

RESEARCH PAPER



Intention to get COVID-19 vaccines: Exploring the role of attitudes, subjective norms, perceived behavioral control, belief in COVID-19 misinformation, and vaccine confidence in Northern India

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ABSTRACT

This study examines people's intention to get COVID-19 vaccines and some of the psychological factors, that can facilitate the vaccination process. Using the theory of planned behavior (TPB) as a theoretical framework, we hypothesized that the key constructs of TPB (attitudes, subjective norms and perceived behavioral control) would explain people's intention to get COVID-19 vaccines. Belief in COVID-19-related misinformation and vaccine confidence were added to the TPB framework in order to comprehensively assess the predictors of COVID-19 vaccine intentions. Data was collected from 400 Indian respondents electronically during Feb–March, 2021. Hierarchical regression analysis was used to analyze the data. The Three components of TPB collectively explained 41% of the variance in the intention to get COVID-19 vaccines. Belief in COVID-19-related misinformation and vaccine confidence, on the other hand, had no significant impact on the intention to get COVID-19 vaccines. We discuss the theoretical and practical implications of these results.

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Introduction

Today's world is in the middle of a pandemic caused by the drastic spread of SARS-CoV-2, which has created an unprecedented global public health and economic crisis.¹ Successfully inoculating a large population in affected countries is one of the most effective ways to contain the impact of the COVID-19 virus,² followed by other preventive measures, such as enforcing strict quarantines, lockdowns, following social distancing measures and ensuring community-use of face masks.³ In India (the site of the present study), two COVID-19 vaccines were launched on 16th January 2021. These vaccines were made available for the general public from March 1, 2021. People of 45 years of age and above are on the priority list for getting the vaccines. However, vaccine availability does not guarantee sufficient population vaccination⁴ as people's willingness to get vaccinated plays a very important role in the vaccination drive.⁵ But many people are hesitant about taking the vaccines⁶ and are expressing fear, doubts and concerns about the safety and effectiveness of vaccines.^{7,8} The situation in India is worrisome, as it has just experienced a -devastating second wave of COVID-19 resulting in a record number of infections and deaths. *A third wave of COVID-19 is also expected to hit India by the end of this year, which might be more catastrophic, therefore, vaccinating a larger proportion of people is necessary to avert the risks of the upcoming wave.*⁹ The total number of infected people in India was 2,98,81,965, and the number of deaths was 3,86,713 on 20th June, 2021,¹⁰ which was only next to the USA. Despite India's highly critical COVID-19 situation in India, only 16.4% of people had received the first

dose of the vaccine and only 3.6% of people were fully vaccinated by 20th June, 2021,¹¹ which is very low as compared to the USA.¹² Therefore, there is an urgent need to understand and investigate people's attitudes towards COVID-19 vaccines to ensure their rapid and requisite uptake.^{13,14} There has been some research on vaccine uptake in the COVID-19 context.^{15,16} However, only a handful of these have been done in India.^{17,18}

Despite the importance of COVID-19 vaccines in developing herd immunity, a large proportion of people are either unsure of or do not trust the safety and effectiveness of COVID-19 vaccines,⁷ which is posing significant challenges in achieving the universal vaccination.¹⁹ Studies have found that 26% of French²⁰ and 20% of US adults did not intend to receive the vaccine even if offered.²¹ Sixty-two percent of Indians also reported vaccine hesitancy stating that they would want to wait before getting vaccinated.²² Several factors have been identified for vaccine hesitancy, such as attitude toward the vaccines,²³ the newness of vaccines, safety concerns and potential side effects,^{8,24} effectiveness of vaccines,²⁵ and mistrust in the vaccination process.¹⁹

Moreover, the significant amount of misinformation being spread about the available COVID-19 vaccines on various social media platforms and other traditional sources such as television and print media, is also making people doubtful about the vaccine's safety.⁷ Several demographic factors like age, gender, educational level, employment status, and residency have also been explored by researchers as potential contributors to vaccine uptake intentions.^{19,23,26} *For example,*

in Western Uganda, young adults aged 18–20 years, males, elites at tertiary level of education (degree or diploma), students, non-salary earners and those living in rural areas were found to be more likely to accept COVID-19 vaccines.²⁷ Religious affiliation and political beliefs held by people have also been found to affect the acceptance of COVID-19 vaccines.^{28,29} As COVID-19 vaccination is a recent development, hence there is a need to explore various factors leading to vaccine uptake in various parts of the world. The present study is thus a modest attempt to add some new insights into the emerging knowledge on COVID-19 vaccine uptake in India.

Theoretical background and hypotheses development

Theory of Planned Behavior (TPB)^{30,31} has been used to conceptualize the present research. TPB has been widely used in studying different health-related intentions and behaviors including smoking, drinking, vaccination intake, and substance use.^{32,33} The basic premise of TPB is that individuals make logical, reasoned decisions to engage in specific health behaviors by evaluating the information around them.³⁴ The key component of TPB is behavioral intent it represents an individual's commitment to engage in a particular behavior³² and also his or her motivation to exert effort in performing that behavior.³⁵ According to TPB, behavioral intention and decision to engage in health behaviors can be explained with the help of its three components: attitude towards the specific health behavior, subjective norms, and perceived behavioral control (PBC).³¹ A brief description of these three is presented below:

- (1) **Attitudes**- The attitude of the person refers to the extent to which he/she has a favorable or unfavorable evaluation of the behavior of interest. It involves considering the outcomes of performing that particular behavior – whether they would be positive or negative for the person.³⁶ The present study aims to assess whether the participants have a positive or negative attitude toward the available COVID-19 vaccines and to what extent the attitude predicts intention to get the vaccine.
- (2) **Subjective norms** – The subjective norms refer to a person's beliefs about what significant social others think about his/her engaging in a particular behavior, and whether they would approve of it or not.³⁵ Thus, subjective norms focus exclusively on our significant others as the reference group and engaging in the target behavior is based on the opinion of significant others and their approval.³³ In the present study, subjective norms would refer to the extent to which people's willingness to take the COVID-19 is influenced by whether their significant social others approve of them taking the vaccine or not. Therefore, subjective norms would predict people's intention to take COVID-19 vaccines.
- (3) **Perceived behavioral control (PBC)** – This refers to the person's perception of the ease or difficulty involved in performing the target behavior and any limitations that may inhibit the behavior.³⁷ In other words, it refers to the extent to which the person expects or perceives control over the intended behavior.³⁵ An individual with high perceived behavioral control will put more

efforts into carrying out the intended behavior.³⁸ Therefore, we believed that PBC would be a predictor of intention to get COVID-19 vaccines.

There is some evidence that TPB has explained vaccine uptake intentions, vaccine hesitancy, and attitude toward COVID-19 vaccines significantly.^{15,16} The model has also emerged as a potentially useful framework for the development of future programs to promote vaccination intentions.³⁹ In one of the meta-analysis on TPB, and its association with vaccine hesitancy and uptake, the researchers⁴⁰ found that the model accounted for 54.3% of the total variance in intention to get vaccines. Some researchers have expanded TPB model and used other health behavior theories including the health belief model (HBM) to explain vaccine uptake holistically.^{26,28} Moreover, an extended parallel process model (EPPM) has also been used with TPB and HBM⁴¹ to study COVID-19 vaccine intentions and it was found that EPPM has added extra variance in the vaccine intentions. These researches have added enormous value to the existing body of knowledge on vaccine intake, however, for a more holistic understanding and better policy formulation, some other important constructs can also be examined along with TPB to study the intention to get COVID-19 vaccines. Belief in COVID-19 related misinformation and vaccine confidence are two such constructs. Therefore, belief in COVID-19 misinformation and vaccine confidence have added to the overall conceptualization of the present research.

Belief in COVID-19 misinformation

There has been a lot of misinformation available on various platforms related to COVID-19 origin, spread, prevention, vaccine development, and treatment.⁴² *The amplification of and the access to misinformation about COVID-19 virus and vaccines through various social media platforms has led to an "infodemic" -overabundance of information, whether correct or false.*⁴³ This has created a divisive atmosphere around the development, availability, importance, and effectiveness of COVID-19 vaccines,⁴⁴ thereby leading to vaccine hesitancy and limiting public uptake of COVID-19 vaccines.^{7,45} *The rise and spread of misinformation about COVID-19 is associated with political and economic upheaval, and also poses a major threat to public health.*^{7,45} *Some misinformation about the COVID-19 may include – 5 G mobile networks are linked with the virus,⁴⁶ vaccine trial participants have died after taking a COVID-19 vaccine, and that the pandemic is a conspiracy or a bioweapon.¹ Social media platforms are well known for the spread of misinformation related to COVID-19 and the vaccines.⁷ Most of these rumors and false information about vaccines shared on social and other media sources, are related to their trials, development, delivery and access.⁴⁷* However, to the best of our knowledge, belief in COVID-19 related misinformation has not been examined along with TPB to explain COVID-19 vaccine uptake intention. Therefore, it is essential to assess the extent to which people believe in the COVID-19 related misinformation so that its unique contribution to vaccine intention can be assessed over and above demographic variables and TPB constructs.

Vaccine confidence

It is defined as *the trust that the population and their families have in (i) the effectiveness and safety of the recommended vaccines; (ii) the agencies and the medical professionals who were involved in the development of vaccines and delivering them. It also includes the reliability and competence of the health professionals and health service providers, and (iii) the intentions of policy-makers who make decisions regarding the vaccines.*⁴⁸ A vaccine does not become trustworthy automatically as there is fear and skepticism among people regarding its safety and effectiveness.²⁵ This has resulted in a ‘crisis of trust.’⁷ Some of the concerns about the vaccines are related to their immediate and long-term side effects,²⁴ rapid development,^{4,8} and lack of transparency in data sharing.¹³ *Exposure to a wide range of misinformation about COVID-19 vaccines, usually through social media sources has also led to mistrust in vaccines, in government institutions and health care services.*⁷ Despite these concerns, vaccine confidence is directly linked to vaccine acceptability and vaccine uptake.^{49,50} However, to the best of our knowledge, vaccine confidence and TPB has not been explored together to explain COVID-19 vaccine uptake intention. Therefore, it is important to assess people’s confidence in COVID-19 vaccines, and its ability to predict their intentions to get vaccines. We also believed that vaccine confidence would add extra value to the intention to get COVID-19 vaccines over and above demographics and three components of TPB.

Hypotheses:

Based on the above discussion, the following *hypotheses (H₁-H₇)* were formulated:

H₁ – Participants with a more positive attitude toward the COVID-19 vaccine will show more intent to get vaccinated.

H₂ – Participants with stronger subjective norms will show stronger intent to get vaccinated.

H₃ – Participants with higher perceived behavioral control will show stronger intent to get vaccinated.

H₄ – Participants believing less in COVID-19 misinformation will show stronger intent to get vaccinated.

H₅ – Believing less in COVID-19 misinformation would explain additional variance in intention to get COVID-19 vaccines over and above demographics and components of TPB.

H₆ – Participants showing higher vaccine confidence will show stronger intent to get vaccinated.

H₇ – Higher vaccine confidence would explain additional variance in intention to get COVID-19 vaccines over and above demographics and components of TPB.

Method

Participants

A cross-sectional online survey was conducted among 400 Indian respondents. Convenience sampling technique was used to collect data through online mode with the help of Google forms in English. The forms were distributed on social media platforms through Whatsapp, Instagram and Facebook. The participants were requested to circulate the forms among their friends and family members. The study was mainly conducted in the Indian states of Bihar, Uttar Pradesh, Madhya Pradesh and Delhi. Participants were in the age range of 18 to 73 years. There were 109 male participants, 290 female participants, and 1 participant belonged to the third gender. Originally, a total of 468 participants filled the survey. Data of 49 respondents (33 participants did not complete the survey, and 16 participants were below the age of 18) were not included in the final analysis. Moreover, 19 participants who reported “poor” overall health in the survey were excluded. Data were collected from 8th February 2021 to 9th March 2021.

Inclusion and exclusion criteria

All Indian adults of age 18 years and above, having a smartphone with internet access were included in this study. However, Indians below the age 18 years, those without access to smartphones and those with poor self-reported health concerns were excluded from the study. Self-reported health was measured by a single item – ‘How would you rate your overall health?’⁵¹ There are five response categories ranging from poor to excellent, and data of the participants who have scored ‘poor’ were excluded from data analysis.

Power analysis

A priori power analysis using the G*Power software version 3.1.9.4 software⁵² recommended a sample size of 119 participants to detect medium effects ($f^2 = .15$), with 80% power using a hierarchical multiple regression (fixed model, R^2 change) at an alpha of .05. Thus, our actual sample size, $N = 400$ was more than adequate to test the study’s hypotheses. Table 1 presents participants’ demographic information.

Measures

Attitude toward COVID-19 vaccines

The attitude of participants toward the COVID-19 vaccines was measured using a single statement.²⁸ The statement was, “Once a recommended COVID-19 vaccine is available to the public, getting it would be” which was followed by six semantic differential scales (to be rated on a seven-point scale). These are: foolish-wise, harmful-beneficial, worthless-valuable, bad-good, negative-positive, and unsatisfactory-satisfactory. *The scores can thus range from 6 to 42 and a high score means favorable attitude than a low score. The scale value for ‘Attitude toward COVID-19 vaccines was*

obtained by dividing the mean value of participants by the total number of items in the scale (i.e., 6). If the scale value lies at 3 or below, then it would be considered as an unfavorable attitude, if the scale value is 4, it refers to a neutral attitude. A scale value of 5 or more would reflect a favorable attitude. The Cronbach's alpha of Attitude toward COVID-19 Vaccines was found to be 0.961 on the current sample indicating high reliability.⁵³

Subjective norms

The subjective norms were measured using five items originally developed for Swine flu vaccines.⁵⁴ The items were changed to suit the context of the COVID-19 vaccines. For example, the first item: "people who are important to me would _____ (Strongly disapprove – strongly approve) _____ of me having a Swine flu vaccine" was changed to "people who are important to me would _____ (Strongly disapprove – strongly approve) _____ of me having a COVID-19 vaccine." The first three items were measured on a 7-point Likert scale ranging from Strongly disapprove (1) to Strongly approve (7). The last two items were also scored on a 7-Point Likert Scale but with different sets of options ranging from Strongly disagree (1) to Strongly agree (7). A Sample item is "I feel under social pressure to have a COVID-19 Vaccine." Item 5 was deleted from the further analysis as the item-total correlation of this item was found to be 0.05, and therefore, only four items (1–4) were used in the analysis of data. *The scores thus ranged from 4 to 28 and a high score indicates strong subjective norms as compared to low score. The scale value for 'subjective norms' was obtained by dividing the mean value of participants by the total number of items (i.e., 4). If the scale value is 3 or below, then it would be considered as weak subjective norms, if the scale value is 4, it refers to uncertain subjective norms. A scale value of 5 or more indicates strong subjective norms.* Cronbach's alpha for the four items of subjective norms scale was found to be 0.691 on the current sample. *It is very close to 0.70 cut off.*⁵³ However, we note that "when dealing with psychological constructs, values even below .7 can, realistically, be expected because of the diversity of the constructs being measured."⁵³

Perceived behavioral control

The PBC was measured using four items originally developed for the Gardasil vaccine for HPV (Human papillomavirus).⁵⁵ The items were scored on a 5-point Likert scale ranging from Strongly disagree (1) to Strongly agree (5). The original items were modified to suit the context of COVID-19 vaccines. For example, the original item: "Getting the Gardasil Vaccine would be easy for me" was changed to "Getting the COVID-19 Vaccine would be easy for me." *The scores ranged from 4 to 20 and a higher score indicates more PBC than a low score. The scale value for PBC was obtained by dividing the mean value of participants on this scale by the number of items in the scale (i.e., 4). If the scale value is 2 or less, then it reflects a low PBC, if the scale value is 3, it refers to moderate PBC. A value of 4 or more indicates high PBC.* Cronbach's alpha for the scale was found to be 0.734 on the current sample, and *it indicates high reliability of the scale.*⁵³

Belief in COVID-19 misinformation (BCIS)

Belief in COVID-19 misinformation was measured using the "Belief in COVID-19 Information Scale" (BCIS).⁵⁶ The BCIS consists of six items to be responded on a 5-point Likert scale ranging from 1 = Strong disbelieve to 5 = Strong believe. The BCIS items share the single item stem of "How much do you believe in the COVID-19 information on/in . . ." with different media sources added to the item stems. In the original scale, the first two media sources were "LINE chat room" and "LINE news page" which were changed to "Whatsapp" and "Twitter and Instagram" respectively because in India (the location of the present study) LINE chat room and news page are not commonly used.⁵⁷ The remaining sources included Facebook, online news, television, and print editions of newspapers. *The scores ranged from 6 to 30 and a higher score indicates more belief in COVID-19 misinformation as compared to low score. The scale value for 'Belief in COVID-19 information scale' was obtained by dividing the mean value of participants by the number of items (i.e., 6). If the scale value is 2 or less then it reflects a low belief in COVID-19 misinformation, if the scale value is 3 it indicates a moderate level of belief. If it is 4 or more, then it reflects a high belief in COVID-19 misinformation.* Cronbach's Alpha for the scale was 0.777 on the current sample, which *indicates high reliability of the scale.*⁵³

Vaccine confidence

The vaccine confidence was measured using the "Global Vaccine Confidence Index."⁵⁸ It consists of four items to be answered on a 4-point Likert scale ranging from Strongly disagree (1) to and Strongly agree (4). All items were adapted to the context of COVID-19. For example, the first item in the original scale was "Overall, I think vaccines are important for children to have" which was changed to "Overall, I think COVID-19 vaccines are important for people to protect them from COVID-19 infection." *The scores on the scale can range from 4 to 16, and a higher score would indicate greater confidence in vaccines than a lower score. The scale value for vaccine confidence index was obtained by dividing the mean value of participants on this scale by the number of items (i.e., 4). If the scale value is 2 or less, it is considered to represent low confidence in vaccines, and if it is 3 or more, it reflects a high vaccine confidence.* The Cronbach's alpha for this tool was found to be 0.800 on the current sample, *which indicates high reliability of the scale.*⁵³

Intention to get COVID-19 vaccine

The intention to get the COVID-19 vaccine was measured using a single item.⁵⁵ The item was scored on a 5-point Likert scale ranging from Strongly disagree (1) to Strongly agree (5). The original item was in terms of the Gardasil vaccine for HPV (Human papillomavirus), but it was changed to suit the context of COVID-19 vaccines. Specifically, "It would be a good idea to get the Gardasil vaccine" was changed to "It would be a good idea to get the COVID-19 vaccine." *The scores ranged from 1 to*

5 and a high score (4 or more) would indicate positive intention, while a score of 2 or less would show low intention, and a score of 3 would show moderate intention to get the COVID-19 vaccines.

Ethics

The study was approved by the Institutional Ethics Committee, Faculty of Social Sciences, Jamia Millia Islamia, New Delhi, India. Ethical standards in the 2013 Declaration of Helsinki were followed. Online informed consent was obtained from the participants after briefing them the purpose and procedure of study.

Analytical plan

Obtained data were analyzed in IBM SPSS Version 22.⁵⁹ Mean, Standard deviation, *Pearson Product Moment Correlation* and Hierarchical multiple regressions were used to make sense of the data. In hierarchical multiple regression, 'Intention to get COVID-19 vaccines' was entered as the criterion variable. Three models were run. In the first model, demographical variables such as age, sex and educational qualification were entered as predictor variables. In the second model, three core constructs of TPB (Attitude toward COVID-19 vaccines, subjective norms and perceived behavioral control) were entered as predictor variables. R square change was also observed after the introduction of new variables in model 2. Similarly, two other variables i.e., belief in COVID-19 misinformation and vaccine confidence were entered as the next set of predictor variables in model 3. R square change was observed after we added the new variables in model 3. Moreover, effect sizes were also obtained for Model 2 over Model 1, and also for Model 3 over Model 2. To interpret the results of the present study, 0.05 was set as the level of significance.

Results

As shown in Table 1, the participants' age ranged from 18 years to 73 years with a mean of 26.70 and an SD of 9.14. 27.3% of participants were males, 72.5% of participants were females and 0.3% belonged to the third gender. In terms of educational qualification, 2 participants (0.5%) had an education of less than high school, 28 participants (7%), were high school pass-outs, 195 were graduates (48.8%) and 175 participants (43.8%)

were pursuing/had completed higher degree (Masters, PhD, etc.). In terms of occupation, 222 participants (55.5%) were students, 99 participants (24.8%) were working or self-employed, 58 participants (14.5%) were unemployed and the remaining 21 (5.3%) belonged to various other occupations (e.g., home-maker, retired professionals, etc.). Out of 400 participants, 38 participants (9.5%) reported having contracted the COVID-19 infection, whereas the remaining 362 (90.5%) participants had not contracted the COVID-19 infection during the time of data collection.

Table 2 shows results for descriptive analysis. It can be seen from the scale value of 'attitude towards COVID-19 Vaccine' i.e. 5.389, that participants have shown a more favorable attitude toward the COVID-19 vaccines. The subjective norms (Scale value = 5.308) was found to be strong, and vaccine confidence (Scale value = 2.987) was found to be in the high range. Perceived behavioral control (Scale value = 3.479), belief in COVID-19 misinformation (Scale value = 2.921), and intention to get COVID-19 vaccine (scale value = 3.575) were found to be in the moderate range.

It's evident from Table 3 that the intention to get the COVID-19 vaccines had a positive significant relation with attitude toward COVID-19 vaccines (0.563, $p < .05$), with subjective norms (0.530, $p < .05$), with perceived behavioral control (0.328, $p < .05$), with vaccine confidence (0.466, $p < .05$), and with belief in COVID-19 misinformation (0.170, $p < .05$). It is also evident that attitude toward COVID-19 vaccines had significant positive relation with perceived behavioral control (0.152, $p < .05$), with subjective norms (0.645, $p < .05$), intention to get COVID-19 vaccines (0.563, $p < .05$), vaccine confidence (0.592, $p < .05$) and belief in COVID-19 misinformation (0.195, $p < .05$).

Table 4 shows that the demographic variables (Model 1) did not influence the intention to get COVID-19 vaccine ($F = 1.333$, $p = .263$). All predictor variables of Model 2, i.e., attitude toward COVID-19 vaccines ($\beta = 0.372$, $p < .05$), subjective norms ($\beta = 0.243$, $p < .05$), and perceived behavioral control ($\beta = 0.221$, $p < .05$) were significant predictors of intention to get COVID-19 vaccines. The two additional constructs of belief in COVID-19 misinformation (Model 3), and vaccine confidence did not influence the intention to get the COVID-19 vaccines. The effect size of Model 2 over Model 1 was found to be .681 which indicates a high effect size⁶⁰ The effect size of Model 3 over Model 2 was found to be .021 which

Table 1. Table showing Demographic details of the participants.

Variable	Categories	Frequency	Percentage
Age	18–73 years (Mean = 26.7; SD = 9.14)	-	-
Sex	Males	109	27.3
	Females	290	72.5
	Other	1	0.3
Educational Qualification	Less than high school	2	0.5
	High school	28	7
	Graduate	195	48.8
	Higher degree (Masters, PhD etc.	175	43.8
Occupation	Student	222	55
	Working in a formal sector	12	3
	Business/Self employed	87	21.8
	Unemployed	58	14.5
	Others (Home makers, superannuated, and daily wagers)	21	5.3
Whether contracted COVID-19 infection	Yes	38	9.5
	No	368	90.5

Table 2. Descriptive analysis.

Variables	N	Mean score	Standard Deviation	Scale value (mean value/no. of items in the scale)	Range of scale value
Attitude toward COVID-19 vaccines	400	32.332	7.853	5.389	3 or less = Unfavorable Attitude 4 = Neutral 5 or more = Favorable attitude
Subjective Norms	400	21.232	4.132	5.308	3 or less = weak subjective norms 4 = uncertain 5 or more = Strong subjective norms
Perceived Behavioral Control	400	13.917	2.684	3.479	2 or less = Low PBC 3 = moderate 4 or more = high PBC
Belief in COVID19 misinformation	400	17.527	3.716	2.921	2 or less = Low belief in COVID-19 misinformation 3 = moderate 4 or more = high belief in COVID-19 misinformation
Vaccine Confidence	400	11.947	2.092	2.987	2 or less = Low vaccine confidence 3 or more = high vaccine confidence
Intention to get COVID19 vaccine	400	3.575	0.957	3.575	2 or less = Low Intention to get vaccine 3 = moderate intention 4 or more = high intention to get vaccine

Table 3. Correlation Coefficients of variables.

Variables	1	2	3	4	5	6
Attitude toward COVID-19 vaccines	1	.152**	.645**	.563**	.195**	.592**
Perceived Behavioral Control		1	.217**	.328**	-.033	.170**
Subjective norms			1	.530**	.134**	.630**
Intention to get COVID-19 vaccine				1	.170**	.466**
Belief in COVID-19 misinformation					1	.222**
Vaccine confidence						1

Note. ** Significant at 0.01 level.

Table 4. Hierarchical multiple regression analysis for predicting Intention to get COVID-19 vaccines from three sets of predictors.

Model	β	t	p	R	R ²	ΔR^2
1.		F(3, 396) = 1.333 (p = .263)		0.100	0.010	0.010
Age	.077	1.483	.139			
Sex	.002	.034	.973			
Educational Qualification	.049	.944	.346			
2.		F(6, 393) = 45.727 (p < .001)		0.641	0.411	0.401
Age	-.021	-.512	.609			
Sex	-.002	-.057	.954			
Educational Qualification	.033	.830	.407			
Attitude toward COVID-19 vaccines	.372	7.312	<.001			
Subjective norms	.243	4.687	<.001			
Perceived behavioral control	.221	5.531	<.001			
Effect size = 0.681 (Model 1–2)						
3.		F(8,391) = 35.757 (p < .001)		0.650	0.423	0.011
Age	-.038	-.917	.359			
Sex	-.013	-.323	.747			
Educational Qualification	.051	1.271	.204			
Attitude toward COVID-19 vaccine	.324	6.035	<.001			
Subjective norms	.201	3.596	<.001			
Perceived behavioral control	.224	5.630	<.001			
Belief in COVID-19 misinformation	.103	1.914	.056			
Vaccine Confidence	.070	1.747	.081			
Effect size = 0.021 (Model 2–3)						

Note: β = standardized regression coefficient; t = student's t test, p = obtained probability; R = multiple correlation, R² = Coefficient of determination; ΔR^2 = R square change.

is very low effect size,⁶⁰ indicating that there was no substantial improvement in the existing model of TPB with the addition of two other variables i.e., belief in COVID-19 misinformation and vaccine confidence.

Discussion

The present research is aimed at studying how the components of TPB such as attitude toward COVID-19 vaccines, subjective norms, and perceived behavioral control influenced people's intention to get the COVID-19 vaccines in India. Two more constructs i.e., belief in COVID-19 misinformation and vaccine confidence were incorporated into the model to make it more comprehensive. We also tested the contributions of certain demographic factors as predictors of intention to get the COVID-19 vaccines. The results indicated that demographic factors (Table 4) such as age, sex, educational qualification of participants had no significant influence on their intention to take up the COVID-19 vaccines. *However, this is contrary to many previous studies in which demographic variables have been found to predict COVID-19 vaccine uptake.⁶¹ Unwillingness to take vaccine is usually found more among black/Hispanic/religious minorities, less educated, and residents of rural areas.⁶² In the current study, religious background and the residence of the participants have not been elicited.* This could explain why the demographic variables might have failed to predict intention to get vaccines vaccinated. *Although there is data on the educational background of the participants, most of the participants were rather educated as 92.5% had a graduate degree and above. This may explain why education failed to predict intention to get vaccinated*

The result further revealed that the three key components of TBP as a whole explained 41% variance in the 'intention to get the COVID-19 vaccines' construct. Furthermore, TPB components produced significant influence (high effect size) over demographic variables in explaining the intention to get COVID-19 vaccines. All three factors of TPB were individually found to be significant predictors of COVID-19 vaccine intention. The relative contributions of attitude, subjective norms and perceived behavioural control were in the same order as was reported in the only meta-analytic study (to the best of our knowledge) on TPB and vaccine hesitancy.⁴⁰ Attitude emerged as the most significant contributor, followed by subjective norms and PBC predicted intentions to get vaccines the least.⁴⁰ It was also found that the participants generally responded moderately to 'the intention to get COVID-19 vaccines.' These results are a bit similar to a study done in India.¹⁸ A World Economic Forum survey conducted in November 2020, across 15 countries found Indians to be the keenest on getting vaccinated whenever a COVID-19 vaccine is available.⁶³

The participants' attitude toward the COVID-19 vaccine was found to be highly favorable in the present study. Moreover, attitude toward COVID-19 vaccine was found to be significantly correlated with intention to get the vaccine and emerged as its most important predictor of it. The result is consistent with previous studies, as a more positive attitude toward COVID-19 vaccines is associated with stronger COVID-19 vaccine uptake intentions.^{28,40} In another study, it was found that COVID-19

vaccination beliefs and attitudes explained the greatest proportion of the variance in vaccine intention for COVID-19.⁶⁴ Some findings also suggest that Americans held a generally positive view toward COVID-19 vaccines as they considered vaccines to be beneficial for themselves as well as for their communities.⁴¹ Young social media users gave the following reasons for holding a positive attitude toward COVID-19 vaccines – to protect their families and relatives, and considering vaccination as their civic responsibility.⁶⁵ *There is no denying of the fact that positive attitude is an important predictor of intention to get vaccine, however, attitude must also be strengthened by debunking misperception and misinformation.⁶⁶ Moreover, important societal agents, such as health professionals, community, and religious leaders can be leveraged to increase people's positive perception of the vaccines and in turn their willingness to get vaccinated.⁴⁰ Persuasive communication may also build more positive attitude toward COVID-19 vaccines.⁶⁷ The results and the discussion thus support H₁ of the present research.*

Participants of the present study scored high on subjective norms as well. The relationship between subjective norms and COVID-19 vaccine uptake intention was found to be positive and significant. Subjective norms also emerged as a significant predictor of intention to get the vaccine. These findings are in line with research showing that stronger subjective norms favoring vaccine uptake behavior result in stronger vaccine uptake intentions^{26,28} as strong subjective norms from friends and relatives drove people to get the COVID-19 vaccines.²⁶ *In this context, it would be pertinent to mention that health care professionals' (who were the first recipient of vaccines, and who earned lots of respect for their selfless effort during the pandemic,⁶⁸) endorsement of COVID-19 vaccines would increase the size of one's reference groups, thus resulting in even stronger subjective norms for vaccines.^{69,70} If getting COVID-19 vaccines is a more socially approved behavior, then it would strengthen the subjective norms and intention to get vaccines relationship.⁴¹ The findings of the current research support H₂.*

Respondents of the present study reported a moderate level of perceived behavioral control, thereby indicating some confidence in their ability to get vaccinated for COVID-19. A positive and significant correlation was found between PBC and the intention to get COVID-19 vaccines. PBC also emerged as a significant predictor of intention to take the COVID-19 vaccines. This suggests that the more an individual perceives himself or herself to have control over taking the COVID-19 vaccine, the stronger his or her intentions would be to get the vaccines. However, PBC is likely to be influenced by vaccine convenience,⁴⁸ and other contextual factors⁶¹ such as vaccines availability, cost, location,⁷¹ and technological challenges.⁷² Unless these contextual factors are not taken care of, PBC would not strongly lead to intention to get vaccines. Out of the three components of TPB, PBC has always been found to be the weakest predictor of behavioral intentions because contextual moderators seem to play important role in the relationship between PBC and behavioral intentions.⁴⁰ While we did find support for H₃ in the present research, the inclusion of some of contextual moderators would have made this relationship even stronger.

The results of present research also showed that believing in misinformation related to COVID-19, had a positive and significant relationship with intention to take the COVID-19 vaccines, even though the relationship is very weak. Participants showed moderate belief in COVID-19 related misinformation, indicating that they neither believe nor disbelieve in the misinformation being spread about COVID-19. This is partially in line with a study that showed that overall, the majority of people in the countries surveyed (UK, Ireland, USA, Spain and Mexico) did not find misinformation about COVID-19 credible.⁴⁵ Moreover, belief in COVID-19 related misinformation did not influence intention to get the vaccine significantly beyond TPB predictors in the present study. This is contrary to another study which found misinformation related to COVID-19 to be one of the factors significantly affecting vaccine acceptance rate.⁷³ The results of the present study somehow supported H_4 as participants of the present study did not clearly believe or disbelieve in misinformation and therefore, they could not make up their minds regarding vaccines uptake. This could perhaps explain why belief in misinformation score could not predict the intention to get the vaccines. Results of the present study also did not support H_5 .

There was a positive significant correlation between vaccine confidence and intention to get the COVID-19 vaccines. However, vaccine confidence could not significantly influence people's intention to take the COVID-19 vaccine above and beyond TPB predictors. This was despite the fact that participants in the present study showed high confidence in the vaccines available in India. This is in contrast to research showing that low vaccine confidence and concerns about vaccine safety are key barriers to people's willingness to take up COVID-19 vaccines.^{19,21} In a multi-country study, it was found that less than half of the respondents were worried about the side effects of vaccines.⁷⁴ There is fear and skepticism among people regarding the lack of transparency in the vaccine development process,¹³ its effectiveness,⁸ and its possible side effects.^{16,24} Although participants of the present study showed high confidence in COVID-19 vaccines, yet it did not predict intention to get COVID-19 vaccines significantly. There could be many reasons for this finding. According to a WHO report on 'behavioral consideration for the acceptance and uptake of COVID-19 vaccine',⁶⁷ it was recommended that for vaccine uptake an enabling environment is very necessary for those who are not deliberately avoiding vaccines. In India, there were many media sources reporting that a large technological divide was causing some people difficulty in registering for COVID-19 vaccines on the Co-Win portal (the official web portal for registration to get the vaccines)^{75,76} because of big technological.,⁷⁶ Moreover, there were long queues at the vaccination centers,⁷⁷ which might have driven many away from these centers because of fear of being infected. These are some plausible reasons for why high vaccine confidence did not result in intention to get vaccines in our study. In sum, H_6 and H_7 could not be supported.

Conclusion

The COVID-19 pandemic has wreaked havoc in the lives of many people and resulted in many innumerable deaths around the globe. As India is one of the worst-hit countries by the

COVID-19 virus, there is an urgent need for mass vaccination to stem the spread of the virus. The current study aimed to explore some of the psychological factors determining people's intention to get vaccinated, which could in turn help to facilitate the vaccination process. Respondents of this study have shown a moderate intention to get COVID-19 vaccines. The findings reveal that demographic factors did not influence intention to get a vaccine. Two key components of TPB (attitude toward COVID-19 vaccine, and subjective norms), were found to be highly positive, while PBC was found to be moderate. All three were significant predictors of intention to take up the COVID-19 vaccine. Thus, the results of present study clearly show that the TPB is an effective model in predicting and explaining vaccine uptake intentions. There is also substantial evidence from the literature that intentions would eventually result in the actual behavior.^{36,40} Therefore, the results of this study can be used to make an effective road-map for a successful COVID-19 vaccination program. Since the majority of participants reported a positive attitude toward COVID-19 vaccines, it should be utilized in encouraging people to get vaccinated for COVID-19. Intentions may also be strengthened by debunking misinformation with scientific evidence. While promoting the intention of people to get the COVID-19 vaccines, the focus should also be on subjective norms and perceived behavioral control. A significant proportion of the respondents reported that their family, friends and other important persons in their life would approve of them getting vaccinated. Participants also reported being confident in their ability to get vaccinated. Thus paying more attention to the attitudes of significant others toward vaccines is also important. Moreover, religious/community leaders and health care professionals can be roped in to promote COVID-19 vaccination drive. This may expand the domain of significant people boosting subjective norms, which would result in a stronger relationship with COVID-19 vaccination intention and uptake. The results also revealed that participants scored moderately on belief in COVID-19 misinformation and high on vaccine confidence. However, these two did not significantly influence COVID-19 vaccine intention. This raises a pertinent point that having a positive attitude toward vaccines, high subjective norms and moderate perceived behavioral control are important predictors of intention to get COVID-19 vaccines. Yet to get the best results, misinformation on social media and other media must be checked carefully. COVID-19 vaccination campaigns should focus on being transparent and on clarifying the rumors around the safety and efficacy of these vaccines in order to build public trust in vaccines and strengthen vaccination intentions.

Moreover, an enabling environment around the vaccine uptake should be created so that vaccine confidence actually results in high vaccine intention.

Limitations

The present research has contributed significantly to the existing body of knowledge. Yet there are a few limitations which need to be addressed by future researchers. Firstly, the study utilized a cross-sectional design conducted mainly in the northern part of India, therefore, one has to be cautious in generalizing the findings of the present research. Secondly,

although the sample size was fairly large, a larger sample size comprising of *different sub-groups (people of various religions, of different caste groups, having various levels of education, from urban, semi-urban and rural background)* could have yielded more effective results, especially considering the diversity of the Indian population. Another limitation of the present research was the presence of more female participants than male. Further since the data was collected online through Google forms, the responses from the older population of India, mainly 45 years and above could not be tapped into properly. This lack of representation is another limitation as this age group is currently in on the vaccination priority list. Notably, intention to get COVID-19 vaccines was measured by a single item, which could be problematic.⁷⁸ One of the items of subjective norms scale was dropped because of low item-total correlation, and this is another possible limitation of the present research.

Availability of Data

Data is available on OFSHOME (<https://osf.io/75x3w/quickfiles>).

Disclosure of potential conflicts of interest

No potential conflicts of interest were disclosed.

Ethics Approval

The research was approved by the Institutional Ethics Committee, Faculty of Social Sciences, Jamia Millia Islamia, New Delhi, India.

Informed Consent

Informed consent was sought from the participants before going ahead with data collection.

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Appendix

Socio-demographic details

- (1) Name – (optional)
- (2) Age –
- (3) Sex –
 - Male
 - Female
 - Other
- (4) Your Educational qualification –
 - Less than high school
 - High school
 - Graduate
 - Higher degree (masters, PhD etc.)
- (5) Occupation –
 - Student
 - Job
 - Business/self employed
 - Unemployed
 - Other _____
- (6) Current location –
- (7) Have you contracted the COVID-19 infection till now –
 - yes
 - no
- (8) If yes, then when? (please specify month and year)

- (9) Do you have any existing chronic disease like diabetes, cardiovascular disease, cancer etc.
 - Yes
 - No
- (10) If yes, then please specify your illness _____
- (11) Since when do you have this illness _____
- (12) How do you rate your overall health? (It was only used for screening of the participants).
 - Poor
 - Fair
 - Good
 - Very good
 - Excellent

Scale 1 – Attitude toward COVID –19 Vaccines

“Given below is a statement on COVID-19 vaccine which is followed by six pairs of adjectives describing the COVID-19 vaccine uptake. Each pair has to be rated between scores 1 and 7, depending on what you think about taking the vaccine.”

“Once a recommended COVID-19 Vaccine is available to public, getting it would be”:

- | | | |
|--------------------|---------------|--------------|
| (1) Foolish | 1 2 3 4 5 6 7 | Wise |
| (2) Harmful | 1 2 3 4 5 6 7 | Beneficial |
| (3) Worthless | 1 2 3 4 5 6 7 | Valuable |
| (4) Bad | 1 2 3 4 5 6 7 | Good |
| (5) Negative | 1 2 3 4 5 6 7 | Positive |
| (6) Unsatisfactory | 1 2 3 4 5 6 7 | Satisfactory |

Scale 2 – Subjective Norms

- (1) People who are important to me would _____ of my having a COVID-19 Vaccine
 - Strongly disapprove
 - Disapprove
 - Somewhat disapprove
 - Neither disapprove nor approve
 - Somewhat approve
 - Approve
 - Strongly approve
- (2) My family would _____ of my having a COVID-19 vaccine

- Strongly disapprove
 - Disapprove
 - Somewhat disapprove
 - Neither disapprove nor approve
 - Somewhat approve
 - Approve
 - Strongly approve
- (3) My friends would _____ of my having a COVID-19 vaccine
 - Strongly disapprove
 - Disapprove
 - Somewhat disapprove
 - Neither approve nor disapprove
 - Somewhat approve
 - Approve
 - Strongly approve
 - (4) I feel under social pressure to have a COVID-19 Vaccine
 - Strongly disagree
 - Disagree
 - Somewhat disagree
 - Neither disagree nor agree
 - Somewhat agree
 - Agree
 - Strongly agree
 - (5) People who are important to me influence my decision to have a COVID-19 vaccine (This was deleted from the final analysis because of low item-total correlation)
 - Strongly disagree
 - Disagree
 - Somewhat disagree
 - Neither disagree nor agree
 - Somewhat agree
 - Agree
 - Strongly agree

Scale 3 – Perceived Behavioral Control

- (1) Getting the COVID-19 Vaccine would be easy for me
 - Strongly disagree
 - Disagree
 - Neither agree nor disagree
 - Agree
 - Strongly agree
- (2) Whether or not I get the COVID-19 vaccine is completely up to me
 - Strongly disagree
 - Disagree
 - Neither agree nor disagree
 - Agree
 - Strongly agree
- (3) If I really want to, I know, I could get the COVID-19 vaccine
 - Strongly disagree
 - Disagree
 - Neither agree nor disagree
 - Agree
 - Strongly agree
- (4) I am confident I can find a place to receive the COVID-19 vaccine
 - Strongly disagree
 - Disagree
 - Neither agree nor disagree
 - Agree
 - Strongly agree

Scale 4 – Belief in COVID – 19 Information Scale

- (1) How much do you believe in COVID-19 information shared on Whatsapp?
 - Strongly disbelieve
 - Disbelieve
 - Neither believe nor disbelieve
 - Believe

- Strongly believe
- (2) How much do you believe in COVID-19 information on twitter and Instagram?
- Strongly disbelieve
 - Disbelieve
 - Neither believe nor disbelieve
 - Believe
 - Strongly believe
- (3) How much do you believe in COVID-19 information on Facebook?
- Strongly disbelieve
 - Disbelieve
 - Neither believe nor disbelieve
 - Believe
 - Strongly believe
- (4) How much do you believe in COVID-19 information in online news?
- Strongly disbelieve
 - Disbelieve
 - Neither believe nor disbelieve
 - Believe
 - Strongly believe
- (5) How much do you believe in COVID-19 information on television?
- Strongly disbelieve
 - Disbelieve
 - Neither believe nor disbelieve
 - Believe
 - Strongly believe
- (6) How much do you believe in COVID-19 information in traditional newspapers?
- Strongly disbelieve
 - Disbelieve
 - Neither believe nor disbelieve
 - Believe
 - Strongly believe

Scale 5 – Global Vaccine Confidence Index

- (1) Overall, I think COVID-19 vaccines are important for people to protect them from Covid-19 infection
- Strongly disagree
 - Tend to disagree
 - Tend to agree
 - Strongly agree
- (2) Overall, I think COVID-19 vaccines available are safe
- Strongly disagree
 - Tend to disagree
 - Tend to agree
 - Strongly agree
- (3) Overall, I think COVID-19 vaccines available are effective
- Strongly disagree
 - Tend to disagree
 - Tend to agree
 - Strongly agree
- (4) The available COVID-19 vaccines are compatible with my religious beliefs
- Strongly disagree
 - Tend to disagree
 - Tend to agree
 - Strongly agree

Intention to Get COVID-19 Vaccine

- (1) It would be a good idea to get the COVID-19 vaccine
- Strongly disagree
 - Disagree
 - Neither agree nor disagree
 - Agree
 - Strongly agree