

Knowledge, Attitude, and Practices Assessment of Unvaccinated Adult In-patients Regarding COVID-19 Vaccination in a Tertiary Hospital in Nueva Vizcaya, Philippines: A Cross-sectional Study

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ABSTRACT

Background. New variants of Coronavirus disease (COVID-19) continue to emerge but the government is still struggling to counter vaccine hesitancy and misinformation to vaccinate populations to protective levels despite the advisories of staying up to date with its vaccinations to reduce risk of severe illness, hospitalization, and death.

Objectives. This quantitative cross-sectional study aimed to determine the level of knowledge, attitude, and practices regarding COVID-19 vaccination of unvaccinated adult patients admitted at Region II Trauma and Medical Center (R2TMC). This may help determine the knowledge gap regarding COVID-19 vaccination, address it, and to achieve the goal to vaccinate all eligible Filipinos. Furthermore, this may also be a springboard for future researches and management regarding novel infections needing new vaccinations.

Methods. Collected data from the sample size of 197 using the formula for finite population with 95% confidence level, population proportion of 50%, population size of 400, allowing 5% margin of error were summarized in a Microsoft excel database and tables, then were analyzed using Jamovi version 2.6.22 software. Frequency, mean, and standard deviation were calculated to measure the knowledge, attitude, and practices; Pearson correlation and Kendall's Tau b correlation for its relationship.

Results. There is moderate level of knowledge (MS: 9.80-11.8), a positive attitude (MR: 2.35-2.60), and good preventive practices (MS: 12.00-13.00) regarding SARS-CoV-2 (COVID-19) vaccination among the unvaccinated adult in-patients of R2TMC post-pandemic. Knowledge, attitudes, and practices statistically differed ($p < 0.05$) specifically in those with higher educational attainment.

Conclusion. There is a significant correlation among the knowledge of the respondents about COVID-19 vaccination, their attitude towards it, and their practices, implying that promoting preventive behaviors toward COVID-19 would require promoting both knowledge and efficacy beliefs among the public.

Keywords: COVID-19 vaccination, knowledge, attitude, practices, unvaccinated adults, in-patients

INTRODUCTION

Coronavirus disease 2019 (COVID-19), caused by the virus SARS-CoV-2, first discovered in December 2019 in Wuhan, China, is highly contagious and has quickly spread around the world, most often causing respiratory symptoms in variable intensity.¹

Leaders at the World Health Organization (WHO) have emphasized the need for international cooperation in vaccination campaigns, noting that a global pandemic requires global efforts to end it, hence dozens of countries and territories have joined the race to vaccinate their

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residents with varying rollout strategies.^{2,3} Some have favored vaccinating as many people as possible, while others have tried to prioritize vaccinating specific vulnerable groups.³ Based on official reported COVID-19 deaths, it was estimated by a mathematical model that vaccinations prevented 14.4 million deaths from COVID-19 in 185 countries and territories between December 8, 2020 and December 8, 2021. In addition, an estimated additional 45% of deaths in low-income countries could have been averted had the 20% vaccination coverage target set by COVAX been met by each country, and that an additional 111% (105–118) of deaths could have been averted had the 40% target set by WHO been met by each country by the end of 2021.⁴

Last November 2021, Omicron, a new variant of SARS-CoV-2, has emerged and continues to spread throughout communities because it can infect people who have been vaccinated or have previously had COVID-19. It was also reported that new variants will continue to occur hence staying up to date with COVID-19 vaccines reduces risk of severe illness, hospitalization, and death from COVID-19.⁵

In the Philippines, the government carried out a national immunization program based on priority sectors and subgroups identified by health experts, as mandated by the Interim National Immunization Technical Advisory Group, DOH Technical Advisory Group, and the COVID-19 Task Force.⁶ Around 15.2 million individuals have gotten the first dose while around 12.6 million were fully vaccinated, with highest shares observed for the A3 category (persons with comorbidities) and A2 category (senior citizens), respectively.⁷

As of January 6, 2022, the Philippines has 46.5% of the population fully vaccinated against COVID-19⁸, and from the National COVID-19 Vaccination Dashboard, as of May 2021, Philippines is the third ASEAN country (next to Indonesia and Singapore) with most doses administered.⁹ Data as of March 2023 from the Statista-statistics portal reports that 3.1% of the total doses administered in the Philippines were given in Region 2.¹⁰

Despite the efforts and accessibility of vaccines, the government is still struggling to counter vaccine hesitancy and misinformation to vaccinate populations to protective levels. During the last quarter of 2022, the Provincial Health Office of Nueva Vizcaya recorded a vaccination rate of 86%, highest in its commercial municipalities: Bambang and Bayombong; lowest in Ambaguio (26%) and Kayapa (30%) despite the effort of the Provincial Integrated Health Office (PIHO) launching a mobile vaccination drive covering all government offices at the Provincial Capitol. In Region II Trauma and Medical Center, one of the COVID-19 vaccination areas in the province, about 42% of admitted patients with respiratory symptoms last October to December 2022 were unvaccinated according to the Hospital's Infection Control and Epidemiology Center. While in January 2023, 50% of admitted patients with respiratory symptoms were unvaccinated and 16% partially vaccinated. Of the 50% unvaccinated patients, 18% are from Solano, 16% from

Bayombong, and 10% from Bambang; the rest are from other municipalities of Nueva Vizcaya and from other neighboring provinces.

Various studies have been conducted globally and nationally to assess the knowledge and attitude of individuals regarding COVID-19 and its vaccines, mostly during the early phase of the pandemic when most vaccines were also in the early phases hence available data were only extracted via online surveys. A KAP study conducted in Mindanao, Philippines revealed that COVID-19 vaccine and vaccination knowledge significantly differed across gender while both attitudes and practices significantly differed across age, gender, monthly income, and teaching experience. Moreover, the result of the study emphasized the significant influence of the COVID-19 vaccine and vaccination knowledge on attitudes and practices.¹¹ On the other hand, there are no available published studies regarding the KAP and demographic data of the unvaccinated population in Region 2.

Recognizing and addressing concerns at all levels, such as strengthening health literacy – a critical tool to combat misinformation that weakens vaccine confidence, and considering the needs of marginalized and vulnerable groups to ensure their access to vaccines, are needed to improve COVID-19 vaccination uptake and reach^{12,13}; hence, governments will need to engage with communities¹².

OBJECTIVES

General Objective

The aim of this study is to determine the level of knowledge, attitude, and practices of unvaccinated adult patients admitted at Region II Trauma and Medical Center regarding COVID-19 vaccination.

Specific Objectives

1. To describe the characteristics of unvaccinated adult in-patients in terms of sociodemographic profile (age, sex, educational attainment, address) and clinical profile (comorbidities, vaccination profile)
2. To determine their level of knowledge, attitude, and practices in terms of their sociodemographic and clinical profile
3. To determine if there is an association among the knowledge, attitude, and practices of the unvaccinated adult in-patients of R2TMC regarding acceptance of COVID-19 vaccination.

Significance of the Study

This research will serve as a basis for making additional health education strategies, modification and/or initiatives for health programs in our locality to further address COVID-19 vaccine hesitancy and misinformation. The results may help address the knowledge gap regarding COVID-19 vaccination to help achieve the goal to vaccinate all eligible Filipinos, or at least, to achieve herd immunity.

This may also be a springboard for further research regarding probable upcoming newer vaccines for COVID-19, its evolving variants, or other novel viruses.

Theoretical/Conceptual Framework

Given the current situation regarding COVID-19 and its vaccination in the Philippines, one approach to improve the behaviors of the unvaccinated group aside from considering other variables such as the sociodemographic and clinical profiles in the post-pandemic time is through KAP (Knowledge, Attitude, Practices) studies¹⁴, conveying that human health behavioral change is achieved through the acquisition of the right knowledge, generation of attitudes, and adoption of behaviors (or practices) as three successive processes.¹⁵ In line with this, many studies have shown that the KAP level of patients was associated with either effective or poor prevention and/or management of their illnesses.^{16,17} Figure 1 shows different KAP studies done in different countries and different years with varying results used as basis of this study, aiming to improve health initiatives and programs, to eventually increase COVID-19 vaccination uptake and prevention of the disease in Nueva Vizcaya, Region 2, Philippines.

Definition of Terms

1. Unvaccinated – those who have not received any dose of an authorized COVID-19 vaccine
2. Adult – 19 years old and above
3. In-patient – awake and coherent patients admitted at Region II Trauma and Medical Center, ward or ICU, for medical or surgical management
4. Attitude – mindset or a tendency to act in a particular way due to both an individual's experience and temperament.
5. Practices – actions done serving as preventive measures or different health care options
6. Vaccine hesitancy – delay, resistance, or rejection to getting vaccinated despite the availability of vaccination services
7. Herd immunity – indirect protection from an infectious disease that happens when a population is immune either through vaccination or immunity developed through previous infection

METHODS

Research Design

The study used a quantitative cross-sectional design to examine the knowledge, attitude, and practices of unvaccinated adult in-patients admitted at Region 2 Trauma and Medical Center, and to determine if there is a significant relationship among these variables.

Locale of the Study

The study was conducted at Region 2 Trauma and Medical Center, since it is one of the biggest COVID-19 vaccination

Background:

KAP Study	Result
<i>Paul et al.</i> 2021 - UK	Distrustful attitudes towards vaccination: higher among individuals from ethnic minority backgrounds, with lower levels of education, lower annual income, poor knowledge of COVID-19, and poor compliance with government COVID-19 guidelines ¹⁸
<i>Al-Marshoudi et al.</i> 2021 - Oman	<ul style="list-style-type: none"> • 52% thought vaccines could protect them from contracting COVID-19 • No concerns regarding the vaccine, they would advise their family and friends to get it • Over half of the respondents are willing to take the vaccine¹⁹
<i>Sherman et al.</i> 2020 - UK	Individuals with an intention to vaccinate had greater knowledge and a more positive attitude toward the COVID-19 vaccine ²⁰
<i>Karsson et al.</i> 2021 - Finland	<ul style="list-style-type: none"> • The strongest predictor of COVID-19 vaccination intentions: trusting the safety of the potential vaccine • Those perceiving COVID-19 as a severe disease: slightly more intent on taking a COVID-19 vaccine • Informing the public about the safety of a forthcoming COVID-19 vaccine should be the focus for health authorities aiming to achieve a high vaccine uptake²¹
<i>Islam et al.</i> 2021 - Bangladesh	Participants who received all the recommended vaccines earlier in life showed more positive attitudes towards COVID-19 vaccinations ²²
<i>Roldan et al.</i> 2022 - Philippines	<ul style="list-style-type: none"> • Many respondents were willing to receive vaccination; however, lack of vaccine supply was the major problem. • Age and regionality were significantly associated with the participant's response: respondents from Visayas and Mindanao showed less awareness and a more negative attitude about the issue²³

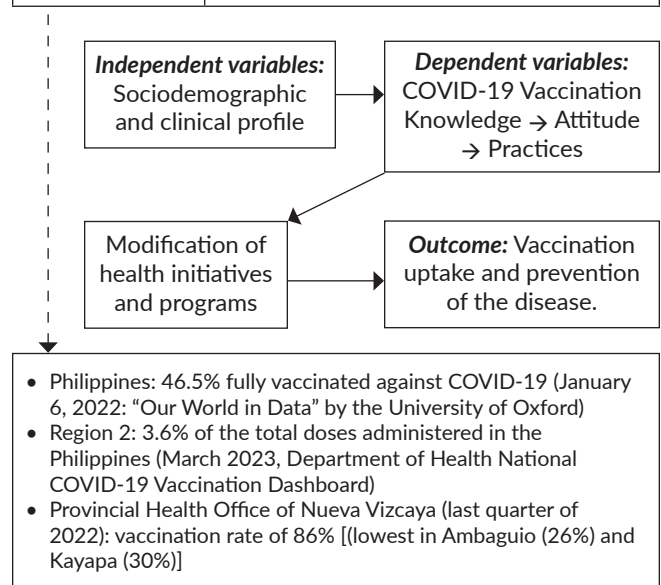


Figure 1. KAP conceptual framework.

areas in the region, being a 500-bed, tertiary hospital located at Asian Highway 26, Magsaysay, Bayombong, Nueva Vizcaya, and is a home to a variety of patients within and outside the province, with six Clinical Departments (Internal Medicine, Pediatrics, Surgery, Orthopedics, ENT, and Obstetrics and Gynecology) that provide medical and surgical treatment modalities. 31%, 48%, and 46% of admitted patients with respiratory symptoms from October to December 2022 respectively, were unvaccinated. Moreover, January 2023 data showed 50% of admitted patients with respiratory symptoms were unvaccinated and 16 % were partially vaccinated. Of the 50% unvaccinated patients, 18% are from Solano, 16% from Bayombong, and 10% from Bambang; the rest are from other municipalities of Nueva Vizcaya and from other neighboring provinces.

Inclusion and Exclusion Criteria

To understand deeper the behaviors of diverse unvaccinated adults post-pandemic while ensuring sound decision-making after informed consent, included in the study are:

1. Adults, defined by the WHO as at least 19 years old
2. Unvaccinated with any anti-COVID-19 vaccine
3. Admitted at Region II Trauma and Medical Center for medical, surgical, obstetrical, and gynecological management

While excluded are those:

1. Critically ill (intubated, decreased sensorium/impaired cognitive function)

Sample and Sampling Procedure

The study used stratified random sampling to avoid selection bias - the different departments being the strata. A total of 197 admitted participants satisfying the inclusion criteria from December 2023 to February 2024 were randomly selected (Figure 2). The sample size was computed using the sample size formula for finite population with 95% confidence

level, population proportion of 50%, population size of 400, allowing 5% margin of error.

Research Instrument

The questionnaire was adapted and based in parts from two different validated and peer-reviewed published studies: a local research by Roldan-Gan et al. entitled “Factors Affecting the Awareness, Acceptance, and Hesitancy among Unvaccinated Filipinos without Medical Background regarding SARS-CoV-2 (COVID-19) Vaccine” and an international study entitled “Knowledge, Attitudes, and Practices of COVID-19 Vaccination among Adults in Singapore: A Cross-Sectional Study” by Juin et al. After obtaining consent from the respective authors, the questions from both studies were collated and formed as a new questionnaire, and was submitted to a Filipino subject elementary teacher for translation. The survey proper had three sections: (1) demographic information, (2) clinical data consisting of comorbidities and vaccination history, and 3) questions on the participant’s knowledge, attitude, and practices regarding COVID-19 and its vaccines. The questionnaire was submitted to experts (two infectious disease specialists and one family and community medicine specialist) for validity testing using the survey instrument validation scale to avoid information bias, then after further suggestions, additional questions were included based from the latest Philippine COVID-19 Living Recommendations by the Philippine Society of Microbiology and Infectious Diseases. The questionnaire was pre-tested to 30 participants then the reliability of the questionnaire was determined using the Cronbach alpha reliability test.

Data Gathering Procedure

All admitted adult patients from December 2023 to February 2024 were initially screened at the admitting section based on being vaccinated or not. The researcher collected the list every 3-5pm of the day then followed them up in their respective wards. Individual participants who fulfilled the inclusion criteria were identified and included in the study. The nature and process of the study were discussed with them, then signed informed consent form was secured prior to administration of the questionnaire. The paper-based questionnaire was self-administered, but the study investigator was around to assist the participant if they had any questions.

After every questionnaire accomplished, the investigator reviewed the completeness of the answers then were encoded using Microsoft Excel. Missing data in the questionnaire were immediately returned to the respondent for completion after further instructions. Data privacy of the respondents was ensured at all times. Respondent names and admitting departments were optional and concealed; both were not included in the data collection and analysis. There were no eligible respondents who withdrew from the study.

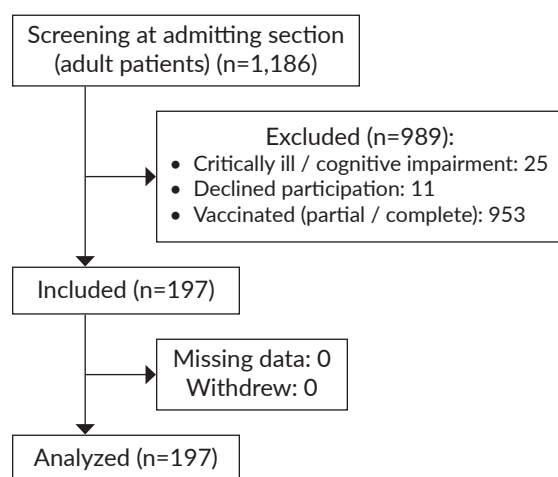


Figure 2. Sample and sampling procedure flowchart.

Treatment of Data

Collected data were summarized in a pre-prepared Microsoft excel database, and were analyzed using Jamovi v.2.6.22 software. Descriptive statistics was performed by calculating the frequency, mean, and standard deviation in measuring the knowledge, attitude, and practices by assigning 1 to correct answers and 0 to wrong ones. For attitude, 0 was assigned for neutral attitude, 2 for disagree, and 1 for agree. Mean Scores of 1.00-9.00 were assigned poor, 9.01-11.99 moderate, and 12.00-15.00 as good; while mean ratings of 1.00 – 1.67 were assigned negative attitude, 1.68 – 2.34 as neutral, and 2.35 – 3.00 as positive.

To determine the association between Knowledge and Practices, Pearson correlation was used, while Kendall's tau b was used for Attitude. Lastly, One-way Analysis of Variance and Bonferroni Test were used to determine the existence of significant differences between and among the groups formed across knowledge, attitude, and practices. A p-value of <0.05 denotes a significant association.

Ethical Consideration

The study obtained approval from the Region II Trauma and Medical Center Institutional Review Board. Participation

in the research study was voluntary; if they did not wish to continue, they had the right to withdraw from the study at any time. Their participation involved answering questionnaires that lasted for 10-15 minutes. There were no anticipated risks associated with the participation in this study and the respondents were not given any money nor gift to take part in this research. The information that the researcher collected from this research project will be kept confidential: any information about respondents have a number on it instead of their name. Both electronic data, stored in a flashdrive with a password only the researcher knows, and physical data were locked up with a lock and key. The information and findings gathered from this research will be brought up to concerned health and administrative sectors, then will be later on utilized in developing programs or educational initiatives to improve vaccination. Data gathered from this study will be destroyed two years after its publication.

RESULTS

Table 1 reflects that most of the respondents belonged to the age group of 40-59 years old (39.6%, n: 78), were males (57.4%, n: 113) with a male-female ratio of 1.3:1, and have

Table 1. Levels of Knowledge, Attitude, and Practices of Unvaccinated Adult In-patients regarding COVID-19 Vaccination when grouped according to Demographic and Clinical Profiles, and their Association

Demographic Profile	Category	Frequency	%	Knowledge		Attitude		Practices	
				MS	QD	MR	QD	MS	QD
Age	20-39	67	34.0	10.76	Moderate	2.35	Positive	11.21	Moderate
	40-59	78	39.6	10.26	Moderate	2.26	Neutral	10.71	Moderate
	60 and above	52	26.4	10.37	Moderate	2.29	Neutral	10.67	Moderate
Sex	Female	84	42.6	10.55	Moderate	2.27	Neutral	11.08	Moderate
	Male	113	57.4	10.39	Moderate	2.32	Neutral	10.71	Moderate
Highest Educational Attainment	No Formal Education	5	2.5	10.20	Moderate	2.20	Neutral	9.80	Moderate
	Elementary	69	35.0	9.83	Moderate	2.20	Neutral	10.33	Moderate
	High School	81	41.1	10.47	Moderate	2.30	Neutral	10.69	Moderate
	College	39	19.8	11.46	Moderate	2.44	Positive	12.18	Good
	Postgraduate	3	1.5	12.00	High	2.60	Positive	12.67	Good
Province	Nueva Vizcaya	149	75.6	10.43	Moderate	2.29	Neutral	10.83	Moderate
	Ifugao	31	15.7	10.16	Moderate	2.28	Neutral	10.61	Moderate
	Cagayan	2	1.0	11.00	Moderate	2.10	Neutral	11.50	Moderate
	Isabela	11	5.6	11.45	Moderate	2.48	Positive	11.64	Moderate
	Other Provinces	4	2.0	10.75	Moderate	2.50	Positive	12.00	Good
Number of Co-morbidity	None	78	39.6	10.58	Moderate	2.34	Neutral	11.33	Moderate
	One	87	44.2	10.41	Moderate	2.28	Neutral	10.43	Moderate
	Two	26	13.2	10.31	Moderate	2.27	Neutral	11.04	Moderate
	Three	6	3.0	10.17	Moderate	2.18	Neutral	10.50	Moderate
Number of Vaccination History	None	51	25.9	9.80	Moderate	2.26	Neutral	9.96	Moderate
	One	88	44.7	10.65	Moderate	2.27	Neutral	10.97	Moderate
	Two	44	22.3	10.41	Moderate	2.32	Neutral	11.11	Moderate
	Three	4	2.0	11.75	Moderate	2.54	Positive	12.25	Good
	Four	10	5.1	11.80	Moderate	2.55	Positive	13.00	Good

Mean Score – MS, Mean Rating – MR, Qualitative Description – QD

For Mean Scores: Poor (1.00 – 9.00); Moderate (9.01 – 11.99); Good (12.00 – 15.00)

For Mean Ratings: 1.00 – 1.67 = Negative; 1.68 – 2.34 = Neutral; 2.35 – 3.00 = Positive

Association: Knowledge & Practices ($p < 0.05$); Knowledge & Attitude ($p < 0.05$); Attitude & Practices ($p < 0.05$)

completed secondary education (high school) only (41.1%, n: 81). More than three-fourths of the respondents were from Nueva Vizcaya (75.6%, n: 149), more than half (60.4%, n: 119) had comorbidities, and 74.1% (n: 146) have had at least one vaccination history.

In terms of knowledge, respondents who are post graduates have high level (MS: 12) while the rest have moderate level regardless of other demographic and clinical profile. In terms of attitude, respondents who belong to the age group of 20-39 years (MR: 2.35), at least college graduates (MR: 2.44-2.60), from Isabela and other provinces outside Nueva Vizcaya (MR: 2.48-2.50), and those who have at least three vaccinations had a positive attitude towards the vaccination (MR: 2.54-2.55); the rest have neutral attitude towards it. In terms of practices, respondents who are at least college graduates (MS: 12.18-12.67), from provinces outside Nueva Vizcaya (MS: 12), and have at least three vaccinations (MS: 12.25-13) had very good practices; the rest of the population had good practices.

Moreover, there is a significant correlation among the knowledge of the respondents about COVID-19 and its vaccination, their attitudes, and their practices about it.

Table 2 shows that 11 out of 15 statements were correctly answered by the respondents. Among the statements, 99% of the respondents knew that the COVID-19 vaccine imported by the government are approved and endorsed by the WHO; 97% were aware that the government is giving out the COVID-19 vaccine to all Filipinos for free; and almost 94%

knew that COVID-19 vaccine provides protection against the COVID-19 virus.

On the other hand, more than 88% still thought that a person suspected of COVID-19 infection should be isolated for at least 14 days (instead of seven days from the new guidelines), and about 77% had a misconception that COVID-19 is caused by bacteria.

From Table 3, 10 out of 15 statements received a positive response from the majority of the respondents, three got a negative response; and two received a neutral response.

Specifically, there was high perceived *safety* of COVID-19 vaccine because 3 of 4 statements in items 6-9 received a positive response among the respondents. Furthermore, most (82.2%, n: 162) agreed that "The COVID-19 vaccine should be distributed fairly to all citizens." but almost half of the respondents (42.6%, n: 84) disagreed with the statement "The side effects of the vaccine do not bother me." On the other hand, there was only moderate perceived *efficacy* of COVID-19 vaccine among the respondents because only three statements in items 1-5 received a positive response. 44.2% (n: 87) of the respondents agreed that "It is not possible to reduce the incidence of COVID-19 without vaccination." while 72.6% (n: 143) disagreed with the statement "After receiving the vaccine, it is safe for me to wash my hands less frequently." Similarly, there was only moderate perceived *uptake* of COVID-19 vaccine among the respondents because only four statements in items 10-15 got a positive response. More than half of the respondents (51.8%, n: 102) disagreed with

Table 2. Frequency and Percent Distribution of Responses on Knowledge about COVID-19 Vaccination

Statement	Correct Knowledge (C)		Incorrect Knowledge (I)		Modal Knowledge
	F	%	f	%	
<i>COVID-19 is caused by bacteria.</i>	45	22.8	152	77.2	Incorrect
<i>A person suspected of COVID-19 infection should be isolated for at least 14 days.</i>	22	11.2	175	88.8	Incorrect
<i>People with hypertension or diabetes are more likely to need hospitalization or die from the infection.</i>	165	83.8	32	16.2	Correct
<i>There are currently five approved COVID-19 vaccines in the Philippines.</i>	147	74.6	50	25.4	Correct
<i>The COVID-19 vaccine imported by the government is approved and endorsed by the World Health Organization (WHO).</i>	195	99.0	2	1.0	Correct
<i>The government is giving out the COVID-19 vaccine to all Filipinos for free.</i>	191	97.0	6	3.0	Correct
<i>The COVID-19 vaccination is given via injection.</i>	181	91.9	16	8.1	Correct
<i>The COVID-19 vaccine provides protection against the COVID-19 virus.</i>	185	93.9	12	6.1	Correct
<i>The COVID-19 vaccine can be administered to everyone, regardless of age.</i>	91	46.2	106	53.8	Incorrect
<i>Individuals with known allergies shouldn't receive the vaccine unless evaluated to be suitable by a specialist.</i>	176	89.3	21	10.7	Correct
<i>There are no side effects at all from taking the COVID-19 vaccine.</i>	123	62.4	74	37.6	Correct
<i>Vaccinating a large proportion of the population results in indirect protection for non-vaccinated individuals (Herd immunity).</i>	117	59.4	80	40.6	Correct
<i>COVID-19 vaccines need to be kept in cold temperature all the time to make sure they remain effective.</i>	170	86.3	27	13.7	Correct
<i>Setting Janssen/Johnson & Johnson vaccine aside, taking one dose of another COVID-19 vaccine is sufficient to gain immunity against the COVID-19 virus.</i>	93	47.2	104	52.8	Incorrect
<i>COVID-19 vaccine booster shot is not safe and not effective.</i>	159	80.7	38	19.3	Correct

the statements “I will delay vaccination even if vaccination is free and accessible.” and “I will not get vaccinated until my preferred brand will be available.”

From Table 4, it can be gleaned that 13 out of 15 practices were correctly implemented by the respondents. Among the practices, more than 95% of the respondents use facemask when going to crowded places; approximately 94%v cover their nose and mouth when coughing; and almost 93% wash/sanitize their hands regularly.

On the other hand, more than 79% still promote steam inhalation plus vitamins instead of vaccination to prevent COVID-19 infection; and more than half (50.8%) of the respondents did not voluntarily subject themselves to receive COVID-19 vaccination. Table 5 indicates that there is a significant ($p < 0.05$) and direct/positive ($r > 0$, b : +) correlation between knowledge and practices regarding COVID-19 vaccination (p : 0.018, r : 0.168), knowledge and attitude (p : 0.001, b : 0.175), and attitude and practices (p : 0.000, b : 0.449).

Table 3. Frequency and Percent Distribution of Responses on Attitude about COVID-19 Vaccination

Statement	Agree (A)		Neutral (N)		Disagree (D)		Modal Attitude
	f	%	F	%	f	%	
A. Efficacy							
After receiving the vaccine, it is safe for me to go to crowded places more frequently.	74	37.6	51	25.9	72	36.5	Positive
After receiving the vaccine, it is safe for me to gather in large groups.	71	36.0	64	32.5	62	31.5	Positive
After receiving the vaccine, it is safe for me to not wear my mask in public.	15	7.6	49	24.9	133	67.5	Negative
After receiving the vaccine, it is safe for me to wash my hands less frequently.	18	9.1	36	18.3	143	72.6	Negative
It is not possible to reduce the incidence of COVID-19 without vaccination.	87	44.2	60	30.5	50	25.4	Positive
B. Safety							
I am confident in the COVID-19 vaccines offered by the Department of Health.	87	44.2	81	41.1	29	14.7	Positive
I will encourage my family/friends/ relatives to get vaccinated.	95	48.2	76	38.6	26	13.2	Positive
The COVID-19 vaccine should be distributed fairly to all citizens.	162	82.2	30	15.2	5	2.5	Positive
The side effects of the vaccine do not bother me.	42	21.3	71	36.0	84	42.6	Negative
C. Uptake							
I will delay vaccination even if vaccination sites are accessible.	36	18.3	59	29.9	102	51.8	Positive
I will delay vaccination even if the vaccination is free.	37	18.8	58	29.4	102	51.8	Positive
I am concerned about the availability of the vaccine.	46	23.4	93	47.2	58	29.4	Neutral
I will not get vaccinated until my preferred brand will be available.	13	6.6	82	41.6	102	51.8	Positive
I do not have the patience to go to the vaccination center and wait in long lines.	29	19.8	59	29.9	99	50.3	Positive
There is a lack of vaccine supply.	32	16.2	116	58.9	49	24.9	Neutral

Table 4. Frequency and Percent Distribution of Responses on Practices about COVID-19 Vaccination

Statement	Correct Practice (C)		Incorrect Practice (I)		Modal Practice
	f	%	f	%	
<i>I avoid socializing in large groups.</i>	159	80.7	38	19.3	C
<i>I avoid staying in public areas for an extended period.</i>	162	82.2	35	17.8	C
<i>I wash hands using the 7 steps of handwashing.</i>	145	73.6	52	26.4	C
<i>I reuse disposable masks.</i>	150	76.1	47	23.9	C
<i>I wash/sanitize my hands regularly.</i>	183	92.9	14	7.1	C
<i>I practice social distancing measures regularly.</i>	144	73.1	53	26.9	C
<i>I promote steam inhalation plus vitamins instead of vaccination to prevent COVID-19 infection.</i>	41	20.8	156	79.2	I
<i>I use facemask when going to crowded places.</i>	188	95.4	9	4.6	C
<i>I voluntarily subject myself to receive COVID-19 vaccination.</i>	97	49.2	100	50.8	I
<i>I disinfect surfaces of the house daily.</i>	131	66.5	66	33.5	C
<i>I cover my nose and mouth when coughing.</i>	185	93.9	12	6.1	C
<i>I don't seek medical consultation when I experience respiratory symptoms such as cough, colds, difficulty of breathing, and fever.</i>	153	77.7	44	22.3	C
<i>I smoke cigarettes/vape.</i>	149	75.6	48	24.4	C
<i>I promote drinking of tawa-tawa to my family members with COVID-19.</i>	102	51.8	95	48.2	C
<i>I refuse to be tested with COVID-19 if I have symptoms.</i>	151	76.6	46	23.4	C

Table 5. Pearson Correlation on Significant Relationship between Knowledge and Practices; Kendall's tau b between Knowledge and Attitude, Attitude and Practice

Domain	r	p-value	Decision
<u>Knowledge</u> <u>Practices</u>	0.168	0.018*	Reject Ho
<u>Knowledge</u> <u>Attitude</u>	0.175	0.001*	Reject Ho
<u>Attitude</u> <u>Practices</u>	0.449	0.000*	Reject Ho

*significant at 0.05 level

DISCUSSION

Most of the unvaccinated in-patients in the study were in the middle age group, males, highschool graduates, from Aritao and Solano, Nueva Vizcaya, with comorbidity, and vaccination other than COVID-19. This is supported by a systematic review on vaccine hesitancy in the era of COVID-19 done in different developed countries, which revealed that a higher level of education seemed to be a protective factor against refusing vaccines and low age was associated to a lower willingness to receive vaccination.²⁴ Since the young and middle age adults are the working group, they are usually healthy, and often have mild symptoms after being infected with COVID-19, hence they tend to refuse vaccination because of the scarce perception of the risk. Another study by Morales et al. concluded that men's hesitancy tends to be driven by lower perceptions of COVID-19 dangers, higher levels of self-rated health, and belief in conspiratorial claims surrounding the disease.^{24,25}

A cross-sectional study regarding the determinants of COVID-19 vaccination uptake done in the Philippines found out that 1) The likelihood of getting vaccinated decreases as the region gets further away from the NCR with concerns about vaccine handling, especially the need for cold storage facilities and vehicles to transport the vaccines; the Geographically Isolated and Disadvantaged Areas (GIDA) affected by the pandemic response due to communist terrorist groups in the area; and 2) People with long standing illness were not likely to get vaccinated against COVID-19 due to lack of understanding, fear of adverse effects, and negative COVID-19 vaccination information.²⁶ While latest national and local data regarding COVID-19 vaccination are yet to be updated, Region 2 ranked 11 among the highest number of COVID-19 vaccine doses administered in the Philippines last March 2023 according to the Statista Research Department¹⁰, and from the end of 2022 data of the Provincial Health Office, Ambaguio, Kayapa, and Kasibu were the top 3 municipalities with lowest vaccination uptakes. The PHO's provincial immunization program coordinator disclosed in an interview, that despite the numerous augmentations by the DOH and Cagayan

Valley Center for Health Development such as launching a mobile vaccination drive covering government offices at the Provincial Capitol in Bayombong, incentivization, and home visitations especially in the said low yielding municipalities, there was still low acceptance rate due to cultural beliefs and the low sense of urgency due to the low prevalence rate of COVID-19 in the area. With these characteristics, Ambaguio, Kayapa, and Kasibu residents may also have poor health seeking behaviors resulting to lower record of admission in this institution compared to Aritao and Solano.

Most of the respondents have complete vaccination other than COVID-19 such as childhood vaccinations because the Expanded Program on Immunization is mandated by the government to be given to all children (RA 10152). In contrast with the COVID-19 vaccine, it was not mandatory before the Presidential announcement requiring vaccination for employees working onsite.²⁷ This study did not also include the occupation/employment status, and the respondents were adults with autonomy to decide on their own.

Most respondents have moderate knowledge regarding COVID-19 vaccination, highest among the college and post graduates, and those with vaccination other than the COVID-19. Although in general, there is lack of knowledge regarding the COVID-19 disease itself. There is high perceived *safety* especially among the college and post graduates, and those with vaccination other than COVID-19, but moderate perceived *efficacy* and *uptake* of COVID-19 vaccine. Literature on vaccine determinants worldwide consistently showed that fewer years of education decreases the chance of COVID-19 vaccine uptake^{28,29} and people with higher education have heightened awareness of the risks and benefits of the vaccine because they use scientific evidence-based information, policies, and campaigns rather than most fake news on social media to make informed decisions regarding the uptake of COVID-19 vaccine and other preventive vaccines²⁵. Another large cross-sectional study done in Japan also found that people's perceptions of the risks and benefits of a COVID-19 vaccine were significantly associated with their vaccination intention implying that for vaccination intention and eventually vaccination decision to increase, the public should be made aware of the benefits of availing the COVID-19 vaccine.³⁰ Furthermore, unvaccinated adult in-patients had good COVID-19 prevention practices.

There is a direct correlation among the knowledge of the respondents about COVID-19 vaccination, their attitude towards it, and their practices; meaning, good knowledge as well as positive attitude play a critical role in enhancing the practice of public preventive behavior. This implies that promoting preventive behaviors toward COVID-19 would require promoting both knowledge and efficacy and safety beliefs among the public.³¹⁻³³

Limitations of the Study

This study did not delve further into the respondents' sources of information nor extensively explored other reasons

for not voluntarily receiving the COVID-19 vaccination, hence further multivariate research on these areas are recommended. Lastly, most of the data was subjective, including the “practices,” and not actually observed hence the concern for its objective reliability.

CONCLUSIONS AND RECOMMENDATIONS

There is a moderate level of knowledge, a positive attitude, and good preventive practices regarding SARS-CoV-2 (COVID-19) vaccination among the unvaccinated adult in-patients of Region 2 Trauma and Medical Center post-pandemic (December 2023-February 2024). Knowledge, attitudes, and practices statistically differed by sociodemographic factors specifically those with higher educational attainment. Lastly, there is a significant correlation among the knowledge of the respondents about COVID-19 vaccination, their attitude towards it, and their practices.

With these results, we encourage authorities such as the Department of Health, local government units, and hospitals to efficiently investigate susceptible subpopulations and prioritize policies and communication efforts to accommodate their needs, by continuously improving platforms in providing updated, scientific-based COVID-19 and vaccine-related information, delivered in an understandable language, targeting most especially those with lower educational attainment and poor vaccination history. This includes specific topics on 1) COVID-19 infection, 2) COVID-19 vaccines safety and efficacy infomercials, and 3) Educating about common myths on COVID-19 treatment like steam inhalation plus vitamins instead of vaccination to prevent COVID-19 infection. Lastly, considering the dynamic results during the start, peak, and post pandemic from different studies, continuous monitoring and research should be conducted to assess the long-term impact of various interventions on the knowledge, attitudes, and practices of the population regarding COVID-19 and its vaccination.

Statement of Authorship

Both authors certified fulfillment of ICMJE authorship criteria.

Author Disclosure

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