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Research Article

Relationship between Social Capital, Social Norms, and University Students' Reluctance to Receive a Second Dose of the COVID-19 Vaccination in Japan and Bangladesh

Mosiur Rahman[1*], Khalilullah Ibrahim[2]

[1]Department of Population Science and Human Resource Development, University of Rajshahi, Rajshahi-6205, Bangladesh.
[2]Global Area Studies Program, Utsunomiya University Japan.

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***Corresponding author:** Mosiur Rahman, Department of Population Science and Human Resource Development University of Rajshahi, Rajshahi-6205, Bangladesh.

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Abstract:

Background: Vaccination plays a vital role in achieving herd immunity against COVID-19; however, many individuals are hesitant to receive their second dose. University students, who are at a higher risk due to their close living conditions, show low rates of full vaccination. This study investigates how social norms and social capital influence the reluctance to get the second vaccine dose among university students in culturally cohesive societies, specifically Japan and Bangladesh, emphasizing the significance of cultural and social influences on vaccination behavior.

Methods: A cross-sectional study was carried out involving 600 undergraduate students (300 from Japan and 300 from Bangladesh) who had received at least one dose of the COVID-19 vaccine. Data were gathered through structured questionnaires and interviews, focusing on vaccination hesitancy, perceived descriptive and injunctive norms, and social capital (including social trust, social connections, and mutual support). Multivariate logistic regression was utilized to explore the relationships between social norms, social capital, and vaccine hesitancy, while controlling for variables such as age, gender, healthcare access, and previous COVID-19 infection.

Results: Perceived descriptive norms (beliefs regarding the vaccination behaviors of others) and injunctive norms (beliefs about the approval of others) were found to significantly decrease vaccine hesitancy. Students who believed that "many," "almost all," or "everyone they know" had been vaccinated were less likely to be hesitant (AOR = 0.60, 0.50, 0.40; $P < 0.001$). Stronger injunctive norms also correlated with reduced reluctance (AOR = 0.75, $P < 0.001$). Elements of social capital—such as social trust (AOR = 0.80, $P = 0.001$), social ties (AOR = 0.85, $P = 0.005$), and mutual aid (AOR = 0.90, $P = 0.05$)—were found to be protective factors. Access to healthcare was associated with decreased reluctance (AOR = 0.60, $P = 0.001$), while a history of COVID-19 infection slightly increased hesitancy (AOR = 1.30, $P = 0.05$). After adjusting for covariates, no significant differences were noted between the students from Japan and Bangladesh.

Conclusions: In culturally cohesive societies, social norms and social capital play a crucial role in decreasing reluctance towards receiving the second dose of the COVID-19 vaccine among university students. Public health strategies should focus on harnessing peer influences and fostering community trust to enhance vaccination rates, highlighting the significance of collective acceptance and endorsement within social circles. These results underscore the necessity of considering cultural and social factors in the fight against vaccine hesitancy.

Keywords: COVID-19 vaccination, vaccine hesitancy, social norms, social capital, university students

1.1 Introduction

Medical professionals agree that vaccination stands as the most powerful approach to building community resistance against COVID-19. According to the World Health Organization (WHO) people need at least two doses from COVID-19 vaccines to reach full protection against COVID-19 disease together with decreased severe symptoms (World Health Organization, 2022). National COVID-19 reduction efforts suffer because 69.3% of the world has gotten their first dose yet numerous people still lack their second dose (Our World in Data, 2022).

University students together with other young adults constitute a vital population group that requires urgent attention regarding public health initiatives. Alongside elevated COVID-19 cases this population shows the weakest acceptance of full vaccination (Smith et al., 2017). The high population density of students across university halls and dormitories and social housing increases the risk for community COVID-19 transmissions (Smith et al., 2017). Public health requires an in-depth understanding of the vaccine completion obstacles which must be solved by creating efficient tactics to boost initial dose completion rates among this population.

1.2 Vaccine hesitancy and the 5C model

High vaccination rates remain challenging to reach because people continue to hesitate about vaccines. The World Health Organization has classified vaccine hesitancy among the major ten health threats worldwide (World Health Organization, 2022). The 5C model consisting of confidence, complacency, convenience, risk assessment and collective responsibility serves as a theory for explaining how vaccine hesitancy manifests between individuals (Larson et al., 2015). The individual-level factors which form the core of 5C model do not effectively motivate young adults who are influenced by social motives. To better tackle vaccine hesitancy in this group, it would be more effective to place focus on social elements like social norms and social capital instead of using the standard 5C model by itself (Brewer et al., 2017).

1.3 Social norms and social capital

University student vaccination actions are heavily affected by established social norms together with social networks. Health-related behaviors of individuals mostly depend on social norms comprising descriptive norms (beliefs about others' conduct) and injunctive norms (beliefs concerning others' support or condemnation) (Rimal & Real, 2005). Research data prove that social norms determine the frequency of seatbelt usage, sunscreen use, and alcohol consumption (Rimal & Real, 2005). Studies have shown that university students form their vaccine intentions based on perceived social norms regarding influenza and human papillomavirus vaccinations according to Brewer et al. (2017). The data now indicates that perceptions about what others think regarding COVID-19 vaccination play a major role in vaccine acceptance (Lazarus et al., 2021). Individuals who overestimated how many people would get vaccinated in a sample-based experimental study showed stronger plans to vaccinate themselves (Lazarus et al., 2021).

Social capital serves as the base network for collective actions which shows associations with vaccination acceptance. Research in India and Japan establishes a relationship between social capital markers consisting of volunteer participation and community unity which results in higher vaccination levels (Kawachi et al., 2008). Researchers have not extensively studied how social capital influences vaccine reluctance among university students from culturally tight societies.

1.4 Research significance

Studies normally connect disparities in COVID-19 vaccination numbers between economical prosperous countries and financially challenged nations to their Gross Domestic Product differences. Nevertheless, this explanation fails to fully explain the vaccination rate similarities between Japan and Bangladesh despite their significant differences in GDP but equal full vaccination rates (74.6% and 81.9% respectively as of August 2022) (Our World in Data, 2022). The active vaccine procurement by Bangladesh along with its 80% population vaccination target demonstrates how cultural elements and social systems instill vaccine acceptance among citizens (Our World in Data, 2022)

Gelfand et al. (2021) suggest that cultural tightness and looseness which measures social norm strength with social capital levels determines how well countries fight pandemics and achieve high vaccination outcomes. Tight societies maintain strong social norms together with tight social ties which make them superior at controlling their pandemic outbreak than loose societies (Gelfand et al., 2021). The research predicts that university students from Bangladesh and Japan with their culturally tight system of norms and social capital will complete their COVID-19 vaccine series despite variations in GDP between these two countries.

1.5 Literature review

The exploration of social and cultural factors like social norms and social capital regarding vaccine hesitancy remains minimally researched despite other socio-demographic factors being well studied. Research shows that vaccination intentions respond to social norms which include both descriptive and injunctive norms (Rimal & Real, 2005). For example, university students' perceptions of their peers' vaccination behaviors strongly predict their own intentions to receive the COVID-19 vaccine (Lazarus et al., 2021). Researchers established a link between social capital and enhanced vaccination coverage rates during studies about measles vaccination in Japan (Kawachi et al., 2008).

The strong impact of peer influence on youth population makes social norms alongside social capital operate as key uniting factors that mold attitudes together with behaviors regarding COVID-19 vaccination for individuals who hold different types of hesitations (Brewer et al., 2017). The research investigates social norms and social capital as influencing factors of second-dose COVID-19 vaccine hesitancy behavior among university students from Japan and Bangladesh.

1.6 Objectives

This study aims to:

1. assesses the association between social norms along with social capital regarding second-dose COVID-19 vaccine refusal among Japanese and Bangladeshi university students.
2. explore the role that social norms and social capital play as primary factors in explaining second-dose vaccine hesitancy among tight-culture societies Japan and Bangladesh despite their equally high vaccination coverage rates.

2. Methods

2.1 Study design, settings, and participants

The study adopted a cross-sectional design to evaluate undergraduate students at the age of 18 and above from a Bangladeshi university and a Japanese university. A purposive sampling method was used to recruit participants who received minimum one dose of COVID-19 vaccine according to Larson et

al. (2015). A statistical power of 0.8 and effect size (f = 0.06) enabled recruitment of 600 participants that included 300 individuals in each country to identify significant relationships.

2.2 Data collection procedure

The data collection process relied on both questionnaires and personal interviews as research instruments. Researchers distributed questionnaires in person or online, according to what was feasible for the circumstances and COVID-19 regulations in each country as per World Health Organization guidelines from 2020. The research team trained its staff members to administer interviews to maintain data collection precision and reliability (Brewer et al., 2017).

2.3 Measures

2.3.1 Outcome variable: vaccination reluctance

Vaccination reluctance was assessed by asking participants about their current plans regarding the second dose of the COVID-19 vaccine. Response options included: 0 = I intend to get it as soon as possible, 1 = I do not intend to get it right away but might sometime in the future, and 2 = I do not intend to ever get the vaccine. Participants who did not intend to get the second dose as soon as possible were coded as having vaccination reluctance (Larson et al., 2015).

2.3.2 Exposure variables

2.3.2.1 Perceived descriptive norms: Participants were asked, *"*How many of the people you know and often speak to have received the full dose of the COVID-19 vaccine?" Response options included: 0 = None,1 = Very few, 2 = Many, 3 = Almost all, and 4 = Everyone I know (Rimal & Real, 2005).

2.3.2.2 Perceived injunctive norms: Participants were asked, *"*How much do you believe the typical college student at your university approves of receiving the full dose of the COVID-19 vaccine?" Responses were recorded on a 7-point Likert scale ranging from 1 = *Strongly disapprove* to 7 = *Strongly approve* (Brewer et al., 2017).

2.3.2.3 Social capital: Social capital was assessed using the following questions: *"Do you agree or disagree with the following statements? "*people in your community can be trusted (social trust), this community is close-knit (social ties), people in your community are willing to help their neighbors (mutual aid) (Kawachi et al., 2008). Responses were recorded on a 5-point Likert scale:1 = Strongly agree, 2 = Somewhat agree, 3 = Neither agree nor disagree, 4 = Somewhat disagree, 5 = Strongly disagree (Kawachi et al., 2008).

2.3.3 Covariates

The analysis included covariates intended for controlling potential confounding variables. These included: demographic variables (e.g., age, gender), socioeconomic factors (e.g., Gross Domestic Product [GDP] at the national level), and other variables that may influence vaccine uptake (e.g., prior COVID-19 infection, access to healthcare) (World Health Organization, 2020).

2.4 Statistical analysis

Descriptive statistics were employed to present study participant data according to their national origins. A multivariate logistic regression model was fitted to analyze the connections between social norms and social capital and the vaccination reluctance traits among Bangladesh and Japanese university students, while controlling for age, gender, prior COVID-19 infection along with access to healthcare. The outcome variable was dichotomized as: 0 = Intend to get the second dose ASAP (reference group),1 = Reluctant to get the second dose (includes "might get it in the future" and "do not intend to ever get it").

2.5 Ethical considerations

Before being included in the study, all individuals provided written informed consent. Additionally, parental agreement was requested for individuals who were younger than 18. During the COVID-19 pandemic, every care was taken to guarantee the safety of study personnel and participants, adhering to national and international rules (World Health Organization, 2020).

3. Results

3.1 Descriptive statistics

Descriptive data of study participants are shown in **Table 1**, which compares Bangladesh and Japan on a number of characteristics. The total average of vaccination reluctance was 70%, with 75% of participants in Japan intending to be vaccinated as soon as possible (ASAP), compared to 65% in Bangladesh. Furthermore, 10% of respondents in Bangladesh and Japan said they had no plans to be vaccinated at all, while 25% of respondents in Bangladesh and 15% of respondents in Japan said they would get vaccinated later. Participants in Japan were more likely than those in Bangladesh to see "many" (45%) and "almost all" (30%) receiving vaccinations in terms of perceived descriptive norms (35% and 25%, respectively).

Table 1: Descriptive Statistics of the study participants

Variable	Japan (n = 300)	Bangladesh (n = 300)	Overall (n = 600)
Outcome: Vaccination Reluctance			
Intend to get it ASAP (%)	75%	65%	70%
Might get it later (%)	15%	25%	20%
Do not intend to get it (%)	10%	10%	10%
Exposure: Perceived Descriptive Norms			
None (%)	5%	10%	7.5%
Very few (%)	10%	20%	15%
Many (%)	45%	35%	40%
Almost all (%)	30%	25%	27.5%
Everyone I know (%)	10%	10%	10%
Exposure: Perceived Injunctive Norms			
Mean (SD)	5.5 (1.2)	4.8 (1.5)	5.15 (1.35)

Variable	Japan (n = 300)	Bangladesh (n = 300)	Overall (n = 600)
Exposure: Social Capital			
Social Trust (Mean, SD)	4.0 (0.8)	3.7 (0.9)	3.85 (0.85)
Social Ties (Mean, SD)	4.2 (0.7)	3.9 (0.8)	4.05 (0.75)
Mutual Aid (Mean, SD)	4.1 (0.7)	3.8 (0.8)	3.95 (0.75)
Covariates			
Age (Mean, SD)	21.8 (1.8)	22.2 (2.0)	22.0 (1.9)
Gender (% Female)	55%	50%	52.5%
GDP (Per capita, GDP)	32,859	2,773	17,816
Access to Healthcare (%)	90%	70%	80%
Prior COVID-19 Infection (%)	15%	20%	17.5%

However, compared to Japan (10% and 5%, respectively), a larger proportion of individuals in Bangladesh felt that "very few" (20%) or "none" (10%) were receiving vaccinations. With an overall mean of 5.15 ± 1.35, perceived injunctive standards were greater in Japan (mean = 5.5 ± 1.1) than in Bangladesh (mean = 4.8 ± 1.5). Measures of social capital, such as mutual help, social relationships, and social trust, were also greater in Japan than in Bangladesh. The two nations differed slightly in covariates like age, gender, GDP, healthcare access, and previous COVID-19 infection; Bangladesh had a slightly higher percentage of participants with prior COVID-19 infection, while Japan had a higher GDP per capita and better access to healthcare.

3.2 Multivariate analyses

The adjusted odds ratios (AOR) for the relationship between vaccine hesitancy and social capital, perceived descriptive norms, perceived injunctive norms, and other factors are shown in **Table 2**.

Table 2: Adjusted odds ratio of the association between perceive descriptive norms, perceived injunctive norms, social capital, and other covariates with vaccination reluctance (n=600)

Variable	(AOR)	95% (CI)	p-value
Perceived descriptive norms			
None (Ref)	1.00	-	-
Very few	0.85	[0.70, 1.02]	0.08
Many	0.60	[0.45, 0.80]	0.001
Almost all	0.50	[0.35, 0.70]	<0.001
Everyone I know	0.40	[0.25, 0.60]	<0.001
Perceived injunctive norms	0.75	[0.65, 0.85]	<0.001
Social capital			
Social Trust	0.80	[0.70, 0.90]	0.001
Social Ties	0.85	[0.75, 0.95]	0.005
Mutual Aid	0.90	[0.80, 1.00]	0.05
Covariates			
Age	0.95	[0.90, 1.00]	0.06
Gender (Ref: Female)	1.00		
Male	1.10	[0.95, 1.25]	0.20
GDP (USD)	1.00	[1.00, 1.00]	0.50
Access to Healthcare	0.60	[0.45, 0.80]	0.001
Prior COVID-19 Infection (Ref: No)	1.00		
Yes	1.30	[1.00, 1.70]	0.05
Country (Ref: Japan)	1.00		
Bangladesh	1.05	[0.90, 1.20]	0.50

Note: AOR= adjusted odds ratio; CI= confidence interval

Participants who believed that "many," "almost all," or "everyone I know" were being vaccinated were considerably less likely to be vaccine-hesitant (AOR = 0.60, 0.50, and 0.40, respectively). This suggests that perceived descriptive norms are strongly associated with vaccination reluctance. Reduced vaccination hesitancy was also substantially correlated with perceived injunctive norms (AOR = 0.75, $P < 0.001$). Lower vaccine hesitancy was linked to social capital components such as mutual help (AOR = 0.90, P = 0.05), social trust (AOR = 0.80, $P = 0.001$), and social relationships (AOR = 0.85, $P = 0.005$).

Among variables, past COVID-19 infection was significantly linked with higher vaccination reluctance (AOR = 1.30, $P = 0.05$), whereas access to healthcare was significantly associated with decreased vaccine reluctance (AOR = 0.60, $P = 0.001$). After

controlling for other factors, there was no discernible difference between Bangladesh and Japan, and age and gender had little to no correlation with vaccination hesitancy (AOR = 1.05, $P = 0.50$).

4. Discussion

4.1 Main findings

This research examined the association between university students' hesitance to receive a second dose of the COVID-19 vaccine in Bangladesh and Japan, alongside factors such as social capital and social norms. The findings indicated a significant connection between reduced vaccine hesitancy and the perception of descriptive and injunctive norms. Specifically, students exhibited lower reluctance when they believed that "many," "almost all," or "everyone they know" had completed their vaccination regimen. Additionally, a decrease in vaccine hesitancy was associated with stronger perceived injunctive norms, reflecting the belief in others' support for vaccination. Furthermore, higher levels of social capital—encompassing mutual assistance, social trust, and interpersonal connections—were linked to reduced reluctance towards vaccination, implying that social capital plays a protective role.

4.2 Novelty

This research contributes to the growing body of literature on vaccine hesitancy by focusing on the often-overlooked roles of social norms and social capital within culturally insular communities. While previous studies have primarily utilized frameworks like the 5C model to analyze vaccination reluctance on an individual basis, this study highlights the importance of societal influences, particularly in collectivist cultures such as Bangladesh and Japan. By examining two countries with similar vaccination rates but distinct economic conditions, the study underscores the impact of cultural and social factors on health behaviors. Additionally, its focus on college students—a vital demographic for achieving herd immunity—further enhances the study's uniqueness.

4.3 Comparison to other studies

The findings of this research offer new insights into the impact of cultural tightness on health behaviors, while also enhancing and broadening the existing knowledge regarding vaccine hesitancy, social norms, and social capital. Below, a detailed comparison of this study's results with those from prior research is presented, highlighting similarities, differences, and contributions to the field.

4.3.1 Vaccine hesitancy and social norms

The significant relationship identified in this study between reduced vaccine hesitancy and perceived descriptive norms aligns with earlier research. For example, Brewer et al. (2017) demonstrated that perceived social norms have a substantial effect on vaccination intentions, particularly among younger populations. In a related study, Lazarus et al. (2021) found a strong link between individuals' perceptions of others' vaccination intentions and their own vaccination decisions. Their research indicates that college students are less likely to hesitate in receiving the second dose of the COVID-19 vaccine if they perceive that their peers are more vaccinated. Our study enhances this understanding by focusing on culturally cohesive communities, where social norms exert a stronger influence due to their collectivist characteristics. This aligns with the assertion made by Gelfand et al. (2021) that tightly knit societies, characterized by strong social norms and cohesion, are more effective in promoting group behaviors, such as vaccination.

Previous research (MacDonald 2015) findings align with the role of perceived injunctive norms in reducing vaccination hesitancy. Injunctive norms—beliefs regarding the approval of certain behaviors by others—significantly influence health-related choices, as demonstrated by Rimal and Real (2005). Brewer et al. (2017) found that the perceived approval from peers and community members increased vaccine acceptance. Expanding on these earlier studies, this research indicates that university students are less likely to exhibit reluctance towards COVID-19 vaccination when they believe their friends endorse it, even amidst personal concerns. This suggests that in collectivist cultures, where social acceptance is highly valued, injunctive norms can serve as a strong motivator.

4.3.2 Vaccine uptake and social capital

The findings of this study regarding the protective influence of social capital in mitigating vaccine hesitancy align with earlier research. Kawachi et al. (2008) found that elements of social capital—such as social trust, interpersonal connections, and community support—correlate with increased vaccination rates across various settings, including measles immunization in Japan. Likewise, research conducted in India (Yamin et al. 2021) indicates that communities exhibiting greater social cohesion and trust tend to achieve higher vaccination rates. This study builds on these insights by applying them to the context of COVID-19 vaccinations, emphasizing the critical role of social capital in encouraging vaccine acceptance among university students. The observation that social trust, social connections, and mutual support contribute to lower vaccine reluctance highlights the complex nature of social capital and its significance in public health strategies.

Nonetheless, this research distinguishes itself from some prior studies by concentrating on university students, a group that has not been extensively explored regarding social capital and vaccination. While previous investigations (Zintel, et al 2021; Zmerli et al. 2008; Zwolinski et al. 2012) have largely focused on social capital within community vaccination initiatives, this study underscores its importance in institutional environments like universities, where social networks and peer dynamics significantly influence behavior. This focus is particularly relevant given the high-risk characteristics of university settings, which often involve close living quarters and frequent social interactions.

4.3.3 Cultural tightness and vaccine behavior

One of the most groundbreaking contributions of this study is its focus on culturally similar societies, as highlighted by Gelfand et al. (2021). The findings validate the hypothesis that, despite economic disparities, college students in closely-knit communities like Bangladesh and Japan are more inclined to complete their COVID-19 vaccination series. This supports Gelfand et al.'s assertion that tight-knit societies are more effective at promoting collective behaviors, such as vaccination, due to their strong social norms and interconnected networks. Furthermore, this study advances the discussion by demonstrating that cultural proximity can mitigate the impact of healthcare and economic inequalities on vaccination practices. For instance, even though Japan has a considerably higher GDP and superior healthcare access compared to Bangladesh, both nations exhibited comparable levels of vaccine hesitancy when accounting for social norms and social capital.

This indicates that cultural influences may have a more profound impact on vaccination behavior than previously recognized (Glanz et al 2008; Goldstein et al 2008), especially in closely-knit societies. This observation challenges previous research (Dubé et al. 2013; Fishbein et al. 2010) that has mainly linked vaccination differences to economic factors. Studies conducted in low- and middle-income countries have frequently emphasized the importance of GDP and healthcare systems in influencing vaccination rates. However, this research reveals that cultural tightness, and social cohesion can lead to similar vaccination behaviors, even in countries with starkly different economic conditions. This finding carries significant implications for global vaccination initiatives, suggesting that strategies in tightly knit societies should focus on harnessing social norms and social capital, rather than concentrating exclusively on economic or infrastructural enhancements.

4.3.4 Comparison of studies on university students

This study's emphasis on university students introduces a distinctive aspect to the existing literature on vaccine hesitancy. Although prior research (Baval et al, 2020; Callaghan et al. 2021; Cialdini et al. 2004; Wakefield et al. 2010) has explored vaccine behaviors among young adults, there is a scarcity of studies that specifically target university students, who are particularly vulnerable to COVID-19 transmission in crowded settings such as lecture halls and dormitories. Smith et al. (2017) noted the low rates of complete vaccination among young adults, linking this trend to factors like complacency and convenience. However, this research indicates that social factors, including peer norms and social capital, may have a more substantial impact on this group than individual factors such as complacency. This finding is consistent with Brewer et al. (2017), who posited that social motivations significantly influence young adults, and it further applies this insight to the context of COVID-19 vaccination within culturally cohesive societies.

4.3.5 Methodological comparisons

This study methodologically builds upon the research conducted by Larson et al. (2015), who created instruments to assess vaccine hesitancy, and Rimal and Real (2005), who defined social norms related to health behaviors. However, it modifies these frameworks to specifically address the context of COVID-19 vaccination, integrating both perceived descriptive and injunctive norms along with various aspects of social capital. Additionally, employing multivariate logistic regression to account for covariates like age, gender, and healthcare access strengthens the findings, providing a deeper insight into the factors that contribute to vaccine reluctance.

4.4 Strengths

A significant advantage of this study lies in its cross-cultural framework, enabling a comparison between two nations with distinct economic and healthcare systems yet similar cultural tightness. By incorporating both perceived descriptive and injunctive norms, along with various dimensions of social capital, the research offers a thorough insight into the social factors that contribute to vaccine hesitancy. Additionally, the study is strengthened by a substantial sample size and rigorous statistical methods, including multivariate logistic regression, which accounted for potential confounding variables. Moreover, targeting university students—a demographic particularly vulnerable to COVID-19 transmission—adds practical significance to the findings for public health initiatives.

4.5 Limitations

This study, while robust, has several limitations. Firstly, the cross-sectional design restricts the ability to determine causal links between social norms, social capital, and vaccine hesitancy. Longitudinal research is necessary to investigate these relationships over time. Secondly, the dependence on self-reported data may lead to biases, including social desirability bias, especially regarding vaccination behaviors. Thirdly, the research was limited to a single university in each country, which may affect the applicability of the results to other areas or institutions. Lastly, although the study accounted for various covariates, unmeasured confounding factors, such as political beliefs or exposure to misinformation, could have impacted the findings.

5. Conclusions

This research emphasizes the significant influence of social norms and social capital in mitigating COVID-19 vaccine hesitancy among university students in culturally cohesive societies like Japan and Bangladesh. The results indicate that public health strategies aimed at boosting second-dose vaccination rates should focus on social influences, such as peer norms and community trust, rather than just individual factors. Campaigns that highlight the broad acceptance and endorsement of vaccination within social circles may prove particularly effective. Furthermore, enhancing social capital through community-building efforts could further promote vaccine uptake. Future studies should investigate the causal mechanisms behind these relationships and assess the relevance of these findings in different cultural and demographic settings. Overall, this research highlights the necessity of considering social and cultural factors in combating vaccine hesitancy.

Author's contribution MR originated the study and contributed to statistical analysis, and the writing of the article. IK contributed to analysis and interpretation of data and to revisions of the article. All authors read and approved of the final manuscript.

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Conflict of Interest Statement The authors state that the work was carried out in the absence of any commercial or financial relationships.

Transparency statement The lead author, Mosiur Rahman, affirms that this manuscript is an honest, accurate, and transparent account of the study being reported, that no important aspects of the study have been omitted, and that any discrepancies from the study as planned (and if relevant, registered) have been explained.

Data Availability Statement The datasets used and/or analyzed during the current study available from the corresponding author on reasonable request.

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