

# Factors Associated with COVID-19 Vaccination Acceptance Among Muslim High School Students in Jakarta Metropolitan Area, Indonesia

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**Purpose:** This study aims to identify the factors associated with COVID-19 vaccination uptake and the intention to receive the COVID-19 vaccine among Muslim high school students in Jakarta, Indonesia.

**Patients and Methods:** A cross-sectional study using an online survey was conducted for high school students. The population in this study were Muslim students grade 11 and 12 at secondary high school living and studying in Jakarta Metropolitan area. A total of 440 samples have been selected using non-probability sampling. In this study, the independent variables were factors associated with vaccination behaviors that were derived from the HBM and TPB theories, while the dependent variables were vaccination uptake and vaccination intention. Factors associated with the dependent variables have been identified using chi-square and Mann-Whitney tests.

**Results:** About 65% respondents had received COVID-19 vaccine and 72% of those who had not received COVID-19 vaccine had the intention to receive the vaccine. Some of the behavioral model variables such as the perceived susceptibility score, perceived severity score, perceived benefits score, perceived barriers score, self-efficacy score, attitude score, and social norms score were significantly associated with COVID-19 vaccine uptake among high school students. Furthermore, all of the behavioral model variables, ie, perceived susceptibility score, perceived severity score, perceived benefits score, perceived barriers score, cues to action score, self-efficacy score, attitude score, social norms score, and perceived behavioral control score were significantly associated with an intention of being vaccinated.

**Conclusion:** The vaccination for students can be set in more affordable locations for example, in schools. In addition, efforts to increase student knowledge regarding the effectiveness and safety of vaccines and the dangers of COVID-19 should be sustained.

**Keywords:** adolescents, COVID-19 vaccination, health belief model, theory of planned behavior, developing countries

## Introduction

After more than a year of its emergence, the Coronavirus disease 2019 (COVID-19) has affected more than 220 countries globally, resulting in at least 260 million confirmed cases and nearly 5.2 million deaths.<sup>1</sup> Indonesia is one of the Southeast Asian countries most affected by COVID-19, with the total cases reaching 228 million and the mortality rate being the second highest, reaching more than 142 thousand deaths during November 2021.<sup>2</sup>

Although several non-pharmaceutical interventions (NPIs) have been done to limit the spread of SARS-CoV-2, vaccines against the virus offer a potential exit strategy for the pandemic.<sup>3</sup> COVID-19 vaccination coverage is an important issue since research has demonstrated that vaccines are a safe and highly effective means of preventing widespread infectious diseases and are the only morally and scientifically acceptable approach for achieving herd immunity on a national or global scale.<sup>4</sup> However, the vaccine efficacy and targets for the population should reach a specifically high level in order to make COVID-19 vaccination successful in achieving herd immunity.<sup>4-7</sup>

The Indonesian government sets a vaccination target of 234.6 million people, consisting of health workers, the elderly, public officials, vulnerable communities, the general public, and those aged 12–17 years.<sup>8</sup> This program remains underway, and at the time of this writing, the vaccination rate was considerably low. In November 2021, only 48.12% of the target population had received the first-dose vaccine and 42.23% had received the second-dose vaccine in Indonesia.<sup>8</sup>

Despite its progress, there are a number of barriers to the COVID-19 vaccination program in Indonesia such as lack of access to vaccine, the emergence of hoax messages related to vaccines, worried about the side effects or safety of the vaccine, do not believe in the effectiveness of the vaccine and religious beliefs.<sup>7,9–11</sup>

Although several studies related to vaccine acceptance have been carried out, the vaccine acceptance among adolescents, both in Indonesia and in other countries, remain understudied. Although COVID-19-related morbidity and mortality in young children and adolescents are considerably low, there have been reports of COVID-19 disease symptoms, some severity, and some instances of death in children and adolescents.<sup>12,13</sup> Moreover, vaccination uptake among adolescents in general is substantially low.<sup>14</sup> This study therefore aims to identify the factors associated with the factors associated with the COVID-19 vaccination uptake and intention to receive COVID-19 vaccine among Muslim high school students in Jakarta Metropolitan Area in Indonesia.

## Materials and Methods

### Study Design

This is a cross-sectional study performed in Jakarta Metropolitan Area (including cities in Jakarta Province, Bogor city, Depok city, Tangerang city, and Bekasi city). The data was collected in two weeks from 6 to 20 August 2021. During the period of data collection, COVID-19 vaccination had been given to the age group of 12 years and above based on the Indonesian Ministry of Health Regulation number HK.02.02/I/1727/2021, and the COVID-19 vaccination for the age group over 12 years began in July 2021.

### Population and Sample

The population in this study were Muslim students grade 11 and 12 at secondary high school living and studying in Jakarta Metropolitan area. This population was selected for this study since the Indonesian government through the Indonesian Ministry of Health has scheduled the COVID-19 vaccination targeting children between 12 and 17 years old since July 2021. Moreover, our sample was only focused on Muslim students in grades 11–12 who studied in the Jakarta Metropolitan area. We chose only Muslim students because some previous research showed that there were still some Muslims who believed that they were prohibited from getting vaccinations because the vaccine contained haram materials.<sup>15,16</sup>

Based on the hypothesis test formula for two population proportions using the sample size software released by the World Health Organization, with a value of 5% level of significance and 90% power, and an expected population proportion from the previous study, a minimum of 292 respondents was calculated.<sup>17,18</sup> Initially, 490 respondents participated in this study, but after sample exclusion there were 50 respondents who did not meet the criteria. Non-Muslim students, students in grades other than 11–12, and students from outside the Jakarta Metropolitan Area were excluded. Therefore, 440 respondents were involved in this study. A non-probability convenience sampling method was used for sample selection in this study. A convenience sample is the one that is drawn from a source that is conveniently accessible to the researcher.<sup>19</sup>

### Research Instrument

Independent variables in this study were factors associated with vaccination behaviors that were adopted from HBM and TPB theory, while dependent variables in this study were vaccination uptake and intention to receive the vaccination. The questionnaire consisted of 3 parts. The first part comprised questions related to the socio-demographic conditions of the respondents. The second part consisted of 21 questions related to the determinants of COVID-19 vaccination which were primarily adopted from Shmueli (2021) with some adjustments to the Indonesian context.<sup>20</sup> We did some adjustments to the context of Indonesian adolescents because the original questionnaire was distributed to Israeli adults. For example, we changed the term “workplace” to “school” in the questionnaire and added some questions about their religious beliefs about vaccination.

Prior to data collection, we have a consultation with two experts to raise the content validity of the questionnaire.<sup>21</sup> Moreover, prior to study, the questionnaire has been tested on 30 students who have similar characteristics to the sample of the study, and the result of the test was later used to calculate the reliability of the questionnaire. The Cronbach alpha value of this questionnaire is 0.6 to 0.7, so it can be stated that the reliability of the instrument is in the satisfactory and good range.<sup>22</sup> The determinants of COVID-19 vaccination were designed by adopting the health belief model theory and the theory of planned behavior model. The health belief model predictor variables were perceived susceptibility with one item: "If I do not get vaccinated, the likelihood of me getting infected with corona will increase", perceived severity with two items: "I believe that COVID-19 vaccine will have high efficacy in preventing significant suffering and complications of the disease" and "The COVID-19 vaccine cannot cause severe side effects and can even cause people to die" (Cronbach  $\alpha = 0.767$ ), perceived benefits with two items: "I believe that the COVID-19 vaccine can establish herd immunity against COVID-19" and "If I am vaccinated against COVID-19 and I am exposed to COVID-19, then it is less likely that I will transmit COVID-19 to my family and relatives" (Cronbach  $\alpha = 0.767$ ), perceived barriers with two items: "It takes quite a long time to get a quota for the COVID-19 vaccine" and "It takes a long queue to get a COVID-19 vaccination" (Cronbach  $\alpha = 0.804$ ), cues to action with five items: If any of the following people recommends you to get COVID-19 vaccine a) religious leader, b) health worker, c) friend, d) teacher, and e) family (Cronbach  $\alpha = 0.645$ ), and self-efficacy with three items: "If my neighbors have been vaccinated, I don't need to get vaccinated against COVID-19", "I don't need to vaccinate because I just need to do COVID-19 preventive behavior", and "A person who has been exposed to COVID-19 does not need to be vaccinated against COVID-19" (Cronbach  $\alpha = 0.811$ ).

The theory of planned behavior variables were attitude with two items: "I support the government to vaccinate COVID-19 to all groups including students" and "I persuade people in my neighborhood to get vaccinated" (Cronbach  $\alpha = 0.895$ ), social norms with two items: "I am willing to be vaccinated because my religion encourages me to get vaccinated against COVID-19" and "I am not willing to be vaccinated because my religion forbids the COVID-19 vaccine" (Cronbach  $\alpha = 0.676$ ), and perceived behavioral controls with two items: "I don't know any institutions/agencies that provide free COVID-19 vaccines for teenagers" and "I want to be vaccinated if the vaccine site is close to home" (Cronbach  $\alpha = 0.804$ ). The items in the HBM and TPB models were measured on a 1–4 scale (1 – strongly disagree, 4 – strongly agree) while the negative items were scored in reverse. The next part of the questionnaire consisted of questions related to the COVID-19 vaccination status. The respondents' answers were categorized into two groups of whether the respondents had received COVID-19 vaccination or not. Those who had not received COVID-19 vaccination were also asked about their willingness to receive COVID-19 vaccination in the near future. The respondents who answered with doubt or not willing to receive COVID-19 vaccination were asked about the reasons for their answer.

## Data Collection

This study used an online self-administered questionnaire. The online questionnaire was distributed to the school administrators in the Jakarta Metropolitan Area through the WhatsApp application, who then distributed the questionnaire to the students. Before filling out the questionnaire, the respondents have been given an explanation regarding the objectives and purposes of the research in the initial informed consent form. The respondents who were willing to fill out the questionnaire agreed to the research's informed consent. Moreover, legal guardian of students under 18 years also have provided informed consent. There was neither forced consent nor sanctions against the respondents who declined to participate during the data collection. As a token of appreciation, IDR 10,000/USD 0.70 phone credit was given to the respondents. Anonymity and confidentiality had been ensured during the research process. Prior to the data collection, the ethical clearance was obtained from the Ethic Committee of the Faculty of Health Sciences of Universitas Islam Negeri Syarif Hidayatullah Jakarta, Indonesia (No. Un.01/F.10/KP.01.1/KE.SP/07.08.103/2021) and followed the Declaration of Helsinki principles.

## Data Analysis

The data was analyzed using statistical software. Descriptive statistics have been used to show the frequency and percentage of respondents' characteristics. Furthermore, the Chi-squared test was used to determine the differences in the respondent's COVID-19 vaccination status based on socio-demographic characteristics. Later, the Kolmogorov–Smirnov test was performed to determine the normality distribution of the independent variable data. The Mann–Whitney test on independent samples was used to identify the significant difference in the mean rank score of HBM and TPB items for

respondents who received the COVID-19 vaccine and those who did not. The Mann–Whitney test has been used because the dependent variable was not normally distributed and this study wanted to compare differences between two independent groups (one that has received vaccination vs one that has not received vaccination; and a group that has not decided and does not intend to receive COVID-19 Vaccine and a group that had an intention to receive COVID-19 Vaccine). The Mann–Whitney test ranked all the values from low to high, and then compared the means. With 95% confidence interval, an association with a p value of .05 was considered significant.

## Results

Of 490 students who participated in this study, 440 were eligible to be the respondents. Table 1 shows the socio-demographic characteristics of the respondents. The majority of the respondents were 16–17 years old (86.6%) (mean: 16.49, min: 14, max:

**Table 1** Socio-Demographic Characteristics of Respondents

| Characteristics             | n   | %    | Characteristics                                                   | n   | %    |
|-----------------------------|-----|------|-------------------------------------------------------------------|-----|------|
| <b>Domicile</b>             |     |      | <b>School owner</b>                                               |     |      |
| Jakarta                     | 148 | 33.6 | Private                                                           | 90  | 20.5 |
| Bogor City                  | 50  | 11.4 | State                                                             | 350 | 79.5 |
| Bogor Regency               | 38  | 8.6  | <b>Specialization</b>                                             |     |      |
| Depok City                  | 9   | 2.0  | Natural sciences                                                  | 127 | 30.5 |
| South Tangerang City        | 120 | 27.3 | Social sciences                                                   | 202 | 48.5 |
| Tangerang City              | 5   | 1.1  | Do not have specialization                                        | 87  | 20.9 |
| Tangerang Regency           | 31  | 7.0  | <b>Have been infected with COVID-19</b>                           |     |      |
| Bekasi City                 | 35  | 8.0  | Yes, get self-isolated elsewhere other than healthcare facilities | 76  | 17.3 |
| Bekasi Regency              | 4   | 9    | Yes, get self-isolated in healthcare                              | 1   | 0.2  |
| <b>Area characteristics</b> |     |      | Yes, get inpatient treatment                                      | 1   | 0.2  |
| Rural                       | 78  | 17.7 | Never have been infected                                          | 362 | 82.3 |
| Urban                       | 362 | 82.3 | <b>Preferred media type for coronavirus information</b>           |     |      |
| <b>Age (in years)</b>       |     |      | Television                                                        | 85  | 19.3 |
| 14                          | 1   | 0.2  | Print-based media                                                 | 1   | 0.2  |
| 15                          | 34  | 7.7  | Internet-based media                                              | 343 | 78.0 |
| 16                          | 178 | 40.5 | Direct communication                                              | 9   | 2.0  |
| 17                          | 203 | 46.1 | Seminar                                                           | 2   | 0.5  |
| 18                          | 24  | 5.5  | <b>Preferred information source for coronavirus information</b>   |     |      |
| <b>Sex</b>                  |     |      | Family                                                            | 114 | 25.9 |
| Male                        | 116 | 26.4 | Friend                                                            | 24  | 5.5  |
| Female                      | 324 | 73.6 | Teacher                                                           | 4   | 0.9  |
| <b>School type</b>          |     |      | Government                                                        | 46  | 10.5 |
| Vocational High School      | 125 | 28.4 | Influencer                                                        | 20  | 4.5  |
| Public High School          | 187 | 42.5 | Neighbor or relatives                                             | 25  | 5.7  |
| Islamic High School         | 128 | 29.1 | News                                                              | 207 | 47.0 |

18 years old) and female (73.6%). The majority of the respondents lived in urban area (82.3%) while only 17.7% respondents lived in rural area. Most of the respondents went to public high school (42.5%) and state high school (79.5%). About 17.7% (n: 78) respondents had been infected with COVID-19. A total of 343 (78.0%) respondents preferred internet-based media to look for information about coronavirus, and 207 respondents chose to obtain information on coronavirus from news.

The comparison of COVID-19 vaccination status between groups is presented in Table 2. There were significant differences in the uptake of COVID-19 vaccine between the respondents living in Jakarta and around Jakarta (p-value: <0.001), with a higher number of the respondents in Jakarta having received COVID-19 vaccine than those around Jakarta (81.1% vs 57.2%). The respondents in the urban area who had received COVID-19 vaccine were more than the respondents in the rural area (p-value: <0.001). The respondents who had not been infected with COVID-19 and had received COVID-19 vaccine were more than the respondents who had not been infected (46.2% VS 69.3%, p-value: <0.001). However, there was no significant difference in the uptake of COVID-19 vaccination based on age group, sex, and preferred source and media type for coronavirus information.

Table 3 shows a comparison of the score of variables based on the behavioral models among the groups who had and had not received COVID-19 vaccine. In general, the respondents who had received COVID-19 vaccine had higher scores

**Table 2** Bivariate Analysis of Socio-Demographic Factors Related to COVID-19 Vaccination Uptake

|                                    | Have Not Received<br>COVID-19 Vaccine<br>(n= 153) |      | Have Received<br>COVID-19 Vaccine<br>(n= 287) |      | p-value |
|------------------------------------|---------------------------------------------------|------|-----------------------------------------------|------|---------|
|                                    | n                                                 | %    | n                                             | %    |         |
| <b>Living area</b>                 |                                                   |      |                                               |      | <0.001  |
| Jakarta                            | 28                                                | 18.9 | 120                                           | 81.1 |         |
| Around Jakarta                     | 125                                               | 42.8 | 167                                           | 57.2 |         |
| <b>Living area characteristics</b> |                                                   |      |                                               |      | <0.001  |
| Rural                              | 48                                                | 61.5 | 30                                            | 38.5 |         |
| Urban                              | 105                                               | 29.0 | 257                                           | 71.0 |         |
| <b>Age group</b>                   |                                                   |      |                                               |      | 0.057   |
| < 16                               | 84                                                | 39.4 | 129                                           | 60.6 |         |
| > 17                               | 69                                                | 30.4 | 158                                           | 69.6 |         |
| <b>Sex</b>                         |                                                   |      |                                               |      | 1.000   |
| Male                               | 40                                                | 34.5 | 76                                            | 65.5 |         |
| Female                             | 113                                               | 34.9 | 211                                           | 65.1 |         |
| <b>Grade</b>                       |                                                   |      |                                               |      | 0.006   |
| 11                                 | 77                                                | 42.3 | 105                                           | 57.7 |         |
| 12                                 | 76                                                | 29.5 | 182                                           | 70.5 |         |
| <b>School type</b>                 |                                                   |      |                                               |      | <0.001  |
| Vocational High School             | 24                                                | 19.2 | 101                                           | 80.8 |         |
| Public High School                 | 70                                                | 37.4 | 117                                           | 62.6 |         |
| Islamic High School                | 59                                                | 46.1 | 69                                            | 53.9 |         |

(Continued)

**Table 2** (Continued).

|                                                     | Have Not Received COVID-19 Vaccine (n= 153) |      | Have Received COVID-19 Vaccine (n= 287) |      | p-value |
|-----------------------------------------------------|---------------------------------------------|------|-----------------------------------------|------|---------|
|                                                     | n                                           | %    | n                                       | %    |         |
| <b>School owner</b>                                 |                                             |      |                                         |      | 0.018   |
| Private                                             | 41                                          | 45.6 | 49                                      | 54.4 |         |
| State                                               | 112                                         | 32.0 | 258                                     | 68.0 |         |
| <b>Specialization group</b>                         |                                             |      |                                         |      | <0.001  |
| Social sciences                                     | 55                                          | 43.3 | 72                                      | 56.7 |         |
| Natural sciences                                    | 80                                          | 39.6 | 122                                     | 60.4 |         |
| Do not have specialization                          | 13                                          | 14.9 | 74                                      | 85.1 |         |
| <b>COVID-19 status</b>                              |                                             |      |                                         |      | <0.001  |
| Have been infected                                  | 42                                          | 53.8 | 36                                      | 46.2 |         |
| Have not been infected                              | 111                                         | 30.7 | 251                                     | 69.3 |         |
| <b>Preferred information source for coronavirus</b> |                                             |      |                                         |      | 0.859   |
| Influencer                                          | 8                                           | 40.0 | 12                                      | 60.0 |         |
| Family, friend, neighbor                            | 56                                          | 33.5 | 111                                     | 66.5 |         |
| News                                                | 71                                          | 34.3 | 136                                     | 65.7 |         |
| Government                                          | 18                                          | 39.1 | 28                                      | 60.9 |         |
| <b>Preferred media type for coronavirus</b>         |                                             |      |                                         |      | 0.904   |
| Internet                                            | 120                                         | 35.0 | 223                                     | 65.0 |         |
| Non-Internet                                        | 33                                          | 34.0 | 64                                      | 66.0 |         |

**Table 3** Bivariate Analysis of Behavioral Factors Related to COVID-19 Vaccine Status

|                                 | Not Received COVID-19 Vaccine | Received COVID-19 Vaccine | Z     | P-value |
|---------------------------------|-------------------------------|---------------------------|-------|---------|
|                                 | Mean Rank                     | Mean Rank                 |       |         |
| Perceived susceptibility        | 199.81                        | 231.53                    | -2.86 | 0.004   |
| Perceived severity              | 191.14                        | 236.15                    | -3.76 | <0.001  |
| Perceived benefits              | 197.57                        | 232.72                    | -2.94 | 0.003   |
| Perceived barriers <sup>a</sup> | 163.05                        | 251.13                    | -7.09 | <0.001  |
| Cues to action                  | 204.94                        | 228.79                    | -1.93 | 0.054   |
| Self-efficacy                   | 188.48                        | 237.57                    | -4.11 | <0.001  |
| Attitude                        | 192.68                        | 235.33                    | -3.56 | <0.001  |
| Social norm                     | 198.45                        | 232.26                    | -2.72 | 0.006   |
| Perceived behavioral control    | 206.95                        | 227.72                    | -1.76 | 0.078   |

**Note:** <sup>a</sup>High score of perceived barriers means low perceived barrier.

of all variables than those who had not received COVID-19 vaccine. There was a significance difference in the perceived susceptibility variable score between the respondents who had received COVID-19 vaccine and those who had not received the vaccine ( $p: 0.004$ ). The mean rank score of perceived susceptibility for the respondents who had received COVID-19 vaccine was higher than the mean rank score of those who had not received COVID-19 vaccine (231.53 vs 199.81). Moreover, the respondents who had received COVID-19 vaccine had scored higher on perceived severity than its counterparts (mean rank: 236.15 vs 191.14,  $p: <0.001$ ). However, there was no significant difference in the average score of cues to action and perceived behavioral control among those who had received COVID-19 vaccine and those who had not received it.

Table 4 shows that those who had not received COVID-19 vaccine, reaching 71.9% ( $n: 110$ ), had the willingness to receive COVID-19 vaccine. There was no significant difference in the uptake of COVID-19 vaccination based on the respondents' living area, area characteristics, age group, sex, grade, school ownership, specialization group, and preferred information source for coronavirus. However, there were significant differences in the intention to receive COVID-19 vaccine between the respondents who preferred internet and those choosing non-internet sources for coronavirus information ( $p$ -value: 0.039). The respondents who had been infected with COVID-19 had an intention to receive COVID-19 vaccine more than the respondents who had not been infected with COVID-19 (88.1 VS 65.8%,  $p$ -value: 0.011).

The score variables based on the behavioral models among the groups that intended and did not intend/did not decide to receive COVID-19 vaccine are shown in Table 5. Generally, the respondents who intended to receive COVID-19 vaccine had a better score of mean rank compared to the respondents who did not want to receive COVID-19 vaccine. Moreover, there was a significance difference ( $p$ -value:  $<0.050$ ) in all variables, namely perceived susceptibility score,

**Table 4** Intention to Get COVID-19 Vaccine Among the Respondents Who Have Not Received COVID-19 Vaccine

|                                    | Have Not Decided and Do Not Intend to Receive COVID-19 Vaccine ( $n= 43$ ) |      | Intend to Receive COVID-19 Vaccine ( $n= 110$ ) |      | p-value |
|------------------------------------|----------------------------------------------------------------------------|------|-------------------------------------------------|------|---------|
|                                    | n                                                                          | %    | n                                               | %    |         |
| <b>Living area</b>                 |                                                                            |      |                                                 |      | 0.686   |
| Jakarta                            | 7                                                                          | 25.0 | 21                                              | 75.0 |         |
| Around Jakarta                     | 36                                                                         | 28.8 | 89                                              | 71.2 |         |
| <b>Living area characteristics</b> |                                                                            |      |                                                 |      | 0.558   |
| Rural                              | 15                                                                         | 31.3 | 33                                              | 68.8 |         |
| Urban                              | 28                                                                         | 26.7 | 77                                              | 73.3 |         |
| <b>Age group</b>                   |                                                                            |      |                                                 |      | 0.826   |
| < 16                               | 23                                                                         | 27.4 | 61                                              | 72.6 |         |
| > 17                               | 20                                                                         | 29.0 | 49                                              | 71.0 |         |
| <b>Sex</b>                         |                                                                            |      |                                                 |      | 0.756   |
| Male                               | 12                                                                         | 30.0 | 28                                              | 70.0 |         |
| Female                             | 31                                                                         | 27.4 | 82                                              | 72.6 |         |
| <b>Grade</b>                       |                                                                            |      |                                                 |      | 1.000   |
| I I                                | 22                                                                         | 26.8 | 55                                              | 71.4 |         |
| I 2                                | 21                                                                         | 27.6 | 55                                              | 72.4 |         |

(Continued)

**Table 4** (Continued).

|                                                     | Have Not Decided and Do Not Intend to Receive COVID-19 Vaccine (n= 43) |      | Intend to Receive COVID-19 Vaccine (n= 110) |      | p-value |
|-----------------------------------------------------|------------------------------------------------------------------------|------|---------------------------------------------|------|---------|
|                                                     | n                                                                      | %    | n                                           | %    |         |
| <b>School type</b>                                  |                                                                        |      |                                             |      | 0.002   |
| Vocational High School                              | 3                                                                      | 12.5 | 21                                          | 87.5 |         |
| Public High School                                  | 14                                                                     | 20.0 | 56                                          | 80.0 |         |
| Islamic High School                                 | 26                                                                     | 44.1 | 33                                          | 55.9 |         |
| <b>School owner</b>                                 |                                                                        |      |                                             |      | 0.832   |
| Private                                             | 11                                                                     | 26.8 | 30                                          | 73.2 |         |
| State                                               | 32                                                                     | 28.6 | 80                                          | 71.4 |         |
| <b>Specialization group</b>                         |                                                                        |      |                                             |      | 0.463   |
| Social sciences                                     | 18                                                                     | 32.7 | 37                                          | 67.3 |         |
| Natural sciences                                    | 23                                                                     | 28.7 | 57                                          | 71.3 |         |
| Do not have specialization                          | 2                                                                      | 15.4 | 11                                          | 84.6 |         |
| <b>COVID-19 status</b>                              |                                                                        |      |                                             |      | 0.011   |
| Have been infected                                  | 5                                                                      | 11.9 | 37                                          | 88.1 |         |
| Have not been infected                              | 38                                                                     | 34.2 | 73                                          | 65.8 |         |
| <b>Preferred information source for coronavirus</b> |                                                                        |      |                                             |      | 0.835   |
| Influencer                                          | 3                                                                      | 37.5 | 5                                           | 62.5 |         |
| Family, friend, neighbor                            | 17                                                                     | 30.4 | 39                                          | 69.6 |         |
| News                                                | 19                                                                     | 26.8 | 52                                          | 73.2 |         |
| Government                                          | 4                                                                      | 22.2 | 14                                          | 77.8 |         |
| <b>Preferred media type for coronavirus</b>         |                                                                        |      |                                             |      | 0.039   |
| Internet                                            | 29                                                                     | 24.2 | 91                                          | 75.8 |         |
| Non-Internet                                        | 14                                                                     | 42.4 | 19                                          | 57.6 |         |

perceived severity score, perceived benefits score, perceived barrier score, cues to action score, self-efficacy score, attitude score, social norms score, and perceived behavioral control score between the respondents who intended to receive COVID-19 vaccine and who did not.

Most of those who had not intended and who had not decided to receive COVID-19 vaccine were still afraid of the side effects of COVID-19 vaccine (n: 16). Other respondents stated some other reasons for not intending or not deciding to receive COVID-19 vaccine, such as still unsure of the safety of the vaccine, having comorbidities, being unsure of the effectiveness, not wanting to go to the vaccine station, not trusting in vaccine, religious reason, following parents' order, having been infected with COVID-19, and having a fear of syringe (Figure 1).

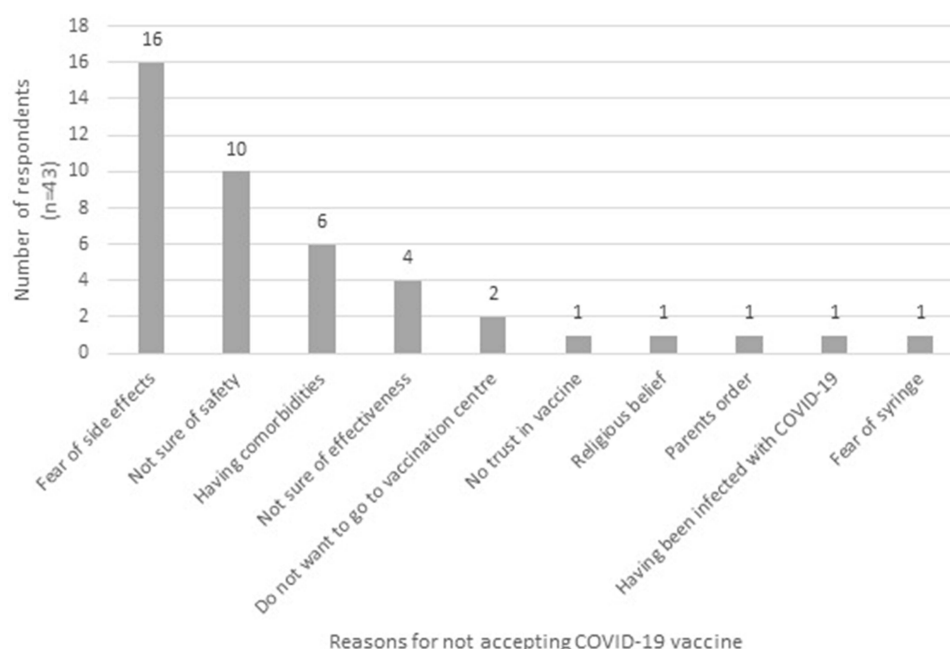
**Table 5** Bivariate Analysis of Behavioral Factors Related to the Intention to Receive COVID-19 Vaccine

|                                 | Have Not Decided and Do Not Intend to Receive COVID-19 Vaccine (n= 287) | Intend to Receive COVID-19 Vaccine (n= 153) | Z     | P-value |
|---------------------------------|-------------------------------------------------------------------------|---------------------------------------------|-------|---------|
|                                 | Mean Rank                                                               | Mean Rank                                   |       |         |
| Perceived susceptibility        | 44.15                                                                   | 89.84                                       | -6.31 | <0.001  |
| Perceived severity              | 50.81                                                                   | 87.24                                       | -4.84 | <0.001  |
| Perceived benefits              | 49.51                                                                   | 87.75                                       | -5.18 | <0.001  |
| Perceived barriers <sup>a</sup> | 64.26                                                                   | 81.98                                       | -2.27 | 0.023   |
| Cues to action                  | 65.41                                                                   | 81.53                                       | -2.06 | 0.039   |
| Self-efficacy                   | 43.51                                                                   | 90.09                                       | -6.18 | <0.001  |
| Attitude                        | 48.17                                                                   | 88.27                                       | -5.27 | <0.001  |
| Social norm                     | 57.93                                                                   | 84.45                                       | -3.41 | 0.001   |
| Perceived behavioral control    | 92.12                                                                   | 71.09                                       | -2.85 | 0.004   |

**Note:** <sup>a</sup>High score of perceived barriers means low perceived barrier.

## Discussion

At the time of the data collection, the Indonesian government implemented a policy called Community Restrictions where the mobility of people was strongly restricted, thus forcing the use of online survey in this study instead of face-to-face survey. Given that situation, there is a tendency that only people who have access to the internet are able to participate in this study.<sup>23</sup> However, data show that the internet use in Indonesia has increased during the pandemic, and since this study focuses on students living in Jakarta Metropolitan area, it is found that the number of internet users in



**Figure 1** Reasons for who do not intend and have not decided to receive COVID-19 vaccine.

that area is higher than that in other areas in Indonesia.<sup>24</sup> Furthermore, this study is also among the first studies that investigate the COVID-19 vaccination acceptance and its determinants among high school students.

The results of this study show that the percentage of high school students in Jakarta who had received COVID-19 vaccination was 81%. The report from the Jakarta Provincial Government also show that COVID-19 vaccination has reached the target.<sup>25</sup> However, only about 57.2% of the students who live around Jakarta area have received COVID-19 vaccine. This result shows that there are disparities in vaccine coverage between regions in Indonesia. In fact, this survey only focuses on urban areas, making it possible that the COVID-19 vaccination coverage among students in the other areas in Indonesia is considerably lower than the coverage found in this study. When this article was written, the researchers found a report showing that the COVID-19 vaccine was limited in number in various regions in Indonesia.<sup>8</sup> Moreover, a previous study performed in Indonesia also showed that immunization coverage was higher in urban areas than in rural ones.<sup>26</sup> Therefore, COVID-19 vaccine should be produced on a larger scale, priced affordably, allocated evenly to make it available where needed, and deployed widely in local communities.<sup>27</sup>

The vaccination coverage is not merely about the supply issues but also the demand from the community. This study shows that among those who had not received COVID-19 vaccine, 62.1% had an intention to receive COVID-19 vaccine whereas there were about 28.1% who did not want or did not decide to receive COVID-19 vaccine. The intention to get COVID-19 vaccine in this study is lower than the studies performed among the age group of over 18 years in the US (69%),<sup>28</sup> among Chinese factory workers (66%),<sup>29</sup> among residents of King Saudi Arabia (65.6%),<sup>30</sup> and among health-care workers in China (76.4%).<sup>31</sup> Yet, the intention rate to get the COVID-19 vaccine in this study is higher compared with the rates found in the studies performed in Malaysia (48.2%) and among the population in Jordan (37.4%).<sup>32,33</sup>

This study shows that respondents who had been vaccinated and intended to get vaccination perceived more susceptibility to being infected with the coronavirus and severity if they got an infection. A study by Shmueli also shows that those who intend to get COVID-19 vaccine perceive more susceptibility to having COVID-19 and COVID-19 as a more serious illness as opposed to those who do not intend to take the vaccine.<sup>20</sup> In the context of adolescent, a study in the United States shows that baby boomers perceive COVID-19 to be significantly more severe compared to the perception held by the younger generation, namely Gen X, Gen Y, and Gen Z.<sup>34</sup> Moreover, a previous research suggests that adolescents reflect more attention to immediate reward consequences rather than delayed aversive consequences of possible risky actions.<sup>35</sup>

In this study, the respondents were asked about whether COVID-19 vaccine was accepted based on their religious and social values. The results show that those who have accepted the COVID-19 vaccine have a better score on religious norms variable. A previous study performed in Indonesia shows that 8% of the respondents do not accept the vaccine due to religious beliefs.<sup>7</sup> In fact, the Indonesian government has involved religious authorities in almost each step in the implementation of COVID-19 countermeasures program. For example, during the COVID-19 vaccination program launch, the Indonesian Islamic Cleric Council (*Majelis Ulama Indonesia*) has declared that the vaccine is halal (allowed under Islamic law) and safe.<sup>36</sup> Not only Indonesian Islamic Cleric Council, *Nahdlatul Ulama* and Muhammadiyah as the largest Muslim organizations in Indonesia have also issued a declaration to support the COVID-19 vaccination program. However, as the results of this study show, there are still groups who think that Islam does not recommend vaccination, thus affecting the vaccine acceptance.<sup>37</sup> Therefore, continuous education is required especially related to the laws of vaccination from a religious perspective in order to raise the awareness of groups who refuse vaccines for religious reasons.

Our study shows that COVID-19 vaccine acceptors have a higher score on the attitude toward COVID-19 vaccination variables. The respondents support COVID-19 vaccination for students considering that vaccination is a prerequisite for the implementation of face-to-face schools. Several surveys conducted in Indonesia reveal that students have difficulties in doing online learning during the pandemic, and most of them want offline schools.<sup>38-40</sup> Moreover, this can be caused by various misinformation circulating in the community. In Indonesia, there is some misinformation related to COVID-19, such as the COVID-19 vaccine containing magnetic microchips and actually endangering one's health. A previous study shows that there have been 528 misinformation or false information related to the COVID-19 vaccine circulating in 52 countries.<sup>41</sup> Moreover, beliefs in misinformation are strongly associated with a decrease in the intention to obtain COVID-19 vaccination.<sup>42</sup>

## Conclusion

In summary, the present paper shows that the factors associated with the uptake of COVID-19 vaccination and the intention to receive COVID-19 vaccine among Muslim high school students in Jakarta Metropolitan Area in Indonesia. This study implies that the location of vaccination for students should be expanded, such as at school, to make the vaccination more affordable and comfortable for students. As it is found that there are students who have disbelief related to COVID-19 vaccine, a continuous education particularly related to the safety and benefits of COVID-19 vaccine for students should continue. Moreover, besides the increasing vaccination coverage, non-pharmaceutical interventions definitely remain needed to contain the outbreak.<sup>3</sup>

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## Disclosure

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