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Original Research Article

Assessment of COVID-19 vaccine hesitancy among undergraduate medical students of a tertiary care teaching hospital, Surat: a source of profound concern

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ABSTRACT

Background: The discussion around COVID-19 vaccines has been in the limelight ever since the announcement was made for mass vaccination campaign in India. Less is known about undergraduate medical students' perception and willingness towards getting COVID-19 vaccination. The aim of the study was to assess reasons for the apprehension if present towards taking the COVID-19 vaccines among medical students and to spread awareness about the ongoing issue.

Methods: This was a prospective, cross sectional, survey-based study which was conducted at Surat Municipal Institute of Medical Education and Research (SMIMER), Surat, Gujarat, India. Questionnaire was distributed among medical students during lectures and exam going students were sent Google form link. Data collection was done from February to March 2021, and 550 students submitted the forms.

Results: While 34.9% students had taken the vaccine voluntarily, category I (acceptance group); 18.2% students were initially hesitant to take the vaccine, but later took it, category II (hesitant group); the frequency increased to 46.9% students who are still hesitant and have not taken the vaccine, category III (refusal group). Top reasons for hesitancy were: concern regarding adverse events (69%), safety (60%) and lack of scientific data (27%) provided for the vaccines.

Conclusions: This study revealed that there was lack of knowledge and positive attitude towards the COVID-19 vaccines among the non-vaccinated students. This evaluation has guided the importance and the need of targeted educational program to address the knowledge gap.

Keywords: COVID-19 vaccines, Undergraduate, Medical students, Hesitancy

INTRODUCTION

The pandemic of corona virus disease 2019 (COVID-19) has caused an unprecedented public health burden in several countries across the globe.¹ According to the data received by WHO from national authorities, as of 9th May 2021, India continues to account for 95% of COVID-19 cases and 93% of deaths in the South-East Asia Region, as well as 50% of global cases and 30% of global deaths.² For all of the public health initiatives in place, including behavioural changes such as using masks and hand sanitization, therapeutic treatments such as antiviral drugs

and most importantly safe and effective vaccinations seem to be the only way to prevent the pandemic from spreading. Despite the fact that phase three clinical trials were not completed for 'Made in India' vaccines, Covishield and Covaxin, were approved for restricted emergency use as part of control measures taken against COVID-19. The National vaccination drive in India began on 16th January 2021, across 3,006 vaccination centres giving priority to health care workers and medical students across India.³ In the first three days, 6, 31,417 people were vaccinated. Of these, 0.18% reported side-effects and nine people (0.002%) were admitted to hospitals for observation and

treatment.⁴ There is concern that the vaccine drive is being slowed down by low turnout, due to a combination of concerns about the safety of the vaccine, technical problems with the software used, and misinformation.⁴

The 21st century vaccination landscape is characterized by unprecedented access to information, rising levels of vaccine hesitancy among patients and healthcare professionals (HCPs) such that vaccine hesitance has been included in the top 10 threats to global health by the WHO.⁵ Medical students are among the group of frontline healthcare providers likely to be exposed to COVID-19 patients.⁶ It is important to achieve high COVID-19 vaccination coverage rates in this group as soon as a vaccine is available.⁶

As future healthcare providers, they will be entrusted with providing vaccine recommendations and counselling vaccine-hesitant patients.⁶ Hence, a survey needs to be carried out to investigate reasons for their apprehensions and design a systemic approach to overcome vaccine hesitancy. COVID-19 vaccine drives in India will depend upon how well the issue of vaccine hesitancy is tackled.

METHODS

A prospective, cross sectional, survey-based study was conducted in targeted population of undergraduate medical students of tertiary care hospital, Surat, Gujarat, India for the duration of one month, February- March 2021. The sample size collected for this study was based upon the responses received within the data collection period. Those students from SMIMER medical college who were not willing to take part in the survey as well as those who were under 18 years of age, therefore not eligible for the vaccine, were excluded from the study.

The questionnaire was self-developed, semi-structured, and pre-validated by the authors before administering the same to the participants. Examination going students were sent online Google form link and students attending college were given questionnaire handouts which were to be filled. A written informed consent was attached with the questionnaire, available both in English and Gujarati, and was presented to the students before they began the survey.

Additionally, in the Google form link sent to examination going students, it was informed to them that participation in the survey will be considered as positive consent for the study. The consent form included details about the purpose of the study, confidentiality rights, the voluntary nature of involvement, and the survey procedure. Permission was obtained from the Institutional Ethics Committee of SMIMER- Surat, India before the commencement of study.

Statistical analysis was done using descriptive statistics. Since some of the questions had multiple responses, sum of the percentage did not always add up to 100%.

Questionnaire

The questionnaire was formed in a pre-designed, semi-structured pattern which composed of eight questions with some follow-on questions. The questionnaire included closed ended questions, open ended questions and multiple-choice questions with predefined answers offering respondents the possibility to choose.⁷

The questionnaire consisted of four sections which assessed mainly four aspects of the students: (a) demographic characteristics; (b) current knowledge about the COVID-19 vaccines; (c) perceived likelihood of taking the COVID-19 vaccines; and (d) general attitudes and perception of vaccines.

The mass vaccination drive in India started on 16th January, 2021, and first round was open for all the doctors, nurses and undergraduate medical students, at SMIMER Medical College, therefore, students had started taking the vaccine. Considering that scenario, the questionnaire was planned out in such a way that those students who have taken the vaccine and those students who have not taken the vaccine both could participate in the survey.

Students were asked whether they were vaccinated or not. Based on the answer to that question, they had to select the category they best fit into and further questions were set accordingly.

Three Categories were formed as follows- (a) category 1: I have taken the vaccine voluntarily (acceptance); (b) category 2: I was initially hesitant, but later took the vaccine (hesitant); (c) category 3: I have not taken the vaccine (refusal). Section one covered the demographic details such as name, age, gender, academic year, and date. Section two assessed the awareness of vaccination program, source of information concerning COVID-19 vaccinations, and response for contracting Corona virus.

Section three covered the likelihood of taking the COVID-19 vaccines and accordingly selecting one of the categories: Acceptance, hesitant, or refusal group they best fit into. Specific sub questions under each category were asked to know the determinants of their decision of accepting, hesitating, and refusing COVID-19 vaccine. Section four assessed student's attitude and perception towards 'Made in India' vaccines, and USA and UK vaccines.

Likelihood of recommending vaccines to others as well as accounting their views and opinions on how the vaccine hesitancy in Indian population could have been avoided was also included in our study.

RESULTS

A total of 550 medical students had responded to the survey. Among the 391 students attending college had filled the survey out of which 17 students were excluded

from the survey because they were under age, hence were not eligible to take the vaccine.

On the other hand, 176 university examination going students responded through Google form link. As a result, our sample size summed up to be 550. To prevent incomplete and missing results of responses through google form, the majority of the questions were marked as necessary to be answered.

Individual Google form responses were checked by the principal investigator to avoid double entry of the data.

Demographic characteristics

In Table 1, age group (years): 18-19 (N=266) (48.4%); 20-21 (N=232) (42.2%); 22-23 (N=43) (7.8%); 24-25 (N=7) (1.3%). Majority of the participant students were females 356 (64.7%) as compared to males 194 (35.3%).

MBBS students from all four years were either given the questionnaire or were sent the Google form link.

Responses are as follow: 178 (32.4%) Ist year, 235 (42.7%) IInd year, 46 (8.4%) IIIrd year, and 91 (16.5%) IIIrd year responded.

Table 1: Demographic characteristics.

Characters	Frequency (N=550)	Percent (%)
Age (years)		
18-19	266	48.4
20-21	232	42.4
22-23	47	7
24-25	7	1.3
Gender		
Male	194	35.3
Female	356	64.7
MBBS year		
I st	178	32.4
II nd	235	42.7
III rd	46	8.4
III rd	91	16.5

Current knowledge about the COVID-19 vaccines

Out of 550 students, 42 students (7.5%) had tested COVID-19 positive as compared to 508 students (92.5%) tested negative for the novel corona virus infection.

All the students, (100%) were aware of the ongoing COVID-19 vaccination program in India.

Student's sources of information regarding COVID-19 vaccinations, in descending order, were: social media (61.5%), news channels (55.8%), and college professors (43.3%), friends/family (39.8%), doctors (37.8%), newspapers (34.4%), and authorised government website (22%) (Table 2).

Table 2: Sources of information preferred for coronavirus.

Sources	Frequency (N=550)	Percent (%)
Authentic government website	121	22
Social media	338	61.5
News channels	307	55.8
Newspapers	189	34.4
Friends/family	219	39.8
Doctors	208	37.8
College professors	238	43.3

Perceived likelihood of taking the COVID-19 vaccine

Among the 550 students, 292 (52.9%) got vaccinated compared to 258 (47.1%) who did not get vaccinated.

Category wise distribution showed that 192 (34.9%) students belonged to category I (acceptance group), 100 (18.2%) students belonged to category II (hesitant group), while 258 (46.9%) students belonged to category III (refusal group) (Table 3).

Table 3: Survey response for category wise selection.

Categories	Frequency (N=550)	Percent (%)
Category I: acceptance I have taken the vaccine voluntarily	192	35.3
Category II: hesitant I was initially hesitant, but later took the vaccine	100	17.8
Category III: refusal I have not taken the vaccine	258	46.9

Furthermore, sub questions were asked under each category to know the specific reasons for their selected category choice. Additionally, an open space was also provided in each sub questions for students to elaborate and express their distinctive view-points.

Multiple options were allowed to be ticked hence the total of percentage did not always add up to 100%.

In category I (acceptance group) (N=192), the factors which influenced their decision on getting vaccinated, from descending order were: (a) positive attitude towards the vaccines (56.5%), (b) trusting the information receiving from the public health experts (43.5%), (c) uncertainty about the future (42.5%), (d) recommendation from known doctors (34.7%), (e) not having contacted COVID-19 infection (21.8%), and (f) peer pressure (0.5%) (Table 4). In category II (hesitant group) (N=100): Students choosing this category were initially hesitant to

take the vaccine but later took it. Therefore, two sub-questions were asked.

Firstly, responses for the reasons of their initial apprehensions towards getting vaccinated, in descending order, were: (a) concerned about serious side effects from COVID-19 vaccination (69%), (b) concerned about the safety of the COVID-19 vaccines (60%), (c) lack of scientific data provided for the vaccines (27%), (d) belief that the COVID-19 vaccine may not be effective (24%), (e) hesitancy among family members (20%), (f) misinformation created panic (20%), (g) not getting the option to choose between the 'Made in India' vaccine (11%), (h) delay due to ongoing university examinations (3%), and (i) history of anaphylaxis (1%) (Table 5).

Secondly, despite the hesitancy, their reasons for considering to take the vaccines, in descending order, were: (a) recommendation by doctors/college professors/healthcare workers (50%), (b) motivated from seeing the doctors and healthcare workers taking the vaccine (45%), (c) uncertainty about the ongoing pandemic (34%), (d) encouragement from family

members (16%), (e) have not contacted the virus (16%), and (f) peer pressure (10%) (Table 6).

All the students from both category I and II, (N= 292) were willing to take the second dose.

In category III (refusal group) (N=258), reasons for not taking the vaccine, in descending order, were as follows: (a) waiting for a better crafted vaccine with fewer side effects (62.4%), (b) need more scientific data to be convinced (26.4%), (c) having better immunity to fight the infection (24%), (d) 1st round of vaccination drive showed side effects (19.4%), (e) elderly should be prioritized (17.8%), (f) friends/colleagues not taking the vaccine (11.2%), (g) developed antibodies without contacting the virus (6.2%), (h) not getting the option to choose between the 'Made in India' vaccines (5.4%), (i) rapid development of vaccine (4.7%), and (j) developed the antibodies after contacting the virus (3.9%). In the open space which was provided, three common reasons cited by the students were (a) took hepatitis B vaccine (2.4%), (b) delayed due to ongoing university exams (2%), and (c) hypersensitivity reaction (1.4%) (Table 7).

Table 4: Survey response for COVID-19 vaccine acceptance group (category I).

Category I: Which factor/s influenced to get vaccinated?	Frequency (N=192)	Percent (%)
Positive attitude towards the vaccines	109	56.5
Trusting the information receiving from the public health experts	85	43.5
Uncertainty about the future	81	42.5
Recommendation from known doctors	67	34.7
Not having contracted COVID-19 infection	42	21.8
Peer pressure	1	0.5

Table 5: Survey response for COVID-19 vaccine hesitant group (category II).

Category II: Why were you initially apprehensive towards getting vaccinated?	Frequency (N=100)	Percent (%)
Concerned about serious side effects from COVID-19 vaccination	69	69
Concerned about the safety of the COVID-19 vaccines	60	60
Lack of scientific data provided for the vaccines	27	27
Belief that the COVID-19 vaccine may not be effective	24	24
Hesitancy among family members	20	20
Misinformation created panic	20	20
Not getting the option to choose between 'Made in India' vaccines available	11	11
Delayed due to ongoing university examinations	3	3
History of anaphylaxis	1	1

Table 6: Survey response for COVID-19 vaccine hesitant group (category II).

Category II: Despite the hesitancy, why did you consider taking the vaccine?	Frequency (N=100)	Percent (%)
Recommendation from doctors/college professors/healthcare workers	50	50
Motivated from seeing the doctors and healthcare workers taking the vaccine	45	45
Uncertainty about the ongoing pandemic	34	34
Encouragement from family members	16	16
Have not contracted the virus	16	16

Table 7: Survey response for COVID-19 vaccine refusal group (category III).

Category III: Why have you not taken the vaccine?	Frequency (N=258)	Percent (%)
Waiting for a better crafted vaccination with fewer side effects	161	62.4
Need more scientific data to be convinced	68	26.4
Have better immunity to fight the infection	62	24
1 st round of vaccination drive showed side effects	50	19.4
Elderly should be prioritized	46	17.8
Friends and colleagues are not taking the vaccine	29	11.2
Not contracted COVID-19 infection but developed antibodies	16	6.2
Between the two vaccines available, not getting the option to choose	14	5.4
Vaccine is developed too quickly	12	4.7
Have contracted COVID-19 infection hence developed the antibodies	10	3.9
Recently taken hepatitis B vaccine	6	2.4
Delaying due to ongoing university exams	5	2
Hypersensitivity reaction	4	1.5

General attitudes and perception of vaccine

While 180 (32.9%) students would rather take Pfizer (BioTech)/Oxford (AstraZeneca)/Moderna vaccine which are given in the USA and UK instead of Covishield/Covaxin which is given in India, 370 (67.1%) showed positive response towards 'Made in India vaccines'. Between the two 'Made in India' vaccines available, Covishield and Covaxin, if the students had the option to choose the vaccine they want, 407 (74%) preferred Covishield, 103 (18.7%) preferred Covaxin, whereas 40 (7.3%) said they would not choose either one (Table 8).

508 (92.4%) students would recommend others to take the vaccine while remaining 42 (7.6%) were not willing to recommend.

Opinion of students was asked regarding what could have been done to avoid vaccine hesitancy in Indian population.

Responses were as follows: 364 (66.2%) suggested More awareness, campaigns/drive should be done by the government/corporation. 308 (56.2%) said education for public and 283 (51.5%) asked for more scientific data to be provided by an authentic source (Table 9).

Table 8: Preferred 'Made in India' COVID-19 vaccine (N=550).

Preferred 'Made in India' COVID-19 vaccine	Frequency (N=550)	Percent (%)
Covishield	407	74
Covaxin	102	18.7
None	40	7.3

Table 9: Implications to avoid future vaccine hesitancy.

How do you feel the vaccine hesitancy in Indian population could have been avoided?	Frequency (N=550)	Percent (%)
More awareness, campaigns/drive should be done by the government/corporation	364	66.2
Education for public	308	56.2
More scientific data provided by an authentic source	285	51.8

DISCUSSION

Current knowledge about COVID-19 vaccines

The millennial generation is known for their technological skills and embracing the digital life, especially promoted during the lockdown, therefore social media platforms could have played a major role to influence their perception towards corona virus and its vaccination. Barello et al., 2020 stated in one of their preliminary findings that vaccination attitude is influenced by the

students' level of health knowledge.⁸ In the present study, most common medium from which students acquired knowledge regarding COVID-19 were: social media (61.6%), news channels (55.8%), and college professors (43.3%). Least source of knowledge came from authorized government website (22%). A similar finding was reported by Saied et al, 2021 in which the author has noted social media, and healthcare providers to be the primary sources of information for COVID-19. Meanwhile, magazines and newspapers were the least.⁹ The same is supported by the finding by Qiao et al, 2020 in which the health agencies

(57.7%), mass media (49.5%), and personal social networks (40.5%) were the leading source for COVID-19 vaccine information.¹⁰ Hence it can be noted that vaccine hesitancy could have been exacerbated by the spread of misinformation through social media and mass media platforms.

Perceived likelihood of taking the COVID-19 vaccine

In spite of being at a high-level risk for contracting the infection, majority of the students were still hesitant to take the vaccine. It was observed that 92.5% of students had not been infected with COVID-19 and 7.5% of students had tested positive with COVID-19 infections. Our results matched with the finding by Saied et al, 2021 in which more than half of the respondents i.e.; 56.4% were not infected with COVID-19, and only 4.4% had confirmed infection.⁹ This result was in consistent with Lucia et al, 2020 in which more than 2 of 10 students were vaccine-hesitant despite self-perception of elevated risk of exposure to COVID-19 infection.⁶ Conversely this finding contradicts research done in the past which showed the key driver of vaccination intentions was perceived from one's risk (of contracting influenza and of suffering from vaccine adverse events) Betsch and Wicker et al.¹¹

The present study also observed that while 35.3% students had voluntarily taken the vaccine and 17.8% of the students were initially hesitant but later took the vaccine, the frequency increased to 46.9% of the students of category III, who had not taken the vaccine. Our results corresponded with the findings of Said et al, 2021 in which 35% of the students accepted the COVID-19 vaccination, 46% were hesitant, and 19% refused among Egyptian medical students.⁹ On the contrary, results differed in a study conducted by Qiao et al, 2020 in which 60.6% students were in the acceptance group, 15.1% students were hesitant and 24.3% belonged to the refusal group among college students in South Carolina.¹⁰ Furthermore, in a study conducted by Lucia et al., 2020 nearly one-quarter of the students of Southeast Michigan was hesitant to be vaccinated.⁶ This shows that acceptance rate among the medical students of Surat city in particular is lower than the other countries and this is a major concern in the ongoing attempts to control the latest COVID-19 pandemic.

Undergraduate medical students in Gujarat particularly, were approached to help in this unsighted situation due to lack of frontline workers. Therefore, after assessing the current situation, students should be well prepared beforehand to tackle future waves, peaks, and pandemic. In fact, study by Barello et al, 2020 and Stokes et al, 2020 stated that medical schools in countries such as England as well as in United States prepare students to help medical teams efficiently, that's why, they should be protected and vaccinated, as vaccination of healthcare workers and students is an important step in preventing health-related infections from close contact with high-risk patients.^{8,12} The students in the acceptance category can play an

important role in encouraging other hesitant students as well as general public to take the vaccine.

Findings reported by Saied et al, 2021 in which most participants reported having concerns about effectiveness, safety, and adverse effects about the vaccine.⁹ In another study conducted by Sun et al, 2020 their result also showed that 88.91% participants endorsed concerns about COVID-19 vaccine side effects.¹³ The above studies support the findings of the present study. Many people who are hesitant about vaccination may consider it if they are reassured and given reliable evidence that the vaccine is safe and effective.

Despite the hesitancy, 50% of the students from category II took the vaccination on recommendation from doctors/college professors/healthcare workers, while 45% students got inspired from seeing the doctors and healthcare workers taking the vaccine. 34% cited that the pandemic is not going to end soon, better to be safe than sorry.

Among the refusal group, category III students, 2.4% had recently taken hepatitis B vaccine and 2% cited ongoing exam university for delaying or not taking the vaccine. This depicts that some students falling in category III are not actually refusing the vaccine but are delaying the vaccination due to short term adverse events which could disrupt them during the exams period. Evidence suggests that working on building confidence in COVID-19 vaccines is crucial. Lucia et al, 2020 underlined the contributing factors to vaccine hesitancy in this age group.⁶ Concerns about serious vaccine side effects and lack of trust in the information received from public health experts and the fact that need for transparency and ability to answer concerns about speedy development of the vaccine should be addressed.

General attitude and perception of vaccines

It was observed that 32.9% students preferred to take Pfizer (BioTech)/Oxford (AstraZeneca)/Moderna vaccine instead of 'Made in India' vaccine. On the contrary, 67.1% students supported the vision, 'Atmanirbhar Bharat', of our honourable Prime Minister Narendra Modiji, and said that even if they had an option to take the vaccines given in the US and UK, they would still take the 'Made in India' vaccines.

Among these students, 74% students preferred to take Covishield, and 18.7% preferred Covaxin if they were given an option to choose the vaccine they would. Evidence suggests that between the two vaccines, only Covishield had released the safety and phase 3 efficacy data publically through a scientific publication of the parent AstraZeneca vaccines.¹⁴ While it was only recently, 3rd March 2021, that the announcement was made public about the 81% efficacy of Covaxin, however the scientific report is yet to be published.¹⁵ Hence, availability of scientific data is significant to gain the trust of public for mass vaccination programs.

Despite the hesitancy and majority of the student not taken the vaccine yet, they would still recommend others to take the vaccination. To overcome the vaccine hesitancy among Indian population, students suggested that the government/corporation should host more awareness, campaigns and vaccination drives along with education for the public. More importantly, enough scientific data should be provided by an authentic source. Lessons learned from previous infectious disease outbreaks and public health emergencies, including HIV, H1N1, SARS, MERS and Ebola; remind us that trusted sources of information and guidance are fundamental to disease control.¹⁶

Limitations

Our study was limited to a single medical college of Surat. Moreover, due to the ongoing university examinations, there was low response rate through online mode of data collection hence this may impact the generalizability.

CONCLUSION

Vaccine apprehension is nothing new; it has existed in all global immunisation programmes, whether it was vaccination for smallpox, cholera, measles, or influenza, and COVID-19 is of no exception. However, the uncertainty over a vaccine, which is our only source to fight the deadly pandemic that has already taken the lives of more than twenty-three million people worldwide, is indeed a source of profound concern. In order to plan an effective post-pandemic approach, it is essential to first consider the students' knowledge, attitude, and perception toward the COVID-19 vaccines and then work to increase their acceptance.

This study revealed that there was lack of knowledge and positive attitude towards the COVID-19 vaccines among the non-vaccinated students. Lesson should be learned that early roll out of vaccines lacking in scientific data will definitely increase the concerns regarding adverse events and safety of the vaccine as well as rise in vaccine hesitancy. Hence, this evaluation has guided us in showing the importance and need of targeted educational interventions to address the knowledge gaps and prepare students to discuss and implement about the ways to avoid vaccine hesitancy problems amongst the Indian population for the future pandemics.

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