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**A cross-sectional study on COVID-19 vaccine hesitancy at peri-urban areas in Kanpur,  
Uttar Pradesh, India**

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**Informed consent:** Participants were informed about the objective of the study and provided with Participants Information sheet in the local language (Hindi). They were explained about study in local language and was given chance for asking any questions pertaining to it.

Informed written consent was taken from each participant. Participants were also given confirmation that they were free to withdraw consent and discontinue participation at any time during the study. Throughout the procedure, the privacy and confidentiality of the information gathered was maintained.

**Data Sharing:** Data will be provided by corresponding author on reasonable request.

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**Abstract**

Vaccination is a potential public health solution for the prevention of infection. It reduces the severity of symptoms in case of COVID-19. Despite the availability of vaccines, some people are hesitant to be vaccinated. The objectives of the study were to measure the proportion of vaccine hesitancy among the peri-urban population and identify its determinants. An adult population of 303 from two peri-urban areas in the field practice area of Urban Health Training Centre, Rama Medical College were interviewed from 22<sup>nd</sup> February 2021 to 25<sup>th</sup> March 2021. Epicollect 5 was used for collecting data and STATA 16 was used for analysis. Multivariable logistic regression was applied to compute the adjusted odd ratio (95% confidence interval) to find out the determinants of vaccine hesitancy. Three Cs model guided tools of data collection and analyses. More than one fourth (28%) of the participants were vaccine-hesitant whereas 34.6% of participants had no confidence in the vaccine. Other reasons were complacency (40.6%) and convenience (35.9%). Vaccine hesitancy was significantly associated with gender [AOR = 2.40 (1.12-5.16)] and trust in government [AOR = 0.18 (0.08-0.45)] but no association with age group, political affiliation and source of information about the vaccine. It is important to build the trust of people in vaccines, make it convenient and resolve the issues that are making them complacent. The health system needs to involve non-governmental organisations to reach out to those for whom there are issues of availability and approach.

**Key words:** COVID-19, vaccine hesitancy, non-confidence, complacency, non-convenience.

**Introduction**

World Health Organization (WHO) declared COVID-19 a pandemic, which created an unprecedented challenge to the global public health care system leading to hundred fifty-five million, six hundred sixty-five thousand and two hundred fourteen confirmed cases of COVID-19 as of 6 May 2021. A day before i.e., 5 May 2021 it was reported that a total of one billion and one seventy million and nine hundred vaccine doses have been administered [1-3]. From the initial stage of this pandemic, scientists were focused on either repurposing the existing drugs or developing vaccines against COVID-19.

Though now the vaccine is available but reach and response to vaccination is yet to be measured [4]. Vaccine hesitancy has been a major barrier to vaccine uptake and could prevent the achievement of the COVID-19 herd immunity threshold [5]. However, a delay in acceptance or refusal of vaccines despite the availability of the COVID-19 vaccine needs to be understood in the larger context [6].

Vaccine hesitancy has been common for all the vaccines. The vaccine hesitancy has been influenced by a number of factors including trust in vaccines [4]. Distrust could be in the vaccine or its provider (vaccine confidence). Many times people do not perceive the need for vaccinating or valuing the vaccine (vaccine complacency) and there could be difficulty in access (vaccine convenience) [7]. Besides there are factors at individual levels to attitudes and socio-political domain [8-13].

Globally, there are many studies that have assessed COVID-19 vaccine hesitancy among key workers (working in health and social care, education, transport, key public services, local or national government, food and necessity goods, public safety, and certain utilities, communications and financial services), students (medical, engineering, arts, etc.) and different communities. There is less information available on the knowledge, side-effects, short-term effects, long-term effects, affordability and its effectiveness of vaccination [8,9,14–19].

Therefore, vaccine hesitancy needs to be understood wherever we work and to take timely actions for building confidence in vaccines and achieve the goal of herd immunity.

**Objective:** To estimate vaccine hesitancy and identify determinants of hesitancy in the peri-urban areas of the field practice area of urban health training centre, Rama Medical College Hospital and research centre, Mandhana, Kanpur.

### **Materials and Methods**

This cross-sectional study was part of an original intended study “A sequential mixed method study on COVID-19 vaccine hesitancy among rural population in block Kalyanpur, district Kanpur, Uttar Pradesh, India”. Due to the state government-imposed lockdown and taking into account the current pandemic situation, the qualitative component was postponed till the situation improves.

Rama Medical College Urban Health Training Centre covers about 14 peri-urban areas. All the peri-urban sites are within 5 km and are approachable, only the two peri-urban areas namely Berikhera, and Akbarpur which were nearest and where the travel was allowed were considered for selecting the study participants for this study. Adult population ( $\geq 18$  years of age) were included in the study.

### **Sample size**

Taking relative error 5%, the prevalence of vaccine hesitancy in a slum area was 83% [13] (hence it was presumed in the peri-urban area the prevalence would be slightly more (85%) and the non-response rate 20%, a sample size of 338 was calculated using formula  $z^2(1-$

$\alpha/2)pq/d^2$  (where  $p$  is 0.85,  $q=1-p$ ,  $d$ = relative error (5% of  $p$ ). The data was collected between 22 February to 25 March 2021. It is important to mention that the refusal rate for participation in the study was quite high 57.6% during this phase of the pandemic. Every refusal was compensated by the next study participant and the survey continued till the total sample was covered.

After obtaining written informed consent from the participants, the data were collected in an online data capture tool Epicollect 5 [20]. The questionnaire was developed on the basis of review of the literature. The sections on socio-demographics, COVID-19 information, political affiliation, and willingness to accept the vaccine were taken from the validated questionnaires [8,10,16,18]. After collecting the data from the participants, the participant was educated on the importance of being vaccinated and the profile of the vaccine (safety, effectiveness of the vaccine and its contra-indication, side effect).

### Measures

As per our operational definition, the measures are defined as follows:

**Vaccine hesitancy:** Unwillingness to accept the vaccine (Covishield or Covaxin Vaccine) on its availability [7] (Those who responded as “No” to the question on willingness to be vaccinated).

**Non-confidence:** Having trust in the vaccine or vaccine provider [7] (Those who responded as “No” to the question on trust in vaccine or vaccine provider).

**Complacency:** Not perceiving the need to be vaccinated [7] (Those who responded as “No” to the question on the perceived need to be vaccinated).

**Non-convenience:** Not having access to the vaccine [7] (Those who responded as “No” for the question on access for vaccine despite its availability).

These were measured as binary outcomes “Yes” or “No”

### Analysis

Data was analysed using STATA16 (StataCorp, 2019. Stata Statistical Software: Release 16. College Station, TX, USA).

Vaccine hesitancy and its components have been reported as proportions. Categorical variables were analysed using Chi-square test/Fisher test. Univariate logistic regression was performed for all the variables, and crude odds ratio were reported with 95% confidence interval and  $p$ -value. Variables were analysed for collinearity through variation inflation factor ( $VIF \geq 10$  was taken as cut off for dropping the variables from the multivariable logistic regression model).

Multivariable logistic regression was used for computing adjusted odds ratio (which was reported with 95% confidence interval and p-value) to find an association between vaccine hesitancy (and its components-confidence, complacency, convenience) and socio-demographic variables, political, health indicators and Covid 19 vaccine variables. A p-value <0.05 was taken as cut off for statistical significance.

**Ethics approval:** The study received ethical approval from Institute's Ethical Committee [IEC/RAMA MEDICAL COLLEGE/Estt. /Dean/2021/12033].

**Informed consent:** Participants were informed about the objective of the study and provided with Participants Information sheet in the local language (Hindi). They were explained about the study in the local language and were given a chance for asking any questions pertaining to it. Informed written consent was taken from each participant. Participants were also given confirmation that they were free to withdraw consent and discontinue participation at any time during the study. Throughout the procedure, the privacy and confidentiality of the information gathered was maintained.

## Results

### Socio-demographic profile

303 participants were recruited in the study. The mean (SD) age of the participants was 38.2 (15.1) years. About one third (68%) of the participants were women, and most (98.7%) were Hindus. In terms of education, the majority of the participants were graduates (27%), followed by illiterate (20.5%) (Table 1).

### Vaccine hesitancy

More than one fourth of participants (27.7%) were not willing to get the vaccine. Lack of confidence, convenience and complacency were seen in 34.9%, 35.9%, and 40.6% of participants respectively. There was no association between Vaccine hesitancy and age group, marital status, political affiliations, employment status, and source of information about vaccines from various types of media. The odds of vaccine hesitancy among females were 2.4 times the odds of vaccine hesitancy among males (95% C.I. 1.12-5.16, p=0.024). The odds of vaccine hesitancy were significantly lower among those who trust the government as compared to those who do not (adjusted O.R. of 0.18, p<0.001) (Table 2). Literate participants had significantly lower odds of being vaccine-hesitant (OR 0.38) compared to illiterate participants in univariable analysis, but this association was not significant in multivariable analysis.

Awareness regarding the availability of COVID-19 vaccines in the country was also associated with lower vaccine hesitancy (crude O.R. 0.40 (0.17-0.94),  $p=0.036$ ), although the variable did not load in multivariable logistic regression due to collinearity. Having awareness regarding Covaxin and Covishield vaccines was also associated with lower OR (crude OR 0.45 (0.22-0.91),  $p=0.027$ ) for vaccine hesitancy compared to not having. The relationship was not significant after multivariable logistic regression (Table 2).

### **Non-confidence**

One hundred six participants (34.9%) were not confident about the available vaccines (Figure 1). Gender was significantly associated with vaccine Non-confidence; More women had non-confidence in the vaccine with OR of 1.87 (1.09-3.18,  $p=0.022$ ) in univariate model. Having trust in the government was significantly protective against non-confidence in vaccination with OR of 0.05 (0.02-0.12,  $p<0.001$ ) (Table 3). Literate participants had significantly lower odds of being non-confident (OR 0.28) compared to illiterate participants in univariable analysis, but this association was not significant in the multivariable model. Participants who had received information about COVID-19 through television [adjusted OR of 0.40 (0.17-0.93)] and government [adjusted OR= 0.10 (0.02-0.52)] had a significant association with non-confidence in the vaccine compared to those who did not get information through these media. Those who were aware of adverse effects following COVID-19 vaccination were significantly more non-confident in the vaccine than those who were not (Table 3).

### **Complacency**

Complacency was present in one hundred twenty-three (40.6%) participants (Figure 1). Literate participants had significantly lower odds of being complacent [adjusted OR 0.32 (0.13-0.81)] compared to illiterate participants in the multivariable analysis. Having trust in government was significantly associated [adjusted OR= 0.08 (0.03-0.24)] with non-complacency compared to not having. Supporters of BJP Party were significantly associated with lower complacency as compared to non-supporter of any party [adjusted OR=0.27(0.11-0.66)] as well as supporters of other party [adjusted OR=0.28 (0.09-0.88)] (Table 4). Having awareness regarding the availability of COVID-19 vaccines in the country was also associated with lower complacency [crude OR 0.49 (0.25-0.98),  $p=0.044$ ], although the variable did not load in multivariable logistic regression due to collinearity. Having awareness regarding Covaxin and Covishield vaccines was also associated with lower OR [crude OR 0.42 (0.21-0.84),  $p=0.015$ ] for complacency compared to not having, although the relationship was not significant after



multivariable logistic regression. Those who did not hear of vaccine side effects were more likely to have no complacency as compared to those who heard about it. Moreover, there was statistical significance (Table 4).

### **Non-convenience**

One hundred and nine (35.9%) participants had non-convenience (Figure 1). Non-convenience was more frequent in the elderly age group [adjusted OR =4.75(1.12-20.21)] as compared to 18-44 age group (Table 5). Education was not found to be associated with non-convenience in both univariable and multivariable analysis. Participants who had received information about COVID-19 through television [(adjusted OR of 0.26 (0.08-0.80)] were significantly associated with Non-convenience, with lower odds amongst those who got information through television media compared to not getting from it. However, participants who received information through radio had significantly higher odds compared to those who did not [13.04 (2.52-67.53)] (Table 5). Having awareness regarding Covaxin and Covishield vaccines was associated with lower odds (crude OR 0.12 (0.05-0.27) for non-convenience as compared to not having awareness. Those who heard someone being vaccinated [0.22 (0.80-0.58)] were associated with lower odds for non-convenience (Table 5).

### **Discussion**

This quantitative cross-sectional study was conducted among rural population of two villages. The findings indicate more than a quarter were vaccine hesitant and hesitancy was predominant in 45-59 years age group, women, illiterate participant, joint family, married, and unemployed participants. About two third of the population was having confidence and compliance while 40.6% were complacent.

There are demographic disparities in vaccine acceptance [9,18-20,23] but in our sample socio-demographic variables were not associated with vaccine hesitancy. Despite having no significant association with most variables' vaccine hesitancy was associated with being younger than 60 years of age, having a lower level of education, and having inadequate knowledge about the recommended action as has been mentioned in other studies [11,18,22]. Gender and education do affect the acceptance of vaccination. Not only in our population men compared to women and graduates were pro-vaccination [16,23].

In our study, almost eighty five percent of participants had trust in government. On the contrary, 46.2% of Austrians had trust in the government to provide safe vaccines [23]. Those who had received information of COVID-19 through television and News media and were aware of the

availability of COVID-19 vaccines in the country were also associated with lower vaccine hesitancy. Other studies reporting reliance on social media as the main source of information about COVID-19 vaccines was associated with vaccine hesitancy [21]. The existing literature points out frequency of social media use, type of content and emotional appeal influence the anti-vaccination movement online [24].

Studies have shown political affiliation influences vaccine hesitancy which has been documented in a survey among the US, Austrian adults and among the Irish and UK populations. [10,12,23]. About a quarter of both UK and Irish participants were vaccine-hesitant [10.] Moreover, vaccine hesitancy among the Austrian adult population was more among those who voted for the opposition party or no party [23]. However, our study showed no association between vaccine hesitancy and political affiliation may be due non-representative of the sample.

It was reported that vaccine hesitancy/resistance among UK and Turkey was evident for 35% and 31% of the populations respectively, perceived risk of contracting infection, frequency of watching, reading, listening news had positive effects on vaccine hesitancy. Those resistant to a COVID-19 vaccine were less likely to obtain information about the pandemic from traditional and authoritative sources and had mistrust in these sources [25].

The studies which have been conducted for assessing vaccine hesitancy among communities (Australia, Austria, Europe, Arabian countries, US, UK, France and Turkey, etc.) are online studies [12,16,18,22,23,25]. The limitations of online studies are constraints in generalizability, sampling issues, self-selection bias and non-response rates, etc. [26].

A study assessing 5Cs – confidence, complacency, convenience, calculate risk and concern using a 5-item Likert scale among 26234 respondents and findings indicate a willingness to be vaccinated had the highest correlations with confidence with the safety of the vaccine, concern with protecting others by being vaccinated, and believing COVID-19 was serious enough to merit vaccination [27].

We assessed 3Cs as binary outcome (present or absent) unlike previous studies using Likert scale to assess the 3Cs in other vaccines such as influenza vaccine [28,29] and found confidence in vaccine, convenience of vaccination and no complacency was associated with trusting the government and supporting the ruling party. The documented limitation in using a Likert scale is the following – social desirability bias, central tendency bias (participants avoid extreme response categories), acquiescence bias (agree with the statements in order to please the experimenter) and validity difficult to demonstrate [30].

A qualitative study is warranted for exploring and understanding the socio-demographic characteristics of the study population, some outside factors (i.e., confounders) that could not be controlled, a different source of media for COVID-19 vaccine influences vaccine hesitancy and the 3Cs to explore the non-significant results with a different set of variables. Moreover, to understand when either confidence is present or complacency absent or convenience is present, then how is vaccine hesitancy present or vice-versa.

This study has a few limitations which warrant consideration. This study followed a cross-sectional study design that cannot establish causal inferences. Therefore, a longitudinal study would overcome this limitation in understanding potential causal relationships. Moreover, the small sample size and study setting are only representative of the similar settings and could not be generalized. Therefore, studies utilizing larger samples from more representative populations are needed.

### **Conclusion**

The findings indicate the population of these two peri-urban areas is vaccine-hesitant, and gender and trust in government were the significant determinants. Multi-sectorial (health system, media, administration) approach is required for mitigating and addressing vaccine hesitancy issues and a qualitative study is to be conducted for understanding the factors influencing the 3Cs.

### **Conflict of Interest**

The authors declare no conflict of interest

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**Author Contribution:** All the authors were involved in the study conceptualization. AJ, ADG and MK were involved in the analysis. All the authors were involved in preparing and finalizing the draft.

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**Table 1. Socio-demographic political profile of participants (n=303).**

<b>Variables</b>	<b>Frequency (n)</b>	<b>Percentage (%)</b>
<b>Mean age (standard deviation)</b>	38.2	15.1
<b>Gender</b>		
Male	97	32.0
Female	206	68.0
<b>Religion</b>		
Hindu	299	98.7
Muslim	4	1.3
Sikh	0	-
<b>Education</b>		
Illiterate	62	20.5
Primary school	48	15.8
middle school	26	8.6
High School	52	17.2
Intermediate	33	10.9
Graduate and above	82	27.1
<b>Occupation</b>		
Unemployed	13	4.3
Employed	82	27.1
Housewife	153	50.5
Student	55	18.2
<b>Marital status</b>		
Married	229	75.6
Unmarried	73	24.1
Separated	1	0.3
<b>type of family</b>		
Nuclear	242	79.9
Joint	61	20.1
Living alone	0	-
<b>Village residence</b>		
Berikhera	197	65.0
Akbarpura	106	34.9

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<b>Political party affiliation</b>		
BJP	156	51.5
Congress	1	0.3
Samajwadi	4	1.3
Bahujan party	31	10.2
Do not support any party	111	36.6

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**Table 2. Association of vaccine hesitancy with various factors (univariable and multivariable analysis)**

Variables		Total (n)	Vaccine hesitancy present		Crude OR	p-value	Adjusted OR	p-value
			(n)	(%)				
<b>Age group (in years)</b>	18-44	188	52	27.7	Reference	-	Reference	-
	45-59	86	25	29.1	1.07 (0.61-1.88)	0.810	1.17(0.55-2.51)	0.685
	≥60	29	7	24.1	0.83 (0.33-2.06)	0.692	1.29(0.38-4.37)	0.687
<b>Sex</b>	Male	97	13	13.4	Reference	-	Reference	-
	Female	206	71	34.5	3.39 (1.77-6.51)	<0.001	2.40(1.12-5.16)	0.024
<b>Education</b>	Illiterate	62	24	38.7	Reference	-	Reference	-
	Literate	241	60	24.9	0.38 (0.18-0.81)	0.012	0.83(0.33-2.12)	0.701
<b>Occupation</b>	Unemployed	13	5	38.5	Reference	-	*	*
	Employed	82	14	17.1	0.33 (0.09-1.16)	0.083	*	*
	HW	153	54	35.3	0.87 (0.27-2.78)	0.819	*	*
	Student	55	11	20.0	0.40 (0.11-1.46)	0.167	*	*
<b>Marital status</b>	Never	73	15	20.5	Reference	-	*	*
	Married							
	Married/ Separated	230	69	30.0	1.65 (0.87-3.12)	0.118	*	*
<b>Family type</b>	Nuclear	242	67	27.7	Reference	-	Reference	-
	Joint	61	17	27.9	1.01 (0.54-1.88)	0.977	0.72(0.29-1.80)	0.481
<b>Party</b>	No party	111	40	36.0	Reference	-	Reference	-
	BJP	156	33	21.1	0.48 (0.28-0.82)	0.008	1.10(0.48-2.49)	0.820



	Other party	36	11	30.5	0.78 (0.35-1.75)	0.549	0.91(0.31-2.70)	0.866
<b>Trust in govt.</b>	No	47	29	61.7	Reference	-	Reference	-
	Yes	256	55	21.5	0.17 (0.09-0.33)	<0.001	0.18(0.08-0.45)	<0.001
<b>Aware about vaccine availability in country</b>	No	37	16	43.2	Reference	-	*	*
	Yes	266	68	25.6	0.40 (0.17-0.94)	0.036	*	*
<b>Aware about COVID-19 vaccine</b>	No	215	61	28.4	Reference	-	Reference	-
	Yes	51	7	13.7	0.45 (0.22-0.91)	0.027	0.50(0.17-1.44)	0.199
<b>Source of info for COVID-19</b>								
<b>Frontline workers</b>	No	249	66	26.5	Reference	-	Reference	-
	Yes	17	2	11.8	0.37 (0.08-1.66)	0.194	0.52(0.10-2.74)	0.440
<b>Television</b>	No	66	25	37.9	Reference	-	Reference	-
	Yes	200	43	21.5	0.45 (0.25-0.82)	0.009	0.48(0.22-1.04)	0.063
<b>Telephone</b>	No	121	30	24.8	Reference	-	Reference	-
	Yes	145	38	26.2	1.08 (0.62-1.87)	0.792	1.18(0.53-2.62)	0.42
<b>Social Media</b>	No	191	53	27.8	Reference	-	Reference	-
	Yes	75	15	20.0	0.65 (0.34-1.24)	0.194	1.23(0.43-3.47)	0.701
<b>Radio</b>	No	204	52	25.5	Reference	-	Reference	-
	Yes	62	16	25.8	1.02 (0.53-1.95)	0.960	3.42(0.94-12.44)	0.062
<b>News</b>	No	84	29	34.5	Reference	-	Reference	-
	Yes	180	39	21.7	0.52 (0.29-0.93)	0.027	0.72(0.32-1.58)	0.407
<b>Government</b>	No	219	59	26.9	Reference	-	Reference	-
	Yes	47	9	19.2	0.64 (0.29-1.41)	0.269	0.51(0.14-1.87)	0.311
<b>Friend</b>	No	181	45	24.9	Reference	-	Reference	-

	Yes	85	23	27.1	1.12 (0.62-2.01)	0.702	1.14(0.37-3.56)	0.819
<b>Family</b>	No	181	44	24.3	Reference	-	Reference	-
	Yes	85	24	28.2	1.22 (0.68-2.19)	0.494	0.62(0.24-1.59)	0.321
<b>COVID-19 heard anyone vaccinated</b>	No	94	28	29.8	Reference	-	Reference	-
	Yes	172	40	23.3	0.71 (0.41-1.26)	0.244	0.78(0.36-1.69)	0.533
<b>Heard COVID-19 vaccine side effects</b>	No	76	18	23.7	0.87 (0.46-1.61)	0.657	0.83(0.37-1.86)	0.648
	Yes	190	50	26.3	Reference	-	Reference	-

\* Variable was dropped due to collinearity and  $vif \geq 10$

**Table 3. Association of vaccine non-confidence with various factors (univariable and multivariable analysis).**

Variables		Total (N)	Non-confidence present		Crude OR	p-value	Adjusted OR	p-value
			(n)	(%)				
<b>Age group (in years)</b>	18-44	188	61	32.4	Reference	-	Reference	-
	45-59	86	35	40.7	1.43 (0.84-2.42)	0.185	1.23(0.55-2.76)	0.620
	≥60	29	10	34.5	1.09 (0.48-2.50)	0.828	1.12(0.30-4.19)	0.865
<b>Sex</b>	Male	97	25	25.8	Reference	-	Reference	-
	Female	206	81	39.3	1.87 (1.09-3.18)	0.022	1.10(0.52-2.33)	0.796
<b>Education</b>	Illiterate	62	33	53.2	Reference	-	Reference	-
	Literate	241	73	30.3	0.28 (0.14-0.58)	<0.001	0.47(0.18-1.21)	0.119
<b>Occupation</b>	Unemployed	13	5	38.5	Reference	-	*	*
	Employed	82	22	26.8	0.59 (0.17-1.98)	0.391	*	*
	House wife	153	63	41.2	1.12 (0.35-3.58)	0.849	*	*
	Student	55	16	29.1	0.66 (0.19-2.31)	0.513	*	*
<b>Marital status</b>	Never Married	73	20	27.4	Reference	-	*	*
	Married/Separated	230	86	37.4	1.58 (0.89-2.82)	0.121	*	*
<b>Family type</b>	Nuclear	242	84	34.7	Reference	-	Reference	-
	Joint	61	22	36.1	1.06 (0.59-1.91)	0.843	0.89(0.33-2.43)	0.820
<b>Party</b>	No Party	111	55	49.6	Reference	-	Reference	-
	BJP	156	39	25.0	0.34 (0.20-0.57)	<0.001	0.41(0.17-1.03)	0.059

	Other party	36	12	33.3	0.51 (0.23-1.12)	0.092	0.18(0.05-0.67)	0.010
<b>Trust in govt.</b>	No	47	41	87.2	Reference	-	Reference	-
	Yes	256	65	25.4	0.05 (0.02-0.12)	<0.001	0.04(0.01-0.12)	<0.001
<b>Aware about vaccine availability in country</b>	No	266	86	32.3	Reference	-	*	*
	Yes	37	20	54.1	0.59 (0.28-1.18)	0.138	*	*
<b>Aware about COVID-19 vaccine</b>	No	215	74	34.4	Reference	-	Reference	-
	Yes	51	12	23.5	0.41 (0.20-0.81)	0.011	1.15(0.41-3.21)	0.792
<b>Source of info for COVID-19</b>								
<b>Frontline workers</b>	No	249	85	34.1	Reference	-	Reference	-
	Yes	17	1	5.9	0.12 (0.02-0.92)	0.042	0.32(0.03-3.15)	0.330
<b>Television</b>	No	66	32	48.5	Reference	-	Reference	-
	Yes	200	54	27.0	0.39 (0.22-0.70)	0.001	0.40(0.17-0.93)	0.033
<b>Telephone</b>	No	121	46	38.0	Reference	-	Reference	-
	Yes	145	40	27.6	0.62 (0.37-1.04)	0.071	0.52(0.22-1.21)	0.130
<b>Social media</b>	No	191	69	36.1	Reference	-	Reference	-
	Yes	75	17	22.7	0.52 (0.28-0.96)	0.036	1.26(0.41-3.93)	0.686
<b>Radio</b>	No	204	73	35.7	Reference	-	Reference	-
	Yes	62	13	20.9	0.48 (0.24-0.94)	0.031	4.12(0.88-19.18)	0.071
<b>News</b>	No	84	37	44.1	Reference	-	Reference	-
	Yes	180	48	26.7	0.46 (0.27-0.79)	0.005	0.88(0.38-2.02)	0.765
<b>Government</b>	No	219	82	37.4	Reference	-	Reference	-

	Yes	47	4	8.5	0.16 (0.05-0.45)	0.001	0.10(0.02-0.52)	0.006
<b>Friend</b>	No	181	62	34.2	Reference	-	Reference	-
	Yes	85	24	28.2	0.76 (0.43-1.33)	0.328	1.61(0.48-5.36)	0.438
<b>Family</b>	No	181	59	32.6	Reference	-	Reference	-
	Yes	85	27	31.8	0.96 (0.55-1.67)	0.892	0.35(0.12-1.01)	0.052
<b>COVID-19 heard anyone</b>	No	94	34	36.2	Reference	-	Reference	-
<b>vaccinated</b>	Yes	172	52	30.2	0.76 (0.45-1.30)	0.323	0.66(0.26-1.68)	0.381
<b>Heard COVID-19 vaccine S/E</b>	No	76	17	22.4	0.51 (0.27-0.93)	0.030	0.35(0.12-0.98)	0.046
	Yes	190	69	36.3	Reference	-	Reference	-

\* Variable was dropped due to collinearity and  $vif \geq 10$

**Table 4. Association of vaccine complacency with various factors (univariable and multivariable analysis).**

Variables		Total	Complacency		Crude OR	p-value	Adjusted OR	p-value
		(N)	(n)	(%)				
<b>Age group (in years)</b>	18-44	188	71	37.8	Reference	-	Reference	-
	45-59	86	39	45.4	1.36 (0.81-2.29)	0.235	1.57(0.73-3.39)	0.249
	≥60	29	13	44.8	1.33 (0.61-2.95)	0.468	1.58(0.48-5.18)	0.452
<b>Sex</b>	Male	97	31	31.9	Reference	-	Reference	-
	Female	206	92	44.7	1.72 (1.03-2.85)	0.037	0.99(0.50-1.98)	0.986
<b>Education</b>	Illiterate	62	36	58.1	Reference	-	Reference	-
	Literate	241	87	36.1	0.60 (0.26-1.41)	0.242	0.32(0.13-0.81)	0.016
<b>Occupation</b>	Unemployed	13	7	53.8	Reference	-	*	*
	Employed	82	25	30.5	0.38 (0.11-1.23)	0.106	*	*
	HW	153	71	46.4	0.74 (0.24-2.31)	0.607	*	*
	Student	55	20	36.4	0.49 (0.14-1.66)	0.252	*	*
<b>Marital status</b>	Never Married	73	23	31.5	Reference	-	*	*
	Married/Separated	230	100	43.5	1.67 (0.96-2.92)	0.071	*	*
<b>Family type</b>	Nuclear	242	98	40.5	Reference	-	Reference	-
	Joint	61	25	40.9	1.02 (0.58-1.81)	0.945	0.72(0.28-1.84)	0.496
<b>Party</b>	No Party	111	64	57.7	Reference	-	Reference	-
	BJP	156	44	28.2	0.29 (0.17-0.48)	<0.001	0.27(0.11-0.66)	0.004

	Other party	36	15	41.7	0.52 (0.24-1.12)	0.097	0.28(0.09-0.88)	0.029
<b>Trust in govt.</b>	No	47	42	89.4	Reference	-	Reference	-
	Yes	256	81	31.6	0.06 (0.02-0.14)	<0.001	0.08(0.03-0.24)	<0.001
<b>Aware about vaccine availability in country</b>	No	37	22	59.5	Reference	-	*	*
	Yes	266	101	37.9	0.49 (0.25-0.98)	0.044	*	*
<b>Aware about COVID-19 vaccine</b>	No	215	88	40.9	Reference	-	Reference	-
	Yes	51	13	25.5	0.42 (0.21-0.84)	0.015	0.53(0.20-1.38)	0.193
<b>Source of info for COVID-19</b>								
<b>Frontline workers</b>	No	249	98	39.4	Reference	-	Reference	-
	Yes	17	3	17.6	0.33 (0.09-1.18)	0.088	0.45(0.08-2.46)	0.355
<b>Television</b>	No	66	31	46.9	Reference	-	Reference	-
	Yes	200	70	35.0	0.61 (0.34-1.07)	0.084	0.94(0.42-2.12)	0.880
<b>Telephone</b>	No	121	47	38.8	Reference	-	Reference	-
	Yes	145	54	37.2	0.93 (0.57-1.53)	0.789	0.92(0.42-2.04)	0.838
<b>Social media</b>	No	191	75	39.3	Reference	-	Reference	-
	Yes	75	26	34.7	0.82 (0.47-1.43)	0.487	1.97(0.70-5.50)	0.197
<b>Radio</b>	No	204	81	39.7	Reference	-	Reference	-
	Yes	62	20	32.3	0.72 (0.39-1.32)	0.291	1.47(0.36-5.94)	0.592
<b>News</b>	No	84	42	50.0	Reference	-	Reference	-
	Yes	180	57	31.7	0.46 (0.27-0.78)	0.004	0.81(0.37-1.79)	0.606
<b>Government</b>	No	219	90	41.1	Reference	-	Reference	-

	Yes	47	11	23.4	0.44 (0.21-0.91)	0.026	0.35(0.09-1.34)	0.125
<b>Friend</b>	No	181	69	38.1	Reference	-	Reference	-
	Yes	85	32	37.7	0.98 (0.58-1.67)	0.941	1.17(0.37-3.70)	0.784
<b>Family</b>	No	181	66	36.5	Reference	-	Reference	-
	Yes	85	35	41.2	1.22 (0.72-2.07)	0.461	0.66(0.25-1.78)	0.416
<b>COVID-19 heard anyone</b>	No	94	46	48.9	Reference	-	Reference	-
<b>vaccinated</b>	Yes	172	55	31.9	0.49 (0.29-0.82)	0.007	0.32(0.14-0.72)	0.006
<b>Heard COVID-19 vaccine S/E</b>	No	76	23	30.3	0.62 (0.35-1.10)	0.103	0.41(0.17-0.98)	0.044
	Yes	190	78	41.1	Reference	-	Reference	-

\* Variable was dropped due to collinearity and  $vif \geq 10$



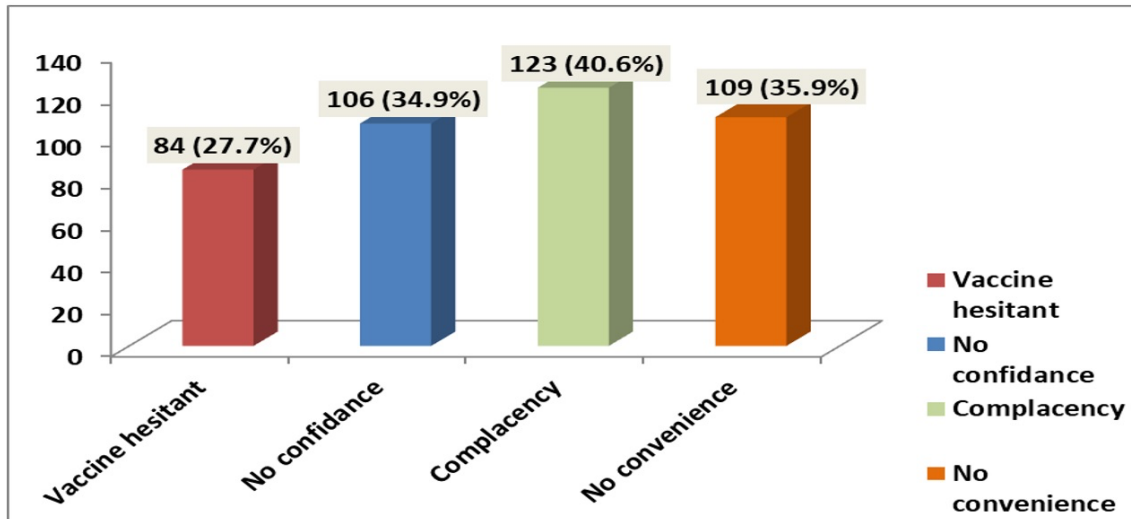
**Table 5. Association of vaccine non-convenience with various factors (univariable and multivariable analysis).**

Variables		Total (N)	Non- convenience present		Crude OR	p-value	Adjusted OR	p-value
			(n)	(%)				
<b>Age group (in years)</b>	18-44	188	72	38.3	Reference	-	Reference	-
	45-59	86	23	26.7	0.59 (0.34-1.03)	0.064	1.11(0.40-3.07)	0.837
	≥60	29	14	48.3	1.50 (0.69-3.30)	0.309	4.75(1.12-20.21)	0.035
<b>Sex</b>	Male	97	22	22.6	Reference	-	Reference	-
	Female	206	87	42.2	2.49 (1.44-4.32)	0.001	0.78(0.29-2.10)	0.623
<b>Education</b>	Illiterate	62	17	27.4	Reference	-	Reference	-
	Literate	241	92	38.2	1.63 (0.88-3.02)	0.118	2.53(0.56-11.54)	0.230
<b>Occupation</b>	Unemployed	13	6	46.2	Reference	-	*	*
	Employed	82	18	22.0	0.32 (0.10-1.10)	0.071	*	*
	HW	153	65	42.5	0.86 (0.28-2.69)	0.797	*	*
	Student	55	20	36.4	0.67 (0.20-2.26)	0.515	*	*
<b>Marital status</b>	Never Married	73	27	37.0	Reference	-	Reference	-
	Married/Separated	230	82	35.6	0.94 (0.55-1.63)	0.836	-	-
<b>Family type</b>	Nuclear	242	73	30.2	Reference	-	Reference	-
	Joint	61	36	59.0	3.33 (1.87-5.95)	<0.001	1.05(0.37-3.02)	0.922
<b>Party</b>	No Party	111	72	64.9	Reference	-	Reference	-

	BJP	156	32	20.5	0.14(0.08-0.24)	<0.001	0.44(0.17-1.13)	0.089
	Other party	36	5	13.9	0.09(0.03-0.24)	<0.001	0.40(0.08-2.10)	0.279
<b>Trust in government</b>	No	47	18	38.3	Reference	-	Reference	-
	Yes	256	91	35.6	0.89 (0.47-1.69)	0.718	0.66(0.21-2.14)	0.492
<b>Aware about vaccine availability</b>	No	215	60	27.9	Reference	-	*	*
<b>in country</b>	Yes	51	20	39.2	1.67 (0.88-3.15)	0.116	*	*
<b>Aware about COVID-19 vaccine</b>	No	37	29	78.4	Reference	-	Reference	-
	Yes	266	80	30.1	0.12 (0.05-0.27)	<0.001	0.51(0.16-1.69)	0.273
<b>Source of info for COVID-19</b>								
<b>Frontline workers</b>	No	249	69	27.7	Reference	-	Reference	-
	Yes	17	11	64.7	4.78 (1.70-13.43)	0.003	0.79(0.18-3.43)	0.749
<b>Television</b>	No	66	21	31.8	Reference	-	Reference	-
	Yes	200	59	29.5	0.90 (0.49-1.63)	0.722	0.26(0.08-0.80)	0.019
<b>Telephone</b>	No	121	10	8.3	Reference	-	Reference	-
	Yes	145	70	48.3	10.36 (5.-2-21.38)	<0.001	2.39(0.76-7.51)	0.136
<b>Social media</b>	No	191	37	19.4	Reference	-	Reference	-
	Yes	75	43	57.3	5.59 (3.13-10.00)	<0.001	2.07(0.54-7.97)	0.289
<b>Radio</b>	No	204	31	15.2	Reference	-	Reference	-
	Yes	62	49	79.0	21.03 (10.23-43.26)	<0.001	13.04(2.52-67.53)	0.002
<b>News</b>	No	84	21	25.0	Reference	-	Reference	-
	Yes	180	58	32.2	1.43 (0.79-0.26)	0.234	0.76(0.24-2.42)	0.647

<b>Government</b>	No	219	45	20.6	Reference	-	Reference	-
	Yes	47	35	74.5	11.28 (5.42-23.47)	<0.001	0.66(0.12-3.48)	0.622
<b>Friend</b>	No	181	21	11.6	Reference	-	Reference	-
	Yes	85	59	69.4	17.29 (9.04-33.05)	<0.001	3.72(0.91-15.19)	0.067
<b>Family</b>	No	181	27	14.9	Reference	-	Reference	-
	Yes	85	53	62.4	9.45 (5.19-17.21)	<0.001	1.59(0.52-4.82)	0.412
<b>COVID-19 heard anyone vaccinated</b>	No	94	44	46.8	Reference	-	Reference	-
	Yes	172	36	20.9	0.30 (0.17-0.52)	<0.001	0.22(0.80-0.58)	0.002
<b>Heard COVID-19 vaccine S/E</b>	No	76	28	36.8	1.55 (0.88-2.72)	0.129	0.49(0.19-1.25)	0.136
	Yes	190	52	27.3	Reference	-	Reference	-

\* Variable was dropped due to collinearity and  $vif \geq 10$



**Figure 1.** Depiction of COVID-19 vaccine hesitancy and its components (n=303).