Determinants of Covid-19 Vaccine Acceptance among Students: A Web-Based Global Survey

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ABSTRACT

Background: Acceptance of a COVID-19 vaccine is crucial to achieve sufficient immunization coverage to end the pandemic. After initially focusing on adults, the emphasis of vaccination is now being geared towards the younger generation. In order to mandate vaccines in schools and attain widespread vaccine uptake, it is important to understand the key determinants that influence students’ willingness to receive a COVID-19 vaccine. Hence, this study was designed to explore students’ willingness to receive a vaccine, their concerns regarding vaccination, and additional factors influencing COVID-19 vaccine acceptance.

Method: Descriptive analytic cross-sectional study using snowball and convenience sample technique was conducted from July - September 2021. Social media networks such as Twitter, WhatsApp and Instagram were used. Data from the student population of both genders receiving secondary and post-secondary education was collected from the Asia-Pacific, Middle East, Europe, and America (26-countries from all over the world). Descriptive statistics and Chi square tests were used. Multivariate logistic regression analysis was used to determine significant predictors for vaccine acceptance.

Results: A total of 201 participants completed the questionnaire (response rate 53%). We found considerably higher willingness (85%) to take a COVID-19 vaccine in the sample; highest among students in the West (95.0%), followed by Asia-Pacific region (84.0%) and the least among Middle East (80.0%). A statistically significant association (p = 0.000) was found between the female gender and the willingness for vaccine receival. Preserving health [OR 18.82, 95%CI 2.88-122.80], understanding the importance of vaccinations for protection against COVID 19 [OR 34.32, 95%CI 3.22-315.55], concerns about vaccine safety [OR 1.77, 95%CI 1.21-2.87] and worry about potential side effects [OR 0.027, 95%CI 0.004-0.213] were significant predictors for vaccine acceptance.

Conclusion: The majority of students were willing to get the COVID-19 vaccine to protect their health; but there were concerns about safety and side effects. Greater understanding about the importance of the vaccine, for protection against COVID-19 was predictive of willingness to receive the vaccine. This study provided evidence for health authorities to provide clear information, reduce misinformation and design measures to address the fears and worries about the effects of the vaccine. Future qualitative studies should be directed towards understanding differences in students’ perspectives in depth.

Keywords: COVID 19 vaccine, pandemic, students, vaccine acceptability, young adults.

I. INTRODUCTION

In the current COVID-19 pandemic, the population’s immunization through vaccination is recognized as a public health priority as the virus has resulted in over 5.6 million deaths worldwide, as of January 22, 2022 [1]. Preventative efforts have been of supreme importance as caseloads rise globally, with vaccines becoming the focus of international attention [2]. Initially, immunization was geared more towards adults and those who were more vulnerable. Now, the emphasis is moving to the younger generation [3]. With the approval of the vaccine for the youth, the public is eager to see an end to the pandemic through immunization and herd immunity. One major hindrance in achieving this is global vaccine hesitancy and skepticism [4]. Vaccine hesitancy was identified as one of the top threats to global health in 2019 by the World Health Organization [5]. Vaccine-hesitant individuals are not quite in favor of the vaccine, nor are they hesitant; they are indecisive about specific vaccines or vaccination and therefore either delay vaccination or refuse it [6], [7]. Vaccine acceptance is a complex phenomenon. Behavioral studies have shown that the determinants of vaccine hesitancy /acceptance are variable, including perceived benefits, effectiveness, perceived risk, side-effects, mistrust, misconceptions, lack of knowledge, ethnicity and complacency, the belief that the risk of contracting COVID is high and the vaccine can negatively impact their lives [8]-[10]. Gen-Z are increasingly in charge of their own healthcare [3]. Research shows that availability of a vaccine does not equal its acceptance [11]. Results of a multi-country study showed that 71.5% of participants reported that they would be very
likely or somewhat likely to get a COVID-19 vaccine [12]. However, the acceptance rates might vary across countries [11]. Previous literature on students and vaccines shows low vaccine knowledge and receipt; potential reasons being side effects, assumptions of not being at risk, and parental influence [7], [13]-[16].

The reality of the pandemic has impacted people of all ages, but students had to face a unique set of circumstances during it. Closure of schools that as an aid to fight against COVID-19 has impacted students mentally, socially and physically [7]. Recently, schools, colleges, and universities worldwide have adopted campus-wide vaccine mandates. For widespread vaccine uptake to be attained, it is important to know the perceptions of this particular group.

Hence, this study was designed to investigate students’ willingness to receive a COVID-19 vaccine and their related concerns. In this study the Health Belief Model was utilized along with model of determinants of vaccine hesitancy. This framework emphasizes that behaviors are influenced by an individual’s beliefs of the threat of an illness, together with belief in the benefits of the recommended health action, and have contextual (socio cultural), individual (attitudes, motivation, perceptions, and vaccine related influence [10], [17].

II. MATERIALS AND METHODS

We employed quantitative methods to obtain students’ perspectives of getting the COVID-19 vaccine. This was a descriptive, cross-sectional study with the participation of 201 samples from the student population (26-countries from all over the world); conducted from July to September, 2021.

The questionnaire was executed using a convenience sample method; google forms and an online questionnaire link was generated and delivered to the students using the snowball technique. This allowed data gathering during the pandemic among students from various institutions in different parts of the world. Social media networks including Twitter, WhatsApp and Instagram were used. The authors encouraged the participants to relay the questionnaire to their contacts, student groups and acquaintances.

Participation was voluntary. Upon clicking the link, students were auto directed to the cover letter of the study, stating it’s aims, the anonymity and confidentiality clause, and the option to consent to participation. This was followed by the survey questionnaire. The questionnaire was kept short in length for ease of completion (approximately 5 minutes). The data collected was analyzed anonymously. Participants were not offered any financial compensation for participation in the study.

A. Sample Size

The target population was students from both genders attending high school and above. The calculated sample size was 377, with a considered margin of error of 5%, and a 95% confidence interval.

B. Instrument Development

The authors reviewed the literature and a relevant, easy to complete questionnaire was developed. The content of the questionnaire was adapted from previously published studies [8], [18]; and was first pilot tested among students to improve its wording and clarity. The questionnaire consisted of 20 statements. The first section included socio-demographic characteristics (age, gender, level of education, country of residence). Participants were asked if they were exposed or diagnosed with COVID 19, or had a close relative who had been diagnosed with it. The second section included questions on willingness to get the vaccine, attitudes/ perceptions towards it, most trusted sources of information, and barriers/ reasons for not getting the vaccine. At the end of the survey, participants were given the option to write their personal opinions regarding the vaccine.

C. Statistical Analysis

The Statistical Package for the Social Sciences (SPSS) [version 21, IBM Corp, Armonk, NY] was used for data analysis. Basic frequencies were used to describe all variables. The Chi square/ANOVA tests were used to test the association and estimate the statistical significance. To identify factors that may be associated with the willingness to get vaccinated, all significant variables were entered to stepwise forward logistic regression analysis. A p-value of <0.05 was considered significant.

III. RESULTS

A total of 201 participants completed the questionnaire (response rate 53%). Table 1 summarizes the socio-demographic characteristics and exposure of the respondents. Participants had an overall mean age of 20.32 years (SD 6.88). The majority (81.0%, n=163) were female, pre-university students (51%, n = 102); and living in the East (Asia/Middle East) (81%; n=162).

| Variable | Category | N (%) |
|----------|----------|-------|
| Age      | <18      | 101(50.2) |
|          | >18      | 100 (49.8) |
| Gender   | male     | 100 (49.8) |
|          | female   | 101(50.2) |
| Academic level | Pre-University | 102(51.0) |
|          | University | 99(49.0) |
| Region   | Asia Pacific | 87 (43.3) |
|          | Middle East | 75(37.3) |
|          | Europe/America | 39(19.4) |
| Have you been exposed to COVID 19? | Yes | 66(32.8) |
|          | No       | 135(67.2) |
| Have you been diagnosed with COVID-19? | Yes | 27(13.4) |
|          | No       | 174(86.6) |
| Has a close relative been diagnosed with COVID19 | Yes | 134 (66.7) |
|          | No       | 67(33.3) |
| Are you in support of a campus vaccine mandate? | Yes | 153 (76.1) |
|          | No       | 48 (23.9) |
| Is it important to get the vaccine, for protection against COVID-19? | Yes | 175 (87.1) |
|          | No       | 26 (12.9) |
| How safe is COVID-19 vaccine for you? | Moderately safe/Very safe | 151(75.1) |
|          | Little/Not safe | 49(24.4) |
A. Key Determinants Affecting Vaccine Acceptance

1) Contextual Influences on Vaccine Acceptance/Use

Table II shows the associations between contextual factors and acceptance/willingness to take the COVID-19 vaccine among students. The willingness for vaccine uptake was highest among students studying in the West (95.0%), followed by the Asia-Pacific region (84.0%) and the least among students in the Middle East (80.0%). A statistically significant association was found between the female gender, country of residence and the willingness for vaccine uptake (p = 0.000; 0.047). No significant association was found between students’ age or level of education and the willingness to take the vaccine.

TABLE II: ASSOCIATION BETWEEN VACCINE ACCEPTANCE AND CONTEXTUAL FACTORS (DEMOGRAPHICS, MEDIA SOURCE, POLICY/MANIPATES) AMONG STUDENTS

| Variable                          | Category         | Vaccine hesitancy N (%) | Willing to get vaccine N (%) | P value |
|-----------------------------------|------------------|-------------------------|------------------------------|---------|
| Age                               | <18              | 18(17.8)                | 83(82.2)                     | 0.344   |
|                                   | >18              | 13(13.0)                | 87(87.0)                     |         |
| Gender                            | Male             | 13(34.2)                | 25(65.8)                     |         |
|                                   | Female           | 18 (11.0)               | 145                          | 0.000   |
| Academic level                    | Pre- university  | 17(16.7)                | 83(83.3)                     | 0.620   |
|                                   | University       | 14(14.1)                | 85(85.9)                     |         |
|                                   | Middle east      | 15(20)                  | 60(80.0)                     |         |
|                                   | Asia Pacific     | 14(16.1)                | 73(83.9)                     |         |
|                                   | Europe/America   | 2(5.1)                  | 37(94.9)                     | 0.047   |
| Trusted source for information about the vaccine | Social media | yes 11(16.7)      | 55(83.3)                      | 0.733   |
|                                   | no 20(14.8)      | 115(85.2)               |                             |         |
|                                   | Family members   | yes 13(28.3)            | 33(71.7)                     | 0.006   |
|                                   | no 18(11.6)      | 115                     |                             |         |
|                                   | Health care provider | yes 15(11.5)         | 115                          | 0.039   |
|                                   | no 16(22.5)      | 55(77.5)                |                             |         |
|                                   | government       | yes 5(7.9)              | 58(92.1)                     | 0.047   |
|                                   | no 26(18.8)      | 112(81.2)               |                             |         |
|                                   | Scientific articles | yes 15(12.9)        | 101(87.1)                    | 0.253   |
|                                   | no 16(18.8)      | 69(81.2)                |                             |         |
|                                   | Are you in support of campus mandate? | yes 8(5.2) | 145(94.8)                      |         |
|                                   | no 23(47.9)      | 25(52.1)                |                             | 0.000   |

2) Trusted Source for Information About the Vaccine

Assessing the different trusted sources of information about the vaccine yielded mixed results (Table II). It was found that conversations with health care providers (130/201, 65%) were most trusted, with the next most common being scientific articles (116/201, 58%). Less than half the participants mentioned social media (66/201, 33%), the government, and family members (63/201, 32%; 46/201, 23%) (Fig. 1). A statistically significant association was found between health care providers, family members, and the government as sources of information and the willingness for vaccine uptake (p = 0.039; 0.006; 0.047). Regarding the vaccine mandate, those who were in favor were more likely to claim that they would get the vaccine as compared to the hesitant cohort (p=0.000) (Table II).

Fig. 1. Students source of information about COVID 19 vaccine.

3) Individual/Social Factors

TABLE III: INDIVIDUAL/SOCIAL FACTORS: (MOTIVATION, ATTITUDES, BARRIERS/PERCEIVED, RISK, EXPOSURE)

| Variable                          | Category         | Vaccine hesitancy N (%) | Willing to get vaccine N (%) | P value |
|-----------------------------------|------------------|-------------------------|------------------------------|---------|
| Motivation                        | Yes              | 7(4.5)                  | 149(95.5)                    | 0.00    |
|                                   | no               | 24(53.3)                | 21(46.7)                     | 0       |
| Protect my health                 | Yes              | 10(6.6)                 | 142(93.4)                    | 0.00    |
|                                   | no               | 21(42.9)                | 28(57.1)                     |         |
| Protect health of family/friend’s health | Yes | 9 (6.9)              | 122(93.1)                    | 0.00    |
|                                   | no               | 22(31.4)                | 48(68.6)                     |         |
| Get back to school                | Yes              | 9(11.0)                 | 73(89.0)                     | 0.14    |
|                                   | no               | 22(18.5)                | 97(81.5)                     |         |
| Resume social activities          | Yes              | 9                          | 97                             | 0.00    |
|                                   | no               | 22                          | 73                             |         |
| Resume travel                     | Yes              | 14(13.0)                 | 94(87.0)                     | 0.29    |
|                                   | no               | 17(18.30)                | 76(81.7)                     |         |
| Encouragement by others to get vaccinated | Yes | 4(14.8)              | 23(85.2)                     | 0.92    |
|                                   | no               | 27(15.5)                 | 147(84.5)                    |         |
| Barriers                          | Lack of knowledge | Yes 13(13.8)         | 81(86.2)                     | 0.55    |
|                                   | no               | 18(16.8)                 | 89(83.2)                     |         |
| Long term side effects            | Yes              | 20(29.9)                 | 47(70.1)                     | 0.01    |
|                                   | no               | 11(8.2)                  | 123(91.8)                    |         |
| Fertility concern                 | Yes              | 14(33.3)                 | 28(66.7)                     | 0.00    |
|                                   | no               | 17(10.7)                 | 142(89.3)                    |         |
| Side effects                      | Yes              | 21(45.7)                 | 255(54.3)                    | 0.00    |
|                                   | no               | 10(6.5)                  | 145(93.5)                    |         |
| Pre-existing medical condition    | Yes              | 6(25.0)                  | 17(75.0)                     | 0.16    |
|                                   | no               | 25(14.1)                 | 152(85.9)                    |         |
| Relative diagnosed with COVID-19  | Yes              | 18(13.4)                 | 116(86.6)                    | 0.92    |
|                                   | no               | 13(19.4)                 | 54(80.6)                     |         |
| Exposure                          | Exposed to COVID-19 | Yes 6(9.1)          | 60(90.9)                     | 0.08    |
|                                   | no               | 25(18.5)                 | 110(81.5)                    |         |
| Diagnosed with COVID-19           | Yes              | 4(14.8)                  | 23(85.2)                     | 0.92    |
|                                   | no               | 27(15.5)                 | 147(84.5)                    |         |
| Relative diagnosed with COVID-19  | Yes              | 18(13.4)                 | 116(86.6)                    | 0.26    |
|                                   | no               | 13(19.4)                 | 54(80.6)                     |         |
| Attitude                          | If important to get the vaccine, for protection against COVID-19 | Agree 9(5.1) | 166(94.9)                      | 0.00    |
|                                   | disagree         | 22(84.6)                 | 4(15.4)                      |         |
| Too much unnecessary worry about COVID-19 outbreak | Agree | 23(29.5) | 55(70.5) | 0.00 |
|                                   | disagree         | 8(6.5)                   | 115(93.5)                    |         |
| Would you transfer your school due to vaccine mandate | Yes | 8(21.1) | 30(78.9) | 0.28 |
|                                   | no               | 23(14.1)                 | 140(85.9)                    |         |
Majority of the participants (85%) were willing to take the vaccine. Table III shows participants’ attitudes, motivation and barriers towards getting the vaccine.

Attitudes toward COVID-19 vaccines were positive. Majority (87%) of the participants agreed that it is important to receive a vaccine for protection against COVID-19. A statistically significant association was found between participants’ perception regarding the importance of vaccine receipt for protection against COVID-19, worry about contracting COVID-19, and willingness for vaccine uptake (p=0.000, 0.000).

The main reasons deterring students not to take the vaccine were insufficient knowledge regarding side effects (47%), concern for long term side effects (33.3%), the fear that the vaccine would be as bad as COVID-19 (23%), fertility issues (21%), and pre-existing medical conditions (11%). A significant association was found between the long-term side effects, fertility concerns, general vaccine side effects, and the willingness to take the vaccine (p = 0.00, p = 0.00, 0.00), respectively. On the other hand, protecting one’s self, family, community, and resuming social activities were significant reasons for students’ willingness to get the vaccine (p= 0.000, 0.000, 0.000, 0.000) (Table III).

4) Perceived Safety and Covid-19 Vaccine Specific Issues

Concerns about the safety of COVID-19 vaccines did not affect the overall acceptance in this cohort. A good percentage of students considered generally vaccines to be safe (87.1%). However, when inquired specifically about the COVID-19 vaccine, only 75% considered it to be safe (Table I). Students with higher concerns about acquiring the disease and greater trust in vaccine safety were significantly more likely to advocate for vaccination (p=0.001; 0.000) (Table IV). Furthermore, findings suggest that concerns about vaccines causing a harmful reaction had a negative impact on willingness to take the vaccine (p=0.001).

5) Factors/Predictors Associated with The Willingness for The Vaccine Uptake Amongst Students

Table V illustrates the significant predictors of vaccine uptake among students. Binary logistic regression analyses were first performed to examine the association between the contextual, individual, and vaccine related variables with the willingness to get vaccinated. After removing non-significant variables, the significant predictors were the effectiveness of the vaccine in protection against COVID-19 [OR 0.51, 95%CI 0.29, 0.89], protection of one’s own health [OR 18.82, 95%CI 2.88-122.80], concerns about vaccine safety [OR 1.77, 95%CI 21.28-28.78], and concerns about side effects [OR 0.027, 95%CI 0.004-0.213].

The analysis to the open-ended question “What are your personal opinions regarding the COVID-19 vaccine?” indicated a mixture of feelings. Individual beliefs have been found to influence the acceptance of vaccines. Students’ personal opinions predominantly showed optimism, the idea that the vaccine was the first step towards freedom, and a positive attitude. However, mistrust and safety concerns were also expressed.

| TABLE IV: VACCINE AND VACCINATION SPECIFIC ISSUES |
|-----------------------------------------------|
| Variable                                    | Category                                                      |
| Vaccine hesitancy n (%) | Willing to get vaccine N (%) | p value |
| Vaccines are safe | agree | 10(5.7) | 165(94.3) | 0.000 |
| Disagree | 21(80.8) | 5(19.2) |
| Can cause a bad reaction | agree | 107(78.7) | 29(21.3) | 0.001 |
| Disagree | 63(96.9) | 2(3.1) |
| Concern about getting COVID-19 | Not concerned | 10(8.4) | 109(91.6) | 0.001 |
| Moderately/Very concerned | 21(25.9) | 60(74.1) |
| How safe is COVID-19 vaccine for you | Moderately safe/Very safe | 7(4.6) | 144(95.4) | 0.000 |
| Little/Not safe | 24(49.0) | 25(51.0) |

| TABLE V: FACTORS AFFECTING THE WILLINGNESS FOR THE UPTAKE AMONGST STUDENTS |
|-----------------------------------------------|
| Variable                                    | Category | Vaccine hesitancy n (%) | Willing to get vaccine n (%) | Unadjusted or [95% ci] | Adjusted or [95% ci] | P value for multivariate |
| It is important to get the vaccine, for protection against covid-19 | Agree | 9(5.1) | 166(94.9) | 101.44(28.80-357.25) | 34.28(3.72-315.95) | 0.002 |
| Disagree | 22(84.6) | 4(15.4) | Ref |
| Protect my health | Yes | 7(4.5) | 149(95.5) | 24.32(9.33-63.39) | 18.82(2.88-122.80) | 0.002 |
| No | 24(53.3) | 21(46.7) | Ref |
| Side effects | Yes | 21(45.7) | 25(54.3) | 0.082(0.03-0.19) | 0.027(0.00-0.21) | 0.001 |
| No | 10(6.5) | 145(93.5) | Ref |
| Moderately safe/very safe | 7(4.6) | 144(95.4) | 19.74(7.69-50.70) | 0.124(1.21-28.78) | 0.028 |
| Little/not safe | 24(49.0) | 25(51.0) | Ref |
6) Contextual and Individual Drivers

a) Mixed emotions

Quotes:
“IT seems very little sacrifice to resume our normal life and protect our loved ones”.
“They made the vaccine just for money”

b) Optimism

Quotes:
“Corona Virus has taken thousands of lives across the world and is no joke. Vaccine was certainly the thing the world was waiting for. As I have successfully received my first dose of a COVID-19 vaccine, I genuinely feel more protected. I know it’s going to boost my immune system and help me dramatically if I catch Corona Virus. We as responsible citizens or residents of a nation should always be determined to provide any sort of contribution which our country/society may need from us on any level.”

“Everyone should get it and people who aren’t getting it mostly are spreading misinformation which is causing more panic than the actual virus.”

“I believe it is essential for everyone to get vaccinated so that we are able to combat the pandemic effectively. It is especially important for those who have to be in contact with others, e.g. employees and students.”

c) Mistrust:

Quotes:
“I think.... it’s not that important. This disease is hardly fatal, and while I may sound foolish, the thing is that many people lost their lives because they already had alarming medical conditions, and COVID made them worse. Some died out of fear and constant social media propaganda. I myself have seen many instances where there were huge crowds and no one seemed to care. I am sure it is not fatal. If you compare other fatal diseases with COVID it doesn't seem fatal at all. Also, I strongly believe in all conspiracy theories because I myself have witnessed many bizarre cases where a lot of things didn't make sense. For e.g. I've heard so many times people who got the vaccine still died of Coronavirus, and many doctors have said vaccines aren't very safe.”

“In my opinion the COVID-19 virus is a man- made virus for decreasing human population in the world and COVID-19 vaccines are working towards the same purpose”.

A student not in favor of the vaccine reported:
“I think that you should not take the vaccine unless you have no other choice. (job restrictions, etc.) You should not take it for leisure activities. I might take the vaccine after knowing the long-term effects.”

d) Safety /Side effects:

A major concern was that vaccine-related adverse side effects have led to reduced public confidence.

Quotes:
“It is not safe and can cause long term side effects, it is in the experimental stage. We should have more information about its long-term side effects.”

“As these vaccines have severe side effects, it must not be mandatory. SOPs should be mandatory and defaulters should be punished and fined heavily.”

“Any vaccine needs at least 5 -10 years to be tested before being offered to the public.”

Another comment: “We need more research on the vaccine before getting it. Officials are making it mandatory for resuming schools or travel, which is why we are getting it without even knowing much about it.”

“It would’ve been great if there were no side effects or chances of contracting COVID after getting vaccinated but unfortunately there are. People in my family got the vaccine and it has affected them the same way COVID could. I’m not sure if I’ll get vaccinated in the future. I think taking care of ourselves and our immunity by adapting a healthy lifestyle is more important and should be promoted more than vaccine”.

e) Vaccine as a way of freedom:

Quotes:
“Everyone should get vaccinated so we can get to live our lives as we used to before COVID-19. Go to school, travel anywhere we want and go outside without wearing masks or being anxious.”

“I think we all need to get vaccinations so that we will able to live as freely as before.”

IV. DISCUSSION

Our study adds to the existing knowledge regarding COVID-19 vaccine acceptance globally by focusing primarily on students with wide geographic distributions across Africa, Asia, Europe and America. As theoretically expected, our findings indicated that students’ beliefs that COVID-19 proposed a severe threat of illness and a positive attitude towards vaccination were significantly associated with intentions to use. This finding is in line with the reported literature which demonstrates that worry/perception of risk is a predictor of the desire/intention to reduce it by prevention and protective behavior [19], [20].

The overall acceptance rate was quite high, highest among students in the West (America/Europe), followed by Asia and the Middle East. The willingness to take the COVID-19 vaccine in this cohort was slightly higher than previously reported among Canadian students; and almost the same as post-secondary students in Italy [7], [21]. However, it was lower than China (91%) [22]. In the East, Asian students had a relatively higher acceptance as compared to the Middle East. This finding is in line with a recent systematic review which reported heterogeneity in COVID-19 vaccine acceptance worldwide with lower rates in the Middle East [23], [24]. A possible reason for this in our study could be the acceleration of cases across South Asia and the extent and intensity of the second wave in neighboring countries such as India. The acceptance for a vaccine varies as a result of distinct pandemic-associated situations, individual experiences, social, environmental, psychological, and cultural influence [25]. However, it can vary by age, gender, and education-level as well. Our results showed sex (female) to be associated with acceptance of the COVID-19 vaccine, and this was much higher than reported literature [26], [27]. This emphasized the need to understand different factors that could affect acceptance regionally, as vaccine hesitancy is not restricted by gender or geographical boundaries.

Health care providers, family, and the government were...
the most trusted sources of information. This was in line with previous evidence that showed influence of social interactions (health care professionals, family etc.) on vaccination receipt [7], [28], [29]. This highlights the key role of these identities in acting as modifying variables by providing accurate information to the public, and influencing them in order to drive vaccine acceptance.

It is worth considering why individuals have willingness or hesitancy towards vaccination. Decision making is influenced by many contextual factors that affects behavior [6]. Aligned with other studies on vaccination uptake, recognition of the importance of being vaccinated for protection against COVID-19 was a predictor of the willingness to become vaccinated. Our results show that vaccine safety and concerns about side effects were important factors aiding vaccine hesitancy. This was further supported by the free text comments provided by the participants. These findings were in line with previous research and indicated that though students were in favor of school mandates and were willing to get a COVID-19 vaccine, they still feared the side effects due to the mere lack of information regarding its safety and long-term side effects. The students are the prime decision makers in receiving their vaccine, and trust/ anxiety issues regarding vaccine receipt is understandable as not enough evidence-based information is provided to them [6], [30].

As COVID-19 vaccines are being mandated for the younger population, it is vital to provide encouragement, clear information, and information regarding the benefits of vaccine uptake.

V. STRENGTHS AND LIMITATIONS
This research provides results on an important section of the population. It is one of the few studies that has captured students’ views on the COVID-19 pandemic globally. Gathering opinions of students as school mandates came into effect generated results more likely to reflect true opinions. The results provided evidence on a vital topic that may be used for further educational campaigns. This study has a number of limitations. This was a cross-sectional study that used the convenience sample method, with a majority of the samples from Asia (Pakistan), the Middle East (Saudi Arabia) and female-identifying participants. Due to the nature of the survey, the participant group may not be wholly representative of the regions, thus enabling the risk of bias. Hence, further research with a larger sample size would be needed to confirm the generalizability of our results in the context of broader students’ populations. Future qualitative studies can explore students’ concerns regarding vaccine uptake in depth.

VI. IMPLICATION STATEMENT
Authorities can overcome hesitancy regarding the COVID-19-vaccine by campaigning and focusing on delivering messages that emphasize the safety of the vaccine and importance of its uptake.

VII. CONCLUSION
The majority of students were willing to get the COVID-19 vaccine to protect their health; but there were concerns about safety and side effects. Greater understanding about the importance of the vaccine, for protection against COVID-19 was predictive of willingness to receive the vaccine. This study provided evidence for health authorities to provide clear information, reduce misinformation and design measures to address the fears and worries about the effects of the vaccine. Future qualitative studies should be directed towards understanding differences in students’ perspectives in depth.

AUTHOR’S CONTRIBUTIONS:
SFI was involved in the concept, study design, literature review, manuscript writing and data analysis. NAA was involved in literature review, data acquisition and critical review and editing. SMI was involved in literature review, manuscript review and data acquisition. The authors believe that the manuscript represents honest work, read the final draft and approved.

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CONFLICT OF INTEREST
Authors declare that they do not have any conflict of interest.

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