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Understanding COVID-19 Vaccination Uptake: Insights from a Coastal Community in Northern Mindanao

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Abstract

Background & Aim: The rapid spread of COVID-19 caused widespread disruption and highlighted the urgent need for vaccination strategies. Despite significant efforts, some communities, including one in coastal Northern Mindanao, faced challenges in achieving vaccination targets. This study aimed to identify barriers to COVID-19 vaccination uptake and their impact on behavioral practices in the community. **Methods & Materials:** This quantitative study employed correlational and descriptive statistical analyses to examine variables. Surveys were distributed to households and the barangay health center, utilizing stratified random sampling to ensure unbiased representation based on age. Participants aged 20-64, eligible for COVID-19 vaccination, were surveyed. Using the Cochran formula, a sample size of approximately 372 residents was determined. **Results:** No significant differences were found in respondents' agreement levels on COVID-19 vaccination behavioral practices across age groups. However, significant differences were observed based on educational attainment and gender. College graduates showed higher agreement levels in attitude and behavioral intention. Female respondents exhibited higher agreement in attitude and perceived behavioral control, while male respondents had higher agreement on subjective norms. No significant differences were found based on religion. **Conclusion**: Knowledge positively correlated with agreement on vaccination practices, underscoring the importance of education in addressing vaccine hesitancy. While religious affiliation influenced attitudes, individual beliefs within religious groups varied. These findings highlight the multifaceted factors influencing COVID-19 vaccination acceptance and suggest targeted interventions to address specific demographic disparities.

Keywords: COVID-19, vaccination, knowledge, behavior

Introduction

The COVID-19 virus swept the globe at an unprecedented rate, catching everyone off guard. This pandemic dramatically altered people's lives within a matter of weeks, inflicting immense human suffering and disrupting core aspects of social well-being (1). By the end of August 2020, the disease had resulted in over 25 million cases and approximately 850,000 fatalities, establishing COVID-19 as the sole pandemic with a profound impact on every aspect of life (2).

Vulnerable and disadvantaged populations bore the brunt of the impact, necessitating special attention in policy responses. To mitigate further damage to public health, developing a COVID-19 vaccine became imperative, with vaccines considered the primary strategy to end the pandemic. Several factors had to be considered to ensure the success of this strategy.

According to the World Health Organization (3), over 63 million Filipinos in the Philippines have received complete COVID-19 vaccination. However, some barangays failed to reach their target population, possibly due to underlying physical and socio-economic factors that put their health at significant risk (4). For example, a coastal barangay in Northern Mindanao only managed to vaccinate 80.79% with the first dose out of the 10,651 target residents, and this number decreased to 3.11% for the corresponding doses (5). The nation still encountered challenges utilizing COVID-19 immunizations for vulnerable populations, especially those in geographically isolated and disadvantaged areas (GIDA). Despite the accessibility and protective benefits of COVID-19 vaccines, refusal or delayed vaccination could harm individuals and communities.

In order to develop effective interventions, understanding the primary influences on public acceptance of vaccinations was crucial, particularly among equity-seeking groups facing racial, ethnic, and socio-economic disparities or marginalization (6). Therefore, this study aimed to identify the barriers that affected the utilization of COVID-19 vaccination and examine their impact on behavioral practices. After careful consideration, the study was conducted in one of the coastal barangays in Northern Mindanao.

This study was based on Icek Ajzen's Theory of Planned Behavior (7), which seeks to understand how individuals make decisions to participate in specific behaviors based on their beliefs. The theory identifies three key factors that shape behavioral intentions: attitude towards the behavior, subjective norms, and perceived behavioral control, all of which were explored further in the literature review (7). This model elucidates how individuals' decisions, influenced by these factors, could affect their choice to receive the COVID-19 vaccination. The decision to engage in a particular behavior, such as getting vaccinated against COVID-19, can be influenced by one's intention to perform that action.

Previous studies have extensively applied the Theory of Planned Behavior to understand vaccination behaviors, focusing on general populations in urban settings and developed countries. However, there is a significant gap in research addressing how these behavioral factors operate in marginalized communities, particularly in geographically isolated and disadvantaged areas (GIDA) like coastal barangays in Northern Mindanao. Existing research has not adequately explored the unique socio-economic, cultural, and logistical barriers faced by these populations, nor has it sufficiently examined the differential impact of educational attainment, gender, and other demographic variables on vaccination behavior in these settings.

Hence, this study is necessary to fill these gaps by assessing the design, implementation, and effectiveness of

healthcare services in these specific contexts. It aims to provide evidence of the impact of these dimensions on vaccination acceptance, addressing concerns regarding barriers to relevance and equity in vaccination utilization. By focusing on a coastal barangay in Northern Mindanao, this study seeks to provide a nuanced understanding of the motivational factors that influence COVID-19 vaccine acceptance among vulnerable populations, ultimately contributing to more targeted and effective public health interventions.

This study aimed to identify the barriers that affected behavioral practices in utilizing the COVID-19 vaccine among residents in one of the coastal barangays in Northern Mindanao. The barangay is characterized by a diverse population with varied socio-economic backgrounds, predominantly consisting of fishing and farming communities. Many residents have limited access to healthcare facilities and information, contributing to challenges in managing health crises. The community's infrastructure is relatively underdeveloped, with some areas being difficult to reach, particularly during adverse weather conditions, which exacerbated during the COVID-19 outbreak.

This study investigated whether there was a significant difference in behavioral practices regarding COVID-19 vaccination among residents when grouped according to age, educational attainment, knowledge, religion, and sex. Additionally, it examined the relationship between knowledge and behavioral practices of utilizing the COVID-19 vaccination among residents in the same barangay. The analysis aimed to provide a comprehensive understanding of how these demographic factors influenced vaccination behavior in a setting where physical isolation and socio-economic disadvantages posed additional challenges to public health interventions.

METHODS

Design

This study utilized a quantitative research design incorporating correlational and descriptive statistical analyses, which were deemed suitable for scrutinizing and comparing the variables under investigation. These quantitative methods were employed to gather quantifiable data for statistical examination of the sampled population and to describe the demographic characteristics of the study participants.

Correlational analysis was employed to assess the strength of the direct relationship between two variables and ascertain their connection. It determined the extent to which changes in one variable corresponded to changes in another, revealing the direction and magnitude of the relationship between the independent and dependent variables. The quantitative approach facilitated a systematic and controlled investigation. In contrast to qualitative methods, where responses are interpreted and quantified based on subjective impressions rather than mathematical and statistical analyses, the findings of this study were subjected to quantitative and statistical scrutiny.

Sample, sample size & sampling technique

The researchers gathered the study's data in one of the coastal barangays in Northern Mindanao. The area had been chosen because it was classified as a Geographically Isolated and Disadvantaged Area (GIDA). As of 2022, the DOH had certified one of the coastal barangays in Northern Mindanao as a GIDA community (8).

The researchers employed the stratified sampling technique to identify clusters of individuals who participated in the research study. Stratified random sampling was utilized as it was considered more effective in gathering relevant and unbiased feedback from the sample while ensuring the representation of every group within the population of interest. This

sampling procedure divided the target population into subgroups or strata, each based on shared qualities or traits. Random samples were then chosen from each stratum, allowing for comparison to draw specific findings (9). It was deemed fitting as age, one of the independent variables used in the study, served as the basis for different subgroups or strata of potential units in the sample size.

Eligible participants from the said barangay were identified first. They were residents of a populous coastal community in Northern Mindanao within the legal age range, expressly limited to the age group 20-64, categorized based on Erik Erikson's 8 Stages of Psychosocial Development: Intimacy vs. Isolation (ages 20 to 39) and Generativity vs. Stagnation (ages 40 to 64). The study excluded residents outside the age group 1-19 and 65 and over, focusing solely on the populous coastal community in Northern Mindanao. The data utilized consisted of the actual age group census of the community, providing population figures in 2022.

The researchers employed the Cochran formula to minimize the population of the focus barangay, which consisted of roughly 15,341 residents. This method was done to ensure that only the target population was reached. The final estimated sample size for this study was approximately 372 residents aged 20 to 64 years old, based on the formula used and the following findings: a 95% confidence level, a margin of error of 0.05, and a variability of 0.5.

The instrument of data collection

In this study, the researchers utilized a modified survey questionnaire to gather data from the respondents. The questionnaire used in this study was patterned from various research studies with minor modifications, particularly those of Azjen (7), López-Cepero et al. (10), and Ranjan et al. (11). With the assistance of consulted validators and to align with the objectives of this study, this research instrument underwent validation and reliability tests through pilot testing, resulting in a Cronbach's alpha of 0.864, which is interpreted as good internal consistency.

Data collection process

Throughout the procedure, the researchers conducted a household survey by distributing questionnaires to every willing household. Simultaneously, some questionnaires were entrusted to the present community health nurse in the barangay health center. This strategy was employed to allow more respondents to access the questionnaires and for the researchers to receive more input from the respondents.

Participants who were not residents of the area, were below 20 years old, were over 64 years old, or had health impairments limiting their ability to answer the questionnaire were excluded. Participants who failed to respond within one week or sign the given informed consent were also excluded, reflecting their voluntary participation. Participants were free to withdraw from the research for any reason, with their data retained unless requested otherwise.

The instrument of data collection

The researchers utilized a structured questionnaire containing controllable questions and short questions with limited response options. Respondents were required to select options that best represented their views using Likert scales. The questionnaires were divided into three major parts. Firstly, there was a section that gathered information about the respondents' characteristics, including age, educational attainment, religion, and sex. Following that, another section used a Likert scale to gauge the respondents' knowledge about the COVID-19 vaccine. Additionally, a separate Likert scale assessed the respondents' agreement levels

regarding receiving the COVID-19 vaccination, focusing on attitudes, behavioral intentions, perceived behavioral control, and subjective norms.

Data analysis

The researchers utilized the T-test and F-test to analyze and assess the collected data. Additionally, they employed the Pearson Correlation Coefficient to examine and gauge the strength of the linear relationship between two variables.

Ethical consideration

Researchers obtained ethics clearance approval from the Xavier University Research Ethics Board (XU REC Package No. NSG-2023001289) before conducting the data-gathering.

RESULTS

Table 1 examined the degree of agreement among respondents regarding behavioral practices related to COVID-19 vaccination, categorized by age groups. The age ranges were selected to represent younger adults (19-40) and older adults (41-65), as these groups may have different perspectives and behaviors towards health interventions. In terms of attitude, behavioral intention, subjective norms, and perceived behavioral control, older respondents consistently exhibited higher ratings compared to younger respondents. The t-test yielded p-values of 0.079 for attitude, 0.893 for behavioral intention, 0.748 for subjective norms, and 0.154 for perceived behavioral control. The null hypothesis was rejected if the p-value was below 0.05. Therefore, since the p-values were above this threshold, the null hypothesis was accepted, indicating no significant difference in the level of agreement among respondents regarding behavioral practices concerning COVID-19 vaccination when grouped by age.

Table 1. T-test Results of Respondent's Level of Agreement on Behavioral Practices Regarding COVID-19 Vaccination When Grouped According to AGE

Profile	Level of Agreement of the Respondents on Behavioral Practices Regarding COVID-19 Vaccination							
	Attitude		Behavioral Intention		Subjective Norms		Perceived Behavioral Control	
Age	Mean	p-value	Mean	p-value	Mean	p-value	Mean	p-value
19-40	3.35	0.079 ns	3.33	0.893 ns	3.32	0.748 ns	3.43	0.154 ns
41-65	3.45		3.34		3.34		3.50	

Legend: ns = Not Significant *=Significant **=Highly Significant

Table 2 summarizes the respondents' level of agreement on behavioral practices regarding COVID-19 vaccination when grouped according to educational attainment. The mean scores were used to quantify the overall level of agreement for each group, providing a clear comparison of attitudes and behaviors across different educational levels. Regarding attitude and behavioral intention, the highest means were obtained by college graduates, with averages of 3.49 and 3.51, respectively. Meanwhile, grade school graduates had the highest level of agreement on subjective norms, with a mean average of 3.44. Lastly, in terms of perceived behavioral control, the highest mean was obtained by respondents who did not graduate from grade school, with a mean value of 3.59. The postgraduate category was statistically negligible since only one respondent was under this educational attainment. An F-test or ANOVA was used and correspondingly produced p-values of 0.526, 0.021, 0.765, and 0.290 for attitude, behavioral intention, subjective norms, and perceived behavioral control. Therefore, the null hypothesis was rejected, indicating a significant difference in the respondents' level of agreement on behavioral practices regarding COVID-19 vaccination when grouped according to educational attainment

Table 2. ANOVA Results of Respondent's Level of Agreement on Behavioral Practices Regarding COVID-19 Vaccination When Grouped According to EDUCATIONAL ATTAINMENT, GENDER, and RELIGION

		Level of Agreement of the Respondents on Behavioral Practices Regarding COVID-19 Vaccination							
		Attitude		Behavioral Intention		Subjective Norms		Perceived Behavioral Control	
Variable		Mean	p-value	Mean	p-value	Mean	p-value	Mean	p-value
Educational Attainment	Grade School Undergraduate	3.42	0.526 ns	3.21	0.021*	3.38	0.765 ns	3.59	0.290 ns
	Grade School Graduate	3.44		3.18		3.44		3.56	
	Highschool undergraduate	3.33		3.23		3.31		3.35	
	Highschool graduate	3.36		3.27		3.31		3.45	
	College undergraduate	3.41		3.47		3.35		3.50	
	College Graduate	3.49		3.51		3.26		3.47	
	Postgraduate	4.00		4.00		4.00		4.00	
Gender	Female	3.43	0.051 ns	3.37	0.230 ns	3.30	0.010*	3.50	<0.01**
	Male	3.35		3.31		3.36		3.42	
	LGBTQ+	3.50		3.50		3.29		3.25	
	I prefer not to say	2.20		2.20		1.57		1.40	
Religion	Roman Catholic	3.38	0.813 ns	3.33	0.392 ns	3.33	0.130 ns	3.45	0.670 ns
	Islam	3.37		3.40		3.41		3.60	
	Born Again Christian	3.41		3.30		3.22		3.37	
	Buddhist	3.40		2.20		2.00		3.00	
	Others	3.48		3.41		3.38		3.51	

Legend: ns = Not Significant *=Significant **=Highly Significant

Table 2 also provided the respondents' level of agreement on behavioral practices regarding COVID-19 vaccination when grouped according to gender. Regarding attitude, behavioral intention, and perceived behavioral control, female respondents had higher levels of agreement than males. Meanwhile, male respondents had a higher agreement on behavioral practices regarding COVID-19 vaccination in terms of subjective norms. Using F-test or ANOVA, the p-values were 0.0521 for attitude, 0.230 for behavioral intention, 0.010 for subjective norms, and less than 0.01 for perceived behavioral control. Thus, the null hypothesis was rejected as there was a significant difference in the respondents' level of agreement on subjective norms and a highly significant difference in perceived behavioral control regarding COVID-19 vaccination when grouped according to gender.

Table 2 examined the respondents' level of agreement on behavioral practices regarding COVID-19 vaccination when grouped according to religion. Regarding attitude and behavioral intention, the highest levels of agreement on the COVID-19 vaccine were obtained by respondents with religions other than Roman Catholicism, Islam, Born Again, and Buddhism. On the other hand, followers of Islam received the highest mean averages under subjective norms and perceived behavioral control. The F-test or ANOVA analysis showed that all the p-values were more significant than 0.05. Thus, the null hypothesis was accepted, indicating no

significant difference in the respondents' level of agreement on behavioral practices regarding COVID-19 vaccination when grouped according to religion.

Table 3 presented whether there was a statistically significant linear relationship between the respondents' knowledge of the COVID-19 vaccine and their behavioral practices. Pearson's correlation coefficient was used to measure the strength and direction of the association that existed between the two variables. Pearson's correlation coefficients were 0.731 for attitude, 0.580 for behavioral intention, 0.522 for subjective norms, and 0.626 for perceived behavioral control. These values implied a moderately positive correlation between behavioral intention (and subjective norms) and respondents' knowledge of the COVID-19 vaccine. Meanwhile, a strong positive correlation existed between the respondents' attitude (and perceived behavioral control) and their vaccine knowledge. Overall, with the p-values all less than 0.01, there was a highly significant relationship between the respondents' knowledge of the COVID-19 vaccine and their behavioral practices regarding vaccination. This finding meant that the higher the respondents' knowledge, the higher their level of agreement on behavioral practices.

Table 3. Pearson *r* Correlation Results Between the Knowledge of the Respondents on COVID-19 Vaccine and their Behavioral Practices Regarding COVID-19 Vaccination

Profile	Level of Agreement of the Respondents on Behavioral Practices Regarding COVID-19 Vaccination							
	Attitude		Behavioral Intention		Subjective Norms		Perceived Behavioral Control	
	r	p-value	r	p-value	r	p-value	r	p-value
Knowledge of COVID-19 Vaccine	0.731	<0.01**	0.580	<0.01**	0.522	<0.01**	0.626	<0.01

Legend: ns = Not Significant *=Significant **=Highly Significant

DISCUSSION

The findings indicate that age might not have been the sole influencing factor in determining behavioral practices related to COVID-19 vaccination. Nonetheless, the research revealed a higher mean acceptance rate among individuals aged 41-65 compared to those aged 19-40, suggesting that the former group was more inclined to accept the COVID-19 vaccine. This observation aligns with the findings (6), who reported that adults aged 46 and above were nearly twice as likely to accept the COVID-19 vaccine compared to those aged 18 to 25. The authors (6) suggested that older individuals may possess a stronger sense of accountability and responsibility toward their own health and that of their families, potentially contributing to their higher vaccination acceptance rates.

However, it's important to acknowledge that vaccination hesitancy varies across different age groups, as emphasized by Schaumleffel et al. (12). Their study in Ohio revealed that perceived support from healthcare providers and parental attitudes toward pediatric COVID-19 vaccination significantly influenced parents' intent to vaccinate their children, underscoring the importance of healthcare providers prioritizing family and patient education regarding vaccination importance and safety. Additionally, Rees et al. (13) found that parents' readiness to receive vaccination strongly correlated with their readiness to vaccinate their children. In summary, this analysis suggests that while age may play a role, it is not the sole determinant of attitudes and decisions regarding COVID-19 vaccination.

The analysis presented revealed that educational achievement played a pivotal role in shaping behavioral patterns related to COVID-19 vaccination. The study suggested that individuals' educational level influenced various factors impacting health behaviors, including perceptions of vaccination efficacy and potential adverse

effects. Scharf et al.'s research (14) indicated that parents with lower educational backgrounds were more likely to display vaccine hesitancy, whereas children and adolescents with parents holding higher educational degrees demonstrated a stronger inclination to receive the COVID-19 vaccine.

Additionally, households where caregivers possessed college degrees exhibited higher intentions for vaccination among children and teenagers. These findings echoed previous research indicating a link between lower educational attainment (below a bachelor's degree) and resistance to routine childhood immunizations and annual influenza vaccinations (15). Therefore, educational attainment significantly affected the acceptance and adherence to the COVID-19 vaccine. Individuals with higher educational levels appeared more inclined to vaccinate themselves and their children against COVID-19, possibly due to their enhanced ability to evaluate vaccination effectiveness and associated risks.

The results indicated that respondents' religious affiliation did not influence their compliance with or opinions regarding the COVID-19 vaccine. According to Hassen (16), vaccine hesitancy did not differ significantly among religious groups. However, the relationship between concern about COVID-19 side effects and vaccine hesitancy varied across religious affiliations, with Orthodox Christian participants showing different associations compared to Protestant Christian and Muslim participants. Thus, demographic data regarding religion and religious beliefs did not pose a substantial difference in individuals' attitudes and decisions concerning COVID-19 vaccination.

Table 2 revealed a notable discrepancy in the level of agreement regarding compliance and intentions regarding the COVID-19 vaccine, with males exhibiting higher agreement and intention compared to females. This finding was consistent with numerous studies reporting a similar trend, wherein males displayed a higher rate of vaccine compliance and uptake compared to females. Zintel (17) reported that the majority of studies (58%) indicated that men had higher intentions to receive the COVID-19 vaccine.

Meta-analytic calculations demonstrated significantly fewer women expressing willingness to get vaccinated than men, (17). A study from Galasso (18) also found that women were less inclined than men to agree to vaccination and to support making vaccination mandatory. Evidence suggested that vaccine hesitancy among women stemmed partly from skepticism, as they were less likely to believe vaccination was the sole solution to COVID-19 and more likely to believe in conspiracy theories attributing the virus to large corporations. Hence, gender played a significant role in the acceptance and adherence to the COVID-19 vaccine.

According to Rahman et al. (19), vaccine hesitancy stemmed from a lack of knowledge and perspective, characterized as "the decision to delay vaccination or the refusal to vaccinate despite accessible vaccination services." Therefore, enhancing public knowledge, willingness, and personal attitudes toward vaccination influenced respondents' behavioral patterns. Insufficient knowledge could hinder decision-making regarding COVID-19 vaccination, emphasizing the crucial need to educate the general public to enhance their understanding and awareness of the COVID-19 vaccine (20).

CONCLUSION

The study reveals that educational attainment, gender, and knowledge significantly influence attitudes and behaviors towards COVID-19 vaccination, impacting behavioral intention, subjective norms, and perceived behavioral control. Higher levels of education and knowledge are positively correlated with more

favorable vaccination attitudes and higher vaccination rates. College graduates demonstrate greater agreement in attitudes and behavioral intentions, while females show higher agreement in perceived behavioral control. Targeted educational interventions are essential to address vaccine hesitancy, particularly among those with lower educational attainment, and public health campaigns should be tailored to different demographic groups, such as older adults and varying gender perspectives. Limitations include minimal representation of postgraduate respondents and a lack of significant findings related to age and religion, suggesting that other influencing factors may exist. Future research should incorporate a more diverse sample and investigate additional variables affecting vaccine uptake.

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