Psycho-Social Drivers of COVID-19 Vaccine Uptake Among University Students

Salma Kaneez[1], Sarah Javed[2*], Nasheed Imtiyaz[3]

[1,2,3]Aligarh Muslim University, Aligarh, India

A B S T R A C T

Background: Students play a significant role in delivering effective messages for better uptake of health promoting behaviour. Understanding factors that are associated with COVID-19 vaccine uptake among students will help develop promising strategies in vaccine promotion of the pandemic. The present investigation was undertaken to look into psycho-social drivers of COVID-19 uptake among Indian students.

Method: 587 students, aged 18-35 years participated in an online survey. Standardized measures targeting socio-demographic details, health anxiety, preventive health behaviour and constructs of health belief model were used for the present study.

Results: The results showed that overall vaccine uptake among students was quite high with nearly 74% of the students reported being vaccinated against COVID-19. Factors like COVID-19 contact, level of education, belief in safety and efficacy of vaccine, social distancing, age, health worry and preoccupation were emerged as the significant drivers of COVID-19 vaccination behaviour increase the probability of vaccine uptake among students. Moreover, factors like Interference with life, Reassurance Seeking, irrational belief about preventive health measures and perceived barriers about vaccination had significant negative link with vaccination decreasing the likelihood of vaccine uptake.

Conclusion: Psychological and socio-demographic factors play vital role in the success of public health strategies of COVID-19 vaccine promotion in managing the pandemic.

Key Words: Covid-19, Vaccine Uptake, Health Anxiety, Preventive Health Behaviour, Health Belief Model

A R T I C L E   I N F O

INTRODUCTION

COVID 19 adversely affected multiple domains[1] including lives and education of college students[2]. To cope with this situation, higher-education institutions adopted stringent measures and restrictions to limit the spread of the virus which included among others, switching from in-person to online learning.[3] Such measures showing limitations the world felt, effective COVID-19 vaccine emerged out to be the most powerful way to curb the spread of disease.[4] In India, the COVID-19 vaccine was introduced as part of the health strategy to tackle the disease giving hope to college campuses returning back to normalcy. Vaccine acceptance involves various factors[5,6] reported to be complex in nature and context specific, varying across time, place, demographics, physical and psychological state, behavioural nature of the community etc.[6,7] Plethora of researches have indicated demographic factors to be significant contributors to vaccine acceptance.[8,9] However, information on socio-demographic factors of vaccination among students against COVID-19 in India is very limited and requires expansion and updating. Therefore, the first objective of our study was to obtain quantitative estimate of how various socio-demographic factors impact vaccine uptake among students in India.

Association between diagnosis of mental disturbances and low probability of access to preventive services has been previously reported.[10] In the context of COVID-19, some researchers found that high levels of health anxiety positively correlated with vaccine acceptance.[11] The subjective levels of anxiety have been identified as important predictors of vaccine acceptance. Individuals with more anxiety have shown significantly higher vaccine acceptance in Turkey, UK[12] and France[13]. But there being a number of inconsistencies, motivated the researchers to set the second objective i.e. To explore the relationship between health anxiety and vaccine uptake.

To slow the spread of coronavirus infection and mitigate its health effects, different preventive health measures have been implemented. Undoubtedly, these preventive health measures helped in flattening the epidemic curve, the resurgence of COVID 19 has been reported as the lockdown was removed.[14,15] Vaccine uptake is a long-term preventive measure for meeting multifaceted catastrophic consequences associated with COVID-19. Previous research has indicated engagement in preventive health behaviours including avoiding social gatherings, wearing masks, staying at home, washing hands robustly predicted the willingness to take a COVID-19 vaccine[16] but it lacked clarity. Accordingly, third objective set was to explore, whether the students adhering to COVID 19 preventive health behaviour guidelines are engaging in vaccine uptake or not?

As benefits and barriers are the strongest predictors of health behavior[17] in the context of COVID-19 vaccine uptake, therefore, they were the entry points for this research effort. Perceived benefits here refer to the belief that the COVID-19 vaccine uptake will reduce the risk or seriousness of the disease threat and perceived barriers refers to the belief that being vaccinated against COVID-19 is restricted due to difficulties related to psychosocial, physical, or financial factors.[18] Keeping in view the potential role of HBM regarding COVID-19 vaccine uptake, the fourth objective of the study was to explore the relationship between perceived benefits, perceived barriers and COVID-19 vaccine uptake.

The present study was, thus, an attempt to add some new insights into the emerging knowledge on COVID-19 vaccine uptake in students of Western part of Uttar Pradesh State, *India*. It aimed to explore the association among personal factors, COVID-19 preventive behaviours, health anxiety, perceived benefits and perceived barriers of vaccine-on-vaccine uptake along with its drivers/correlates among Indian students. Other factors, such as presence of chronic diseases and having contact with COVID-19 infection or infected person were also explored.

METHODOLOGY

Sample: An online survey study was conducted by enlisting students studying in different universities/ colleges in India (*n* =587). Participants were in the age range of 18-35 with an average age of 21.22± 2.91 years. Among 587 participants, 435 were vaccinated and 152 were not vaccinated. (Table 1). The current study used a web-based survey that was conducted using social media platforms, including LinkedIn, Instagram, WhatsApp and Emails.

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all participants for being included in the study.[19]

Instruments

Demographic blank: The questionnaire involving demographic data like age, gender, living environment (urban/rural), education, family monthly income, existence of comorbidities (with/without chronic disease), and contact with Covid-19.

Health anxiety Inventory: The Health Anxiety Questionnaire (HAQ)[20] measures health anxiety. It comprises of 21 items and requires respondents to indicate their frequency of engaging in specific activities on a 4-point Likert type scale ranging from 'not at all' or rarely' to 'most of the time'. The questionnaire comprises four interrelated domains: health worry and preoccupation, fear of illness and death, reassurance-seeking behaviour and interference with life. Lucock and Morley[21] indicate that, as a whole, the instrument is internally consistent (overall = .92; split half r = .91, p <.01) and has temporal

stability (test–retest reliability over 6 weeks r = .87, p < .01; over 1 year r = .53, p< .01). The reliability co-efficient (Cronbach Alpha) for health anxiety scale was found to be.881.

Preventive health behaviour: Preventive health behaviour was measured using four questions keeping in view the WHO preventive health behaviour guidelines for COVID-19. In addition, one extra item (5th item) measures belief about COVID-19 protocol. Responses were on a 5-point Likert scale ranging from Always (5) to never (1). Sample items include 1. *"I wear mask". 2. I wash hands with soap immediately after entering home and before touching anything"; 3. "I reduce group activities like outings and gatherings", 4. "I keep a safe distance from strangers when going out (at least 1meter)".5. "Strict adherence to Covid-19 protocol is enough to prevent me from Covid-19".* The reliability coefficient for Preventive Health behaviour scale was .858 in current sample.

Health belief model construct: HBM derived items were used to measure the participants' belief about COVID-19 vaccination[21,22] The questions probed perceived benefits to COVID-19 vaccination (three items),*1. Getting the Covid-19 vaccine will decrease my chances of being infected with "Covid-19.,2. Preventive and control measures could prevent me and my family from contacting with Covid-19.,3. Covid 19 vaccine available in India is safe. 4. Covid 19 vaccine will boost the immunity against Covid.* Further, the questions probed perceived barriers to getting a vaccination against COVID-19 (two items)-*1. Covid-19 vaccine is not effective for the new variant of Covid., 2.*

Getting the Covid-19 vaccine exposes me to unnecessary health risks. A five-point Likert scale was used ranging from 'strongly agree' (5) to 'strongly disagree' (1). Chronbach Alpha for HBM Construct was 0.654 for the sample.

Statistical Analysis: The collected data was analyzed by descriptive statistics, and Hierarchical Logistic Regression. To describe participant's characteristics, descriptive statistics – frequency, percentage mean, standard deviation and correlation were used. To identify the drivers / predictors of COVID-19 vaccine uptake Hierarchical binary logistic regression was applied. Socio-demographic details, health anxiety, preventive health behaviour and Health Belief Model constructs were considered as independent variables and vaccine uptake against COVID-19 as the dependent variable.

RESULTS

Demographic Characteristics of Participants

The demographic details of the total 587 participant are provided in Table-1. They were in the age range of 18-35 years, with an average age of 21.22± 2.91. 91% of them aged 18-24, 341 individuals (58%) were males. 70% were residing in urban areas, 71% were enrolled in bachelor programs and 7% in higher degree. Among them, 95% i.e., 555 were not having any chronic disease. 33% of participants came in contact with COVID-19 patients or were diagnosed as COVID positive. Among 587 participants, 435 were vaccinated and 152 were not vaccinated.

Table 1: Socio-demographic characteristics of participants (N=587)

Variables	Not Vaccinated (%) (n=152)	Vaccinated (%) (n=435)	Overall (%) (N=587)
Age (years)			
18-24	143(24.4)	392(66.8)	535(91.1)
25-30	5 (.9)	33 (5.6)	38(6.5)
31-35	4 (.7)	10 (1.7)	14(2.4)
Gender			
Female	60 (10.20)	186(31.7)	246 (41.9)
Male	92 (15.71)	249(57.20)	341(58.1)
Residence			
Rural	38 (6.40)	140(23.90)	178(30.30)
Urban	144 (19.40)	295(50.30)	409(69.70)
Education level			
Up to Senior secondary & Certificate course	53 (9.00)	81(13.80)	134(22.80)
Graduation	99 (16.90)	315(53,70)	414(70.50)
Higher degree (post-graduation, PhD etc.)	00 (00)	39(6.60)	39(6.60)
Marital status			
Unmarried	142(24.20)	410(69.80)	552(94)
Married	10(1.70)	25(4.30)	35(6)
Socio-Economic Status			
Less than Rs. 10000	45(7.70)	131(22.30)	176(30)
Rs. 11000- 50000	53(9.00)	192(32.70)	245(41.70)
Above Rs. 51000	54(9.20)	112(19.10)	166(28.30)
Disease			
No Chronic Disease	142(24.20)	413(70.40)	555(94.50)
Chronic Disease	7(1.70)	22(3.70)	32(5.40)
Contact			
No Covid-19 Contact	122(20.80)	271(69)	393(67)
Covid-19 Contact	30(5.10)	164(27.90)	194(33)

Table 2: Hierarchical Logistic Regression Analysis: Drivers / Predictors of COVID-19 vaccine uptake

Predictor Variables	Pseudo R² (Nagelkarke)	B	S.E.	Sig.	Odd Ratio Exp(B)	95.0% C.I. Exp(B)
Model 1 Socio-demographic Variables	0.116					
1.Age		0.165	0.053	.002**	1.179	1.063 - 1.308
2.Gender						
Female		Reference				
Male		-0.214	0.216	0.32	0.807	0.529 - 1.232
3.Residence						
Rural		Reference				
Urban		-0.329	0.232	0.156	0.72	0.457 - 1.133
4. Marital Status						
Unmarried		Reference				
Married		-1.54	0.586	.009**	0.214	0.068 - 0.676
5. SE- Status						
Low		Reference				
High		-0.036	0.218	0.868	0.964	0.63 - 1.477
6. Education						
Senior Secondary		Reference				
Graduation & Higher degree		0.677	0.222	.002**	1.969	1.274 - 3.043
7.Contact with COVID-19						
No		Reference				
Yes		0.919	0.24	.000**	2.506	1.567 - 4.008
8. Chronic Disease						
No		Reference				
Yes		-0.546	0.428	0.203	0.579	0.25 - 1.341
Constant		-2.657	1.086	.014**	0.07	
Model-2 Health Anxiety	0.047					
1.Health worry and Preoccupation (HWP)		0.112	0.028	.000**	1.119	1.058 - 1.183
2.Illness and Death (ILD)		-0.024	0.054	0.654	0.976	0.878 - 1.086
3.Reassurance Seeking (RS)		-0.17	0.064	.008**	0.844	0.744 - 0.958
4.Interference with Life (IWL)		-0.163	0.068	.016**	0.849	0.743 - 0.97
Constant		-3.037	1.118	.007**	0.048	
Model -3 Preventive Health Behavior	0.041					
1.Wearing Mask		0.048	0.108	0.654	1.049	0.85 - 1.296
2.Washing Hand		0.151	0.12	0.208	1.163	0.919 - 1.471
3.Reduced group Activities		0.117	0.111	0.294	1.124	0.904 - 1.397
4.Social Distancing		0.239	0.105	.023**	1.27	1.033 - 1.561
5.Belief about Preventive Protocol		-0.23	0.112	.039**	0.794	0.638 - 0.989
Constant		-3.503	1.186	.003**	0.03	
Model-4 Perceived Benefits and Risk/ Barriers of Covid-19 Vaccine	0.1					
B1. Decreases the chance of infection		0.402	0.111	.000**	1.494	1.201 - 1.859
B2. Prevent me and family from infection		-0.228	0.125	.068*	0.796	0.624 - 1.017
B3. Safe		0.459	0.129	.000**	1.582	1.229 - 2.036
B4. Boost immunity		1.03	0.689	0.135	2.801	0.726 - 10.807
R1. Efficacy for New Variant of Covid		-2.111	1.102	.055*	0.121	0.014 - 1.05
R2. Exposure to Health risk		-0.351	0.11	.001**	0.704	0.567 - 0.874
Constant		-4.61	1.279	.000**	0.01	

*p value significant at .05 level of significance, ** p value significant at .001 level of significance*

To develop the predictive model, the binary variable, COVID-19 vaccination (vaccinated=1, Not vaccinated=0) was used as dependent variable and socio-demographic variables (age, gender, residence, marital status, education, marital status, social status, chronic disease and contact with COVID-19, health anxiety, preventive health behaviour and perceived benefits - risk of vaccination were used as predictor variables.

At the first step in hierarchical logistic regression, the socio-demographic variables were entered into the model and accounted for 11.6 % significant variance (Pseudo $R^2_{(Nagelkarke)}$ = .116) in vaccine uptake. Age, education, marital status and COVID-19 contact

were emerged as the significant predictors/ drivers of COVID-19 vaccine uptake.

The older students were 1.179 times (OR=1.179, 95% CI= 1.063 - 1.308) more likely to get vaccinated than students of younger age. Students with graduation and higher degree of education received vaccine two times more than those having lower (below university) level of education (OR= 1.969, 95% CI= 1.274 - .043). Moreover, respondents having COVID-19 contact (self-diagnosed or having family members with COVID-19) were 2.5 times more likely to get vaccinated than those not having direct contact with the disease (OR= 2.506, 95% CI=1.567 - 4.008). Whereas marital status OR= .214, 95% CI= .068 - 676

had the equal probability. Other socio-demographic factors like, gender, residence, and chronic disease were not significantly related to COVID-19 vaccination uptake.

At the second step, dimensions of health anxiety (health worry and preoccupation, illness and death, reassurance seeking and interference with life) were entered into the model which added additional 4.7 % significant variance (Pseudo $R^2_{(Nagelkarke)} = .047$) in COVID-19 vaccination behaviour. Health worry and Preoccupation, Reassurance Seeking and Interference with life were found to be significant predictors of COVID-19vaccination except illness and death. It clearly indicated that students preoccupied with the fear and worry of getting infected with COVID-19 were 1.11 times more likely to take vaccine than those not having the worry and fear of the disease (OR= 1.119, 95% CI= 1.058-1.183). In addition, the odd ratios for RS (OR=.844, 95% CI .744 -.958) and IWL (OR=.866, 95% CI .758-.990) revealed that these factors lowered the probability of getting vaccinated.

Preventive health behaviour was added at the third step and accounted for an additional 4.1% (Pseudo $R^2_{(Nagelkarke)} = .041$) significant variance in COVID-19 vaccination behaviour. Associated odd ratio implied that social distancing increases (OR= 1.270, 95% CI= 1.033 -1.561) while etiquettes decrease (OR= .794, 95% CI= .638 -989) the likelihood of vaccine uptake.

At the last step, perceived benefits and barrier/ risk of vaccination were entered and accounted for an extra 10% variation making a total of 30.4% variance in vaccine uptake. The odd ratio for efficacy (OR= 1.494, 95% CI= 1.201 -1.859) and safety (OR= 1.582, 95% CI=1.229 -2.036) showed that belief in the efficacy and safety of vaccine (to decrease the risk of Covid-19) increase the probability of taking vaccine by 1.49 times and 1.11 times respectively than the students lacking the belief. In contrast, perceived barrier about vaccination had significant negative link with vaccination (B= -.351, p= .001) and decreases (OR= .704, 95% CI=.567- .874) the likelihood of vaccine uptake.

In the final model, Chi-square value (Hosmer-Lemeshow test) was 9.492 (df =8, p = 0.303 >.05), manifesting a good fit of the model with the original data. The model correctly predicts 40.1% of cases of no vaccine and 92.6% cases of vaccine uptake, giving an overall correct prediction rate of 79%. In other words, the model showed a good predictive accuracy.

Results show that COVID-19 contact was the most significant drivers/determinants, that increase the likelihood of vaccine uptake among students followed by higher education, strong belief in vaccine safety and efficacy, social distancing (PHB), age and preoccupation & worry (HA) respectively. While interference with life, reassurance seeking, irrational belief about Covid-19 protocol and perceived risk/ barrier diminished the chances of getting vaccinated against COVID-19.

DISCUSSION

The results show that overall vaccine uptake among students was quite high. With nearly 74.1% of the students reported they have vaccinated against COVID-19, leaving only 25.9% of the total unvaccinated. Among those not vaccinated 19.3% expressed their intention to get vaccinated and only 6.6% of them were undecided.

Our first objective was to identify the socio-demographic drivers/ correlates of vaccine uptake among students. The findings implied that age, education and contact with COVID-19 had significant positive relation with vaccine acceptance. In fact, factors like COVID-19 contact (self-diagnosed or having family members with COVID-19), older age, and higher education (graduation and higher degree) grew the chances of vaccine uptake among students.

The finding is consistent with the studies measuring intentions to COVID-19 vaccine. Accordingly, lower level of education[23,24] was reported to be associated with poor intention to get vaccinated. Similarly, people with higher education were most likely to be vaccinated against COVID-19, while people with secondary education or lower were least likely to be vaccinated.[25-30] With the highest odd, Covid-19 contact was the most significant driver of COVID-19 vaccine uptake. Suffering from a contagious disease like COVID-19 is a traumatic experience. Having witnessed the complications and the severity of the disease by themselves as a patient, famil1y members with COVID-19 seems to motivate students to get vaccinated more than those not having COVID-19 contact and thus avoided resultant suffering.

Moreover, gender, residence, SES and chronic disease were not significantly related to COVID-19 vaccination uptake among students. COVID-19 vaccination is a part of preventive services in public interest. The vaccine is free and easily accessible in Government hospitals in India. Therefore, gender, residence, SES and chronic disease did not differentially affect vaccination behaviour among students.

The second objective was to identify the dimensions of Health Anxiety as correlates of vaccine uptake among students. It is worth noting that three out of the four dimensions of health anxiety had significant association with vaccine uptake. Health worry and Preoccupation found to have significant positive relation, while Reassurance Seeking and Interference with Life had significant negative association with COVID-19 vaccination. Health anxiety was an issue during the current pandemic leading to serious consequences. Preoccupation and worry about COVID-19 were commonly found during the outbreak among general public including students.[31] High levels of increased worry and health preoccupation with contracting COVID-19 disease would have motivated the students to receive vaccine more than those with low levels of worry and preoccupation. This is similar to a COVID-19 study which reported that high

levels of health anxiety positively correlated with vaccine acceptance.[11] Association between high anxiety and vaccine acceptance is also noted in the studies conducted in Turkey, UK[12] and France[13]. The result further shows that seeking reassurance frequently about the symptoms of COVID-19 from professionals and family members as well the interference of symptoms/ vaccine with daily living consequently results in the avoidance of vaccine.

People with high health anxiety during COVID-19 outbreaks tend to engage in a variety of maladaptive safety behaviours including excessive hand washing, social withdrawal, etc. Though all these behaviours are consistent with public health recommendations for managing pandemics, those with high health anxiety were driven to an extreme that could have negative consequences to themselves.

Next objective was to determine preventive Health Behaviours as correlate of vaccine uptake among students. The result manifests that compliance to preventive protocol particularly maintaining physical distancing had significant positive association with vaccine uptake. Students who were health conscious and maintained a safe distance while in public were more likely to get vaccine than those not following the norms of social distancing. In educational institutions, students are supposed to be in a social environment where maintaining physical distancing is difficult which imposes greater risk for the transmission of the pandemic. Thus, the concern over social distancing is most important preventive factor that drives students for getting COVID-19 vaccine. Similarly, Latkin et al[16] has found that avoiding social gathering was one of the preventive health behaviours significantly predicting the willingness to accept Covid-19 vaccine. And poor adherence to COVID-19 protective behaviour was reported to be associated with poor intention to get vaccinated.[32] Contrary to this, students having irrational belief regarding Covid-19 etiquettes were less willing to receive vaccine. They might believe that strict adherence was enough to keep them away from the disease.

Last objective was to determine, perceived benefits and perceived barriers as correlate of vaccine uptake among students. In this context, findings confirm the role of health belief model constructs in vaccine uptake behaviour. Two factors of HBM particularly, perceived benefits of vaccination had significant positive and perceived barriers had negative link with vaccine uptake. HBM suggests that an individuals' engagement/ not engagement in health promoting behaviour can be explained by their beliefs about health problems i.e., perceived benefit of action, barriers to action and self –efficacy. Strong belief in the efficacy and safety of vaccine (to decrease the risk of COVID-19) increases the probability of taking vaccine than those lacking the belief. In contrast, concern over exposure to unnecessary health risk due to vaccination act as significant barrier and decreases the likelihood of vaccine uptake.

This is consistent with the findings of Dror et al.[33] who reported that vaccination compliance relies on a personal risk-benefit perception. Similarly, confidence in vaccine safety as a predictor of vaccine acceptance was reported by Carpenter, 2010.[17] In another study, mistrust of vaccine benefit and concerns about future unforeseen side effect were reported[8] as important determinants of uncertainty and unwillingness to vaccinate against COVID-19.

LIMITATIONS & RECOMMENDATIONS

In the current study data was collected online via social media which may lead to selection bias. As the people belonging to the low socio-economic status and those not having the access to online survey was not the part of the study. In addition, being the cross-sectional survey, the casual relationship cannot be studied. More research is needed to understand how individual difference factors, including negative emotions, impact behaviour in response to COVID-19.

CONCLUSION

In sum, psycho-social factors play vital role in the success of public health strategies like COVID-19 vaccine to manage the pandemic. Factors like health anxiety (worry and preoccupation), adherence to social distancing, contact with COVID-19, perceived benefits and risks regarding efficacy-safety were emerged as significant drivers that positively influence COVID-19 vaccine uptake among students. The findings highlight that the preventive health measures need to have a broader, more holistic focus including the consideration of health anxiety, fear, benefits, risks and other emotions of the target population beyond just developing and providing vaccine to make the program more effective.

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