
COVID-19 Vaccine Literacy, Confidence, and Vaccination Coverage in Two Geographically Isolated and Disadvantaged Areas (GIDAs) in Floridablanca, Pampanga: A Descriptive Cross-Sectional Study

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Abstract

Introduction Effective vaccination campaigns have been instrumental in reducing COVID-19 transmission and severe disease outcomes. Despite efforts to improve vaccine accessibility, vaccine literacy and confidence remain important determinants of vaccine uptake. Rural and geographically isolated communities often experience barriers to healthcare access that may affect vaccination coverage. This study aimed to assess COVID-19 vaccination coverage, vaccine literacy, and vaccine confidence among residents of selected Geographically Isolated and Disadvantaged Areas (GIDAs) in Floridablanca, Pampanga.

Methods A descriptive cross-sectional study was conducted among 211 residents of Barangays San Ramon and Nabuclod. Data were collected through face-to-face interviews using a translated and pretested questionnaire on vaccine literacy and vaccine confidence. Vaccination records obtained from the Rural Health Unit were reviewed to determine COVID-19 vaccination coverage. Descriptive statistics, including frequencies and percentages, were used to summarize the data.

Results The majority of respondents demonstrated an average level of vaccine literacy (75.8%), while 17.5% exhibited high vaccine literacy. Most respondents also demonstrated positive to very positive vaccine confidence (71.6%). Among the eligible population, 80.5% had completed the primary COVID-19 vaccination series, whereas 19.5% remained unvaccinated. Among those who completed the primary series, only 24.2% had received at least one booster dose.

Conclusion Residents of the selected GIDAs generally demonstrated average vaccine literacy, positive vaccine confidence, and relatively high primary COVID-19 vaccination coverage. However, low booster uptake and the persistence of unvaccinated individuals highlight the need for sustained health education, improved healthcare accessibility, and targeted community-based interventions. These findings underscore the importance of strengthening vaccine literacy and confidence to support future immunization programs in geographically isolated communities.

Key words: COVID-19, geographically isolated and disadvantaged areas, rural health, vaccination coverage, vaccine confidence, vaccine literacy

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The coronavirus disease 2019 (COVID-19) pandemic, caused by the novel coronavirus SARS-CoV-2, posed unprecedented challenges to healthcare systems worldwide. Although vaccination remains one of the most effective strategies for controlling the spread of COVID-19, vaccine hesitancy continues to hinder public health efforts.¹ A study among Filipino emerging adults reported that 61% expressed hesitancy toward receiving a COVID-19 vaccine.² Studies in other settings have also shown that predictors of vaccine hesitancy may be more prevalent in rural areas than in urban communities, potentially resulting in lower vaccine uptake in geographically isolated populations.³ Despite the well-documented benefits of vaccination in preventing infectious diseases, Geographically Isolated and Disadvantaged Areas (GIDAs) in the Philippines continue to experience suboptimal vaccination coverage. However, studies examining the factors that influence vaccine literacy, confidence, and uptake in these communities remain limited. Consequently, understanding COVID-19 vaccine literacy and hesitancy in GIDAs remains a critical public health concern that warrants further investigation.

Although the acute phase of the COVID-19 pandemic has passed, understanding the factors that influence vaccine literacy, confidence, and uptake remains highly relevant. Vaccine confidence has emerged as a critical determinant of acceptance not only of COVID-19 vaccines but also of routine immunizations and future outbreak-response vaccines. Geographically Isolated and Disadvantaged Areas (GIDAs) continue to face unique barriers to healthcare access, health information dissemination, and preventive service delivery. Examining vaccine literacy and confidence in these communities provides valuable insights for strengthening health system resilience, improving adult immunization programs, addressing misinformation, and enhancing preparedness for future infectious disease emergencies.

Effective vaccination campaigns have played a vital role in reducing COVID-19-related morbidity and mortality, while also mitigating disease transmission.¹ This is particularly significant in disadvantaged and hard-to-reach communities in the Philippines. Floridablanca, a first-class municipality in Pampanga, is located along the Zambales mountain ranges and is composed of 33 barangays, three of which are classified as GIDAs. As of 2020, the municipality had a population of 135,542 residents,⁴ including

communities situated in remote and underserved areas. In response to the pandemic, the Municipal Health Office of Floridablanca implemented phased vaccination campaigns, beginning with priority groups and eventually extending to the general population.⁵ In this context, assessing vaccine literacy and vaccine confidence is essential in evaluating the effectiveness and acceptance of these public health initiatives.

By determining the sociodemographic profile, vaccination coverage, vaccine literacy, and vaccine confidence among residents of selected barangays, this study aims to provide valuable insights for healthcare professionals, epidemiologists, and policymakers in designing future vaccination programs tailored to the unique needs of GIDAs.

Methods

After obtaining Ethics Review Committee approval (ERC Code: 1716/C/2024/083), a descriptive cross-sectional research design was conducted to look into the sociodemographic characteristics, vaccine literacy and confidence.

This study was conducted in Barangays Nabuclod and San Ramon in Floridablanca, Pampanga, categorized as GIDAs by the Department of Health (DOH) based on DOH-Administrative Order No. 2020-0023.⁷ GIDAs are physically and socioeconomically marginalized communities with limited access to healthcare and basic services due to geographic isolation, transportation barriers, poverty, and vulnerability to crises and armed conflict.⁷

Household members aged 18 years and above, permanently residing for more than a year in any of these barangays were invited to participate in the interview-guided survey. The minimum computed sample size was 169 based on an anticipated vaccination rate of 86% and 5% margin error.⁶ A total of 211 individuals participated in the survey.

The primary data collection instrument was a three-part questionnaire adapted from a previously validated instrument.⁶ The first section collected respondents' sociodemographic characteristics. The second section assessed vaccine literacy using an 8-item questionnaire on COVID-19 vaccines and vaccination, with response options of "Correct," "Incorrect," or "I do not know." Scores ranging from 21 to 24 were classified as high vaccine literacy, 15 to 20 as average vaccine literacy, and ≤ 14 as low or no vaccine literacy.

The third section assessed vaccine confidence using a 12-item, 5-point Likert scale with response options ranging from “Strongly Agree” to “Strongly Disagree.” Total scores of 52 to 60 were classified as very positive, 42 to 51 as positive, 32 to 41 as neutral, 22 to 31 as unfavorable, and ≤ 21 as very unfavorable attitudes toward vaccination. To determine COVID-19 vaccination coverage, data were extracted from Rural Health Unit (RHU) records using a standardized abstraction form. The abstraction form captured information on the number of vaccine doses administered, categorized by vaccine brand and type of dose (primary series and booster doses). Summary data on the number of partially vaccinated individuals, fully vaccinated individuals, and those who received one or more booster doses were also obtained.

With permission from the original authors, the questionnaire was translated from English into Kapampangan and subsequently back-translated into English by bilingual individuals fluent in both languages. Discrepancies between the original and back-translated versions were reviewed and resolved by the research team.

A cognitive interview using the think-aloud technique was conducted among 10 residents of Sitio Camachili, Nabuclod to assess comprehension and clarity of the questionnaire items. Feedback obtained was used to refine selected items.

The translated questionnaire underwent expert review by a panel consisting of Rural Health Unit personnel and faculty members from the Department of Preventive and Community Medicine. No major modifications were required following the review.

Pretesting was conducted among 30 residents of Sitio Camachili, Nabuclod. The questionnaire demonstrated acceptable internal consistency reliability, with a Cronbach’s alpha of 0.71.

The data was collected face to face through a house-to-house approach accompanied by a Barangay Health Worker (BHW).

The data were entered and analyzed using Microsoft Excel software. Descriptive statistics, such as counts and proportions were utilized to summarize the data. Frequency tables were generated to show distribution of the respondents according to vaccine literacy, confidence, and coverage.

Results

A total of 211 respondents participated in the study, of whom 74.9% were female and 25.1% were male.

Nearly half (49.3%) were aged 18–34 years, while 15.2% were aged 60 years and older. The majority were married (58.8%). Approximately one-third (31.8%) had attained some primary education, whereas only 8.5% had completed primary education. Furthermore, only 10.4% had education beyond the secondary level. More than half of the respondents (51.2%) belonged to households comprising four to six members (Table 1). Responses to the vaccine literacy questionnaire indicated that most participants correctly answered several items related to COVID-19 vaccines and vaccination. Specifically, 65.9% correctly identified the statement “Vaccines can harm the immune system” as incorrect. Likewise, 86.7% correctly recognized that COVID-19 vaccines help the body develop immunity against the virus without causing the disease. In addition, 61.6% were aware that some COVID-19 vaccines require more than one dose (Table 2).

In some items, the combined number of respondents who expressed uncertainty and who answered incorrectly was nearly the same as the number of respondents who responded correctly. For instance, although more than half (52.6%) of the participants understood that immunity does not develop immediately post-vaccination and that there is a window of vulnerability, 47.4% were either unsure or thought it wrong. Similarly, 46.5% were either uncertain or thought it incorrect that there is no full protection if it is just less than two weeks from a shot or if there is a need for a second shot. In addition, 38.4% were uncertain about the single-dose requirement and the need to wait for two weeks before being considered fully vaccinated with Janssen COVID-19 vaccine (Johnson & Johnson). For Pfizer-BioNTech and Moderna COVID-19 vaccines, 48.3% were unsure of the two-dose requirement of these vaccines, and the need to wait for two weeks after the second shot before being considered fully vaccinated (Table 2).

Majority of the respondents (75.8%), demonstrated an average score (15 to 20) on literacy concerning COVID-19 vaccines and vaccinations. This was followed by those with a high score (21 to 24) (17.5%) and those with a low score (≤ 14) (6.6%) (Table 3).

A large proportion of respondents (89.1%) agreed that maintaining high vaccination coverage is essential to prevent the emergence of new COVID-19 cases. Additionally, 84.4% maintained that educating parents on the importance of vaccines is a crucial strategy for improving vaccination coverage, and an even higher

Table 1. Sociodemographic profile of respondents.

Characteristics	Frequency (%) n= 211
Gender	
Male	53 (25.1)
Female	158 (74.9)
Age groups (in years)	
18 - 24	42 (19.9)
25 - 29	31 (14.7)
30 - 34	31 (14.7)
35 - 39	11 (5.2)
40 - 44	17 (8.1)
45 - 49	20 (9.5)
50 - 54	14 (6.6)
55 - 59	10 (4.7)
60 and above	32 (15.2)
Unrecalled	3 (1.4)
Civil Status	
Single	72 (34.1)
Married	124 (58.8)
Separated	4 (1.9)
Widow/er	11 (5.2)
Highest Educational Attainment	
No Schooling	37 (17.5)
Some Primary	67 (31.8)
Completed Primary	18 (8.5)
Some Secondary	39 (18.5)
Completed Secondary	28 (13.3)
More Than Secondary	22 (10.4)
No. of Household Members	
1 - 3	55 (26.1)
4 - 6	108 (51.2)
7 - 9	37 (17.5)
10 - 12	11 (5.2)

Table 2. Vaccine literacy towards COVID-19 vaccination per question item.

Items	Frequency (%)		
	Correct	Don't Know	Incorrect
Vaccines are 100% effective	178 (84.4)	22 (10.4)	11 (5.2)
Vaccines can harm the immune system	41 (19.4)	31 (14.7)	139 (65.9)
COVID-19 vaccines help our bodies develop immunity to the virus that causes COVID-19 without us having to get the illness	183 (86.7)	13 (6.2)	15 (7.1)
It is possible that a person could be infected with the virus that causes COVID-19 just before or just after vaccination and then get sick because the vaccine did not have enough time to provide protection	111 (52.6)	60 (28.4)	40 (19.0)
Some COVID-19 vaccines require more than one shot	130 (61.6)	45 (21.3)	36 (17.1)
Pfizer-BioNTech and Moderna COVID-19 vaccines require two shots and you are considered fully vaccinated two weeks after your second shot.	92 (43.6)	102 (48.3)	17 (8.1)
Janssen COVID-19 vaccine only requires one shot and you are considered fully vaccinated two weeks after your shot	118 (55.9)	81 (38.4)	12 (5.7)
If it has been less than two weeks since your shot, or if you still need to get your second shot, you are NOT fully protected	113 (53.6)	55 (26.1)	43 (20.4)

Table 3. Overall vaccine literacy towards COVID-19 vaccination.

Level	Frequency (%) n=211
Low (≤ 14)	14 (6.6)
Average (15 - 20)	160 (75.8)
High (21 - 24)	37 (17.5)

percentage (91.5%) saw a key role for doctors in communicating vaccine importance to parents.

Conversely, there was substantial disagreement with statements that expressed vaccine hesitancy. For instance, 64.9% of respondents disagreed that COVID-19 would naturally disappear without vaccination. Moreover, 69.2% believed that it is safer to avoid vaccination despite the risk of COVID-19. On government mandates, a significant portion (72.5%) supported the right of individuals to decide on vaccination rather than government imposition, although 85.8% still expressed support for the

government's COVID-19 vaccination program. In terms of personal willingness, 71.6% of respondents reported that they would willingly get vaccinated if a COVID-19 vaccine was available.

Items reflective of uncertainty or unfavorable attitude towards vaccination were those concerning vaccine safety and trustworthiness. Specifically, 50.7% of the respondents indicated that the side effects of the vaccine have caused them to question vaccine safety. An equal proportion of respondents (50.7%) believed that there is not enough evidence to prove that immunization effectively prevents infectious diseases. Forty-six per cent (46.4%) argued that pharmaceutical companies promote vaccination for profit despite them being aware of its harmful effects. Finally, 45.9% of respondents thought that vaccines contain substances that have been proven harmful especially to children and senior citizens (Table 4).

Overall, majority had a positive attitude towards COVID-19 vaccination (55.9%), followed by those having a neutral attitude (25.6%) and those with a very positive attitude (15.6%) (Table 5).

All individuals aged 5 to >60 years old in Barangay San Ramon have completed their primary doses of COVID-19 vaccines. However, none of those in the 5 to 11-year-old age group received any booster dose. Only 2.2% (5 out of 225) among those aged 12 to 17

years have received a booster dose. Thirty-two per cent of the 18- to 59-year-olds have received at least one booster dose and 14.0% have received two booster doses. Among those aged 60 years and above, 43% have received at least one booster dose and 7.6% have received two booster doses (Table 6).

Table 4. Vaccine confidence towards COVID-19 vaccination.

Items	Frequency (%)				
	SA	A	N	D	SD
Sometimes after vaccination, the process of building immunity can cause symptoms, such as fever, which have led me to doubt vaccination as a safe method.	51 (24.2)	56 (26.5)	19 (9.0)	39 (18.5)	46 (21.8)
It is important to keep vaccination coverage of the population in order to avoid the emergence of new COVID cases.	101 (47.9)	87 (41.2)	10 (4.7)	8 (3.8)	5 (2.4)
Educating parents about vaccines is an important way to connect vaccination coverage of the population	110 (52.1)	68 (32.2)	12 (5.7)	15 (7.1)	6 (2.8)
The doctor has an important role in, educating parents about the importance of vaccination	119 (56.4)	74 (35.1)	4 (1.9)	7 (3.3)	7 (3.3)
It is not necessary to vaccinate people because coronavirus will be gone naturally.	20 (9.5)	23 (10.9)	31 (14.7)	84 (39.8)	53 (25.1)
Vaccines contain substances that have been proven harmful especially to children and senior citizens.	23 (10.9)	33 (15.6)	41 (19.4)	75 (35.5)	39 (18.5)
It is a safer choice to stay idle with the COVID-19 disease than to be vaccinated against it.	16 (7.6)	27 (12.8)	22 (10.4)	68 (32.2)	78 (37.0)
The government has no right to impose the obligation of vaccination, but everybody should be the ones who bring the decision	77 (36.5)	76 (36.0)	14 (6.6)	34 (16.1)	10 (4.7)
There is not enough evidence that immunization prevents the occurrence of infectious disease	27 (12.8)	53 (25.1)	27 (12.8)	68 (32.2)	36 (17.1)
Pharmaceutical companies promote vaccination for profit, although they are aware that it is harmful	18 (8.5)	33 (15.6)	47 (22.3)	63 (29.9)	50 (23.7)
I support the vaccination program of the government	99 (46.9)	82 (38.9)	16 (7.6)	6 (2.8)	8 (3.8)
If a coronavirus vaccine is available, I would definitely be vaccinated.	98 (46.4)	53 (25.1)	22 (10.4)	22 (10.4)	16 (7.6)

Table 5. Overall vaccine confidence towards COVID-19 vaccination.

Attitude Category	Frequency (%) n=211
Very Unfavorable Attitude (≤ 21)	1 (0.5)
Unfavorable Attitude (22 - 31)	5 (2.4)
Neutral Attitude (32 - 41)	54 (25.6)
Positive Attitude (42 - 51)	118 (55.9)
Very Positive Attitude (52 - 60)	33 (15.6)

Table 6. Administered vaccines per brand in Barangay San Ramon.

Age Group: 5 to 11 years old				
Vaccine Brand	1 st Primary	2 nd Primary	1 st Booster	2 nd Booster
Pfizer	182	182	-	-
Moderna	5	5	-	-
Total	187	187	-	-
Age Group: 12 to 17 years old				
Vaccine Brand	1 st Primary	2 nd Primary	1 st Booster	2 nd Booster
Pfizer	221	221	4	-
Moderna	4	4	1	-
Total	225	225	5	-
Age Group: 18 to 59 years old				
Vaccine Brand	1 st Primary	2 nd Primary	1 st Booster	2 nd Booster
Pfizer	317	317	129	63
Moderna	51	51	65	26
Johnson & Johnson	54	-	-	-
AstraZeneca	317	317	86	41
Sinovac	195	195	27	2
Others	11	11	-	-
Total	945	891	307	132
Age Group: 60 years old and above				
Vaccine Brand	1 st Primary	2 nd Primary	1 st Booster	2 nd Booster
Pfizer	27	27	32	5
Moderna	5	5	4	3
Johnson & Johnson	36	-	-	-
AstraZeneca	23	23	8	-
Sinovac	14	14	1	-
Total	105	69	45	8

Among the vaccinated individuals in Barangay San Ramon, 82.6% completed the primary doses (one dose for Janssen COVID 19 vaccine), two doses for the rest) with no additional booster dose, while 31.7% of them have received one or two booster doses on top of their primary doses (Table 7).

All individuals aged 12 to >60 years old in Barangay Nabuclod have completed their primary doses of COVID-19 vaccines. There is no data on the vaccination status for the 5 to 11-year-old age group. All fully vaccinated 12 to 17-year-olds have received a booster dose. Among those aged 18 to 59 years old, 14.7% have received at least one booster dose and 4.3% have received two booster doses. Among those aged 60 years and above, 22.2% have received at least one booster dose and 5.6% have received two booster doses (Table 8).

Among the vaccinated individuals in Barangay Nabuclod, 49.5% completed their primary doses (one dose for Janssen COVID 19 vaccine, two doses for the rest) with no additional booster dose, while 27.6% of them have received one or two booster doses on top of their primary doses (Table 9).

Out of 2922 eligible vaccinees in the two barangays, 2353 (80.5%) completed the primary vaccination series. Among those fully vaccinated, 569 (24.2%) received at least one booster dose of the applicable vaccine brands; 569 (19.5%) remained unvaccinated.

Discussion

The findings indicate generally favorable COVID-19 vaccination outcomes among residents of the selected

GIDAs. Most respondents demonstrated average to high vaccine literacy and positive vaccine confidence. In addition, 80.5% of the eligible population completed the primary COVID-19 vaccination series. Despite this relatively high coverage, booster uptake remained low, and nearly one-fifth of the eligible population remained unvaccinated. These findings suggest that while acceptance of primary COVID-19 vaccination was generally favorable, gaps in vaccine-related knowledge and persistent barriers to vaccination may continue to influence the uptake of booster doses and contribute to incomplete vaccination in these communities.

The majority of respondents (75.8%) demonstrated an average level of COVID-19 vaccine literacy, while 17.5% exhibited high vaccine literacy and only 6.6% demonstrated low vaccine literacy. This finding suggests a generally adequate level of knowledge regarding COVID-19 vaccines and vaccination among residents of the selected GIDAs. A small proportion of respondents demonstrated limited understanding of some questionnaire items, which may reflect challenges in accessing and understanding health information. Geographic and structural barriers in GIDAs, including limited transportation, inadequate healthcare services, shortages of healthcare personnel, and insufficient resources and facilities, may contribute to reduced access to accurate health information and influence health-seeking behaviors.⁷ These challenges may, in turn, affect community understanding of important health issues, including vaccination. Furthermore, GIDAs often face deficiencies in basic services and infrastructure, including education, sanitation, electricity, and healthcare facilities.^{8,9} These

Table 7. Summary of vaccination status in Barangay San Ramon.

Vaccine Brand	Partially Vaccinated Only	Fully Vaccinated Only	With Booster Doses
Pfizer	-	582	165
Moderna	-	9	70
Johnson & Johnson	-	90	-
AstraZeneca	-	246	94
Sinovac	-	181	28
Others	-	11	-
Total	-	1126	357

Table 8. Administered vaccines per brand in Barangay Nabuclod.

Age Group: 12 to 17 years old				
Vaccine Brand	1 st Primary	2 nd Primary	1 st Booster	2 nd Booster
Pfizer	19	19	81	-
Total	19	19	81	-
Age Group: 18 to 59 years old				
Vaccine Brand	1 st Primary	2 nd Primary	1 st Booster	2 nd Booster
Pfizer	3	27	49	35
Moderna	-	7	15	-
Johnson & Johnson	441	-	-	-
AstraZeneca	1	126	59	-
Sinovac	10	218	-	1
Others	6	17	-	-
Total	461	395	123	36
Age Group: 60 years old and above				
Vaccine Brand	1 st Primary	2 nd Primary	1 st Booster	2 nd Booster
Pfizer	2	2	2	2
Moderna	-	-	1	-
Johnson & Johnson	12	-	-	-
AstraZeneca	6	6	5	-
Sinovac	16	16	-	-
Total	36	24	8	2

Table 9. Summary of vaccination status in Barangay Nabuclod.

Vaccine Brand	Partially Vaccinated Only	Fully Vaccinated Only	With Booster Doses
Pfizer	-	-	132
Moderna	-	-	16
Johnson & Johnson	-	453	-
AstraZeneca	-	68	64
Sinovac	-	234	1
Others	-	17	-
Total	-	772	213

challenges contribute to poorer health outcomes and may limit access to health information and preventive healthcare services. Residents of geographically isolated communities frequently encounter financial and geographic barriers that restrict access to healthcare, including vaccination services.^{8,9} Compared with urban populations, individuals living in GIDAs generally have fewer healthcare resources available and lower utilization of health services, conditions that continue to characterize many GIDA communities in the Philippines.⁷⁻⁹

Socioeconomic challenges, including financial constraints and low levels of formal education, may contribute to limited understanding of the importance of vaccination. These factors can hinder access to and comprehension of accurate health information, increasing susceptibility to misinformation. Limited health literacy has been reported to be more prevalent among individuals with lower educational attainment, placing them at greater risk of misconceptions regarding vaccination.¹⁰ These findings highlight the importance of improving access to understandable and reliable health information in underserved communities. Strengthening community-based health education and deploying healthcare workers to provide accurate vaccine information may help promote informed health decisions and improve vaccine uptake.¹¹

The majority of respondents in the present study demonstrated an average level of vaccine literacy, in contrast to a 2022 study conducted among GIDA communities in Samar, where most respondents exhibited low vaccine literacy.⁶ This difference may reflect improvements in access to health information and vaccination-related education over time, including efforts to strengthen healthcare services in underserved communities.¹¹ Previous studies have shown that higher health literacy is associated with greater vaccine confidence.¹² Consistent with these findings, respondents in the present study generally demonstrated average vaccine literacy and positive vaccine confidence. However, the relationship between these variables was not formally examined and warrants further investigation.

A substantial proportion of respondents demonstrated a positive attitude toward COVID-19 vaccination despite concerns related to fear, anxiety, and vaccine hesitancy.¹³ This finding contrasts with a previous study conducted among GIDA residents in

Samar, where attitudes toward COVID-19 vaccination were generally neutral.⁶ The authors suggested that residents in these communities often prioritized immediate day-to-day concerns over preventive measures such as vaccination.⁶

In the present study, only a small proportion of respondents exhibited unfavorable attitudes toward COVID-19 vaccination. Some respondents expressed doubts regarding the effectiveness of vaccines in preventing infectious diseases. Concerns about vaccine safety were also evident, as more than half of the respondents reported that symptoms experienced after vaccination sometimes led them to question vaccine safety. Previous studies have shown that negative attitudes toward vaccination may be influenced by misinformation, distrust in government vaccination programs, and skepticism regarding vaccine-related policies.¹⁵ These factors may be particularly relevant in geographically isolated and underserved communities, where limited access to health information and healthcare services can affect perceptions of public health interventions.⁷

COVID-19 vaccination coverage in the two barangays was relatively high, with 80.5% of the eligible population aged 5 years and older having completed the primary vaccination series. Nevertheless, nearly one-fifth (19.5%) remained unvaccinated, and booster uptake was low, with only 24.2% of fully vaccinated individuals receiving at least one booster dose.

Current Philippine pediatric guidelines recommend COVID-19 vaccination for eligible age groups, including children aged 5–11 years, using duly approved vaccines.¹⁶ Despite the relatively high vaccination coverage observed in the present study, nearly one-fifth of the eligible population remained unvaccinated. This finding highlights the need to address persistent barriers to healthcare access and strengthen community-based strategies that promote vaccination and other preventive health services in geographically isolated communities.⁷⁻⁹

During the COVID-19 pandemic, the Philippine government implemented nationwide vaccination campaigns to achieve broad population protection and mitigate the health and socioeconomic effects of COVID-19.¹⁷ Although vaccination coverage in the study communities was relatively high, it remains uncertain whether optimal coverage was achieved. Vaccine preference, vaccine hesitancy, vaccine literacy, trust in government, and inequitable access to

vaccination services may have influenced vaccination uptake.¹⁸

Vaccination of susceptible and high-risk groups remains an important strategy for reducing severe COVID-19 outcomes and mortality.¹⁹ Vulnerable populations, including older adults and residents of geographically isolated and disadvantaged areas, should remain a priority for vaccination efforts because of the barriers they face in accessing healthcare services.

Booster doses remain an important component of vaccination programs, particularly for maintaining protection among vulnerable populations and reducing the risk of severe disease.²⁰ In the present study, only 24.2% of fully vaccinated individuals received at least one booster dose. This finding is consistent with the respondents' vaccine literacy scores, particularly regarding knowledge of vaccine dosing schedules. Approximately half of the respondents were uncertain or incorrectly believed that an individual could be fully protected without completing the recommended vaccine series. Similar views were observed during the interview-guided survey, where some participants indicated that a single vaccine dose was sufficient for protection. This misconception may have contributed to incomplete vaccination and low booster uptake. In addition, misinformation regarding COVID-19 vaccines, including beliefs that vaccination could alter an individual's DNA, has been identified as a contributor to vaccine hesitancy and incomplete vaccination.²¹

Low booster uptake has also been reported in rural communities, where booster doses are often perceived as unnecessary.^{22,23} This perception may partly explain the low booster coverage observed in the present study. Addressing misconceptions regarding the role of booster doses through targeted health education and community-based outreach initiatives may help improve vaccine acceptance and uptake in geographically isolated populations.

Among the 211 respondents, 173 were from Barangay Nabuclod and 38 were from Barangay San Ramon. Although both barangays are classified as GIDAs, respondents from Barangay Nabuclod generally had lower levels of educational attainment, with some reporting no formal education. In addition, a larger proportion belonged to indigenous communities compared with respondents from Barangay San Ramon. These sociodemographic characteristics may

have implications for health literacy, access to health information, and perceptions toward vaccination.

One limitation of the study was the potential for miscommunication arising from language differences between the researchers and respondents despite the assistance of translators. In addition, responses obtained through the interview-guided survey may have been influenced by variations in how questions were conveyed or interpreted. The accuracy of vaccination coverage estimates was also dependent on the completeness and accuracy of census and vaccination records obtained from the Rural Health Unit, which may not fully reflect actual vaccination coverage in the study communities. The cross-sectional design precludes the assessment of causal relationships between sociodemographic characteristics, vaccine literacy, vaccine confidence, and vaccination uptake.

The predominance of female respondents in this study contrasts with the larger male population reported in Pampanga.²⁴ This may be explained by the house-to-house survey approach, which favored the inclusion of individuals who were available at home during data collection. Men may have been underrepresented because many were away for work at the time of the survey.⁵

In terms of educational attainment, most respondents had completed only the early years of primary education, while some had reached the secondary level and a notable proportion had no formal education. This educational profile is consistent with the challenges faced by many GIDA communities, where geographic isolation, considerable distances to schools, and limited educational resources and personnel may hinder access to quality education.^{6,25}

Overall, residents of the selected GIDAs demonstrated average vaccine literacy, positive vaccine confidence, and relatively high primary COVID-19 vaccination coverage. However, low booster uptake and the continued presence of unvaccinated individuals highlight the need for sustained health education, improved healthcare accessibility, and targeted community-based interventions. Beyond COVID-19, these findings underscore the importance of strengthening vaccine literacy, addressing misinformation, and fostering trust in immunization programs among geographically isolated populations. Such efforts may support future vaccination initiatives and enhance preparedness

for public health emergencies in underserved communities.

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