 23,18,547 confirmed COVID-19 cases were reported among them 14,279 were dead(*MoHFW | Home*, n.d.). By March 9 2022, total number of vaccination done is 8,68,93,669 in Andhra Pradesh.India initiated vaccination programme by 16 January 2021[9]. The vaccination was done priorly to all the front line workers followed by geriatrics with or without co-morbidities then citizens belonging to age group 45-65 years, followed by 18-45 age group. By January 2022, Andhra Pradesh government has announced vaccination for children belonging to 15-17 age groups[10]. In India different type of vaccines are available. They are Covishield, Covaxin, ZyCoV-D, Sputnik V, Biological E's Novel COVID Vaccine, BBV154- Intranasal Vaccine, COVOVAX and mRNA based Vaccine (HGCO19).The process of vaccination registration is done by using CO-WIN portal with support of United Nations development program.Adverse event following immunization [AEFI] is any untoward medical occurrence which follows immunization and which doesnot necessarily have a casual relationship with the usage of vaccine[11]. According to the recent survey conducted in Andhra Pradesh regarding distribution of age group for vaccination. This survey resulted in decreased vaccination rate among age group 18-45, when compared to other eligible age groups[12]. The Purpose of this study is to find the willingness to receive the COVID-19 vaccine in residents of Andhra Pradesh, taking into account the relationship with socio-demographic and health related characteristics. Also the incidence rate of AEFI after immunisation is determined. This study also conducted to compare the adverse effects between available COVID-19 vaccine in Andhra Pradesh. This comparison of AEFI provides safety data of the vaccine to the manufacturers and government.

Materials and methods:

Study sample: All the literate participants of age >18 years and residents of Andhra Pradesh are included in the study.

Study Design:A cross sectional study was conducted in online platform using E-mail, Whatsapp, Face book and Telegram.

Data collection tool: After the approval from Ethical Committee RIPER with approval No. RIPER/IRB/PP/2021/009. A questionnaire was framed using google forms. This questionnaire collects socio-demographic details; willingness of the participants to accept and rejectCOVID-19 vaccine, immunization history, history of COVID-19 infection, and the data was collected after taking the informed consent from the participants. If the participants were already vaccinated, they were asked about type of vaccine, observed any AEFI, felt any mental pressure after vaccination, received appropriate counselling following vaccination, and willingness to vaccinate their children in future. An advocacy column was added at the end of the questionnaire to create awareness among the participants regarding adverse events following immunization and its primary management. A pilot study was conducted on 30 subjects using this questionnaire and validated by Cronbach's alpha.Cronbach's alpha value of the questionnaire is 0.78, which lies in acceptable range.

Statistical analysis:

Data collected in this study is analysed using SPSS version 26. We used descriptive statistics to measure the willingness to accept COVID-19 vaccination, and adverse events followed by vaccination. Descriptive statistics is also used to compare the adverse events followed by vaccination between COVAXIN andCOVISHIELD. The association between demographics and COVID-19 vaccine acceptance is determined by using Binary logistic regression analysis.

Results and discussion:

This study was conducted during a period of September 2021 to February 2022, at time when second wave caused much human loss and third COVID-19 wave is on the way to India. COVID-19 vaccine was approved by government and it was made available by 16 January 2021. The vaccination program has resulted in decreased mortality rate due to COVID-19 infection. As per the recent survey by September

2021, only 38.3% of the people belonging to age group 18-45 were vaccinated[12]. COVID-19 vaccines were made available to 18-45 age groups by May 2021. By January 2022, only 68% of people belonging to age group 18-45 were vaccinated[13]. When compared this vaccination rate with age group 15-17 are having higher vaccination rate than 18-45 age group. The purpose of conducting this study is to know the association of socio-demographics with vaccine acceptance, and to find the incidence of AEFI among immunised participants

Socio-demographic characteristics: This study received 437 online responses by filtering responses irrelevant to our study, a total of 426 responses were received. Among them males and females are 187 and 239 respectively. This study is having higher vaccine acceptance rate of (370)86%. This results vary from other studies conducted in Bangladesh (67%)[14], Tamil Nadu (>50%)[15], Kerala (70%)[16], West Bengal (44.3%)[17], South Korea (70.8%)[18], China (77.4%)[19], Saudi Arabia (64.7%)[20], Kashmir(46%)[21],in a survey conducted in 16 countries(52%) pregnant[22], in a global survey(71.5%)[23] and India(83.6%)[24]. Another public survey conducted showed of 88% vaccine acceptance[25] which is high than our outcome. A scoping review of 22 COVID-19 surveys reported, the vaccine acceptance was 72% by September 2020[26]. A study conducted in Spain showed 1.5% vaccine hesitancy which is lower than vaccine hesitancy in present study[27]. A study conducted to determine participants attitude to 50% & 90% effective vaccine, resulted in 67% & 93.3% of vaccine acceptance respectively[28].

The distribution of socio-demographics characteristics were represented in Table.1. From the Table.1, 87.8% of Hindus, 85.7% Christians, 79.1% Muslims are willing to get vaccinated. High vaccine acceptance was seen in participants with education level primary school certificate (100%) &post graduate(93.1%). 89.2% of participants belonging to engineering field are accepting vaccine. 96.8% of participants above 1 lakh monthly income are willing to get vaccinated. Participant living in rural area are having low vaccine acceptance rate(81.9%).

Table 1: Percentage of willingness to vaccinate among residents of Andhra Pradesh

Characteristics		**Total**	**Yes**	**No**	**χ^2value**	**p-value**
Overall		426	370[86%]	56[13%]		
Gender	Male	187	158[84%]	29[15.5%]	1.55	0.21
	Female	239	212[88.49%]	27[11.2%]		
Age	18-45	391	340[86.9%]	51[13%]	0.22	0.89
	46-60	34	29[85.%]	5[14.7%]		
	>60	1	1[100%]	0		
Religion	Hindu	371	326[87.8%]	45[12.1%]	2.82	0.24
	Muslim	48	38[79.1%]	10[20.8%]		
	Christian	7	6[85.7%]	1[14.2%]		
Education level	Above graduation	34	30[88.2%]	4[11.7%]	8.12	0.32
	graduation	229	197[86%]	32[13.9%]		
	Intermediate or diploma	18	15[83.3%]	3[16.6%]		
	High school certificate	9	8[88.8%]	1[11.1%]		
	Higher secondary certificate and below	7	4[57.1%]	3[42.8%]		
	Primary school certificate	2	2[100%]	0		
	Post graduate and above	58	54[93.1%]	4[6.89%]		
	undergraduate	69	60[86.9%]	9[13.1%]		
Occupation	Student	241	209[86.7%]	32[13.2%]	6.07	0.41
	Medical field	16	14[87.5%]	2[12.5%]		
	Pharmacy field	65	55[84.6%]	10[15.3%]		
	Engineering	28	25[89.2%]	3[10.7%]		
	House wife/ retired	8	6[75%]	2[25%]		
	Bank employee	5	3[60%]	2[40%]		
	Others	63	58[92%]	5[8%]		
Monthly family income	Less than 15,000	160	137[85.6%]	23[14.4%]	3.54	0.61
	15,000-70,000	184	160[86.9%]	24[13.18%]		
	1 lakh	22	18[81.8%]	4[18.1%]		
	Above 1 lakh	32	31[96.8%]	1[3.1%]		
	others	28	24[85.7%]	4[14.2%]		
Current place of	Rural	166	136[81.9%]	30[18%]	7.10	<0.05*

living	Semi urban	72	62[86.1%]	10[13.8%]		
	Urban	188	172[91.4%]	16[8.5%]		
Acquired COVID-19 infection in past 3 months	Yes	91	84[92.3%]	7[7.6%]	3.01	0.08
	No	335	286[85.3%]	49[14.6%]		

A study conducted among medical and dental students showed vaccine hesitancy about 23% among medical students and 45% among dental students[29]. Current study shows low vaccine hesitancy among medical students (11.7%).The present study shows 87.5% vaccine acceptance in medical staff which is similar to study conducted on medical staff in Western France(>80%)[30]. A study conducted on nursing students showed 84.33% of willingness to get vaccinated[31].In this study the vaccine acceptance among graduates is 86% which is higher than vaccine acceptance in a US survey (28.4%)[32].

Table 2: Association of variables with willingness to accept vaccine

Characteristics		**Number of accepted sample/ total number of cases**	**Odds Ratio(CI 95%)**	**P value**
Current place of living	Rural	136/166[0.81]	0.22(reference)	1
	Semi urban	62/72[0.86]	0.731(0.33-1.58)	0.42
	Urban	172/188[0.91]	0.42(0.22-0.8)	<0.01*
Vaccine protect against infectious disease	Yes	261/285[0.91]	0.09(reference)	1
	May be	91/113[0.8]	2.62(1.4-4.91)	0.002
	No	18/28[0.64]	6.04(2.5-14.5)	<0.001*

Logistical regression analysis: from the Table.2, place of living and belief of vaccine protects against infectious disease is having significant association with vaccine acceptance. In the present study, the socio-demographic variable region of living ($p<0.05$) is having significant association with vaccine acceptance. In a similar study conducted in Bangladesh the significant socio-demographic variables (where $p<0.05$) include age, religion, region, education, occupation, monthly income and condition of physical health[14]. In this study participants stated vaccines will protect against infectious disease(40%) and vaccination will stop the ongoing pandemic(30%) as the major reason for accepting vaccination. Study in Bangladesh also reported vaccine protects against infectious disease(64.3%) and will help in stopping the COVID-19 pandemic(49.9%) as the major barrier[14].

Table 3: Percentage distribution of vaccine acceptance reasons

Variables		**N (No. of responses)**	**Percentage(%)**
Reasons behind accepting COVID-19 vaccine	Vaccine protect against infectious disease	271	49.0
	Vaccination will stop ongoing COVID-19 pandemic	170	30.7
	Not afraid of adverse effects of Vaccine	48	8.6
	Influenced by friends and family	31	5.6
	Others	33	5.9
Reasons behind rejecting COVID-19 vaccine	Doubted effectiveness	72	16.7
	Side effects of vaccine	140	32.6
	Lack of information	84	19.5
	Having chronic illness	15	3.4
	Religious or personal believes	17	3.9
	Difficulty to reach vaccination centre	20	4.6
	Others	79	18.4

Attitude towards COVID-19 vaccination: From table 3, the distribution of reasons behind accepting vaccine are vaccines protect against infectious disease(49%), vaccine will stop ongoing pandemic(30.7%), not afraid of side effects of vaccine(8.3%), and influenced by family and friends(5.6%). The distribution of reasons behind not accepting vaccination: side effects of vaccine(32.6%), doubted effectiveness(16.7%), lack of information about vaccine(19.5%), having chronic illness(3.4%), religious and personal beliefs(3.9%), and difficulty to reach vaccination centre(4.6%).5.6% of the participants in current study are willing to vaccinate due to influence by family and friends. This is similar with a study conducted in Kerala with 8.81% of willingness to vaccinate by influence of family and friends[16]. In the current study adverse effects(32.6%)

following vaccination, lack of information regarding vaccine(19.5%) and doubted effectiveness of vaccine(16.7%)are the major reasons to hesitate vaccination. Study in Bangladesh reported doubted effectiveness(60%) and side effects of vaccine(57%) as the major barrier[14]. Side effects after vaccination stood as a major barrier in Kerala (86%)[16], Kashmir(67.2%)[21], South Korea(13.4%)[18] and also in a study conducted in overall India(35.6%)[24].

56% of participants reported doubted effectiveness of vaccine as one of the major reason in rejecting vaccine. 35% of participant of a survey in India stated lack of availability of vaccination as the major barrier[24].In a study conducted in pregnant population, reported fear of harmful effects to foetus as the major concern in not accepting COVID-19 vaccine[22].

Table 4 : Percentage of vaccinated people according to age groups

Variable	Total	Vaccinated	Not Vaccinated
18-45	392	316[80.6%]	76[19.3%]
46-60	34	33[97%]	1[3%]
Greater than 60	1	1[100%]	0

Distribution of age group among vaccinated people: from table.4, there is low vaccination rate among 18-45 age group(80.6%), and participants of >60yrs is having 100% vaccination rate.

Table 5: Percentage of AEFI following vaccination.

Variables		n (%)
Already received COVID-19 vaccine	Yes	351 (81.8)
	No	78(18.1)
Type of vaccine	Covaxin	118(33.6)
	Covishield	233(66.3)
	Sputnik V	0
Felt any mental pressure after receiving vaccine	Yes	53(15.1)
	No	297(84.8)
Received counselling after vaccination	Yes	87(57.6)
	No	64(42.3)
Encountered with AEFI after receiving vaccine	Yes	195(80.2)
	No	48(19.7)
Type of AEFI encountered	Fever	204(28.9)
	Body pains	178(25.2)
	Pain at injection site	191(27.0)
	Head ache	105(14.8)
	Allergy	3(0.4)
	Itching	3(0.4)
	Diarrhoea	2(0.2)
	Thrombosis	0
	Vomiting	7(0.9)
	Others	12(1.7)
Received any medicines for AEFI	Yes	197(48.5)
	No	209(51.4)
Type of medicines	Paracetamol	232(83.1)
	Pain killers	8(2.8)
	Anti histamines	0
	ORS	4(1.4)
	Others	35(12.5)
Received anadaiah medicine	Yes	197(48.5)
	No	209(51.4)
Encountered with any AEFI for anadaiah medicine	Yes	36(10.1)
	No	317(89.8)

In present study 81.8% of the participants were already immunised, where 33.6% of participants received Covaxin and 66.3% received Covishield vaccine. This study shows low vaccination rate(80.6%) among 18-45 age group, where vaccination rate in 45-60 is 97% and >60yrs is 100%. 57.6% of the immunised

participants received counselling regarding AEFI and life style modifications immediately after immunisation.

After immunisation 15.1% participants felt mental pressure, when compared study in Bangladesh reported 18.17% participants felt mental pressure[14]. After immunisation 80.2% subjects encountered with AEFI within 48 hours of immunisation. The rate of AEFI incidence is high in this study, where Bangladesh reported 57% of incidence of side effects[14].The major adverse effects observed after immunisation are fever (28.9%), pain at injection site (27%), body pains (25.2%) & headache (14.8%). Study in Bangladesh also reported similar major side effects of fever (36%), muscle pain (31%), pain at injection site (30%) & headache (23%)[14]. A survey in Odisha reported fever (37.9%) & headache (13.8%) as the major adverse effects[33]. However the present study reported less incidence of allergy(0.4%), itching(0.4%), vomiting (0.9%) and diarrhoea(0.2%).

Table 6: Comparison of AEFI between CovaxinandCovishield

Type of vaccine		**n (%)**
Covaxin	Fever	60(25.1)
	Body pains	41(17.1)
	Pain at injection site	79(33.0)
	Head ache	49(20.5)
	Allergy	1(0.4)
	Itching	2(0.8)
	Diarrhoea	1(0.4)
	Thrombosis	0
	Vomiting	1(0.4)
	others	5(2.0)
Covishield	Fever	138(29.4)
	Body pains	127(27.1)
	Pain at injection site	92(19.6)
	Head ache	86(18.3)
	Allergy	2(0.4)
	Itching	4(0.8)
	Diarrhoea	1(0.2)
	Thrombosis	0
	Vomiting	9(1.9)
	others	9(1.9)

This study compared the AEFI between Covaxin and Covishield. High incidence of fever (29.4%) & body pains(27%) is observed in Covishield. Occurrence of pain at injection site(33%) and headache(20%) is seen in Covaxin.

Table 7: Acceptance of COVID-19 vaccine for their children

Characteristics		**total**	**yes**	**no**	**χ^2value**	**p-value**
Overall		426	347[81.4%]	79 [18.5%]		
Gender	Male	187	136 [72.7%]	51[27.2%]	16.8	4.13
	Female	239	211[88.2%]	28[11.7%]		
Religion	Hindu	371	312 [84%]	59[16%]	13.59	0.001*
	Muslim	48	30 [62.5%]	18[37.5%]		
	Christian	7	5 [71.4%]	2 [28.5%]		
Education level	Above graduation	34	28[82.3%]	6 [17.6%]	17.5	0.01*
	Graduation	229	192[83.8%]	37 [16.1%]		
	Intermediate or diploma	18	11[61.1%]	7 [78.8%]		
	High school certificate	9	4[44.4%]	5 [55.5%]		
	Higher secondary certificate and below	7	5[71.4%]	2[28.5%]		
	Primary school certificate	2	1[50%]	1 [50%]		

	Post graduate	58	51[87.9%]	7[12.1%]		
	Under graduate	69	55[79.7%]	14[20.2%]		
Occupation	Student	241	196[81.3%]	45 [18.6%]	9.43	0.15
	Medical field	16	16[100%]	0		
	Pharmacy field	65	48[73.8%]	17 [26.1%]		
	Engineering	28	22[78.5%]	6 [21.4%]		
	House wife/ retired	8	7[87.5%]	1 [21.4%]		
	Bank employee	5	3[60%]	2[40%]		
	others	63	55[87.3%]	8[12.6%]		
Monthly family income	Less than 15,000	160	129[80.6%]	31 [19.4%]	6.2	0.18
	15,000-70,000	184	149[81%]	35 [19%]		
	1 lakh	22	16[72.7%]	6 [27.2%]		
	Above 1 lakh	32	28[87.5%]	4 [12.5%]		
	others	28	25[89.2%]	3[10.7%]		
Current place of living	Rural	166	121[72.8%]	45 [27.1%]	176.99	3.68
	Semi urban	72	60[83.3%]	12 [16.6%]		
	Urban	188	166[88.2%]	22 [11.7%]		

In this study 81.4% of the participants were willing to vaccinate their children. In socio-demographic variable religion and education qualification were having significant association (where $p<0.05$) with acceptance of vaccinating their children.

Table 8: Reasons for rejecting COVID-19vaccination for children

Variables		**Number of responses (%)**
Reasons to reject vaccination to their children	Side effects of vaccine	50(25.3)
	Lack of information	34(17.2)
	Previously vaccinated to other flu virus	18(9.1)
	others	95(48.2)

From table.8, the reasons behind not accepting vaccination to their children are adverse effects after vaccination(25.2%), lack of information(17.2%), previously vaccinated to other flu vaccine(9.1%). 45% of the participants were not willing to share the reason behind not accepting vaccination.

Conclusion:

Though vaccination rate was increased across India, there is decreased vaccine acceptance rate among participants of age group 18-45 in Andhra Pradesh, due to adverse events followed by vaccination as the major reason to hesitate vaccination Place of living and belief of vaccine protects against infectious disease is having significant association with willingness to accept COVID-19 vaccine. As XBB 1.16 variant is emerging across the globe, there is a need to take immediate precautions to prevent another pandemic in 2023. This study helps government to implement various policies and awareness programs to overcome the barriers associated with vaccine acceptance.This study provides information that helps various vaccine manufacturing companies in manufacturing COVID-19 vaccine in view of safety of the population.

Future scope:

As this is an online survey we included literate participants only. Future researchers can focus on illiterate participants to prevent COVID-19 of new variants.

Limitations:

Limitation of this study is we used snowball sampling technique, so there may be chances of selection bias in this study.

Strengths of our study:

1. Our study fills the gap in literature from other states.
2. In our study along with the determination of acceptance of COVID-19 vaccine, we also determine the distribution of AEFI between Covaxin and Covishield.

3. Our study helps government to implement various policies to overcome the barriers associated with vaccine acceptance.
4. This study helps in introducing various awareness programs to get vaccinated in view of preventing BF.7 variant of COVID-19virus, before it rapidly spreads in India.
5. This study provides information that helps various vaccine manufacturing companies in manufacturing COVID-19 vaccine in view of safety of the population.

Conflict Of Interest: The authors hereby declare that there is no conflict of interest.

Author contributions:
Dr.BhupalamPradeepkumar- Guidance regarding framing the study, statistical analysis.
Dr. A. Sudheer- Guidance regarding ethical practices during study.
B.H.Sai Dharani- Framing data collection tool, Literature Review, and Performing Statistical Analysis.
T.Priyanka- Data Collection
D.SuhasVatsal- Data Collection.

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