

Determining the Prevalence and Correlates of COVID-19 Booster Vaccine Hesitancy in the Singapore Population Following the Completion of the Primary Vaccination Series



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Abstract

As COVID-19 variants continue to arise amidst declining vaccine-induced immunity in vaccinated populations, vaccination boosters continue to be crucial. This study sought to identify the sociodemographic, emotional and psychological factors associated with COVID-19 booster vaccine hesitancy in Singapore.

Multivariable models indicated that the following were associated with higher odds of booster vaccine hesitancy:

- Tertiary education
- Lower COVID-19 threat perception
- Lower perceived benefits
- Higher perceived concerns
- Lower benefit/concerns differential score

Introduction

COVID-19 vaccines have established their effectiveness and efficacy against severe disease [1,2], but a rapid waning in vaccine-induced immunity over time [3,4], and the emergence of new variants have led to the launch of booster vaccination programmes in several countries. Research on booster vaccine hesitancy for COVID-19 is limited as well.

It remains unclear how individuals in the community perceive the ratio of benefits versus risks for booster vaccination. Studies investigating the specific role of negative emotions in hesitancy regarding COVID-19 booster vaccines are scarce as well.

With accounts of potentially new COVID-19 variants requiring the adaptation of existing vaccines and repeated doses [5], promulgation of anti-vaccination beliefs, conspiracies and misinformation on social media [6], as well as reports of the decreased severity of Omicron and waning vaccine immunity [7], hesitancy involving booster doses warrants investigation.

Methods

Scores for all items evaluating perceived benefits and concerns were summed and averaged for the 1552 participants who completed the survey. Benefits/concerns differential scores were subsequently computed by subtracting the concerns mean scores from the benefits mean scores to obtain a continuous measure.

A single item was used to quantify COVID-19 booster vaccine hesitancy:

“When invited by the health ministry to take the booster vaccination, would you comply?”

“Yes”

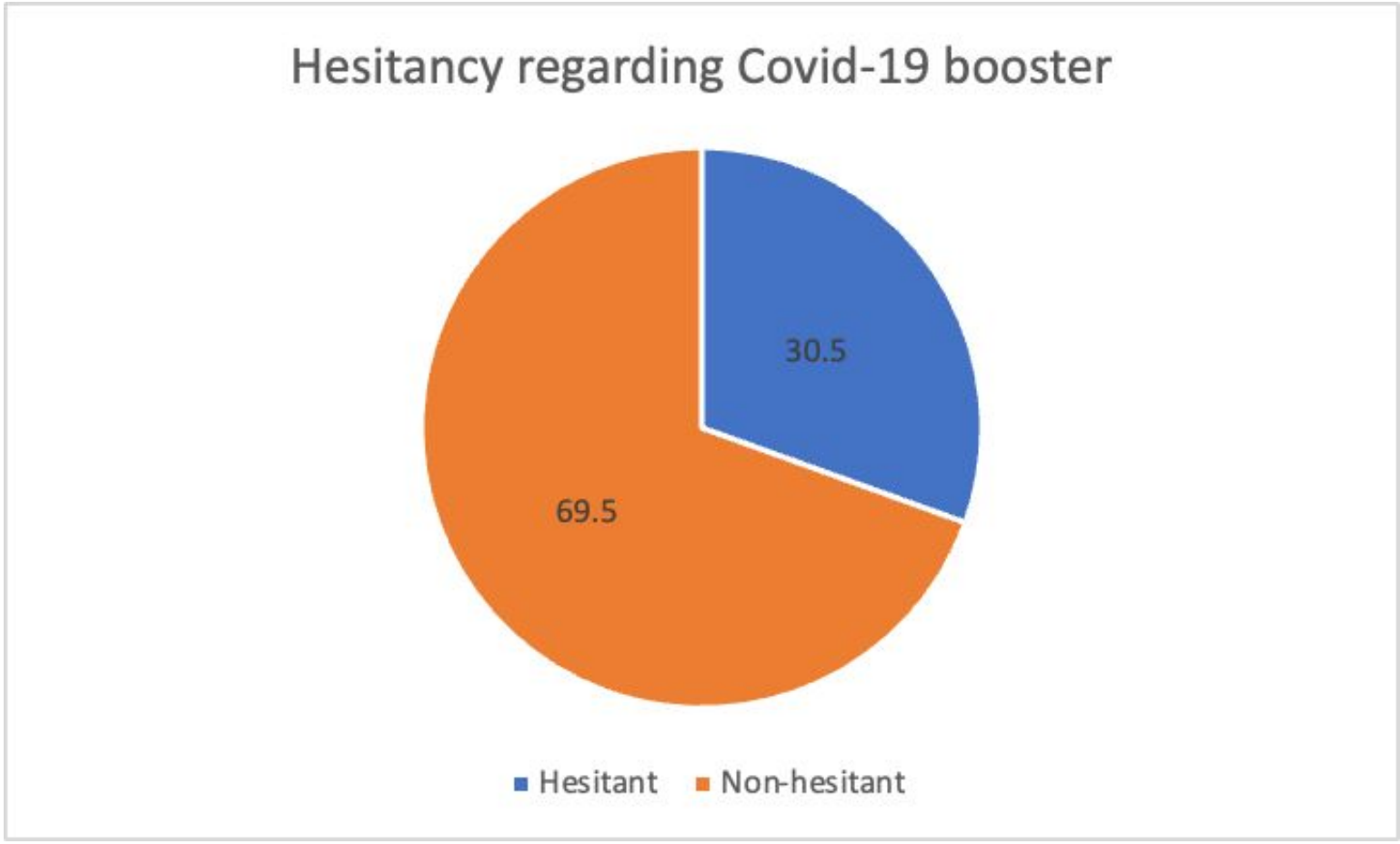
“No”

- Non-hesitant
- “Intent to vaccinate/no booster hesitancy” group
- Hesitant
- “Booster vaccine hesitant” group

- Univariate logistic regression was carried out to identify factors associated with booster vaccine hesitancy based on these factors:
 - ◆ Sociodemographic
 - ◆ Emotional
 - ◆ Psychological
- This was followed by two double-block multivariable binary logistic regression models combining all parameters.

Reliability analyses conducted for all multi-item psychological variables suggested good internal consistency (all $\alpha > 0.7$). The statistical significance level was set at an alpha of 0.05.

Results



Hesitancy regarding taking booster	30.5%
Unsure, have not yet taken booster	25.9%
Refused booster	4.7%
Perceived more vaccine risks than benefits	39.2%

Univariate analyses revealed the following significant factors associated with booster hesitancy:

- Age (**older respondents**)
- Occupation status (**unemployed, self-employed and students**)
- Daily regular contact (**≥50 people**)

However, these factors ceased to be significant when psychological parameters were entered to the model

Multivariate analyses revealed the following significant factors associated with booster hesitancy:

Factor	Odds Ratio (OR)
Tertiary education	0.109 (no formal/primary education) 0.540 (secondary/post-secondary education)
Lower perceptions of booster vaccination benefits	0.257
Lower perceived need for booster vaccines	0.537
Higher perceived concerns	1.6938
Lower perceived risk of COVID-19	0.790

Discussion

- Hesitancy for booster vaccines was higher among those unemployed/in school, compared to those who were employed.
 - Among those employed, hesitancy was higher in those self-employed (39.8%) compared to those who were otherwise employed (27.4%).*
 - Self-employed individuals have more flexible work environments, thus may be less concerned about mandates regarding vaccination requirements.*
- Hesitancy for booster vaccines was higher in those with a higher level of education.
 - Hesitancy was highest in those with tertiary education (32.3%), followed by those with secondary/postsecondary education (28.7%), and those with no formal education/primary education (14.3%).*
 - Education was only significant in the multivariable model after other sociodemographic and psychological concepts were included.*
- Beliefs about vaccination (i.e., perceived need, benefits, concerns etc.) were the main drivers of COVID-19 booster vaccine hesitancy.
 - The strongest associations were shown for the perception of benefits.*
- A higher rate of booster vaccine hesitancy in older respondents was found.
 - Hesitancy was highest in those 60 years and above (40.9%).*
 - Older individuals are less socially active, thus are less concerned about restrictions.*

There were limitations faced during the study:

- Adoption of cross-sectional design for study ➡ No causal inferences can be made
- Overrepresentation of females (national registry = 51.0%, sample = 62.1%) and underrepresentation of individuals 60 years old and above (national registry = ~23.5%, sample = 10.9%) in the study sample [8]
- Not all of the adult population strata in Singapore had immediate access to COVID-19 booster vaccines ➡ Intention was assessed over actual uptake

Conclusion

The results of this study provide a cautionary note that the success of primary COVID-19 vaccination programmes may not necessarily warrant the uptake of booster and/or recurrent doses of COVID-19 vaccines.

Health communication strategies and measures should aim to maximise the perceived benefits of booster vaccination, while also minimising perceived concerns, and target individual needs for booster vaccination.

Addressing barriers that are more prevalent among certain sociodemographic groups could go a long way towards encouraging and increasing the uptake of COVID-19 booster vaccines.

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