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COVID-19 vaccination intent and willingness to pay in Bangladesh: a cross-sectional study

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Abstract

Aim: This article reports the intent to receive a COVID-19 vaccine, its predictors and willingness to pay in Bangladesh.

Subject and Methods: We did a cross-sectional survey of 697 adults in January 2021. A structured questionnaire was used to assess vaccination intent. Questionnaire included potential socio-demographic variables and health belief model constructs which may predict vaccination intent.

Results: Among the participants, 25.5% demonstrated a definite intent, 43% probable intent, 24% probable negative, and 7.5% a definite negative intention. Multivariable logistic regression analyses suggest association between definite intent and previous COVID-19 infection (OR: 2.86; 95% CI: 1.71 – 4.78), perceiving COVID-19 as serious (OR: 1.93; 1.04 – 3.59), the belief that vaccination would make them feel less worried about COVID-19 (OR: 4.42; 2.25 – 8.68), and concerns about vaccine affordability (OR: 1.51; 1.01 – 2.25). Individuals afraid of the side effects (OR: 0.34; 0.21 – 0.53) and would take the vaccine if the vaccine were taken by many in public (OR: 0.44; 0.29 – 0.67) are less likely to have a definite intent. A definite negative intent is associated with the concern that the vaccine may not be halal (OR: 2.03; 1.04 – 3.96). 68.4% are willing to pay for vaccine. The median amount they are willing to pay is $7.08.

Conclusion: Adequate monitoring to stop the spreading of misinformation, and further research work to understand challenges in making a new vaccine acceptable by the population are needed.

Introduction

The coronavirus disease 2019 (COVID-19) is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-Cov-2) (Adhikari et al. 2020). The disease was first reported in Wuhan, China in December 2019(Pillai et al. 2020; Zhu et al. 2020). The disease then spread widely across the globe, causing severe humanitarian and economic burden, in addition to the burden on healthcare services. As of 12th February 2021, more than 107.4 million COVID-19 cases, and 2.4 million COVID-19 attributable deaths were reported globally (WHO 2021a). In Bangladesh, 539, 571 COVID-19 tested positive cases and 8248 COVID-19 caused deaths were reported (WHO 2021a). However, the actual number of cases and COVID-19 related deaths might be much higher in Bangladesh because of the inadequate testing and poor surveillance system (Cousins 2020).

Although many drugs are being tested, there is no approved treatment for COVID-19 infection (McArthur et al. 2020). The lack of effective treatment, the severe burden of COVID-19 infection, and its fast spread necessitate the need for rapid vaccine development, leading to unprecedented scale and speed for developing an efficacious and safe vaccine. This process hit a record by entering human clinical trial testing in March 2020 (Thanh Le et al. 2020) and by April 2020, more than 100 vaccine candidates were being developed across different countries using various methods; five of which was in the clinical evaluation stage and 73 at exploratory or pre-clinical stage (Thanh Le et al. 2020; WHO 2020). As of 12 November 2020, the number of candidate vaccines in preclinical evaluation grew to 164. Among the 48

vaccines which were in clinical evaluation stage, four vaccines so far cleared for phase three trails: Pfizer/BioNTech's BNT162b2, Moderna's mRNA-1273, University of Oxford & AstraZeneca's AZD1222, and Gamaleya's Sputnik V vaccine (Mishra and Tripathi 2021). Among these, Pfizer/BioNTech's vaccine and two versions of the AstraZeneca/Oxford COVID-19 vaccine produced by AstraZeneca-SKBio (Republic of Korea) and the Serum Institute of India are listed by WHO for emergency use (WHO 2021b).

Vaccine hesitancy is one of the ten threats to global health. As reported by WHO (2019), reasons behind refusal or unwillingness can be due to inconvenience in accessing vaccines, complacency, or lack of trust (WHO 2019). Yet, there is a variety of unclassifiable factors associated with vaccine hesitancy with different unmeasurable influence power, determining vaccine hesitancy a complex matter that varies depending on the context, time, place, and vaccine (Larson et al. 2014). Vaccine hesitancy affects population coverage and thus affect the containment of the targeted diseases. A significant portion of the population might prefer a COVID-19 vaccine over other measures like social distancing or other lockdown measures. A study in the USA (Bartsch et al. 2020) reported the need for at least 60% COVID-19 vaccine efficacy when 100% of the population is covered by the vaccine. The efficacy rate increases to 80% with the dropping of the population coverage to 75%. However, for only 60% population coverage the vaccine must be 100% efficacious for the epidemic to be extinguished. Inadequate coverage will only reduce the peak of epidemic even with a vaccine with 100% efficacy. Another study, in the USA (Iboi et al. 2020), shows that with 80% vaccine efficacy and 10% mask usage, COVID-19 may be eliminated from the USA with at least 90% population coverage. The population coverage percent can be decreased to 82% if mask compliance increases to 50% of the population.

There are differences in the acceptance rate of COVID-19 vaccination across a sample population of 19 different countries; from less than 55% in Russia to 90% in China (Lazarus et al. 2020). In a global overview of 20 studies, vaccine hesitancy for the not yet available vaccine differed from very low in China to very high (more than 40%) in Czechia Turkey (Feleszko et al. 2020). Positive attitude toward COVID-19 vaccine was associated with the high level of education, income, medium and increased number of cases and fatality-rates, and trust in the government (Lazarus et al. 2020).

In the first half of 2020, the intent to receive COVID-19 vaccine, if it became available, was different in different countries. For example, 64.7% in Saudi Arabia (Al-Mohaithef and Padhi 2020), >72% in China (Fu et al. 2020), and only 20% of USA surveyed participants expressed unwillingness to take the vaccine (Thunstrom et al. 2020). In England, the majority expressed the wiliness to accept a COVID-19 vaccine for themselves– 55.8% said definitely; 34% were unsure but leaning towards yes (Bell et al. 2020). However, the mentioned studies data on intent to receive hypothetical vaccine were mainly collected on the first half of 2020, which raise the question if individuals who expressed their willingness to take the vaccine are still willing to take it after it is made available to the public, and after much time had passed. According to a study conducted in the USA among more than 7000 individuals, willingness to receive COVID-19 vaccine declined from 71% in April to 53.6% in October 2020. In contrast, the percentage of unwillingness to take the vaccine increased from 18% to 32%. Most of the unwilling to be vaccinated

people feared the side effects and long-lasting health complications in addition to being uncertain of the vaccine effectiveness (Daly and Robinson 2020).

With inept and inadequate health care systems, Bangladesh has been attempting to contain the impact of the COVID-19 pandemic since March 2020 (Siam et al. 2021). Bangladesh severely lacked the preparedness to tackle the spread of the COVID-19 (Biswas et al. 2020), and the country's COVID-19 testing system has also been criticized at a global level (Cousins 2020). However, Bangladesh has experience of running successful immunization programme for children. The success of any vaccination programme depends on widespread public education campaigns regarding vaccine safety and efficacy. It is time to see whether the country is ready to accept new COVID-19 vaccines. The Bangladesh government launched the COVID-19 vaccination program on 27 January 2021 and announced that interested individuals could register their interest to get vaccinated through a designated website. This process is not convenient for the elderly and rural population groups (Ahamad et al. 2021). A recent global survey in vaccine confidence and barriers to vaccine uptake revealed that highest estimated percentage of respondents from Bangladesh strongly agreed that vaccines are necessary and safe to use to control an infectious disease (de Figueiredo et al. 2020). However, the lower official mortality rate due to COVID-19 infection and the lower official rate of infection among the population may also work against vaccine uptake (Ahamad et al. 2021).

To reach the maximum possible population coverage, it is crucial to study the current level of acceptance of COVID-19 vaccine and assess the influencing factors to assist government and public health officials in addressing vaccine hesitancy and come up with proper education materials to build vaccine literacy on encouraging the public to receive safe and efficient immunization. In this context, this article reports the intent to receive the COVID-19 vaccine offered by the Government of Bangladesh, the socio-demographic predictors of the intent, and the Health Belief Model (HBM) constructs that can predict the intent to receive the COVID-19 vaccine in Bangladesh. In addition, this article reports the wiliness to pay for a COVID-19 vaccines and vaccine preferences among the people in Bangladesh.

Materials And Methods

We conducted an online cross-sectional survey in January 2021 in Bangladesh. To disseminate our online questionnaire, we used all commonly used social media platforms in Bangladesh. We used various social media groups and email network to disseminate the questionnaire. Every individual completing our questionnaire was requested to forward the survey link to their network. By the end of January, when we closed our survey, 700 individuals received our invitation, of which three refused participation. Hence, our final sample size included 697 individuals. Any individuals living in Bangladesh and aged 18 years or over were considered eligible for this study.

Our questionnaire included questions on socio-demographic variables, health status, COVID-19 experience, intention to receive a COVID-19 vaccine and HBM constructs related to COVID-19 vaccination. Socio-demographic questions included age, gender, ethnicity, religion, marital status, education, and

occupation. To assess health status, we collected information on any diagnosis of chronic diseases. To assess participants' COVID-19 experience, we collected data on COVID-19 infection among the participants and their family members, relatives, friends, neighbours, or colleagues. Participants' intention to receive a COVID-19 vaccine was assessed using a one-item question (if a vaccine against COVID-19 infection is available for you, would you take it?) on a four-point Likert type scale ('No, definitely not' to 'Yes, definitely'). We developed the questionnaire reviewing relevant literature. To ensure the relevance and clarity of the questions, a panel of public health scientists assessed the content validity of the questionnaire. Besides, this questionnaire was pilot tested among a group of university students.

To assess the HBM constructs we asked three questions to determine perceived susceptibility to COVID-19 infection, three questions to assess perceived severity of COVID-19 illness, two questions to assess perceived benefits of a COVID-19 vaccine, five questions to assess perceived barriers to getting a vaccination against COVID-19 and two questions to assess cues to action. We used simplified response options—agree/disagree since we are doing an online self-administered survey.

We first generated frequency tables for all the variables included in the questionnaire; we examined the tables for discrepancies, incorrect reporting, outliers, and patterns. Descriptive analyses were performed to report the distribution of socio-demographic, health status, vaccination intent variables, and HBM constructs among the participants. Finally, we run logistic regression analyses to identify the most relevant and significant determinants of COVID-19 vaccination intent in terms of socio-demographic characteristics and HBM constructs. We reported the odds ratio (OR) with 95% confidence interval (CI), depicting the likelihood of vaccine acceptance by variables from the HBM and the socio-demographic variables from the logistic regression models.

Ethical approval was obtained from the Research Ethics Committee of Sapporo Dental College and Hospital (reference number: SDC/C-7/2021/784). All participants were informed about the objectives of the study. They were also informed that participating in this study is entirely voluntary, and participation and non-participation are not associated with any benefit or harm. The first page of the survey form contained an informed consent form.

Results

Participants' characteristics

A total of 697 completed the online questionnaire. Table 1 presents their socio-demographic and health-related background. Our participant has fair representation from both genders with 53.4% male and 46.6% female but were dominated by young adults aged 18 – 29 years (65.6%); residents of Dhaka (71.7%); individuals with tertiary level education (81.8%); Muslims (94.4%); students (42.6%) and health professionals/workers (19.4%). Regarding health status, over a fifth participant (20.5%) reported having known diagnosis of any chronic disease, the majority (62.6%) reported having at least one family

member with a known diagnosis of any chronic disease, 14.6% were infected with the COVID-19, and over a quarter (28.1%) reported having at least one family member who was infected with the COVID-19.

Perceived COVID-19 related health beliefs

Figure 1 presents the perceive health beliefs of the participants in relation to the COVID-19 vaccine. Most of the participants believe that they are susceptible to COVID-19 infection with 59.3% think that in their current situation getting infected with COVID-19 is very likely and 60.3% think that possibility of COVID-19 infection in the future is very high for them. Most of them also perceive the COVID-19 as a severe disease with 84.2% considering COVID-19 complication as very serious, may even life-threatening, 60.5% are afraid that they will be very sick if infected the COVID-19, and 56.4% are afraid of COVID-19. Most of the participants consider COVID-19 vaccine beneficial, with 74.3% reports that vaccine will make them feel less worried about catching COVID-19, and 73.5% believe that COVID-19 vaccination will decrease their chance of getting COVID-19. However, 77.5% of the participants were worried that side-effects of the COVID-19 vaccine would interfere with their usual activities, 81.8% doubt the efficacy of the vaccine and 83.1% were concerned about the vaccine's safety. Among the perceived barriers, most participants were not concerned about affordability and the COVID-19 vaccine being ‘halal’ or not with only 46.9% were concerned with affordability and 34.7% were concerned with the vaccine being ‘halal’ or not. Regarding cues to action, 91.1% reported that they would take the vaccine only after receiving complete information on its composition, safety, and efficacy, and 67.1% will take the vaccine after many in public has already taken it.

COVID-19 vaccination intent and predictors

Figure 2 presents various degrees of COVID-19 vaccination intention among the participants. Most of the participants demonstrated some degree of intent with 25.5% reported that they would definitely receive the vaccine and 43% said they would probably receive the vaccine. However, 7.5% demonstrated a definite negative intention and the remaining 24% indicated a probable negative intention.

Table 2 presents the socio-demographic predictors of COVID-19 vaccination intent. We found no evidence of a significant association between definite COVID-19 vaccination intent and socio-demographic variables— gender, age, education, occupation, area of residence, religion, and health status. However, the significant association was observed between definite vaccination intent and participants ‘previous COVID-19 infection status with the odds of definite vaccination intent among the individuals with previous COVID-19 infection is 2.86 (95% CI: 1.71 – 4.78) times the odds among individuals without any history of the previous infection, adjusting for the effect of all other socio-demographic variables.

While with a definite or probably intent of COVID-19 vaccination, we found evidence of signification association with occupation and religion after adjusting for the effect of all other socio-demographic variables mentioned previously. Individuals in private service are 60% less likely to have a definite or

probable vaccination intent than unemployed/housewife individuals (OR: 0.40; 95% CI: 0.18 – 0.90). However, no significant association was found with other occupational groups. We have also found that the Muslims are 64% less likely to have a definite or probably vaccination intent than non-Muslims given the effect of other variables are held constant (OR: 0.36; 95% CI: 0.15 – 0.89).

Regarding definite negative intent, we found a statistically significant association with the area of residence after adjusting for the effect of other socio-demographic variables. Individuals living outside of Dhaka are 70% less likely to have a definite negative intent of COVID-19 vaccination than the ones living in Dhaka after adjusting for the effects of other variables (OR: 0.30, 95% CI: 0.13 – 0.74).

Table 3 shows an association between HBM constructs and different degrees of COVID-19 vaccination intent. We found no evidence of association between perceived susceptibility constructs and definite vaccination intent, adjusting for the effect of all other HBM constructs. Our findings suggest a statistically significant association between definite vaccination intent and the perception that complications from COVID-19 are serious among the perceived severity construct items. Individuals who perceive that complications from COVID-19 are serious are more likely to have a definite intent (OR: 1.93, 95% CI: 1.04 – 3.59), adjusting for the effect of all other HBM constructs. Also, our results suggest that individuals with the belief that vaccination makes them feel less worried about catching COVID-19 (OR: 4.42, 95% CI: 2.25 – 8.68), and individuals who are concerned about the affordability of the vaccine (OR: 1.51, 95% CI: 1.01 – 2.25) have significantly higher odds of having a definite vaccination intent than the individuals without such belief and concern. On the other hand, individuals who are concerned that possible side effect of the vaccine might interfere with their usual activities (OR: 0.34, 95% CI: 0.21 – 0.53) and the individuals who will take the vaccine if the vaccine is taken by many in public (OR: 0.44, 95% CI: 0.29 – 0.67) are less likely to have a definite intent than the other groups.

Regarding association between definite or probable COVID-19 vaccination intent, our results suggest that individuals who believe that vaccination will decrease their chance of getting COVID-19 are 2.23 times more likely to have vaccination intent compared to the individuals who do not believe so (OR: 2.23, 95% CI: 1.39 – 3.59), adjusting for the effect of all other HBM items. Besides, individuals who think that vaccination will make them feel less worried about catching COVID-19 have higher odds of definite or probable vaccination intent (OR: 4.31, 95% CI: 2.73 – 6.82) than the individuals who do not think so, adjusting for the effect of all other HBM construct items. On the other hand, individuals who are concerned about the side effect of the COVID-19 vaccine are 51% less likely to have a vaccination intent compared to the individuals who are not concerned with vaccine-related side effects (OR: 0.49, 95% CI: 0.29 – 0.84), adjusting for the impact of other HBM construct items.

Regarding the association between definite negative COVID-19 vaccination intent and HBM construct items, our results suggest evidence of a significant association between definite negative intent and the concern that the vaccine may not be halal. The feeling that vaccination will make them less worried about catching COVID-19. Individuals concerned that the COVID-19 vaccine may not be halal are 2.03 times likely to have a definite negative intent than the individuals who do not have such concern (OR:

2.03, 95% CI: 1.04 – 3.96), adjusting for the effect of other HBM items. On the other hand, individuals who think that vaccination will make them feel less worried about catching COVID-19 are 80% less likely to have a negative intent compared to the individuals without such feeling (OR: 0.20, 95% CI: 0.09 – 0.46), adjusting for the effect of other HBM items.

Willingness to pay and vaccination preference

Table 4 presents the willingness to pay and other preferences for a COVID-19 vaccination. Our results suggest that most people (68.4%) are willing to pay for the COVID-19 vaccine. The median amount they are willing to pay is BDT 600 ($7.08). Our results also suggest that for over half of the people (52.2%), the country of the origin of the vaccine matters. Furthermore, one third (32.9%) of the population would prefer to buy a vaccine from the private sector's available alternatives than getting the free vaccine offered by the Government.

Discussion

The article reports intent to receive a COVID-19 vaccine in Bangladesh, and how the Health Belief Model helps predict this intent. The study findings have shown that only 7% and 24% of participants definitely and probably not accept the vaccine and 26% participants definitely and 43% probably going to intake the vaccine. The findings are similar to a study in China where the majority reported a probably yes intent (54.6%), followed by a definite yes intent (28.7%) (Lin et al, 2020). Our study suggests a lack of association between the different degree of vaccination intent and most socio-demographic variables but significant association with most HBM constructs.

Although this study found no evidence of the association between COVID-19 vaccination intent or hesitancy and most socio-demographic variables (age, gender, education), studies done elsewhere reported otherwise. A recent study in Ireland and UK revealed that younger age participants between 18 and 24 years are more vaccine-hesitant (Murphy et al. 2021). In the USA, about 86% of participants over 61 years of age are more likely to take the COVID-19 vaccine (Khubchandani et al. 2021). Another study in Jordan and Kuwait found that the COVID-19 vaccine acceptance rate is higher among males and higher educational levels (Sallam et al. 2021). Surprisingly, our study suggests that compared to the Dhaka city residents, other city residents are significantly less likely to have a definite intent against vaccination. This is probably because the COVID-19-vaccination awareness programs are not running adequately. Many people are inclined to believe rumours that are not based on science because of their reliance on social media for information. Besides, this could also be attributable to people's mistrust of the Government as reported by studies conducted elsewhere. Studies suggest that misinformation, rumours, and conspiracy theories about COVID-19 negatively affect the willingness of population to be vaccinated (Kabamba Nzaji et al. 2020; Roozenbeek et al. 2020). This study also found that religious belief is an essential predictor for vaccine acceptance. A longitudinal survey in Australia found that higher religiosity levels were more likely to be hesitant (Edwards et al. 2020). Our study also suggests that people

previously infected with the COVID-19 infection are almost three times more likely to accept the COVID-19 vaccine than the uninfected population. This is in line with other study findings in Saudi Arabia (Al-Mohaithef and Padhi 2020) and France (Ward et al. 2020). COVID-19 not only negatively affect one's physical health but also psycho-social wellbeing. Hence, their negative experience of suffering from COVID-19 is perhaps the reason for higher intent to receive the vaccine.

The Health belief model analysis revealed that perceived severity, perceived benefits, and barriers are associated with taking the vaccine. The participants who had high scores for the complication of COVID-19 is very serious were more likely to be vaccinated. Also, those who had high scores for vaccination will decrease the chance of getting COVID-19, they were definitely or probably to be vaccinated. The people who experienced COVID-19 accepted the fact that vaccine can interrupt the transmission of COVID-19 infection. Some participants concerned that vaccine may not be halal; they were more likely to be unvaccinated.

Generally, people are getting mixed information about COVID-19 vaccine. Especially the social media has played a big part here to spread a lot of antivaccination misinformation and rumours that vaccines are not halal. Public health related misinformation spread both in social-platform and digital media has become a vital for the ongoing second wave and panic regarding COVID-19 vaccines' updates (Shams et al. 2021). From the Islamic point of view, preservation of life comes second after preserving religion and Muslims refusing to take vaccines on the grounds that they are non-halal is a significant problem in many Muslim countries (Zainudin et al. 2018).

A vast majority of the participants (68.4%) are willing to pay for the vaccine and average amount they are ready to pay for the vaccine is 600 BDT. Studies from Indonesia and Ecuador found that about 78.3% and 85% of participants are prepared to pay for the vaccine respectively and participants from Australia are ready to pay to reduce the waiting time limit (Harapan et al, 2020; Sarasty et al, 2020; Borriello et al, 2020). The study participants also shared that vaccine origin is an important criterion for them to accept the vaccine and preferred foreign developed and manufactured vaccine. A contrasting result reported from the participants in China reported a preference for a locally manufactured over foreign-made COVID-19 vaccine (Lin et al, 2020).

Although this research will make an apt contribution to the field of academic literature, there are several limitations. Firstly, there are limited internet services in Bangladesh, so the online survey questionnaire was distributed to individuals with access to internet connection. Also, majority of the participants of the survey are educated and health-conscious people of Bangladesh. Hence it might affect the generalizability of the study. The other limitations of using convenient sampling method to recruit the participants hence the findings of the study cannot be generalised for the whole population. The Scientific community and Bangladesh government should work together to overcome this dilemma around COVID-19 vaccination among the general population and use proper scientific evidence to educate the people. Moreover, Bangladesh is also hosting and sheltering approximately a million Rohingya refugees residing in Cox's Bazar district, which is also a well-known tourist destination. The

refugee camps are overcrowded, meaning that they are at risk of getting infected with the COVID-19. Thus, the current vaccination strategy implemented by the Bangladeshi health authorities should be followed and trusted by the general population (Isha et al. 2021). There should be adequate monitoring for social media platforms to stop the spreading of misinformation and further research work is needed to understand common challenges to accept a new vaccine by the general population.

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Declarations

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Consent to participate: Informed consent was obtained from all the participants

Consent for publication: Not applicable

Availability of data and material: Data set used will be preserved for a maximum of three years and will be available from the PI, Mohammad Chowdhury, with reasonable request.

Code availability: Not applicable

Authors' contributions: IM and RK conceptualized the study. MC, SJ, SN and EA supervised data collection. IM and SJ analyzed data with input from RK. IM, RK, DV and EA wrote first draft. All authors critically reviewed and revised the draft. All authors read and approved the final manuscript for submission.

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Tables

Table 1. Characteristics of the participants, COVID-19 vaccination intent and WTP, cross-sectional survey, January 2021, Bangladesh

Characteristics	Per cent (count)
Gender	
Male	53.4 (372)
Female	46.6 (325)
Age	
18 – 29 years	65.6 (457)
30 – 39 years	18.1 (126)
40 – 49 years	10.3 (72)
50 years or more	6.0 (42)
Education	
Primary or below	2.7 (19)
Secondary	15.5 (108)
Tertiary (college/university)	81.8 (570)
Occupation	
Unemployed	8.3 (58)
General worker	3.4 (24)
Student	42.6 (297)
Self-employed	5.5 (38)
Private service	13.6 (95)
Government service	7.2 (50)
Health professionals	19.4 (135)
Area of residence	
Dhaka	71.7 (500)
Outside of Dhaka	28.3 (197)
Religion	
Islam	94.4 (658)
Other	5.6 (39)
Participant has chronic disease	
No	79.5 (554)

Yes	20.5 (143)
Family member has chronic disease	
No	37.4 (261)
Yes	62.6 (436)
Participant diagnosed with COVID-19	
No	85.4 (595)
Yes	14.6 (102)
Family member diagnosed with COVID-19	
No	71.9 (501)
Yes	28.1 (196)

Table 2. Socio-demographic predictors of intention to receive COVID-19 vaccine in Bangladesh

Characteristics	Definite intent	Definite or probable intent	Definite intent against vaccination
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Gender			
Female	1	1	1
Male	1.32 (.91 – 1.92)	1.20 (.84 - 1.70)	.63 (.32 – 1.21)
Age			
18 – 29 years	1	1	1
30 – 39 years	1.11 (.63 – 1.99)	.87 (.52 – 1.45)	.80 (.29 – 2.24)
40 – 49 years	1.37 (.67 – 2.80)	1.04 (.53 – 2.01)	2.60 (.96 – 7.07)
50 years or more	1.78 (.70 – 4.53)	.86 (.37 – 1.98)	3 (.87 – 10.24)
Education			
Tertiary (college/university)	1	1	1
Secondary	.90 (.53 – 1.52)	.99 (.61 – 1.60)	2.01 (.91 – 4.45)
Primary or below	.99 (.24 – 4.05)	.67 (.22 – 1.98)	2.81 (.64 – 12.36)
Occupation			
Unemployed	1	1	1
General worker	.53 (.12 – 2.35)	.56 (.18 – 1.69)	4.30 (.93 – 19.84)
Student	1.71 (.73 – 4.03)	.59 (.26 – 1.30)	1.04 (.28 – 3.84)
Self-employed	.71 (.22 – 2.24)	.48 (.18 – 1.24)	3.33 (.81 – 13.65)
Private service	.58 (.22 – 1.52)	**.40 (.18 – .90)**	1.97 (.52 – 7.40)
Government service	1.82 (.70 – 4.70)	.70 (.27 – 1.74)	2.96 (.74 – 11.40)
Health professionals	2.06 (.88 – 4.83)	.71 (.32 – 1.59)	.73 (.18 – 3.01)
Area of residence			

Dhaka	1	1	1
Outside of Dhaka	.77 (.51 – 1.16)	.85 (.58 – 1.22)	**.30 (.13 – .74)**
Religion			
Other	1	1	1
Islam	.52 (.25 – 1.08)	**.36 (.15 –.89)**	1.11 (.24 – 5.17)
Participant has chronic disease			
No	1	1	1
Yes	.68 (.40 – 1.15)	1.05 (.67 – 1.67)	.44 (.18 – 1.07)
Family member with chronic disease			
No	1	1	1
Yes	.95 (.65 – 1.40)	1.23 (.87 – 1.75)	1.07 (.57 – 2.04)
Participant diagnosed with COVID-19			
No	1	1	1
Yes	**2.86 (1.71 – 4.79)**	1.25 (.74 – 2.11)	.52 (.16 – 1.65)
Family member diagnosed with COVID-19			
No	1	1	1
Yes	.74 (.48 – 1.17)	1.05 (.70 – 1.59)	1.23 (.59 – 2.54)

Table 3. Health belief model constructs and COVID-19 vaccination intent in Bangladesh, multivariable logistic regression analyses

HBM constructs	Definite intent	Definite or probable intention	Definite intent against vaccination
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Perceived susceptibility			
Chance of getting COVID-19 in the future is very high	.70 (.43 – 1.14)	.53 (.33 – .83)	2.01 (.93– 4.36)
Currently, getting COVID-19 is a strong possibility	.88 (.54 – 1.42)	.80 (.50 – 1.27)	.97 (.44– 2.14)
Perceived severity			
Complications of COVID-19 is very serious	**1.93 (1.04 – 3.59)**	.91 (.53 – 1.60)	.83 (.34– 2.02)
Will be very sick if I get COVID-19	.81 (.52 – 1.26)	.79 (.50 – 1.22)	1.28 (.56– 2.89)
Afraid of COVID-19	1.17 (.72 – 1.74)	.99 (.64 – 1.52)	1.10 (.51– 2.38)
Perceived benefits			
Vaccination will decrease my chance of getting COVID-19	1.71 (.94 – 3.14)	**2.23(1.39 – 3.59)**	.59(.26– 1.33)
Vaccination will make me feel less worried about catching COVID-19	**4.42 (2.25 – 8.68)**	**4.31 (2.73 – 6.82)**	**.20 (.09 – .46)**
Perceived barriers			
Possible side effects may interfere my usual activities	**.34 (.21 – .53)**	**.49 (.29 – .84)**	2.53 (.85– 7.45)
Doubt the efficacy of the vaccination available	1.39 (.72 – 2.67)	1.68 (.94 – 3.02)	.59 (.23– 1.49)
Doubt the safety of the vaccine available	.62 (.33 – 1.18)	.79 (.42 – 1.48)	1.29 (.46 – 3.62)
Concerned about affordability of the vaccine	**1.51 (1.01 – 2.25)**	1.30 (.88 – 1.90)	1.40 (.72– 2.74)
Concerned that the vaccine available may not be halal	.66 (.42 – 1.01)	.92 (.62 – 1.38)	**2.03 (1.04 – 3.96)**
Cues to action			
Will take the vaccine after receiving complete information	.85 (.41 – 1.75)	1.20 (.61 – 2.34)	.41 (.16– 1.04)
Will take the vaccine if the vaccine is taken by many in the public	**.44 (.29 –.67)**	1.21 (.80 – 1.83)	**.40 (.20 – .79)**

Table 4. Willingness to pay and preference for COVID-19 vaccine in Bangladesh

Willingness to pay and preference	Participants
Willing to pay	68.4%
Median amount willing to pay in BDT	600
Prefer buying a vaccine from available alternatives over the free one provided by the government	32.9%
Country of origin of the vaccine matters	52.2%