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Short communication

Preferences and willingness of accepting COVID-19 vaccine booster: Results from a middle-income country

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ABSTRACT

The recent wave of COVID-19 cases has led to the potential need for booster doses. We surveyed 6,294 people and found that 87.6% reported willingness to take a booster dose, with vaccine efficacy rate being the most common reason cited to accept booster dose. Differences in acceptance rates were noted among those working in non-health related sectors, different ethnic groups as well as those who had taken viral vector vaccines.

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1. Introduction

Coronavirus disease 2019 (COVID-19) vaccines have been successful in preventing hospitalisation and death from a variety of strains, but some may experience rare breakthrough infections [1–3]. The progressive reduction in the effectiveness is thought to be due to a waning immunity, suggesting that booster doses are needed [4]. A single booster dose of BNT162b2 vaccine was recently approved by the United States Food and Drug Administration for high-risk populations. Nevertheless, vaccination hesitancy among the general public may arise due to concerns about booster efficacy, safety, side effects, cost as well as beliefs [5,6]. We aim to explore the vaccination willingness, preference and perception of the COVID-19 vaccine booster in Malaysia, a middle-income country.

2. Methods

2.1. Survey instrument and procedure

We conducted a cross-sectional web-based survey from October 5th to 20th, 2021. Respondents were Malaysian citizens, aged 18 years and above who provided informed consent. The questionnaires were available in both Malay and English language. The survey items were developed based upon past research [7,8]. The intention to accept a COVID-19 booster vaccine was assessed using the question “Are you willing to receive a COVID-19 vaccine booster?” on a four-point scale (‘definitely no’ to ‘definitely yes’). Willingness to pay was measured using a one-item question “How much are you willing to pay to get a booster dose of COVID-19?” on a seven-point scale (I don’t want to pay to I don’t mind any cost). Preferences on COVID-19 vaccine booster were measured based on the brand name including Pfizer, Astra Zeneca, Sinovac, Sinopharm, Cansino and no preference. The factors affecting willingness to take booster doses were measured using multiple choice checkboxes. Perception on barriers and motivators for taking COVID-19 vaccine booster were measured using a five-point Likert scale, from strongly disagree to strongly agree.

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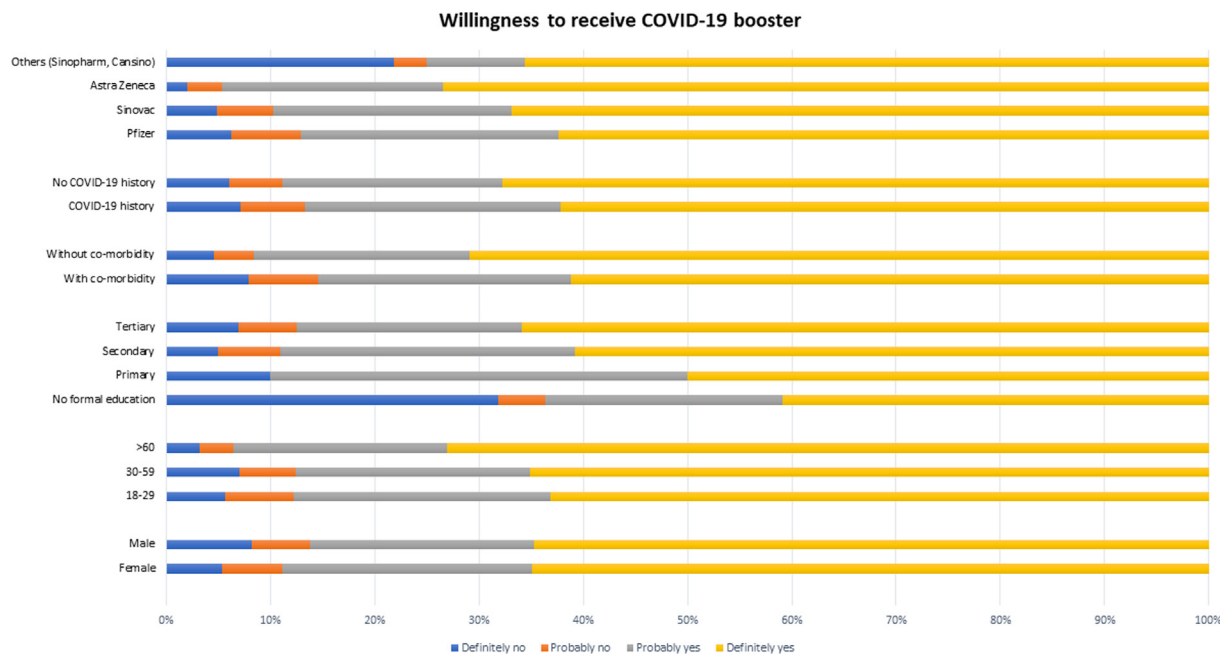


Fig. 1. Agreement across demographic factors with the statement “Are you willing to receive a COVID-19 vaccine booster?”

2.2. Sample size calculation, sampling frame, sampling strategy

Sample size was calculated using Raosoft online sample size calculator based on the formula for estimation of a proportion with infinite population correction and using a value of 50% as the desired proportion. It is the most conservative approach which generated the largest possible samples size. With a precision of 0.05, a total of 377 samples are required for the survey. Assuming 20 percent incomplete response rate, a total of 500 samples will be required for the survey. Residents in Malaysia including citizen, permanent residents, and foreigners above 18 years of age were included. Citizen staying permanently in other countries were excluded. All participants were invited to participate in the study through social media (Facebook, WhatsApp, Twitter) using snow-ball sampling.

2.3. Data collection

Data collection form was developed using RedCap. The link (URL) of the online questionnaire were distributed to the target participants using the aforementioned social media. Participants were initially directed to an online Participant Information Sheet. Further details of the study and the choice to participate in the study were given. Participants who consented were directed to the questionnaire. Individuals who refused to consent were directed to a “thank you” page.

2.4. Statistical analysis

Respondents’ demographics were summarized using descriptive statistics. We ran ordinal regression models to examine demographic and attitudinal factors which were predictive of respondents’ willingness to get vaccinated and candidates with p-values of < 0.2 were included into the multivariable regression model. Data were analysed using Stata version 16.0 (StataCorp, College Station, TX).

3. Results

We received 6,294 responses to this survey. Of these, 3,619 (58.0%) were identified as female, 4,043 (65.8%) as Malays, 1,118 (18.2%) as Chinese, and 287 (4.7%) as Indians. The mean age of respondents was 36.0 years (range 18–86). Respondents were geographically diverse across Malaysia census regions, with 1324 (21.2%) from North Peninsular Malaysia, 2400 (38.4%) from Central Peninsular Malaysia, 1074 (17.2%) from South peninsular, 599 (9.6%) from East peninsular, and 854 (13.7%) from East Malaysia (Fig. 1 and Supplementary Tables 1 & 2).

3.1. Willingness for booster shots

Almost nine in ten respondents (n = 5,508) expressed intention to have booster shots, with 64.7% (n = 4,069) reported “definitely yes” while another 1,439 respondents reported “probably yes” (22.9%). Respondents indicated that the maximum they would pay out-of-pocket was less than RM50 (equivalent to USD \$12, n = 1,822; 29.2%). We noted that the high-risk populations including those working in healthcare sectors (14.3%) and individuals with co-morbidities (14.6%) were more hesitant to receive a booster dose (Supplementary Tables 1 & 2).

Almost one-quarter of respondents were not willing to have a heterologous mixture of vaccine (n = 1,462; 23.3%) with another 1,097 (17.5%) respondents reported “probably no”. Those who received the vector and protein subunit vaccines were more willing to have a heterologous mix compared to those receiving mRNA vaccine (p < 0.01). The most common reasons respondents were willing to take booster shots were the effectiveness of vaccine (63.6%), duration of protection (47.3%) and suggestion from doctors or policy makers from Ministry of Health (41.8%). Respondents who were worried about the adverse effects of vaccine boosters, cost of vaccination, access to vaccination and misinformation were less willing to receive booster vaccination (Table 1 & Supplementary Tables 3 & 4). Multivariable regression analyses found Chinese ethnicity (Odds Ratio: 1.54; 95% CI: 1.07–2.22), working in non-health related sectors (1.32; 1.01 – 1.73) and had taken viral vector

Table 1
Attitudes towards COVID-19 booster vaccination.

	N (%)
Factors affecting willingness to take booster vaccine	
Effectiveness	4,002 (63.6)
Duration of protection	2,979 (47.3)
Suggestion from doctors or Ministry of Health	2,629 (41.8)
Health status	2,447 (38.9)
Number of positive COVID-19 cases	2,048 (32.5)
Government policy	1,726 (27.4)
Number of COVID-19 deaths	1,636 (26.0)
Type of vaccine	1,608 (25.6)
Age	1,115 (17.7)
Adverse effects	1,052 (16.7)
Requirement by employer	968 (15.4)
Cost	665 (10.6)
Country that produces the vaccine	658 (10.5)
Number of doses for COVID-19 vaccine boosters required	589 (9.4)
Suggestion from friends or family	277 (4.4)
Which brand of COVID-19 vaccine booster you prefer?	
Pfizer	4,137 (65.7)
Astra Zeneca	1,381 (21.9)
Sinovac	1,313 (20.9)
No preference	940 (14.9)
Sinopharm	158 (2.5)
Cansino	142 (2.3)
What is your preferred COVID-19 vaccine booster injection site?	
Public health clinics	2,093 (33.3)
Private health clinics	1,993 (31.7)
Public hospital	1,807 (28.7)
Private hospital	1,769 (28.1)
Temporary vaccines administration centre:	
Stadiums	1,203 (19.1)
Halls	2,187 (34.8)
Convention centres	2,022 (32.1)
How much are you willing to pay for a COVID-19 booster vaccination?	
I do not want to pay at all	2,290 (36.7)
I cant afford to pay	920 (14.8)
Less than RM 50	1,822 (29.2)
RM 50- RM 100	782 (12.5)
RM 100- RM 150	163 (2.6)
> RM150	41 (0.7)
I don't mind any cost	218 (3.5)

vaccines (1.35; 1.07 – 1.71) were more likely to agree to receive booster vaccines (Table 2).

4. Discussion

This study revealed that a large proportion (87.6%) of our respondents were willing to accept COVID-19 vaccine booster. An

Table 2
Multivariate logistic regression analyses of those who were willing to receive booster vaccines.

Variable	Odds ratio	95% CI
Ethnicity		
Malay	Ref	
Chinese	1.54	1.07 – 2.22
Indian	0.73	0.44 – 1.20
Others	1.51	0.80 – 2.84
Educational status		
No formal education	Ref	
Primary	0.59	0.07 – 4.87
Secondary	0.21	0.03 – 1.92
Tertiary	0.52	0.39–0.70
Vaccine type		
mRNA	Ref	
Viral vector	1.35	1.07 – 1.71
Working sector health related		
Yes	Ref	
No	1.32	1.01–1.73

earlier Malaysian study in December 2020 revealed that the willingness to accept primary doses of COVID-19 vaccines was only 64.5% [8]. While the study population was not identical to ours, this may imply the success of public health messages on the importance of COVID-19 vaccines over the year. A systematic review reported that previous studies examining willingness to receive COVID-19 primary vaccination worldwide averaged at 77% [5].

The safety and efficacy of mRNA COVID-19 vaccines was reported in December 2020 [2], followed by a systematic review in 2021 [9]. In Malaysia, COVID-19 mRNA vaccines were the most commonly used. The Delta variant which is highly transmissible was discovered in late 2020 [9]. COVID-19 death toll in Malaysia reached its peak on the 15th of September 2021, with 422 COVID-19 related deaths reported. Hence, the possible reasons for the increase in willingness to accept COVID-19 vaccine booster include the emerging evidence on the efficacy and safety of the COVID-19 vaccines, increasing mortality due to COVID-19 and emergence of new variants of concerns especially the Delta variant.

The willingness to receive COVID-19 vaccine booster reported in this study was similar to that reported in China (84.8%) [10] and the German speaking D-A-CH region in Europe (82.4%) [11], but higher than those reported in Poland (71%) [12], Saudi Arabia (66.8%) [13], United States (45.0%) [14]. However, there could be possible divergence between willingness to accept a vaccine booster and the actual behaviour. For instance, an Algeria study reported that more than half (51.6%) of the respondents were willing to accept a COVID-19 vaccine booster, but only 13.2% actually received the booster dose [15]. According to the Malaysian official portal, 49.7% of the Malaysian population has received the first booster dose, while only 1.5% received the second booster dose. Therefore, there is a need to study the determinants of the willingness to accept a vaccine booster and the actual uptake rate.

Our findings indicate that the inherent characteristics of vaccine including efficacy, duration of protection, safety and endorsement from health authorities were major factors that affected the public decision to be vaccinated with a booster dose [5,16]. Interestingly, we note some ethnic differences in the perception and willingness, especially among the Chinese who demonstrated a high level of willingness in comparison to the Malays. This could possibly be due to the religious concerns Malays which were Muslims in faith on the concerns over the 'halal' status of the source and manufacturing of vaccines [17]. Given the difference in willingness between different ethnic groups, messages and information delivered should be reviewed and tailored according to each ethnicity's culture and beliefs.

Of note, this study found that people with higher educational levels and healthcare professional were less willing to accept COVID-19 booster dose, which was similarly observed in China [10] and Algeria [15]. Results of our study also concur with those from Canada, Spain, and the UK, where those with higher education were less willing to accept COVID-19 vaccination [18]. While we did not examine the reasons for this, we postulate that this could be due to the lack of studies on the safety and efficacy of booster dose at the time of writing [19].

It is noteworthy that in the event COVID-19 vaccines were not subsidized, nearly two in every five respondents considered cost as a major barrier for taking the booster, with a threshold of willingness to pay at about USD \$12. This could possibly be due to the expectation that such vaccination should be funded by the government and the transportation cost involved [20]. To address this, many countries including Malaysia participated in the COVAX allocation plan to guarantee the access to vaccines. Fortunately, healthcare in Malaysia is heavily subsidized by the government and common types of COVID-19 vaccines were provided for free.

To the best of our knowledge, this was one of the first studies that assessed the willingness of the public towards taking a COVID-19 vaccines booster in Malaysia. Findings can provide crucial information for the government to find strategies to increase public understanding and uptake of the COVID-19 vaccine booster. This needs to be considered in light of the limitations. We used a convenience and snowball sampling strategy, which raises the possibility of selection bias. Respondents' ages were skewed toward the younger end, which may affect generalizability among the older population. In addition, due to the nature of our study being online, we were unable to determine the response rate, and thus the study representativeness. Nevertheless, our sample response rates were generally representative of the Malaysian population, which may lend some credibility to our results. While there are multiple reasons for vaccination hesitancy, our study was not designed to elucidate these specific reasons. Finally, the study was conducted at one single timepoint, and due to the rapidly changing dynamics of the pandemic, the willingness will change over time.

5. Conclusion

While there appears to be a high level of willingness to receive a COVID-19 vaccine booster dose overall, ethnic differences, health-related occupation, educational level and types of primary vaccines received were associated with different levels of hesitancy to receive vaccine booster. As such, strengthening of COVID-19 vaccine booster educational message and campaigns with scientific evidence on its efficacy and safety needs to be tailored to ensure culturally appropriate messages are delivered to increase public acceptance of COVID-19 vaccine booster dose.

6. Ethics approval

This study was approved by Malaysian Research Ethics Committee (NMRR-21-1930-61440) and Monash University Human Research Ethics Committee (2021-30850-65807)

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8. Data availability

All data to reproduce the tables and figures in the manuscript and [Supplementary Information](#) can be obtained with reasonable request from the corresponding author.

Data availability

Data will be made available on request.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.vaccine.2022.10.057>.

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