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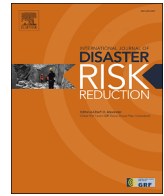
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# COVID-19 vaccination at a mosque with multilingual and religious considerations for ethnic minorities: A case study in Kanagawa, Japan

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## ABSTRACT

During a disaster, such as a pandemic, ethnic minorities tend to be left behind due to linguistic and religious differences. In the COVID-19 vaccination process, measures to include them are necessary, including the utilization of their resources and networks. The functions and challenges of such measures should be explored in real-world cases. We targeted a case in Ebina, Kanagawa, Japan, where a mosque, being a hub of foreign Muslims, was used as a vaccination site. This was the first, and the only, case in Japan with the involvement of the local government. We aimed to detail (1) the linguistic and religious responses at the mosque, (2) the perceptions of vaccine recipients regarding linguistic and religious issues and considerations, and (3) the problems that arose when using the mosque. We conducted an e-mail survey of the local government and a field survey—field observations and interviews with relevant stakeholders (e.g., mosque managers and female vaccinees). The surveys found various linguistic (e.g., interpretation by mosque-related volunteers) and religious (i.e., separating vaccination spaces based on gender) considerations provided at the mosque, which the vaccinees favorably accepted. The measure likely promoted vaccination by increasing the intention to vaccinate and closing the intention-behavior gap. If some identified problems (e.g., complaints from the Japanese) are mitigated, the function of the mosque as a vaccination site would be further enhanced. The results also support the significant potential of mosques in Muslim-minority societies to approach ethnic minorities in disasters, including pandemics.

## 1. Introduction

During disasters, ethnic minorities are disproportionately affected by language and religious differences [1,2]. The pandemic of coronavirus diseases 2019 (COVID-19) has followed a similar trend. Disproportionate COVID-19 rates and mortality among minority ethnic groups have been reported, for example, in the USA and UK [3]. This likely resulted from a complex interaction of cultural and language barriers to accessing care, socio-economic health determinants, and/or a higher prevalence of underlying medical comorbidities, often leading to severity of infection [3].

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Ethnic minorities are also likely to be left out of the vaccination process, which is one of the preventive measures against COVID-19. In terms of language, they may not be able to get vaccinated because of language barriers in the country of vaccination. For example, in Japan, a vaccination voucher distributed by the local government is necessary to make a vaccine appointment; however, the voucher is primarily written in Japanese. Some foreigners who are unfamiliar with the Japanese language cannot understand what is written on the voucher and make appointments [4]. A survey of the second vaccination rate of foreign nationals as of September 2021 in 25 municipalities in a prefecture showed that the vaccination rate of foreigners was lower than that of the entire population in all municipalities [5]. Another well-known obstacle is religion. Whether a vaccine is halal may affect the motivation to vaccinate [6–8]. There is a need for responses that reduce these language and religious barriers and do not leave ethnic minorities behind [9,10].

Several attempts have been made in Japan to remove these barriers and include ethnic minority groups. In terms of language support, for example, in October 2021, the Foreign Residents Support Center in Tokyo of Japan's Immigration Service Agency began offering telephone assistance in 18 languages (e.g., English, Chinese, Korean, Portuguese, and Spanish) for vaccine appointments [11]. Some hospitals and clinics have provided interpretations of medical interviews before vaccination using tablet terminals connected to remote interpreters [4]. Besides these attempts, launching tailored and targeted campaigns and working with ethnic minority groups to produce appropriate communication enabling increased vaccine uptake are emphasized [12,13].

A case example in Japan that utilized the resources and networks of ethnic minority groups is vaccination at a mosque<sup>1</sup> [14,15]. Ebina Mosque (or Ebina Masjid<sup>2</sup>) in Ebina City, Kanagawa Prefecture, became the vaccination site mainly for mosque users of foreign nationalities, from the end of July 2021 to the latter half of October 2021. This effort, using the mosque as a vaccination site, is the first and, as of December 2021, the only case in Japan in which a local government has collaborated with a mosque. As of 2018, an estimated 157,000 foreign Muslims lived in Japan [16].<sup>3</sup> This number is overwhelmingly small compared to the entire population (including foreigners) of approximately 130 million. Owing to language and religious differences, they are likely to be left behind in vaccination.

Mosques are familiar facilities for regular daily prayers and special prayers during Ramadan [17–20]. The mosque administrators are often foreign nationals. Efforts to use the mosque, which has its own unique resources and networks, as a vaccination site may have contributed to ensuring that foreign Muslims, who are minorities, are not left behind in the COVID-19 crisis.

The role of religious organizations and institutions as community-based organizations has been highlighted in disaster risk reduction [21–24]. The response and recovery efforts of mosques during disasters have been explored mainly in Muslim-majority societies, e.g., Afghanistan and Bangladesh [25], Indonesia [26], Pakistan [27,28], and India [29]. Meanwhile, roles in Muslim-minority societies have also recently begun to be known. For example, in Japan, mosques are known to have played a role in not only supporting the Japanese people [30,31] but also the minorities of foreign nationals. In the 1995 Kobe earthquake, the Kobe Muslim Mosque became a shelter for Muslim survivors for several months [32,33]. During the 2016 Kumamoto earthquake, the Kumamoto Islamic Center (Kumamoto Masjid) delivered food and foreign language information to foreign survivors [34]. During the COVID-19 pandemic, some mosques in Japan responded appropriately to the needs of foreign religious minorities, translating and disseminating information to foreign Muslims and providing religious meals to them [35].

Vaccination at the Ebina Mosque was reported only by Kotani et al. [36], with a brief description of how it started and what happened on the day of vaccination. However, it does not describe in detail the linguistic and religious considerations that the mosque made toward foreign religious minorities, how vaccine recipients perceived linguistic and religious issues as well as considerations at the mosque, and the problems arising from the use of the mosque as a vaccination site. By revealing these, we explore the advantages of using mosques as vaccination sites and provide implications for more effective coordination and operation when third and subsequent vaccinations are required. Moreover, the above findings on COVID-19 vaccination as well as case studies on natural hazard-related disasters (e.g., earthquakes and tsunamis) strongly suggest that mosques in Muslim-minority societies have the potential to approach minority groups in future disasters (including other pandemics and natural hazard-related disasters).

The aim of this study was threefold: (1) to detail the linguistic and religious responses at the Ebina Mosque outlined by Kotani et al. [36]; (2) to identify the vaccinees' perceptions of linguistic and religious issues and considerations, and their motivation to be vaccinated at the mosque; and (3) to determine the problems caused by using mosques as a vaccination site. During the vaccination period, we obtained information from a questionnaire (sent to a local government official) and a field survey at the mosque (i.e., field observations and interview surveys with mosque managers, a city office worker, a doctor, a nurse, and vaccine recipients).

## 2. Target mosque and methods

### 2.1. Ebina Mosque in Kanagawa Prefecture

The Ebina Mosque is located in Ebina City, Kanagawa Prefecture, Japan (Fig. 1). It is one of approximately 100 mosques in Japan as of 2017 [18]. It is a four-story building constructed in 1998, with spaces for worship on the first three floors. It is managed and operated by a representative from Sri Lanka, deputy representative from Pakistan, and two *imams* (or religious leaders, one from Sri

<sup>1</sup> The history of mosque construction in Japan begins with the Kobe Muslim Mosque in 1935 [17]. With the economic boom after the 1980s, there was a massive influx of Muslims as foreign workers. Subsequently, an increasing number of mosques have been built since the 1990s. There existed 80 mosques in 2014 [17], which increased to 96 in 2017, and if those under construction are included, the number reaches 100 [18].

<sup>2</sup> *Masjid* means a mosque in Arabic.

<sup>3</sup> A large proportion of the Muslims in Japan are thought to have foreign nationalities, with prior studies estimating that the foreigners accounted for 79% of all Muslims in 2018 [16]. The top countries of origin are mainly in Southeast Asia and South Asia, such as Indonesia, Pakistan, the Philippines, Bangladesh, Malaysia, Turkey, and Iran as of 2018 [16].

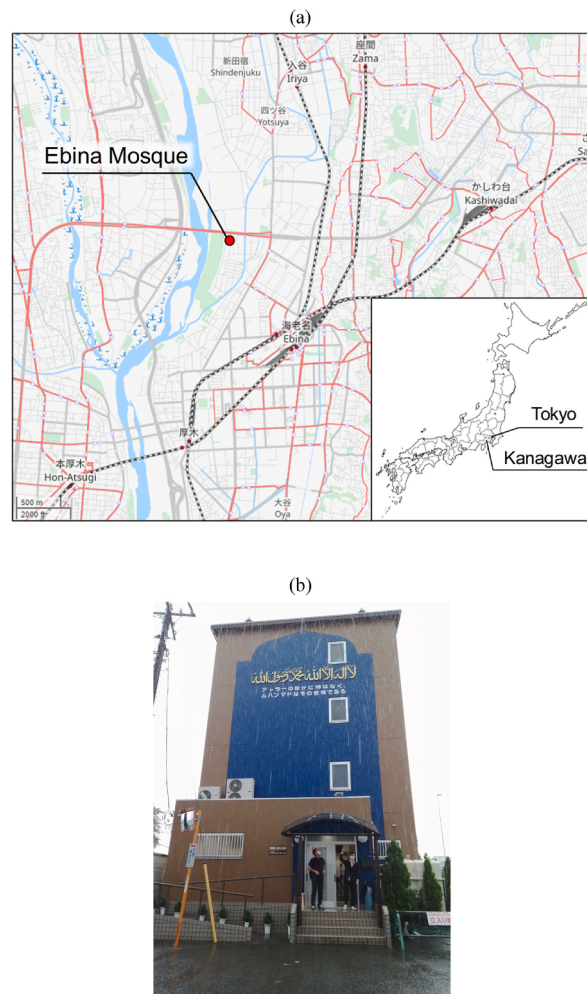


Fig. 1. (a) Location © OpenStreetMap contributors; (b) The exterior of Ebina Mosque in Kanagawa Prefecture, Japan.

Lanka and the other from Pakistan). These two imams reside on the fourth floor. It is also one of the 19 mosques managed by a religious corporation (i.e., Darussalam) [18].

The mosque is a place of activity for Muslims living in Ebina City and its neighboring municipalities. Even during the COVID-19 pandemic, 10 to 50 Muslims gather for regular prayers five times a day on weekdays; 300 to 400 gather for mass prayers on Fridays. Before the pandemic, approximately 600 people gathered for Friday prayers, and approximately 200 people held a dinner party after Saturday prayers. The nationalities of the worshippers are diverse, mainly Sri Lankan, but also Pakistani, Bangladeshi, Indian, Fijian, etc. The mosque is primarily used by men, except for special events held during Ramadan.

Vaccination at the Ebina Mosque started on July 31, 2021 [14,15,36,37]. The Ebina City Office (i.e., local government/authority of Ebina City) had three group vaccination sites (i.e., two gymnasiums and one convention center).<sup>4</sup> However, from late June 2021, the city office planned to use the mosque, where foreign nationals gathered regularly, as a vaccination site. The city office intended to combat the hindrance in receiving vaccination due to language barriers and thereby increase the rate of vaccination in the region. After lobbying the mosque, the city office executed the plan,<sup>5</sup> and vaccinations were conducted every Saturday. Those living in Ebina were the first to be vaccinated, but the target population was extended to those living in neighboring municipalities. Most recipients were Muslims of foreign nationalities, but a few Japanese (i.e., spouses and children of foreign Muslims) and people of other religions with connections to the mosque were also included. In general, to receive group vaccinations, people must make appointments through the city's booking website. In contrast, for vaccination at the mosque, mosque managers accepted reservations by phone or

<sup>4</sup> In Japan, people have three main options for vaccination: (1) individual vaccination (at local hospitals or clinics), (2) group vaccination (at local gymnasiums or convention centers set up by local governments), and (3) workplace vaccination (arranged by their companies or universities). Those ineligible for workplace vaccination should make an appointment for individual or group vaccination through their local government's booking website.

<sup>5</sup> The vaccinations at Ebina Mosque started when vaccine coverage among people under 65 years old was low. In Kanagawa Prefecture, to which Ebina City belongs, the vaccination coverage as of August 01, 2021, was as follows [52]: for the population aged 65 and over, 86.0% had received the first dose and 78.5% had received the second dose, while for the population aged 12–64 years, 22.5% had received the first dose and 7.8% had received the second dose.



verbally and reported them to the city. Approximately 100 people were vaccinated weekly by doctors, nurses, and paramedics entrusted by the city office with Pfizer vaccines. A 75-square-meter room on the second and/or third floor, usually reserved for prayers, was used for vaccination. The Ebina City Office planned to provide vaccines to approximately 1200 people who regularly used the mosque by mid-December 2021 [37]. Approximately 1000 people made reservations to get vaccinated at the mosque, but some of them later went to individual medical institutions or group vaccination sites in local municipalities. Consequently, a total of approximately 750 people were vaccinated at the mosque from the end of July till October 23, 2021, ahead of schedule.

## 2.2. Vaccination process

Vaccinations held every Saturday were implemented from 2 p.m. to about 1.5 h [36]. The reception desk opened at 1:30. The residence card and certificate of each person with a reservation were checked at the desk. Once checked, people went to the designated vaccination rooms on the second or third floor, which were well-ventilated with open windows and an electric fan. They entered the rooms in order and sat waiting. When about 30 people gathered, a Japanese doctor explained the precautions in front of them in Japanese. Subsequently, doctors walked around and conducted individual medical interviews. Following which, nurses and paramedics administered vaccinations to those who had completed the medical interview (Fig. 2). After vaccination, the vaccine recipients waited 15 min for observation, after which they left. This cycle was repeated until the scheduled number of participants on the day was completed.

## 2.3. Outline of survey

The surveys targeted multiple stakeholders to collect a wide range of information. We used two primary information collection methods (Table 1).

The first method was an e-mail survey of a city office worker managing the vaccination at the mosque. The questions were mainly related to the process of vaccination at the mosque, also including the following topics: (1) language and religious considerations taken at the mosque (e.g., Who are playing roles as interpreters? Does the city office convey information about vaccines being halal? Is there any consideration for women?); and (2) problems that have arisen (e.g., Have there been any problems since the start of vaccination at the mosque? Are there any criticisms from the public regarding the use of a religious facility as a vaccination site?). The reason for including gender in religious considerations is that gender, as well as halal, is often cited as a religious issue concerning Islam during disasters [24,27]. We sent the questions on August 26, 2021, and received responses on September 8, 2021.

The second method was a field survey, consisting of observations and semi-structured interviews. On September 18, 2021 (the vaccination day), we visited the mosque. The interviews were conducted with two mosque managers (i.e., one Pakistani mosque deputy representative and one Sri Lankan imam), a city office worker (the same person who responded to the e-mail survey), one doctor, and one nurse. They were asked about the language and religious considerations and problems that arose from using the mosque as a vaccination site. Only the interview with mosque managers was audio recorded (approximately 50 min) after obtaining their permission.

The interviews also targeted vaccine recipients, especially females, assumed to be highly gender-sensitive. The interviews were conducted individually before and after vaccination. The questions included reasons for choosing to get vaccinated at the mosque and opinions on language and religious issues (e.g., Did you understand the letter from your local government about the vaccination voucher? Did you care that the vaccine was halal? Would you prefer separate vaccination spaces for men and women? Were you reluctant to enter the male-only mosque? Why did you choose to get vaccinated at the mosque?). Responses were obtained from 18 female recipients (15 of them were foreign nationals).<sup>6</sup>

The language used in the interviews depended on the respondents. English or Japanese was used for interviews with mosque managers and vaccine recipients, depending on their language preferences. Japanese was used for interviews with the city office worker, doctor, and nurse. The field survey was conducted with prior consent from the Ebina City Office, the Ebina Medical Association, and the Ebina Mosque. Interviews with the vaccine recipients were conducted with their onsite verbal consent. Field notes were taken extensively during field observations and interviews to record what was seen and heard. Observational data were also recorded in the form of videos and photos. The audio-recorded interview was subsequently summarized as text. Field notes, interview texts, and secondary data (e.g., published newspaper articles [14,15] and a city office report [37]) were cross-referenced during the analysis.

## 3. Results

### 3.1. Multilingual and religious considerations taken at the mosque

Since people of different nationalities wanted to be vaccinated, the mosque as the vaccination site provided a variety of multilingual services. For example, at the reception desk, confirmation and questions about vaccination precautions (i.e., history of anaphylaxis) were posted in a wide variety of languages: Japanese, English, Tamil, Urdu, Sinhalese, and Bengali (Fig. 3 (a)). Medical questionnaire sheets were also prepared in Japanese and English. Three or four interpreters who could speak several foreign languages were on standby. All interpreters were volunteers from among the daily worshippers, as well as mosque representatives and imams. They interpreted beside the doctors during the initial group explanations (Fig. 3 (b)) and individual medical interviews (Fig. 3 (c)). They translated Japanese into not only English but also Bengali, Tamil, Sinhala, and other languages. They also wore scrimmage vests with the name of the language each interpreter was the most proficient in. This allowed vaccinees and Japanese staff to quickly iden-

<sup>6</sup> A total of three Japanese interviewees consisted of two wives and one daughter of foreign nationals; 15 foreign interviewees consisted of seven Sri Lankan, five Pakistani, one Bangladeshi, one Tanzanian, and one Vietnamese participants.



Fig. 2. (a) Vaccination site at the 3rd floor used only for men; (b) vaccinated by a paramedic (the paramedic wore a sky blue scrimmage vest).

Table 1

Survey methods, dates, and target people.

Type of survey	Date in 2021	Target
E-mail survey	Sent on August 26 Received on September 8	Ebina City Office worker (one person)
Field survey: field observations and interviews	September 18	Mosque managers (a Pakistani deputy representative and a Sri Lankan imam) A city office worker A doctor and a nurse Vaccine recipients (18 females)

tify the most proficient language for each interpreter. In addition, vaccine recipients were given stickers (Fig. 3 (d)) with the names of the languages in which they were fluent (e.g., Japanese, English, Sinhalese, and Tamil) at the reception desk. The stickers enabled Japanese staff to quickly determine which interpreters recipients needed.

Most of the religious considerations taken at the mosque were gender-related. Specifically, measures were taken to prevent females from sharing the same space as males. Men were supposed to enter and exit the building through the mosque's main entrance, whereas women entered and exited through the emergency stairs at the back of the building. In the first cycle of vaccination, the vaccination rooms were divided between women and men (about 30 women on the second floor and 30 men on the third floor) (Fig. 2 (a) and Fig. 4 (a)). In the second cycle, as there were only approximately five female recipients, the second floor was partitioned using a curtain (Fig. 4 (b)). Women were vaccinated in the space enclosed by the curtain (Fig. 4 (c)), and men were vaccinated in the space outside the curtain, with only female nurses vaccinating female recipients (Fig. 4 (c)). Meanwhile, according to the city office worker and mosque managers, they did not make conscious efforts to explain that the vaccines were halal.

### 3.2. Voices of vaccine recipients

How did vaccine recipients perceive issues and considerations regarding language? We asked, "Did you understand the letter from your local government about the vaccine voucher?" for the vaccine recipients.<sup>7</sup> The four respondents with foreign nationalities expressed opinions such as "I did not understand the letter, but I could understand most of it with Google Translate," and "I did not understand how to make an appointment." This suggests that there were language barriers to making vaccine appointments. We also asked, "Why did you choose to get vaccinated at the mosque?" About ten respondents stated, for example, "Because I could not get an appointment at my local municipality" and "I thought that I could get vaccinated earlier at the mosque." This indicates that they could make appointments immediately through mosque managers faced with the difficulty of making appointments in their local municipalities due to the shortage of vaccines. One Sri Lankan woman said, "I wanted to get the shot at the mosque because I knew the location and because it would solve the language problem"; another Bangladeshi woman said, "I was willing to get vaccinated at the mosque where I knew the location and where there were interpreters." Barriers existed to getting vaccinated, in the form of partial incomprehensibility of the contents of the vaccination voucher and the difficulty of making appointments at local municipalities. Such barriers were likely mitigated as vaccine recipients could easily make appointments through mosque managers and receive linguistic support at the familiar site.

Regarding religious issues, most of the female vaccinees in our survey were concerned about gender, while few were concerned about halal issues. We asked, "Would you prefer to separate vaccination spaces for men and women?" Three interviewees mentioned, "I did not mind," but nine said, "I would prefer a separate space" and "I would want a separation of men and women, because I have to show my skin." We also asked, "Were you reluctant to enter the men-only mosque?" The majority of them answered, "no, not really," and three said, for example, "It is not a problem because the inside of the building is separated for men and women." Differentiating

<sup>7</sup> All the female interviewees had received information about the vaccination at the mosque from their husbands or fathers who were mosque users.



Fig. 3. (a) Multilingual questions about vaccination precautions posted at the reception; (b) interpretation in front of all recipients; (c) interpretation beside a doctor (the interpreter wore a blue scrimmage vest, and the doctor wore the red); (d) multilingual stickers to be put on vaccine recipients.

spaces and flow lines according to gender was favorably received by the respondents. When asked if they knew that the vaccine was halal, most of the respondents answered, “Yes, I knew” or “I did not care.” Some said, “I wished to be vaccinated anyhow,” and “Getting the vaccine was most important.” We did not confirm the issue of halal as a barrier to vaccination in these women.

### 3.3. Problems

According to the interviewees (i.e., the city office worker, mosque managers, doctor, and nurse), vaccination at the mosque mostly went well, but some problems were recognized. First, people without an appointment came to the mosque for vaccination. According to the nurse, some people pretending to be unaware of non-appointments entered the vaccination room. They were denied vaccinations, however, and were told to move to another group vaccination site. Mosque managers warned these people.

Second, there were complaints and criticisms from Japanese people. According to the city office worker, some Japanese residents were scheduled for vaccinations in December 2021 due to the shortage of vaccines, and some asked, “Why can foreigners be vaccinated earlier than Japanese citizens?” to the city office. In addition, the city office struggled to deal with people who had no connections to the mosque. On the day of our field survey, two Japanese people living in another municipality with no connection to the mosque visited the mosque and asked the city office worker if they could be vaccinated at the mosque. Since some of the foreign nationals vaccinated at the mosque could speak Japanese, the Japanese people argued, “Why can't we get vaccinated at the mosque while non-Ebina City residents who can speak Japanese can?” As mentioned in [Subsection 2.1](#), vaccination at the mosque started with the aim of including people who could not be vaccinated due to language barriers. The argument from the Japanese people is presumably based on the idea that foreign nationals who can speak Japanese should make an appointment through a general booking website and go to a group vaccination site rather than Ebina Mosque. According to the doctor interviewed, to reduce the criticism of foreign nationals getting vaccinated before Japanese people, opinions from several doctors were posted on the Ebina City Office website [38]. The website stated, “A virus can spread regardless of country, race, religion, and income.”





Fig. 4. (a) 2nd floor used for only females; (b) curtain to separate males and females; (c) female recipients vaccinated by female nurses in a separate space (the nurses wore purple scrimmage vests).

#### 4. Discussion and conclusions

Ethnic minority groups tend to be left behind in disasters, including pandemics, owing to language and religious differences [1–3], and measures to include them in vaccination are required during the COVID-19 pandemic [9,10,12]. In this study, as a measure to utilize the resources and networks of ethnic minority groups, we focused on the efforts of the local government to use the Ebina Mosque, which is mainly used by foreign Muslims, as a vaccination site. The following topics were investigated: (1) the kind of linguistic and religious considerations given at the mosque; (2) the perception of linguistic and religious issues and considerations at the mosque by the vaccine recipients, and their motivation for getting vaccinated at the mosque; and (3) problems arising from the use of the mosque as vaccination site. For the investigation, we conducted an e-mail survey to the Ebina City Office and a field survey at the vaccination site, including observations and interviews with relevant stakeholders (i.e., mosque managers, the city office worker, the doctors, and the nurse). The interviews also targeted female recipients, who were assumed to be highly influenced by gender—a critical religious issue.

##### 4.1. Mosque as a disaster risk reduction stakeholder

As shown in Subsection 3.1, various considerations were provided for multiple languages at the vaccination site. Specifically, there were multilingual notices (Fig. 3 (a)), Japanese/English medical questionnaire sheets, interpretations provided by volunteers of mosque users (Figs. 3 (b) and (c)), and stickers to identify the preferred language of vaccine recipients (Fig. 3 (d)). Linguistic support in minor languages such as Tamil, Urdu, Sinhalese, and Bengali, which were rarely covered by governmental sectors, were considered. Subsection 3.2 demonstrated that the vaccine recipients felt that they had the advantage of receiving linguistic support at the site.

As for religious considerations, Subsection 3.1 indicated that the vaccination site divided flow lines and vaccination spaces according to gender (Fig. 4). As shown in Subsection 3.2, most female recipients perceived these measures favorably. Halal issues have been pointed out in previous studies [6–8], but recipients in this study were found to be unconcerned with halal issues, and the issue of halal did not significantly affect their motivation for vaccination.

The significant barriers to making a vaccine appointment were, as shown in [Subsection 3.2](#), the insufficient understanding of vaccination vouchers due to low proficiency in the Japanese language as well as high demand in municipality booking websites. The inability to understand vouchers because of low language proficiency is consistent with what was previously reported [4,5,39]. Meanwhile, it was easy to make an appointment with familiar managers at the Ebina Mosque.

To promote vaccination, greater motivation to get vaccinated and closing the intention-behavior gap (i.e., the gap between positive intent and corresponding action) are essential ([Fig. 5](#)) [10,40]. As shown in [Fig. 5](#), to increase motivation, there is a need for approaches such as tailoring messages to communities, using local phrases and cultural references, and leveraging existing networks. The fact that foreign Muslims favorably accepted linguistic and religious considerations at the mosque implies that these approaches worked, probably increasing their motivation for vaccination. Promising approaches to close the intention-behavior gap include, for example, using pop-up and non-clinical venues to widen access and providing access to interpreters and translated resources in primary care. The familiar mosque as a vaccination site with linguistic considerations is likely equivalent to these approaches. Therefore, the mosque as a vaccination site with linguistic and religious considerations may have positively enhanced the intention to vaccinate and reduced the intention-behavior gap. In other words, it likely encouraged foreign Muslims, an ethnic minority group, to be vaccinated and not left behind during the vaccination process.

These findings reinforce the claim that mosques in Muslim-minority societies can successfully approach ethnic minority groups during disasters. In natural hazard-related disasters (e.g., earthquakes and tsunamis) as well as the COVID-19 pandemic, there are generally special needs for foreign nationals in terms of language and/or religion. For example, foreigners without Japanese proficiency tend to experience difficulties in obtaining information related to disaster after disaster occurrence because they cannot understand the Japanese language [41]. Foreigners practicing certain religions are also more likely to experience difficulties in obtaining suitable emergency foods from evacuation shelters, as religious food constraints are rarely considered (e.g., halal) [24,42,43]. Such needs are not easily met by government sectors alone [24]. Meanwhile, mosques in Japan have not only reached out to the majority of Japanese victims [30,31] but also to foreign nationals as minorities. During the 1995 Kobe earthquake, the Kobe Muslim Mosque (which was used as a shelter for foreign Muslims) provided halal food [32]. During the 2016 Kumamoto earthquake, the Kumamoto Islamic Center (Kumamoto Masjid) delivered food and foreign language assistance to foreign survivors [34]. Similarly, some mosques translated and disseminated COVID-19-related information to affected foreign Muslims and provided religious meals during the early phase of the COVID-19 pandemic [35]. The findings of this case study on the use of a mosque as a vaccination site further strengthen our knowledge of the mosques' ability to approach ethnic minority groups with linguistic and religious considerations in Muslim-minority societies during disasters. To prepare for natural hazard-related disasters, a growing number of local governments in Japan have formed disaster relief agreements with religious institutions and organizations of major religions, that is, Buddhism and Shintoism [44]. Our findings will also help local governments comprehend minority religious organizations and groups (i.e., mosques and possibly other ethnic minority groups<sup>8</sup>) and may facilitate their collaboration at times of disaster.<sup>9</sup>

Multi-stakeholder partnerships are in international demand to achieve sustainable development goals (SDGs) [45]. While our study focused on the Muslim minority in Japan, ethnic minority groups depend on country and region. Our findings can be applied to other countries or regions if we adjust them to the local contexts.

#### 4.2. Issues to be resolved to further function as a critical stakeholder

While we found that the mosque as a vaccination site probably ensured that ethnic minority groups were not excluded, potential areas for improvement were revealed as well. First, as mentioned in [Subsection 3.3](#), people who did not have reservations suddenly appeared at the site. Compared to the case of general group vaccination sites, it is more important to make announcements in advance and carefully check the list of people with reservations at the reception desk.

The second issue pertains to complaints and criticism from Japanese residents. When vaccinations at the mosque started, there was a shortage of vaccines, and many municipalities (including Ebina City) could not promptly accept vaccine appointments. Resource scarcity drives intergroup conflict because it creates the perception that external groups threaten one's access to limited resources, with discrimination often serving as justification for withholding limited resources from others [46,47]. Such intergroup threats can be linked to negative attitudes toward minorities (e.g., Islamophobia) and xenophobia [46], which can negatively impact the mental health of recipients [48] and reduce their motivation to get vaccinated [49]. We must ensure that complaints and criticism among Japanese residents do not amount to xenophobia.

Several measures can be taken to mitigate xenophobia. For example, public authorities need to inform the public that they ensure ethnic minorities' access to vaccination. As [Crawshaw et al. \[10\]](#) suggest, ensuring access is not the same as prioritizing access. In the case of Ebina City, as indicated in [Subsection 3.3](#), the medical association has already issued a statement and implemented similar efforts, but stronger communication is warranted. In addition, the selection of those eligible for vaccination at the mosque relied heavily on mosque managers. Enhanced clarity and transparency of selection can help reduce people's misunderstanding around prioritization of minority groups. The situation in which those who wish to be vaccinated cannot make appointments needs to be addressed as well, to alleviate people's perceptions of resource scarcity.

<sup>8</sup> Examples of ethnic minority groups in Japan include Brazilian Protestant Churches, Thai Theravada Buddhist Temples, and Sri Lankan Buddhist Temples [53].

<sup>9</sup> It should be noted that such practical relationship-building requires considering the differences between each mosque. Unlike other countries, Japan does not have a central institution that controls most of the mosques in the country. Thus, in Japan, the management structure of mosques (e.g., in recent years, some Japanese Muslims have been involved in the management of mosques) and their connections with local residents, governmental organizations, and other mosques vary depending on the mosque [18]. Future work should further accumulate the findings of the case studies of each mosque during natural hazard-related disasters and the COVID-19 pandemic, to make detailed suggestions for collaborations based on the mosque's characteristics.

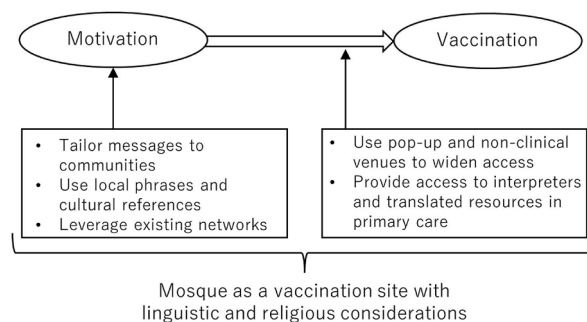


Fig. 5. Functions of the mosque as a vaccination site for vaccine rollout (based on Brewer et al. [40] and Crawshaw et al. [10]).

Contrary to expectations, altruistic behavior is known to dominate immediately after a disaster happens [50,51]. When local authorities collaborate with mosques during disasters in the future, xenophobia is unlikely to be a severe problem. Nevertheless, a careful consideration of the issues mentioned above will further strengthen the role of mosques in disaster risk reduction.

#### 4.3. Limitations and future research

This study has several limitations. First, the opinions presented in Subsection 3.2 were from 18 female recipients on the day of the survey during the vaccination period. Although we collected opinions from recipients of various nationalities, the number was limited. The circumstances of vaccine recipients are diverse, and their opinions may differ. Thus, our results in Subsection 3.2 may not represent the voices of all the recipients but rather may be interpreted as only those of some of them. In the future, it is necessary to collect opinions of vaccine recipients more widely to increase the validity of the results. Moreover, unvaccinated people were not surveyed; future research should elucidate the specific reasons for and barriers to non-vaccination. Such opinions will allow us to identify people who are more likely to be vaccinated at the mosque and demonstrate the value of this effort further.

Second, we limited our focus to considerations at the mosque, the vaccinees' evaluation of them, and the issues in need of resolution. It is also necessary to clarify the factors that enabled the Ebina Mosque to cooperate with the local government. For example, the current mayor of Ebina City hails from the area where the mosque is located and has experience in mediating between local Muslims and Japanese residents, in building the mosque. It would be interesting to determine how much the above fact and other factors contributed to implementing vaccination at the mosque.

Third, this study exclusively focused on the first and only case in Japan, where a mosque collaborated with the local government to provide vaccinations. Meanwhile, another mosque, Osaka Islamic Center, was used as a vaccination site with the cooperation of a private clinic. A comparative analysis will reveal the advantages and disadvantages of collaborating with the local governments.

Despite the above limitations, our study suggests that the Ebina Mosque, which served as the vaccination site, was likely to encourage vaccination of ethnic minority groups by implementing linguistic and religious considerations. The role of mosques will be further heightened, as related issues are resolved. The good practices and lessons from this study must be shared domestically and internationally [12] to realize a society where no one is left behind [45].

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#### 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.

#### Data availability

Data will be made available on request.

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