



## RESEARCH ARTICLE

# REVISSED Parental coronavirus disease vaccine hesitancy for children in Bangladesh: a cross-sectional study [version 2; peer review: 3 approved]

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## Abstract

**Background:** Coronavirus disease 2019 (COVID-19) requires mass immunization to control the severity of symptoms and global spread. Data from developed countries have shown a high prevalence of parental COVID-19 vaccine hesitancy. However, parental vaccine hesitancy data in low- and middle-income countries are scarce. This study aimed to assess the prevalence of parental vaccine hesitancy and identify subgroups with higher odds of vaccine hesitancy in parents in Bangladesh.

**Methods:** A cross-sectional study was conducted on the parents of children aged <18 years from October 10, 2021 to October 31, 2021. Parents participated in face-to-face interviews in randomly selected locations in Bangladesh using a vaccine hesitancy questionnaire. Factors associated with COVID-19 vaccine hesitancy were identified using binary logistic regression analysis.

**Results:** Data from 2,633 eligible parents were analyzed. Overall, 42.8% reported COVID-19 vaccine hesitancy for their youngest child. The final model suggested the following factors were associated with hesitancy: children's age; parent's age, religion, occupation, monthly household income, permanent address, living location, status of tobacco use, adherence with regular government vaccination programs (other than COVID-19), perceptions of COVID-19 vaccine efficacy among Bangladeshi children, self-vaccination intentions, reported family members' illness or death from COVID-19, and perceived threat of COVID-19 were the independent predictors of

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parental COVID-19 vaccine hesitancy. Conversely, participants who were not tobacco users, parents who were very likely to believe that their children or family members could be infected with COVID-19 in the following year and who were very concerned about their children or a family member contracting COVID-19 in the next year had significantly lower odds of COVID-19 vaccine hesitancy.

**Conclusions:** Our study suggested that vaccine hesitation varied based on sociodemographic characteristics, religion, behavior, and perceived COVID-19 threat. Therefore, interventions focused on addressing vaccine hesitancy among specific subgroups are warranted.

### Keywords

Bangladesh, COVID-19, developing countries, parents, pediatrics, vaccine hesitancy.



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**REVISED Amendments from Version 1**

The abstract was rewritten to make it concise and increase readability.  
 The introduction section was amended to make the aim more specific and precise.  
 Changes were made in the p-values for better understanding.  
 The conclusion section was amended to specify the implication of the study.

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**Introduction**

Mass immunization against coronavirus disease 2019 (COVID-19) is one of the heaviest relied upon measures to control the spread of symptomatic severe acute respiratory syndrome coronavirus 2 (SARS-CoV2) and end the global pandemic.<sup>1</sup> Many countries have targeted vaccinating at least 80% of their total population, including individuals aged 18 years and below, to achieve herd immunity.<sup>2,3</sup> However, vaccine hesitancy, defined as a delay in acceptance or refusal of vaccines despite the availability of vaccination services,<sup>4</sup> is a significant threat to the smooth uptake of vaccinations worldwide.<sup>5</sup>

Since December 2019, more than 433 million COVID-19 cases have been identified globally, and more than 5.8 million people have died of the disease, with a significantly high prevalence in older adults.<sup>6</sup> However, the infection rate among children and adolescents is not negligible, and they can carry and spread the virus.<sup>7</sup> Furthermore, unvaccinated populations are supposedly suitable hosts for new variants.<sup>8</sup>

Recent data indicate that a small number of countries, such as the USA, are unlikely to reach the 80% target for herd immunity; however, vaccinating 22% of the American population, which is the size of the pediatric population, would effectively boost community protection against COVID-19.<sup>3</sup> Nonetheless, more than one in three parents in the USA were vaccine-hesitant for their children.<sup>3</sup> In China, this rate was 52.5%.<sup>9</sup> Along with sociodemographic variables such as age, sex, educational qualification, occupation, and religious beliefs, overall vaccine hesitancy also varies by political theology, perceived pandemic threat, or the socioeconomic status of the target population.<sup>10–12</sup> Additionally, the reporting of adverse events, the vaccine's effectiveness in children, and availability of research on the specific age groups of their children may play a crucial role when parents decide to vaccinate their children. Furthermore, one survey revealed that along with potential immediate adverse effects of the vaccines, the possible long-term harmful effects were a growing concern for parents.<sup>13</sup>

The triumph of immunization, among other programs, relies on the vaccination of a wide proportion of pediatric and adult populations in low- and middle-income countries where variants of concern, such as SARS-CoV-2 B.1.617.2 Delta, have been detected.<sup>14,15</sup> In Bangladesh, by November 2021, only 18% of the entire population had been fully vaccinated against this disease.<sup>16</sup> However, approximately 35% of the Bangladeshi population are aged 18 years and younger.<sup>17</sup> Thus, to achieve herd immunity, this young cohort should be included in the mass vaccination program. Therefore, the government of Bangladesh has planned to vaccinate students aged between 12 and 17 years. Vaccination among the young student cohort began, to a limited extent, in cities including Dhaka from November 1, 2021.<sup>18</sup>

There is a lack of information regarding vaccine hesitancy among parents of children aged 18 years and below worldwide. In Bangladesh, a previous study revealed that 32% of the adult study population refused to be vaccinated against COVID-19.<sup>10</sup> We hypothesized that the parental vaccine hesitancy rate would not match that in the general adult population. Therefore, this study sought to (1) conduct a nationally representative assessment of parental vaccine hesitancy and (2) identify subgroups of parents with higher odds of vaccine hesitancy.

**Methods****Ethics statements**

The Institutional Review Board of Uttara Adhunik Medical College and Hospital approved this study (Approval number: UAMC-IRB-2021/09). Written informed consent for both participation and publication of data was obtained from all participants.

**Study design and participants**

This cross-sectional study was conducted in Bangladesh from October 10, 2021 to October 31, 2021. A margin of 2% error, confidence level of 95%, and response distribution of 50% were used to calculate the sample size to target fathers/mothers of 80 million children and obtain a minimum sample size of 2,401 participants.<sup>19,20</sup> Approximately 3,000 parents aged  $\geq 18$  years with children aged under 18 years who permanently live in Bangladesh were conveniently invited to participate in individualized interview sessions using a previously employed vaccine hesitancy questionnaire.<sup>10,21,35</sup>

We received data from 2,703 parents, as a result of a 10% refusal rate. However, 36 parents who did not answer all questions were excluded. We also excluded 34 data points for contradicting answers. Considering these exclusions, 2,633 respondents were ultimately included in the final analysis.<sup>35</sup>

### Study questionnaire

In the first portion of the questionnaire, participants were queried regarding vaccine hesitancy and perceived COVID-19 threat. First, parents were asked about the likelihood of vaccinating their youngest children. Parental vaccine hesitancy was measured using the question, “If a vaccine that would be effective against coronavirus disease among children was available, how likely would you be to have your children vaccinated?” (response options: very likely, somewhat likely, not likely, or definitely not). Second, participants were asked two questions regarding the perceived COVID-19 threat: (1) “How likely is it that your children or a family member could get infected with coronavirus in the next year?” (response options: very likely, somewhat likely, not likely, or definitely not). (2) “How concerned are you that your children or a family member could get infected with coronavirus in the next year?” (response options: very concerned, concerned, slightly concerned, or not concerned at all).

The second part of the questionnaire included a wide array of sociodemographic questions for both children and parents. A set of structured questions assessed the child's health (healthy/disabled), age, and sex. Information on parents' sex, age, religion, current marital status, education, employment status, monthly household income (Bangladeshi taka), permanent address, region of residence (north, south, and central zones in Bangladesh, including Dhaka), current residence type (own/rented/others), family type (nuclear or extended, number of children, current tobacco use status, religious practice habits, and political affiliation was collected. Additionally, parents were asked several other COVID-19 vaccine-related questions: “Do you think the COVID-19 vaccine will be effective among Bangladeshi children?” (response options: no, yes, or skeptical), “Have you received or plan to receive the COVID-19 vaccine,” “Did you or your family member(s) test positive for COVID-19,” and “Have you lost any of your family member(s) to COVID-19?” The last three questions received dichotomous (yes or no) answers.

### Sampling technique and data collection

Data were collected from all eight geographic divisions of Bangladesh, and a dual-stage cluster sampling technique was used to include potential samples. We randomly chose marketplaces, shopping malls, waiting rooms of large hospitals, diagnostic centers, bus and railway stations, and residences and processed them as clusters in the first stage. To obtain data from the parents of children with disabilities, we also visited randomly selected centers for disabled children. The list of given data collection sites was collected from division websites. In the second stage, we chose participants conveniently. Data from exclusively the father or mother of a child were taken to avoid repeating data.

Eight teams of two persons each were created. A team member read the questions aloud to the interviewees individually, and read response options from which participants' choices were recorded. Subsequently, the answers were checked and confirmed by the second team member. The coinvestigator reviewed the data collection sheets for completeness, accuracy, and internal consistency and secured them with the principal investigator. Individual face-to-face interviews were conducted to ensure participant privacy. All participants were informed of the voluntary nature of their participation, and the interviews were conducted in Bangla.

### Statistical analyses

The crucial outcome of this study was vaccine hesitancy. We dichotomized the four responses to the vaccine hesitancy question as either a positive (very likely and somewhat likely) or a negative (not likely and definitely not) attitude toward the COVID-19 vaccine.<sup>10</sup> Fisher's exact test was used for two nominal variables, and the chi-square test was used for more than two nominal variables to assess vaccine hesitancy rates and draw comparisons between the groups. Binary logistic regression analyses were performed to identify the predictors of parental COVID-19 vaccine hesitancy and compute adjusted odds ratios (AORs) with a 95% confidence interval (CI). Factors significantly associated with vaccine hesitancy in the descriptive analysis were included in the regression model. A goodness-of-fit test for the adjusted logistic regression model was performed using the Hosmer-Lemeshow test. The significance level was set at  $p < 0.05$ , and SPSS (version 22.0; IBM Corp; RRID: SCR\_002865) was used to perform all data analyses.

## Results

### Parents and children's characteristics

Overall, 2,633 parents aged  $34.97 \pm 7.87$  years (mean  $\pm$  standard deviation) were included in the analysis, with 52.8% (1,390) being women. In total, 396 (15%) parents of children with a physical disability were included. Among the children, 1,372 (52.1%) were boys, and 1,206 (45.8%) were in the 0–4-year-old group. Most parents (653, 24.8%) were in the 31–35-year-old group. Overall, 2,358 (89.4%) parents were Muslim, 1,791 (68%) were a nuclear family member, 1,075 (40.8%) had two children, 1,022 (38.8%) had a low education level, 756 (28.7%) were homemakers, and

833 (31.6%) had a low-middle household income. Among all participants, 1,528 (58%) were from a village, 1,323 (50%) were living in the central zone including Dhaka, 1,695 (64.4%) were tobacco non-users, 1,797 (68.2%) were regular religious practitioners, and 1,032 (39.2%) were politically neutral respondents. A total of 177 (6.3%) parents did not adhere to the regular government vaccination programs other than COVID-19, and 1,458 (55.4%) remained skeptical about the effectiveness of the COVID-19 vaccine for Bangladeshi children. Furthermore, 722 (27.4%) parents were either not vaccinated or did not receive the COVID-19 vaccine; however, 752 (28.6%) parents reported that they or their family members tested positive for COVID-19, and 151 (5.7%) had lost a family member to COVID-19. Details of the responses to the questions regarding the likelihood of children or family members' infection by COVID-19 and the level of concern about children or family members contracting the disease in the next year are shown in [Table 1](#).

**Table 1. Descriptive analysis: Sociodemographic characteristics, COVID-19 threat, and parental vaccine hesitancy.**

Variables	Total sample n (%)	Likelihood of vaccinating children		P-value
		Not likely/definitely not n (%)	Very likely/somewhat likely n (%)	
All participants	2633 (100)	1126 (42.8)	1507 (57.2)	N/A
<i>Children's health</i>				0.507
Healthy	2237 (85)	957 (42.8)	1280 (57.2)	
Disabled	396 (15)	169 (42.7)	227 (57.3)	
<i>Children's age group</i>				<0.001
0–4	1206 (45.8)	649 (53.8)	557 (46.2)	
5–9	870 (33)	344 (39.5)	526 (60.5)	
10–14	354 (13.4)	98 (27.7)	256 (72.3)	
15–<18	203 (7.7)	35 (17.2)	168 (82.8)	
<i>Children's sex</i>				<0.001
Male	1372 (52.1)	537 (39.1)	835 (60.9)	
Female	1261 (47.9)	589 (46.7)	672 (53.3)	
<i>Parents' age group</i>				<0.001
18–25	268 (10.2)	146 (54.5)	122 (45.5)	
26–30	604 (22.9)	329 (54.5)	275 (45.5)	
31–35	653 (24.8)	288 (43.8)	367 (56.2)	
36–40	563 (21.4)	223 (39.6)	340 (60.4)	
41–45	285 (10.8)	86 (30.2)	199 (69.8)	
46–50	162 (6.2)	37 (22.8)	125 (77.2)	
≥51	98 (3.7)	19 (19.4)	79 (80.6)	
<i>Parents' sex</i>				0.237
Female	1390 (52.8)	604 (43.5)	786 (56.5)	
Male	1243 (47.2)	522 (42)	721 (58)	
<i>Marital status</i>				0.438
Married	2527 (96)	1082 (42.8)	1445 (57.2)	
Divorced or widowed	106 (4)	44 (41.5)	62 (58.5)	
<i>Religion</i>				<0.001
Muslim	2358 (89.4)	1069 (45.4)	1285 (54.6)	
Hindu	258 (9.8)	56 (21.7)	202 (78.3)	
Buddhist	6 (0.2)	0 (0)	6 (100)	
Christian	15 (0.6)	1 (6.7)	14 (93.3)	

**Table 1.** *Continued*

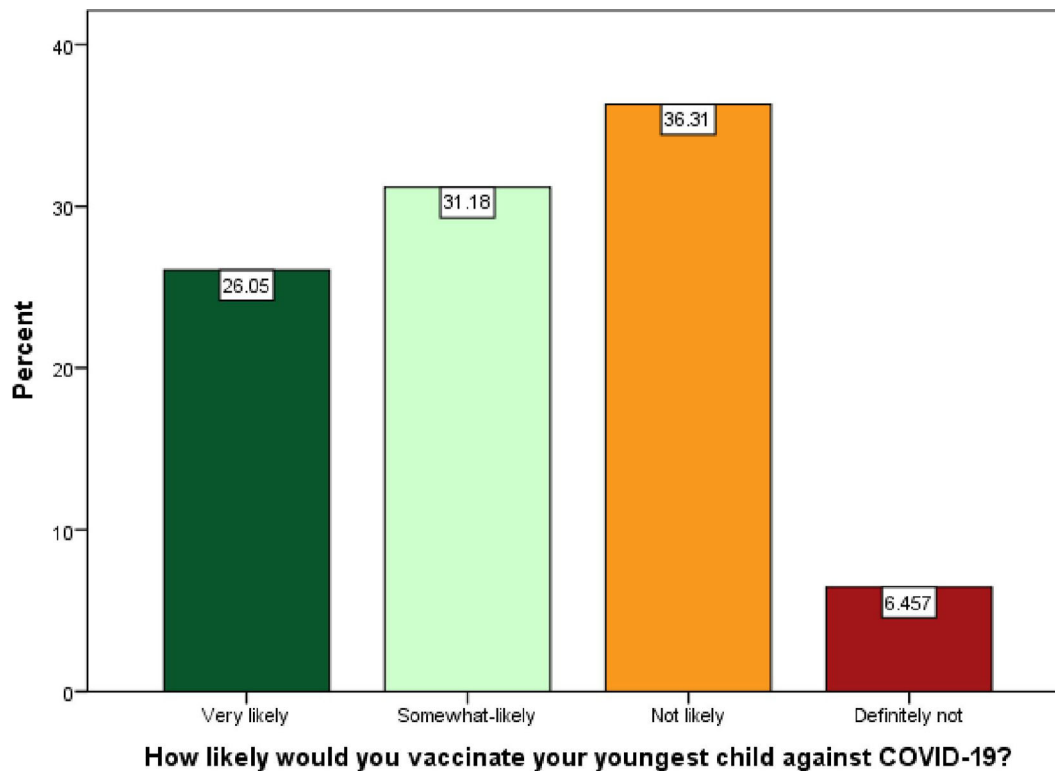
Variables	Total sample n (%)	Likelihood of vaccinating children		P-value
		Not likely/definitely not n (%)	Very likely/somewhat likely n (%)	
<i>Type of family</i>				0.167
Extended family	842 (32)	372 (44.2)	470 (55.8)	
Nuclear family	1791 (68)	754 (42.1)	1037 (57.9)	
<i>Number of children</i>				0.993
One	924 (35.1)	395 (42.7)	529 (57.3)	
Two	1075 (40.8)	461 (42.9)	614 (57.1)	
Three or more	634 (24.1)	270 (42.6)	364 (57.4)	
<i>Educational qualification</i>				<0.001
≤ High school	1022 (38.8)	473 (46.3)	549 (53.7)	
Higher secondary education	594 (22.6)	316 (53.2)	278 (46.8)	
Graduate	608 (23.1)	236 (38.8)	372 (61.2)	
Postgraduate	409 (15.5)	101 (24.7)	308 (75.3)	
<i>Occupation</i>				<0.001
Service	677 (25.7)	248 (36.6)	429 (63.4)	
Business	472 (17.9)	198 (41.9)	274 (58.1)	
Unemployed	179 (6.8)	132 (73.7)	47 (26.3)	
Student	56 (2.1)	34 (30.7)	22 (39.3)	
Home maker	756 (28.7)	364 (48.1)	392 (51.9)	
Healthcare	216 (8.2)	64 (29.6)	152 (70.4)	
Daily labor	277 (10.5)	86 (31)	191 (69)	
<i>Monthly household income (₹)</i>				<0.001
<₹ 15 000	799 (30.3)	401 (50.2)	398 (49.8)	
₹ 15000–30000	833 (31.6)	409 (49.1)	424 (50.9)	
₹ 31000–45000	433 (16.4)	150 (34.6)	283 (65.4)	
>₹ 45000	568 (21.6)	166 (29.2)	402 (70.8)	
<i>Current residence type</i>				0.030
Own	1436 (54.5)	646 (45)	790 (55)	
Rented	1075 (40.8)	427 (39.7)	648 (60.3)	
Others	122 (4.6)	53 (43.4)	69 (56.6)	
<i>Permanent address</i>				<0.001
Village	1528 (58)	687 (45)	814 (55)	
Semi-urban	535 (20.3)	247 (45.2)	288 (53.8)	
City	570 (21.6)	192 (33.7)	378 (66.3)	
<i>Current living location</i>				<0.001
Central zone	1323 (50.2)	542 (41.0)	781 (59.0)	
North zone	921 (35)	472 (51.2)	449 (48.8)	
South zone	389 (14.8)	112 (28.8)	277 (71.2)	
<i>Present tobacco user</i>				<0.001
No	1695 (64.4)	679 (40.1)	1016 (59.9)	
Yes	938 (35.6)	447 (47.7)	491 (52.3)	

**Table 1.** *Continued*

Variables	Total sample n (%)	Likelihood of vaccinating children		P-value
		Not likely/definitely not n (%)	Very likely/somewhat likely n (%)	
<i>Regular religious practice</i>				
No	836 (31.8)	377 (45.1)	459 (54.9)	0.099
Yes	1797 (68.2)	749 (41.7)	1048 (58.3)	
<i>Political affiliation</i>				
Ruling party	779 (30.3)	283 (35.8)	516 (64.6)	<b>&lt;0.001</b>
Opposition	296 (11.2)	175 (59.1)	121 (40.9)	
Neutral	1032 (39.2)	488 (47.3)	544 (52.7)	
Prefer not to say	506 (19.2)	180 (35.6)	326 (64.4)	
<i>Vaccinated/plan to vaccinate children under regular (other than COVID-19) govt. vaccination programs</i>				
No	177 (6.7)	103 (58.2)	74 (41.8)	<b>&lt;0.001</b>
Yes	2456 (93.3)	1023 (41.7)	1433 (58.3)	
<i>Do you think the COVID-19 vaccine will be effective in Bangladeshi children?</i>				
No	167 (6.3)	151 (90.4)	16 (9.6)	<b>&lt;0.001</b>
Yes	1008 (38.3)	54 (5.4)	954 (94.6)	
Skeptical	1458 (55.4)	921 (63.2)	537 (36.8)	
<i>Have you taken or plan to take the COVID-19 vaccine?</i>				
No	722 (27.4)	653 (88)	87 (12)	<b>&lt;0.001</b>
Yes	1911 (72.6)	491 (25.7)	1420 (74.3)	
<i>Have you or your family member(s) tested positive for COVID-19?</i>				
No	1881 (71.4)	947 (50.3)	934 (49.7)	<b>&lt;0.001</b>
Yes	752 (28.6)	179 (23.8)	573 (76.2)	
<i>Have you lost any of your family member(s) to COVID-19?</i>				
No	2482 (94.3)	1105 (44.5)	1377 (55.5)	<b>&lt;0.001</b>
Yes	151 (5.7)	21 (13.9)	130 (86.1)	
<i>Perceived likelihood of children or family members' infection in the next year</i>				
Very likely	345 (13.1)	51 (14.8)	294 (85.2)	<b>&lt;0.001</b>
Somewhat likely	1678 (63.7)	665 (39.6)	1013 (60.4)	
Not likely	451 (17.1)	296 (65.6)	155 (34.4)	
Definitely not	159 (6)	114 (71.7)	45 (28.3)	
<i>Level of concern about children or family members' infection in the next year</i>				
Very concerned	386 (14.7)	72 (18.7)	314 (81.3)	<b>&lt;0.001</b>
Concerned	1020 (38.7)	384 (37.6)	636 (62.4)	
Slightly concerned	673 (25.6)	303 (45)	370 (55)	
Not concerned at all	554 (21)	367 (66.2)	187 (33.8)	

### Results of the descriptive analysis

Overall, 42.8% of parents reported hesitancy toward the COVID-19 vaccine for their youngest child. Closer analysis revealed that 26.05% of parents were very likely, 31.18% were somewhat likely, and 36.31% were not likely to vaccinate their child. While only 6.46% were definitely not vaccinating their child against COVID-19 (Figure 1). The incidence of vaccine hesitancy was significantly high among the parents of 0–4-year-old children (53.8%;  $p < 0.001$ ), parents of girls (46.7%;  $p < 0.001$ ), young parents (54.5%;  $p < 0.001$ ), Muslims (45.4%;  $p < 0.001$ ), parents who received college education (53.2%;  $p < 0.001$ ), unemployed parents (73.7%;  $p < 0.001$ ), parents with a household income of  $< \text{₳}15,000$  (50.2%;  $p < 0.001$ ), those who lived in their own house (45%;  $p = 0.030$ ), came from a village (45%;  $p < 0.001$ ), lived in the north



**Figure 1.** Likelihood of COVID-19 vaccine acceptance/refusal by Bangladeshi parents for children aged <18.

zone (51.2%;  $p < 0.001$ ), tobacco users (47.7%;  $p < 0.001$ ), and parents politically affiliated with opposition parties (59.1%;  $p < 0.001$ ). Similarly, participants who did/will not vaccinate their child with regular vaccines (other than COVID-19) available under government programs (58.2%;  $p < 0.001$ ), those who did not believe in the effectiveness of the COVID-19 vaccine for Bangladeshi children (90%;  $p < 0.001$ ), and those who did not/will not receive the COVID-19 vaccine for themselves (88%;  $p < 0.001$ ) showed high vaccine hesitancy. Parents who were not likely to believe that their children or a family member could be infected with COVID-19 in the next year (71.7%;  $p < 0.001$ ) and those not concerned about their children or a family member getting COVID-19 in the next year (66.2%;  $p < 0.001$ ) showed high levels of vaccine hesitancy (Table 1).

#### Results of the regression analysis

Subgroups with significant higher odds of vaccine hesitancy were found to be parents of children aged 0–4 years (AOR=5.87, 95% CI=2.91–11.85;  $p < 0.001$ ), parents aged 26–30 years (AOR=2.73, 95% CI=1.04–7.16;  $p = 0.035$ ), Muslims (AOR=24.27, 95% CI=2.36–248.74;  $p = 0.007$ ), unemployed parents (AOR=2.94, 95% CI=1.35–6.41;  $p = 0.007$ ), parents with a household income of <₹15 000 (AOR=1.49, 95% CI=0.962–1.84;  $p = 0.009$ ), those from a semi-urban area (AOR=1.61, 95% CI=1.09–2.38;  $p = 0.016$ ), those residing in the north zone (AOR=3.71, 95% CI=2.37–5.82;  $p < 0.001$ ), those who did not vaccinate or will not vaccinate their child with regular vaccines (other than COVID-19) available under government programs (AOR=1.93, 95% CI=1.19–3.14;  $p = 0.007$ ), those who did not believe in the effectiveness of the COVID-19 vaccine for Bangladeshi children (AOR=5.80, 95% CI=3.12–10.78;  $p < 0.001$ ), and those who did/will not receive the COVID-19 vaccine for themselves (AOR=10.15, 95% CI=7.16–14.39;  $p < 0.001$ ).

Contrarily, participants who were non-tobacco users (AOR=0.71, 95% CI=0.53–0.96;  $p = 0.025$ ), who appeared to be very likely to believe that their children or a family member could be infected with COVID-19 in the next year (AOR=0.21, 95% CI=0.97–0.44;  $p < 0.001$ ), and who were very concerned about their children or a family member contracting COVID-19 in the next year (AOR=0.34, 95% CI=0.21–0.58;  $p < 0.001$ ) had significantly lower odds of COVID-19 vaccine hesitancy (Table 2).

#### Discussion

This nationally representative comprehensive study found a significantly high prevalence of COVID-19 vaccine hesitancy among parents in Bangladesh for their children. The prevalence of parental vaccine hesitancy was much higher than the prevalence previously found in adults (42.8 vs 32.5), which supported our hypothesis. There were



**Table 2. Binary logistic regression: predictors of parental vaccine hesitancy in study participants.**

Variables	Adjusted OR	Standard error	95% CI		P-value
<i>Children's age group (year)</i>					
0–4	5.876	0.358	2.914	11.850	<b>&lt;0.001</b>
5–10	2.845	0.348	1.438	5.631	<b>0.003</b>
11–14	1.101	0.359	0.545	2.225	0.789
15–<18	References				
<i>Children's sex</i>					
Male	0.918	0.127	0.716	1.176	0.498
Female	Reference				
<i>Parents' age group</i>					
18–25	1.513	0.522	0.544	4.205	0.427
26–30	2.732	0.492	1.042	7.165	<b>0.041</b>
31–35	2.755	0.481	1.073	7.075	<b>0.035</b>
36–40	2.737	0.476	1.077	6.958	<b>0.034</b>
41–45	2.524	0.487	0.972	6.552	0.057
46–50	1.101	0.522	0.396	3.064	0.853
≥51	Reference				
<i>Religion</i>					
Muslim	24.277	1.187	2.369	248.740	<b>0.007</b>
Hindu	18.704	1.206	1.758	198.977	<b>0.015</b>
Others	Reference				
<i>Educational qualification</i>					
≤High school	1.002	0.279	0.579	1.731	0.995
Higher secondary education	1.292	0.246	0.798	2.093	0.297
Graduate	1.007	0.223	0.651	1.560	0.974
Postgraduate	Reference				
<i>Occupation</i>					
Service	2.327	0.303	1.285	4.213	<b>0.005</b>
Business	1.463	0.310	0.797	2.686	0.219
Unemployed	2.943	0.398	1.350	6.415	<b>0.007</b>
Student	4.389	0.480	1.714	11.242	<b>0.002</b>
Home maker	2.105	0.281	1.214	3.650	<b>0.008</b>
Healthcare	2.775	0.370	1.344	5.728	<b>0.006</b>
Daily labor	Reference				
<i>Monthly household income (₹)</i>					
<₹ 15 000	1.499	0.266	0.962	1.840	<b>0.009</b>
₹ 15000–30000	0.826	0.210	0.547	1.248	0.364
₹ 31000–45000	0.559	0.216	0.366	0.854	<b>0.007</b>
>₹ 45000	Reference				
<i>Current residence type</i>					
Own	1.202	0.310	0.655	2.205	0.552
Rented	0.984	0.311	0.535	1.810	0.959
Others	Reference				

**Table 2.** *Continued*

<b>Variables</b>	<b>Adjusted OR</b>	<b>Standard error</b>	<b>95% CI</b>		<b>P-value</b>
<i>Permanent address</i>					
Village	1.259	0.177	0.891	1.780	0.192
Semi-urban	1.614	0.198	1.095	2.381	<b>0.016</b>
City	Reference				
<i>Current living location</i>					
Central zone including Dhaka	3.112	0.213	2.049	4.727	<b>&lt;0.001</b>
North zone	3.716	0.230	2.370	5.827	<b>&lt;0.001</b>
South zone	Reference				
<i>Present tobacco user</i>					
No	0.716	0.149	0.535	0.959	<b>0.025</b>
Yes	Reference				
<i>Political affiliation</i>					
Ruling party	1.001	0.188	0.692	1.448	0.997
Opposition	1.310	0.261	0.785	2.188	0.301
Neutral	0.971	0.176	0.687	1.371	0.865
I prefer not to say	Reference				
<i>Vaccinated/plan to vaccinate children under regular (other than COVID-19) govt. vaccination programs</i>					
No	1.937	0.247	1.193	3.144	<b>0.007</b>
Yes	Reference				
<i>Do you think the COVID-19 vaccine will be effective for Bangladeshi children</i>					
No	5.805	0.316	3.124	10.786	<b>&lt;0.001</b>
Yes	0.052	0.171	0.037	0.073	<b>&lt;0.001</b>
Skeptical	Reference				
<i>Have you taken or plan to take the COVID-19 vaccine</i>					
No	10.152	0.178	7.161	14.392	<b>&lt;0.001</b>
Yes	Reference				
<i>Have you or your family member(s) tested positive for COVID-19</i>					
No	1.320	0.164	0.956	1.822	0.091
Yes	Reference				
<i>Have you lost any of your family member(s) to COVID-19</i>					
No	2.502	0.337	1.293	4.839	<b>0.006</b>
Yes	Reference				
<i>Perceived likelihood of children or family members' infection in the next year</i>					
Very likely	0.206	0.383	0.097	0.437	<b>&lt;0.001</b>
Somewhat likely	0.413	0.330	0.216	0.788	<b>0.007</b>
Not likely	0.687	0.329	0.360	1.309	0.253
Definitely not	Reference				
<i>Level of concern about children or family members' infection in the next year</i>					
Very concerned	0.345	0.267	0.205	0.583	<b>&lt;0.001</b>
Concerned	0.502	0.207	0.334	0.754	<b>0.001</b>
Slightly concerned	0.593	0.202	0.399	0.881	<b>0.010</b>
Not concerned at all	Reference				

substantial differences in COVID-19 vaccine hesitancy according to sociodemographic factors and perceived COVID-19 threat among parents. The logistic regression model revealed that the children's age and parents' age, religion, occupation, monthly household income, permanent address, current living location, tobacco use, adherence to the regular government pediatric vaccination programs (other than COVID-19), perception about COVID-19 vaccine effectiveness for children in Bangladesh, self-vaccine hesitancy, loss of a family member due to COVID-19, and perceived COVID-19 threat could all be used independently to predict parental vaccine hesitancy for children aged <18 years.

To the best of our knowledge, this is the first study to examine parental COVID-19 vaccine hesitancy in Bangladesh. Furthermore, very limited data are available for parental vaccine hesitancy in Indian subcontinental countries. Thus, there is limited information about the previous hesitancy rate in this region. However, the rate observed in this study (42.8%) is similar to that found in the USA (42%)<sup>21</sup> and slightly lower than that found in China (52%).<sup>9</sup> Contrarily, the observed rate was significantly higher than that in Brazil, Malaysia, and Saudi Arabia.<sup>8,22,23</sup> The high parental vaccine hesitancy rate in Bangladesh poses a threat to the global public health goal of vaccinating an optimal percentage of the subcontinental population and achieving herd immunity; this is a concern not only in Bangladesh but also in other countries in the Indian subcontinent.

Health behavior theory is centrally influenced by disease risk perception. Herein, a strong association was found between perceived COVID-19 threat and parental vaccine hesitancy. Parents who thought their children or family members were not likely to be at risk of contracting COVID-19 were highly hesitant toward vaccinating their children. Similarly, parents who were not concerned about children or family members' infections were hesitant. Furthermore, vaccine hesitancy was significantly higher among those who did not believe or remained skeptical about COVID-19 vaccine efficacy among Bangladeshi children than among those who did. These findings were consistent with the results of previous studies that measured COVID-19 vaccine hesitancy among the adult population.<sup>10,24,25</sup> Ignorance, belief in conspiracy theories, and even denial of the existence of COVID-19 may influence one's perceptions of self-vaccination or vaccinating a child.<sup>26</sup> Therefore, further studies are warranted to improve understanding the in-depth association between COVID-19 threat and vaccine hesitancy among different population groups.

Parents who reported unemployment, an education level lower than or equal to high school, a household income of <₳ 15 000-₳ 30 000, along with those from the village or semi-urban area were significantly more vaccine-hesitant. Similarly, a previous study found high vaccine hesitancy among parents who were unemployed, had a low education level, and those belonging to lower-income in several high- and middle-income countries.<sup>3,8,22,27</sup> Furthermore, our previous study on the adult Bangladeshi population found a similar trend.<sup>10</sup> Global research and studies conducted in the USA and Saudi Arabia among the general population reported identical results.<sup>28-30</sup>

A previous study found a higher prevalence of vaccine hesitancy among younger parents and parents of children aged between 0 and 4 years,<sup>21</sup> and our analysis yielded similar results. However, unlike a previous study in Malaysia (a multi-ethnic country),<sup>23</sup> in Bangladesh, we found high vaccine hesitancy among Muslim parents than among non-Muslim parents in Bangladesh. Hence, more studies are warranted to understand the influence of religion on the decisions regarding vaccine acceptance and rejection.

Our study found a significantly high prevalence of parental vaccine hesitancy among tobacco users. A previous study also found a similar result, citing the association between unhealthy life practices and vaccine hesitancy among tobacco users.<sup>10</sup> Interestingly, vaccine hesitancy among parents living in the north zone of Bangladesh has also been shown to be high. This is likely because the north zone of Bangladesh is a tobacco-producing area with a high poverty level. Therefore, this information may explain the high prevalence of vaccine hesitancy among parents who are tobacco users and reside in the north zone of Bangladesh.

Additionally, this study found a strong association between self-vaccination intention and vaccination decision for children. The incidence of parental vaccine hesitancy was 10 times higher among parents who did not receive or will not receive the COVID-19 vaccine for themselves than among those who did and will receive the COVID-19 vaccine. Furthermore, parents who did not get their children vaccinated with regular vaccines other than COVID-19 were also highly hesitant toward the COVID-19 vaccine for their children, indicating stubborn vaccine hesitancy among groups of people. Therefore, special advocacy targeting these groups is recommended when including them in the vaccination program to eradicate vaccine-preventable diseases. Conversely, we found high vaccination willingness among parents who reported that their family member(s) had either tested positive for or died of COVID-19. The harmful effect of COVID-19 may encourage patients to make a favorable decision about vaccinating their children when the vaccine becomes available.

## Strengths and limitations

This is the first study to reveal the rate of parental vaccine hesitancy for children in Bangladesh. This study included parental data from all eight divisions of Bangladesh by randomly selected data collection sites; of the participating parents, 52% were women, 10% Hindu parents, and 1% Buddhist and Christian, providing a good representation of the population. Additionally, we conducted anonymous face-to-face interviews to reduce social desirability bias, minimize non-response, and maximize the quality of collected data. Data from parents of children with disabilities have also increased the generalizability of our findings.

Nevertheless, this study has several limitations. Previous studies have found that vaccine hesitancy is complicated; time and location vary, and adherence-specific matter depends on the perceived behavioral nature of the community.<sup>31–33</sup> We conducted this study when the COVID-19 detection rate in the community was significantly lower than the average rate in the country, which may have influenced the perceived threat of the disease and the vaccine hesitancy rate. This study did not measure social and traditional media influences, which may have confounded the results.<sup>34</sup> Lastly, our questionnaire did not include questions specific to attitudes, beliefs, or mistrust about the vaccine.

## Conclusions

Our study identified several subgroups of parents who show significantly COVID-19 vaccine hesitancy for their children. To ensure the optimum coverage of vaccines, the government, public health officials, and advocates should be prepared to address parental vaccine hesitancy to reach their target and establish programs to improve childhood COVID-19 vaccine literacy among parents. The rates of willingness are subject to change with the suitability of vaccines; however, the ambivalent effects of vaccines may further reduce those rates. Special strategies should be taken targeting the subgroups of parents with higher vaccine hesitancy in this study. Furthermore, availability of safety and efficacy data for COVID-19 vaccines for children in social and traditional media, community and healthcare centers, and mosques/temples would likely positively impact community members' attitudes toward childhood COVID-19 vaccination and, thus, may increase vaccination rates in general. Engaging community and religious leaders, family physicians, and trustworthy relatives should accelerate advocacy programs to reduce parental vaccine hesitancy for their children in the community.

## Data availability

### Underlying data

Open Science Framework: Parental coronavirus disease vaccine hesitancy for children in Bangladesh: a cross-sectional study. <https://doi.org/10.17605/OSF.IO/43G5M><sup>35</sup>

The project contains the following underlying data:

- Parental Vac Hesitancy F1000.sav (raw data from questionnaires)

### Extended data

Open Science Framework: Parental coronavirus disease vaccine hesitancy for children in Bangladesh: a cross-sectional study. <https://doi.org/10.17605/OSF.IO/43G5M><sup>35</sup>

The project contains the following extended data:

- Parental Vac Questionnaire.docx

### Reporting guidelines

Open Science Framework: Parental coronavirus disease vaccine hesitancy for children in Bangladesh: a cross-sectional study. <https://doi.org/10.17605/OSF.IO/43G5M><sup>35</sup>

This project contains the following reporting guidelines checklist:

- STROBE\_checklist\_Par\_Vac\_Hesi.docx

Data are available under the terms of the [Creative Commons Attribution 4.0 International license](https://creativecommons.org/licenses/by/4.0/) (CC-BY 4.0).

## Acknowledgements

The authors would like to thank the participants for providing the information used to conduct the study. Also, the authors would like to thank Zarin Tasnim and Umme Salma Khan for assisting with data collection.

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# Open Peer Review

Current Peer Review Status:   

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## Version 2

Reviewer Report 16 March 2022

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**F. M. Moinuddin**

Mayo Clinic Neuro-Informatics Laboratory, Mayo Clinic, Rochester, MN, USA

Revised version is satisfactory.

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Methodology and structure

**I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.**

Reviewer Report 14 March 2022

<https://doi.org/10.5256/f1000research.121888.r125946>

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**Shakil Ahmed** 

Maternal and Child Health Division, ICDDR, Dhaka, Bangladesh

**Further comments:**

**Methods:**

*Study design and participants:*

1. Do not use the "Approximately" term in the Methodology section. Please use the exact number of the parents.

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Sexual and reproductive health, Maternal health, Child health, Non-communicable diseases, Pandemics, COVID-19, Gender research

**I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.**

Reviewer Report 03 March 2022

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**Dr. Manzur Kader** 

Post doctoral researcher, Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden

No more comments.

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Public health, Global Health, Epidemiology,

**I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.**

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**Version 1**

Reviewer Report 11 February 2022

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**Dr. Manzur Kader** 

Post doctoral researcher, Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden

**Abstract**

- In methods, the Authors say “Predictors were identified using binary logistic regression analysis. Rephrase it like “Factors associated with vaccine hesitancy were identified using binary logistic regression analysis”. Because identifying predictors require a stronger study design than the cross-sectional study.
- Replace the word “face-to-face interviews” with an interview-administered questionnaire. Because “face-to-face interviews” is commonly used in a qualitative study
- Write the name of the questionnaire used to assess vaccine hesitancy

## Results

Results should be more specific:

- children's age (specify the age?), parent's age (specify the age?, religion (specify?), occupation (specify what occupation?), monthly household income (what level?), permanent address, living location (zone? Specify)
- Write “associated factors with parental vaccine hesitancy”, instead of “the independent predictors of parental vaccine hesitancy

## Introduction

- Authors provide some data of prevalence of vaccine hesitancy, for example, the USA, and China (high-resourced countries).” Provide some similar examples from low-resourced countries if available as the study setting.
- Provide a clear justification of vaccine hesitancy, why this might happen? In relation to fear, safety, the effectiveness of vaccines? It’s not clear the setting of reference 13, specify it.
- Authors say, “along with sociodemographic variabilities and religious beliefs....” Specify the sociodemographic variabilities.

## Methods

- “completeness, accuracy, and internal consistency and secured them ....” Did you use any statistical test to assess such internal validity or reliability of the questionnaire? For example, to assess internal consistency requires Cronbach's alpha. Or did you asses it just by visual perception? specify.
- Was the vaccine hesitancy questionnaire validated in a similar population like in Bangladesh? write some more about the questionnaire.

## Results

- Write higher secondary, instead of “College education”. Write BDT instead of “<math>\\$</math>”

## Discussion

- Write a statement if the results agree with the hypothesis?

## Is the work clearly and accurately presented and does it cite the current literature?

Yes



**Is the study design appropriate and is the work technically sound?**

Yes

**Are sufficient details of methods and analysis provided to allow replication by others?**

Yes

**If applicable, is the statistical analysis and its interpretation appropriate?**

Yes

**Are all the source data underlying the results available to ensure full reproducibility?**

Yes

**Are the conclusions drawn adequately supported by the results?**

Yes

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Public health, Global Health, Epidemiology,

**I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.**

Author Response 27 Feb 2022

**Mohammad Ali**, Uttara Adhunik Medical College, Dhaka, Bangladesh

Dear reviewer, thank you very much for your precise suggestions. We have revised our manuscript in light of your directions.

**Abstract:**

Method

1. We relaced the word predictor by associated factors.
2. Most of the studies used a web-based data collection method in the pandemic time. However, we use the in-person interviews (face-to-face) method to get high-quality data.
3. The question was named as vaccine hesitancy questionnaire.

Result

1. & 2. We rewrote the result section.

**Main text:**

Introduction:

1. Data regarding parental vaccine hesitancy in low and middle-income countries were scarce; thus, we could not add more references.
2. We amended the sentence.
3. Example added.

Method:

1. We can not extract Cronbach's alfa value for a questionnaire consisting of only one.

2. This questionnaire was used for a vaccine hesitancy study among adults in Bangladesh (Ali & Hossain, 2021).

Result:

1. The symbol is well accepted and used by the British Medical Journal.

Discussion:

1. The statement has been added in the discussion section.

References:

Ali, M., & Hossain, A. (2021). What is the extent of COVID-19 vaccine hesitancy in Bangladesh? A cross-sectional rapid national survey. *BMJ Open*, 11(8), e050303. <https://doi.org/10.1136/bmjopen-2021-050303>

**Competing Interests:** None

Reviewer Report 09 February 2022

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**F. M. Moinuddin**

Mayo Clinic Neuro-Informatics Laboratory, Mayo Clinic, Rochester, MN, USA

The paper presented intends to show the prevalence of parental vaccine hesitancy in Bangladesh. They found that vaccine hesitation varied based on sociodemographic characteristics, religion, behavior, and perceived COVID-19 threat. The paper may be useful for the policymaker to identify the obstacle in the mass vaccination program. The paper is well written and well-planned. The methodology is acceptable. However, the following comments are recommended:

1. The authors should change  $p=0.000$  to  $<0.001$  for better understanding in Table 1.
2. Please add a zero before a decimal point in Table 1.
3. The COVID vaccine is recommended for students aged between 12 and 17 years in Bangladesh. However, the study participant who had children below 12 years is more than 78% of the total participants. The author should mention the justification for including this group in their discussion.

**Is the work clearly and accurately presented and does it cite the current literature?**

Yes

**Is the study design appropriate and is the work technically sound?**

Yes

**Are sufficient details of methods and analysis provided to allow replication by others?**

Yes

**If applicable, is the statistical analysis and its interpretation appropriate?**

Yes

**Are all the source data underlying the results available to ensure full reproducibility?**

Yes

**Are the conclusions drawn adequately supported by the results?**

Yes

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Methodology and structure

**I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.**

Author Response 27 Feb 2022

**Mohammad Ali**, Uttara Adhunik Medical College, Dhaka, Bangladesh

Dear reviewer, thank you very much for your review and insight. We have revised our paper according to your suggestions.

1. We replaced 0.000 by <0.001.
2. In table 1, zero has been added before the decimal point.
3. You are right; we get most data for children under 12. However, the vaccine is being approved for all the pediatric population (0-<18 years). This study will be useful when the COVID-19 vaccine is approved for children under 12 years.

**Competing Interests:** None

Reviewer Report 08 February 2022

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**Shakil Ahmed** 

Maternal and Child Health Division, ICDDR, Dhaka, Bangladesh

**Abstract:**

- The abstract requires a more precise statement in each section, i.e., Background, Methods, Results, and Conclusion.
- The Methods are not clear. As the first line of the “Methods” indicates, the parents of children <18 years were interviewed between October 10 – October 31, 2021. However, the following line points out that the parents aged  $\geq 18$  years underwent face-to-face interviews. At first glance, it is not easy to understand the study population of this study.
- The key independent predictors of parental vaccine hesitancy should contain more numbers, i.e., odds ratio (OR) and 95% CI’s upper and lower values. Otherwise, it will not be easy for the readers to grasp the primary findings of this study just by reading the abstract.

**Introduction:**

- It would be more standard if the author would use the word “more than/greater than/similar terms” instead of using the sign “>” in the introduction.
- There are some grammatical errors in the introduction section (especially in the articles). Please correct.
- It’s not clear why vaccine hesitancy research is essential for Bangladesh. A clear justification is required with proper reference and evidence.
- Why are the parents aged  $\geq 18$  years important? Is there any evidence?

**Methods:**

**Study design and participants:**

- Please clarify what do you mean by Parents aged  $\geq 18$  years? Whether it is the father, aged  $\geq 18$  years or the mother  $\geq 18$  years or both? What did you do if one of the parents was aged <18 years?
- More clear inclusion and exclusion criteria should be mentioned in the manuscript.
- What language did you use in the vaccine hesitance questionnaire to collect the data?
- It would be great for the general readers if the authors could add the sample size formula in the manuscript
- Did the authors validate the vaccine hesitancy questionnaire for the Bangladeshi population as they mentioned they were using a previously employed vaccine hesitancy questionnaire? Is there any cultural validation evidence?

**Study questionnaire:**

- It would be great if the authors could attach the vaccine hesitancy questionnaire as

supplementary documents for the ease of the readers both English and Bengali (if any), which they have used to collect data

- The authors did not add any funding information. Please add.

### **Sampling technique and data collection:**

How did the authors choose the marketplaces, shopping malls, waiting rooms of large hospitals, diagnostic centres, bus and rail stations randomly? Did they acquire any list? If yes, then from where did you acquire the list? Please provide evidence (if there's any)

### **Statistical analysis:**

- How do you dichotomize the four responses to vaccine hesitancy? Is there any evidence or previous research which have done the same? Please provide the proper evidence.
- Age, Number of children, Educational qualification, and monthly household income are ordinal variables. What analysis did you perform for these variables to compare with the vaccine hesitancy?
- Why did you consider all the variables in the logistic regression model? Please explain.

### **Results:**

- As you have collected data from the eight divisions of Bangladesh, it would be logical if the author could show the difference in divisional vaccine hesitancy of Bangladesh. Then it would be easier for the policymaker to emphasize the efforts where it is more required

Parents and children characteristics (Table 1):

- Please use the term "lost a family member" instead of using "lost a loved one."
- Please do not refer the readers as – "Details of the responses to the questions regarding the likelihood of children or family members' infection by COVID-19 and the level of concern about children or family members' disease in the next year are shown". The author should describe the findings.

Results of descriptive analysis (Table 1):

- The author should not use the content of the outcome variable as the independent variables and use it in the analysis, such as – "Perceived likelihood of children or family members' infection in the next year", "Level of concern about children or family members' infection in the next year". Please correct.
- For a better understanding, please mention the meaning of the sign "₳" as "Bangladeshi Taka/BDT/Taka/similar term" in the footnote of the table or the manuscript.

Results of regression analysis (Table 2):

- Please mention the comparison group in the table-2's header. Otherwise, it is hard to interpret for the readers.
- The author should not use the content of the outcome variable as the independent variables and use it in the analysis, such as – "Perceived likelihood of children or family members' infection in the next year", "Level of concern about children or family members' infection in the next year". Please correct.

- The religion variable's result might be overestimated. The author considered the lowest number of population group "Other", as the reference group. This variable should be categorized into "Muslim and Non-muslim".

### Strengths and Limitations

- What did the author mean by 1%, non-muslim parents? Here, the groups should be mentioned as written in Table 1.

### Conclusions

- What are the recommendations for the policymakers, and how do the policymakers should address the recommendations are not clear. Please elaborate.

### Is the work clearly and accurately presented and does it cite the current literature?

Yes

### Is the study design appropriate and is the work technically sound?

Yes

### Are sufficient details of methods and analysis provided to allow replication by others?

Partly

### If applicable, is the statistical analysis and its interpretation appropriate?

Yes

### Are all the source data underlying the results available to ensure full reproducibility?

Yes

### Are the conclusions drawn adequately supported by the results?

Partly

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Sexual and reproductive health, Maternal health, Child health, Non-communicable diseases, Pandemics, COVID-19, Gender research

**I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.**

Author Response 27 Feb 2022

**Mohammad Ali**, Uttara Adhunik Medical College, Dhaka, Bangladesh

Dear reviewer, thank you very much for your time and insight. We have amended our manuscript based on your directions. Please find the point-by-point solution to the problems.

**Abstract:**

1. We have amended the abstract according to your suggestion.
2. The correction has been made in the method section. We replaced < by below where appropriate.
3. The result section has been rewritten. However, we can not add AOR and CI due to word restrictions of the abstract.

**Main text:**

## Introduction:

1. We replaced symbols with words where applicable.
2. Please be assured that this manuscript is grammatical-error-free; however, we rechecked and made amendments where needed.
3. We amended the justification of the study.
4. The age of marriage in Bangladesh is 18 years and above, thus, we have taken data only from adult parents.

## Methods:

## Study design

1. We exclude parents <18 years. We clarified inclusion and exclusion criteria.
2. We use the Bangla language, clearly mentioned in the method section.
3. The sample size formula has been described clearly; please find the formula with appropriate references.
4. This is a questionnaire consisting of one question. British Medical Journal has published data using this questionnaire in Bangladesh (Ali & Hossain, 2021).

## Questionnaire

1. Please find the questionnaire in the supplementary section.
2. Funding information has been added; find the information at the upper end of the article.

## Sampling technique

1. We clearly described that the list had been collected from the division's website.

## Statistical analysis

1. Yes, we followed previously published studies when categorising the vaccine intention (Ali & Hossain, 2021; Khubchandani et al., 2021).
2. We used descriptive analysis for categorical variables.
3. The final model has included significant variables found in the descriptive analysis. Find the information in the statistical analysis section.

## Results

1. Our aim was not to compare the hesitancy considering division; rather, we compared the zones of Bangladesh. Future studies should compare the prevalence of COVID-19 vaccine hesitancy according to the divisions.
2. We replaced the loved one with a family member. Thanks for the suggestion.
3. To reduce the words, we refer a few to the table.
4. We use perceived threat as the independent variable, which is one of our core findings. This variable has been used in previous studies as an independent variable.
5. Symbol of Bangladeshi taka is well accepted any used previously by British Medical Journal. We kept the symbol.

6. Mentioned.
7. We used the variable as it is at the core of vaccine hesitancy. We discussed the implications in the discussion section.
8. We have shown the diversity of religions in the study that clearly reflects the general Bangladeshi population. However, when we take this variable in regression, we combined Christian and Buddhists (total 21 samples).
9. We corrected the error. Thank you for your meticulous observation.

#### Conclusion

1. We rewrote the conclusion section.

Finally, we would like to thank you again for your time and dedication when reviewing the paper. Your suggestion made the paper improve than before.

#### References:

- Ali, M., & Hossain, A. (2021). What is the extent of COVID-19 vaccine hesitancy in Bangladesh? A cross-sectional rapid national survey. *BMJ Open*, 11(8), e050303. <https://doi.org/10.1136/bmjopen-2021-050303>
- Khubchandani, J., Sharma, S., Price, J. H., Wiblishauser, M. J., Sharma, M., & Webb, F. J. (2021). COVID-19 Vaccination Hesitancy in the United States: A Rapid National Assessment. *Journal of Community Health*, 1–8. <https://doi.org/10.1007/s10900-020-00958-x>

**Competing Interests:** None

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