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Coronavirus Pandemic

Knowledge, attitudes, and practices towards COVID-19 among residents of Quang Binh, Vietnam

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Abstract

Introduction: The COVID-19 pandemic is raging worldwide; the number of new cases and deaths is increasing daily. This study aims to examine the knowledge, attitudes, and practices (KAP) toward COVID-19 among residents of Quang Binh, Vietnam.
Methodology: A cross-sectional study was conducted between the 1st and 10th of March 2022 in Quang Binh with 413 participants through convenience sampling. A self-designed questionnaire was used for data collection, using SPSS (IBM Corp, Armonk, NY) version 26.0 for management and analysis.
Results: Among the 413 participants, 80.5% of participants had good knowledge about COVID-19. Kinh people and those with a high level of education have higher odds of having good knowledge. 78.2% of participants had a positive attitude and 78.2% had good practice toward COVID-19. Knowledge-Practice scores and Attitude-Practice scores have a positive correlation. TV (65.4%) and the internet (66.6%) are the most popular channels for information about COVID-19. Common barriers for participants taking COVID-19 prevention measures were "due to the demands of life" (61%) or "due to the specificity of the work" (47.7%).
Conclusions: Residents of Quang Binh have a moderate KAP towards COVID-19. Health education programs are needed to improve knowledge about COVID-19 among Quang Binh residents, with a focus on ethnic minorities and people with low levels of education.

Key words: COVID-19; Knowledge; Attitudes; Practices; Pandemic.

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Introduction

Coronavirus disease 2019 (COVID-19) is an acute respiratory illness caused by infection with the novel coronavirus. COVID-19 broke out in December 2019, originating in a seafood market in Hunan, Wuhan, China. The disease spreads rapidly through the respiratory tract, and the main clinical symptoms of the disease include fever, dry cough, myalgia, fatigue, and shortness of breath. Severe cases can lead to death due to respiratory failure, septic shock, and multi-organ failure [1]. On March 11, 2020, the World Health Organization (WHO) declared COVID-19 a global pandemic with many cases and deaths [2]. The ongoing COVID-19 outbreak is rapidly spreading. The pandemic situation is still complicated as of the time of this study (March 2022), with over 455 million cases and 6 million deaths, and this number is growing by the day [3].

Vietnam is also one of the countries seriously affected by the COVID-19 pandemic. The government has reported more than 5 million COVID-19 infections and over 40,000 deaths. The Vietnam Ministry of Health (VMH) has issued many recommendations and guidelines in the current situation, such as wearing a mask when going out, keeping a safe distance, washing hands frequently, and avoiding crowded places. However, the number of cases still increased rapidly and reached a record of more than 150,000 cases/day [4].

While the fight against the COVID-19 pandemic continues worldwide, currently there is no specific treatment for COVID-19 patients [5]. Therefore, the goal of many countries is to improve people's knowledge about the prevention and treatment of COVID-19 and provide people with effective anti-epidemic measures. When people have good knowledge, positive attitudes, and good practices, they will be more proactive in pandemic prevention. As a result, many Knowledge, Attitudes, and Practices (KAP) assessment studies have been carried out

worldwide to assess the effectiveness of COVID-19 prevention measures [6].

Quang Binh province is a traffic bridge between North and South Vietnam, which is currently heavily affected by the COVID-19 pandemic. The population is just over 895,000 people, but the number of cases has reached more than 83,000, and the number of new cases is more than 2,500 cases/day [4]. Therefore, to facilitate the management of the COVID-19 outbreak in Quang Binh, it is urgent to understand the KAP about COVID-19 of the people at this critical time. This study investigates the KAP towards COVID-19 of Quang Binh residents during the period of rapid COVID-19 outbreak, it is also the first study in Quang Binh.

Methodology

Study population

A cross-sectional study was conducted in Quang Binh (Figure 1) between the 1st and 10th March 2022. Residents aged ≥ 18 years were invited to complete a survey questionnaire.

Sample size

The required sample size is estimated as follows [7,8]:

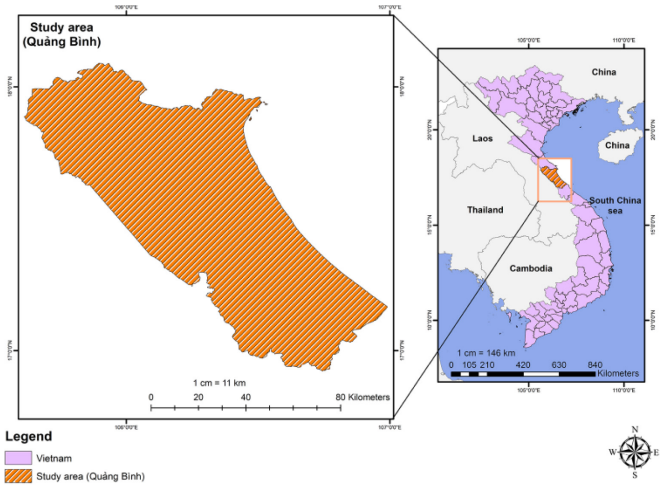
$$n = \frac{Z^2 \times p(1-p)}{d^2}$$

Where: n = sample size; Z is standard normal variate (at 5% type 1 error) = 1.96; p is the population proportion = 50%; d absolute precision = 0.05. The required sample size was 384.

Sampling technique

In the context of a strong outbreak in Quang Binh affecting travel, we used a convenient sampling method. The investigator travelled to different areas in Quang Binh (depending on the COVID-19 pandemic situation in those areas), then based on the convenience or accessibility they selected participants (with sufficient conditions and consent to participate in the study) until the required sample size was reached. Before participants answer the questionnaire, the investigator briefly introduced the background and objectives of the study, as well as assured the participants about data privacy and anonymity when participating in the study. Participants were free to withdraw their consent for participation at any time.

Figure 1. Study area (Quang Binh, Vietnam).



Data collection tool

The questionnaire was used from a previously published study by Park DI [9], which was subsequently adapted to the recommendations of VMH. The original questionnaire in English has been translated into Vietnamese. It was later confirmed by a team of public health experts from the Quang Binh Provincial Centers for Disease Control and Prevention (CDC).

The questionnaire is divided into two parts: part one contains questions about demographic characteristics, and part two contains the main set of KAP questions on COVID-19. The questionnaire was completed by 413 people in this study.

Data analysis and statistical method

The demographic characteristics of the study subjects were presented using descriptive statistics. The Chi-squared test or Fisher's exact test was used to examine the relationship between categorical variables. A multivariable binary logistic regression analysis investigated the relationship between population characteristics and KAP towards COVID-19. The Pearson correlation test was used to determine the correlation between KAP scores. SPSS (IBM Corp, Armonk, NY) version 26.0 was used to manage and analyze data. All statistical tests were two-sided with a test level of $\alpha = 0.05$.

Measurements

Knowledge of COVID-19 was assessed using 12 true-false questions to determine participants' knowledge of signs and symptoms, routes of transmission, COVID-19 treatment, and prevention measures. Each correct answer is worth one point, while each incorrect answer is worth zero points. Knowledge scores can range from 0 to 12, scores ≥ 9 are assessed as "Good knowledge", and scores < 9 are assessed as "Poor knowledge". Cronbach's alpha internal consistency coefficient for the Knowledge scale is 0.51.

Attitudes toward COVID-19 were assessed using seven questions. Each item is rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Attitude scores range from 7 to 35, scores ≥ 28 are assessed as a "Positive Attitude", and scores < 28 are assessed as a "Negative Attitude". Cronbach's alpha internal consistency coefficient for the Attitude scale is 0.89.

Eight questions covering aspects of COVID-19 prevention practices recommended by the VMH were used to assess COVID-19 prevention practices. Each "yes" answer is worth one point, while each "no" answer is worth zero points. A practice score can range from 0 to 8, scores ≥ 7 are assessed as "Good Practice" and scores < 7 are assessed as "Poor Practice". Cronbach's alpha internal consistency coefficient for the Practice scale is 0.73.

The way to assess knowledge, attitudes and practices toward COVID-19 is based on the author's subjective opinion.

Ethics approval

The Ethics Committee of Guangxi Medical University approved the study (decision No. 1027, dated 23.02.2022). All participants provided informed consent to the principles embodied in the Declaration of Helsinki. Participants were completely voluntary and had the choice to withdraw from the study at any time. Participant anonymity will be preserved under all circumstances.

Results

Demographic characteristics and COVID-19 information channels of the participants

In total, 413 participants were included in the final analysis, with 228 participants (55.2%) being male. The participants were mostly under 50 years old (86.6%), and only 3.9% were 60 years old or older. More than two-thirds of participants were married or living together (76.3%), and only 3.4% were ethnic minorities. Most of them live in the countryside and are not religious. The level of education is quite high with 66.1% of the participants having a College/University degree or above, their main occupations are Government employees (36.3%) and Private-employees (35.4%). 97.1% of participants self-rated their economic status as Average / Well-off. The proportion of people who have received two doses of the COVID-19 vaccine is 96.8%.

TV (65.4%) and the internet (66.6%) are the most popular channels for information about COVID-19. In addition, information from family/friends (45.5%), propaganda by loudspeakers (55.0%), and SMS received from the VMH (54%) account for a sizable proportion. Radio (22.3%), newspapers (26.6%), and healthcare staff (35.1%) are the other less popular information channels (Table 1).

Knowledge among participants about COVID-19

Knowledge among participants about COVID-19 with different characteristics is presented in Table 2. The average knowledge scores of 413 participants were 9.43 ± 1.251 out of a maximum score of 12. There were

Table 1. Demographic characteristics of the participants in this survey (n = 413).

Characteristics	*N (%)*
Gender	
Male	228 (55.2)
Female	185 (44.8)
Age	
18~29	102 (24.7)
30~39	167 (40.4)
40~49	89 (21.5)
50~59	39 (9.4)
≥ 60	16 (3.9)
Marital status	
Single/widowed/divorced	98 (23.7)
Married/living together	315 (76.3)
Ethnic	
Kinh	399 (96.6)
Other	14 (3.4)
Religion	
None	391 (94.7)
Other	22 (5.3)
Educational level	
Hight school or below	140 (33.9)
College/University degree or above	273 (66.1)
Location	
City/town	75 (18.2)
Countryside	338 (81.8)
Work status	
Private-employee	146 (35.4)
Merchant	38 (9.2)
Government employee	150 (36.3)
Student	21 (5.1)
Other	58 (14.0)
Economic status	
Poor / near-poor	12 (2.9)
Average / Well-off	401 (97.1)
Received two doses of the COVID-19 vaccine	
Yes	400 (96.8)
No	13 (3.2)
Information channels	
TV	270 (65.4)
Radio	92 (22.3)
Newspapers	110 (26.6)
Healthcare staff	145 (35.1)
Family, friends	188 (45.5)
Internet	275 (66.6)
Propaganda by loudspeakers	227 (55.0)
SMS on the phone received from the VMH	223 (54.0)
Other	36 (8.7)

330 people (79.9%) who scored ≥ 9 points, which was assessed as "Good knowledge". There is a statistically significant difference in knowledge about COVID-19 between groups of Gender (χ^2 = 5.138, p = 0.023), Ethnic (χ^2 = 12.385, p = 0.002), and Education level (χ^2 = 6.548, p = 0.011). The multivariable binary logistic regression model results showed that Kinh ethnic people and those with a high level of education have higher odds of having good knowledge (Table 3).

Attitudes among participants toward COVID-19

The average attitude scores of the participants were 29.15 ± 3.599 out of a maximum total of 35. There are 78.2% of participants with a "Positive attitude" (≥ 28 points) toward COVID-19. In which, 79.4% of participants worry about themselves or their family infected with COVID-19, 97.1% are willing to improve their knowledge about COVID-19, 72.6% are worried about contact with people returning from pandemic areas, 93.9 % believe that following the guidelines of the VMH will control the pandemic. However, there was no statistically significant difference in Attitudes toward COVID-19 between the population groups (Table 2).

Practices among participants toward COVID-19

The average practice scores of the participants were 7.51 ± 1.083 out of a maximum total of 8. There are 78.2% of participants had good practice (≥ 7 points) in COVID-19 prevention. Most participants (75.5%) practiced all eight measures to prevent COVID-19 recommended by the VMH. The most common practice was wearing a mask often when going out (98.5%), followed by avoiding crowded places (96.6%), regularly cleaning the house (96.4%), washing hands frequently with soap or sanitizer (96.1%), installing the "Electronic health book" application (95.5%), avoid touching face (95.4%), keep a distance of at least 2

Table 2. Differences in KAP towards COVID-19 by demographic variables.

Variable	Knowledge			Attitude			Practice		
	Good n (%)	Poor n (%)	χ^2 (*P*) [1]	Positive n (%)	Negative n (%)	χ^2 (*P*) [1]	Good n (%)	Poor n (%)	χ^2 (*P*) [1]
Gender			5.138 **(0.023)**			0.006 (0.94)			0.528 (0.467)
Male	173 (75.5)	55 (24.1)		178 (78.1)	50 (21.9)		194 (85.1)	34 (14.9)	
Female	157 (84.9)	28 (15.1)		145 (78.4)	40 (21.6)		162 (87.6)	23 (12.4)	
Age			4.032 (0.402)			8.118 (0.087)			4.404 (0.401)
18~29	84 (82.4)	18 (17.6)		74 (72.5)	28 (27.5)		88 (86.3)	14 (13.7)	
30~39	133 (79.6)	34 (20.4)		140 (83.8)	27 (16.2)		150 (89.8)	17 (10.2)	
40~49	70 (78.7)	19 (21.3)		67 (75.3)	22 (24.7)		73 (82.0)	16 (18.0)	
50~59	33 (84.6)	6 (15.4)		32 (82.1)	7 (17.9)		32 (82.1)	7 (17.9)	
≥60	10 (62.5)	6 (37.5)		10 (62.5)	6 (37.5)		13 (81.3)	3 (18.7)	
Marital status			0.008 (0.930)			2.501 (0.114)			0.025 (0.874)
Single/widowed/divorced	78 (79.6)	20 (20.4)		71 (72.4)	27 (27.6)		84 (85.7)	14 (14.3)	
Married/living together	252 (80.0)	63 (20.0)		252 (80.0)	63 (20.0)		272 (86.3)	43 (13.7)	
Ethnic			12.385 **(0.002)** [2]			1.825 (0.32) [2]			5.849 **(0.031)** [2]
Kinh	324 (81.2)	75 (18.8)		310 (77.7)	89 (22.3)		347 (87.0)	52 (13.0)	
Other	6 (42.9)	8 (57.1)		13 (92.9)	1 (7.1)		9 (64.3)	5 (35.7)	
Religion			0.745 (0.412) [2]			1.371 (0.286) [2]			0.001 (1.000) [2]
None	314 (80.3)	77 (19.7)		308 (77.7)	83 (22.3)		337 (86.2)	54 (13.8)	
Other	16 (72.7)	6 (27.3)		15 (92.9)	7 (7.1)		19 (86.4)	3 (13.6)	
Educational level			6.548 **(0.011)**			1.279 (0.258)			8.508 **(0.004)**
Hight school or below	102 (72.9)	38 (27.1)		105 (75.0)	35 (25.0)		111 (79.3)	29 (20.7)	
College/University or above	228 (83.5)	45 (16.5)		218 (79.9)	55 (20.1)		245 (89.7)	28 (10.3)	
Location			0.299 (0.584)			0.562 (0.453)			2.731 (0.098)
City/town	59 (77.6)	17 (22.4)		57 (75.0)	19 (25.0)		70 (92.1)	6 (7.9)	
Countryside	271 (80.4)	66 (19.6)		266 (78.9)	71 (21.1)		286 (84.9)	51 (15.1)	
Work status			2.941 (0.568)			1.452 (0.835)			2.312 (0.678)
Private-employee	111 (76.0)	35 (24.0)		115 (78.8)	31 (21.2)		127 (87.0)	19 (13.0)	
Merchant	30 (78.9)	8 (21.1)		30 (78.9)	8 (21.1)		30 (78.9)	8 (21.1)	
Government employee	125 (83.3)	25 (16.7)		120 (80.0)	30 (20.0)		132 (88.0)	18 (12.0)	
Student	18 (85.7)	3 (14.3)		15 (71.4)	6 (28.6)		18 (85.7)	3 (14.3)	
Other	46 (79.3)	12 (20.7)		43 (74.1)	15 (25.9)		49 (84.5)	9 (15.5)	
Economic status			0.185 (0.714) [2]			0.19 (1.000) [2]			0.085 (0.675) [2]
Poor / near-poor	9 (75.0)	3 (25.0)		10 (83.3)	2 (16.7)		10 (83.3)	2 (16.7)	
Average / well-off	321 (80.0)	80 (20.0)		313 (78.1)	88 (21.9)		346 (86.6)	55 (13.7)	
Vaccinated 2 doses			0.186 (1.000) [2]			0.635 (0.493) [2]			0.971 (0.402) [2]
Yes	319 (79.8)	81 (20.2)		314 (78.5)	86 (21.5)		346 (86.5)	54 (13.5)	
No	11 (84.6)	2 (15.4)		9 (69.2)	4 (30.8)		10 (76.9)	3 (23.1)	

[1] Statistically significant differences are highlighted in **bold type**. [2] Fisher's Exact Test.

meters from others (90.8%), and avoid shaking hands (88.6%).

There was a significant difference between the Ethnic ($\chi^2 = 5.849$, $p = 0.031$) and Education Level ($\chi^2 = 8.508$, $p = 0.004$) of the participants (Table 2). Multivariable binary logistic regression analysis revealed that people with good knowledge (OR = 2.42, $p = 0.009$) and positive attitude (OR = 2.77, $p = 0.002$) have a higher odds of having good practice in COVID-19 prevention (Table 3). A positive correlation was found between Knowledge-Practice scores (r = 0.196, $p < 0.001$) and Attitude-Practice scores (r = 0.099, $p = 0.044$) (Table 4).

Barriers to practicing COVID-19 prevention

When implementing COVID-19 prevention measures, the majority of participants encountered barriers. The most common barrier is due to the

Table 4. Correlation between scores of KAP towards COVID-19.

Variable	Correlation Coefficient	P
Knowledge - Attitude	0.035	0.484
Attitude – Practice	0.099 [2)]	**0.044**
Knowledge - Practice	0.196 [1)]	**0.000**

1) Correlation significant at 0.01 level (2-tailed). 2) Correlation significant at 0.05 level (2-tailed).

Table 3. Multiple logistics regression analysis for factors related to KAP towards COVID-19.

Variable	Knowledge		Attitude		Practice	
	OR (95% CI)	*P* [1)]	OR (95% CI)	*P* [1)]	OR (95% CI)	*P* [1)]
Gender						
Male	1.00	-	1.00	-	1.00	-
Female	1.167 (0.96-2.79)	0.071	0.970 (0.59-1.59)	0.904	1.213 (0.64-2.28)	0.549
Age						
18~29	1.00	-	1.00	-	1.00	-
30~39	0.745 (0.31-1.77)	0.505	1.532 (0.70-3.38)	0.291	1.251 (0.44-3.54)	0.674
40~49	0.659 (0.26-1.69)	0.384	0.981 (0.42-2.28)	0.965	0.733 (0.26-2.12)	0.567
50~59	1.169 (0.34-4.00)	0.804	1.485 (0.50-4.40)	0.475	0.583 (0.17-2.07)	0.404
≥60	0.312 (0.08-1.23)	0.096	0.526 (0.14-1.94)	0.335	1.081 (0.21-5.66)	0.927
Marital status						
Single/widowed/divorced	1.00	-	1.00	-	1.00	-
Married/living together	1.053 (0.47-2.36)	0.900	1.334 (0.67-2.80)	0.445	0.930 (0.36-2.40)	0.881
Ethnic						
Kinh	1.00	-	1.00	-	1.00	-
Other	0.155 (0.05-0.52)	**0.003**	4.333 (0.53-35.73)	0.173	0.316 (0.08-1.18)	0.087
Religion						
None	1.00	-	1.00	-	1.00	-
Other	0.738 (0.26-2.08)	0.566	0.593 (0.22-1.58)	0.297	1.309 (0.33-5.17)	0.701
Educational level						
Hight school or below	1.00	-	1.00	-	1.00	-
College/University or above	2.025 (1.08-3.79)	**0.027**	1.301 (0.71-2.40)	0.398	1.822 (0.87-3.84)	0.114
Location						
City/town	1.00	-	1.00	-	1.00	-
Countryside	1.690 (0.87-3.27)	0.120	1.248 (0.67-2.34)	0.488	0.535 (0.21-1.38)	0.196
Work status						
Private-employee	1.00	-	1.00	-	1.00	-
Merchant	1.369 (0.53-3.55)	0.519	1.172 (0.45-3.04)	0.744	0.635 (0.23-1.76)	0.382
Government employee	1.254 (0.66-2.40)	0.494	0.950 (0.51-1.78)	0.872	0.751 (0.34-1.68)	0.487
Student	1.145 (0.27-4.94)	0.856	0.867 (0.27-2.80)	0.812	0.618 (0.13-2.96)	0.547
Other	1.632 (0.66-4.02)	0.287	0.980 (0.43-2.25)	0.962	1.203 (0.43-3.37)	0.726
Economic status						
Poor / near-poor	1.00	-	1.00	-	1.00	-
Average / well-off	0.558 (0.11-2.96)	0.493	0.739 (0.15-3.77)	0.716	0.767 (0.13-4.39)	0.766
Vaccinated 2 doses						
Yes	1.00	-	1.00	-	1.00	-
No	1.600 (0.32-7.96)	0.566	0.652 (0.18-2.32)	0.509	0.642 (0.15-2.82)	0.558
Knowledge						
Poor	-	-	1.00	-	1.00	-
Good	-	-	1.268 (0.70-2.30)	0.433	2.419 (1.25-4.70)	**0.009**
Attitude						
Negative	-	-	-	-	1.00	-
Positive	-	-	-	-	2.772 (1.45-5.28)	**0.002**

[1)] Statistically significant differences are highlighted in **bold type.**

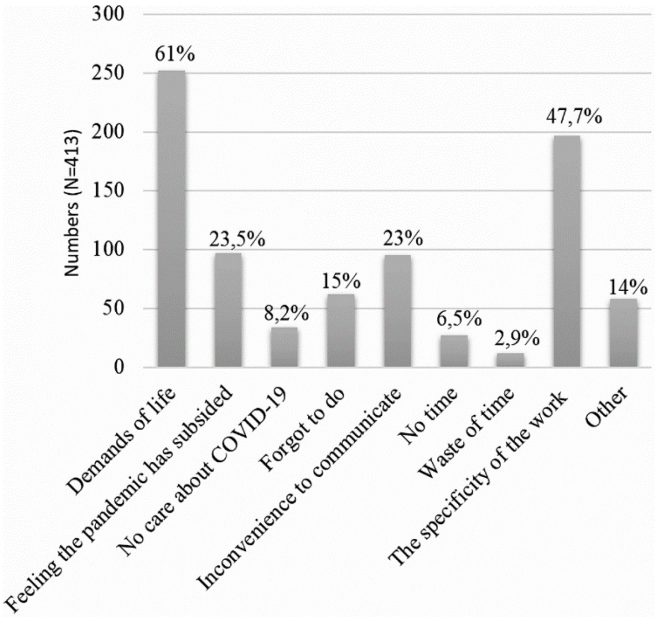
demands of life (61%), followed by the specificity of the work (47.7%). A small number of participants believe the pandemic has subsided and that they are no longer required to practice COVID-19 prevention (23.5%). In particular, 8.2% of participants were unconcerned about the pandemic, and 2.9% thought it was a waste of time (Figure 2).

Discussion

To the best of our knowledge, several studies in Vietnam have been conducted to assess KAP towards COVID-19 in a variety of population groups [10–12]. According to a study conducted by Ha *et al.* [12], the majority of people had relatively high KAP scores, with 92.2% of participants having good knowledge about COVID-19, 68.6% having a positive attitude and 75.8% practicing good measures to prevent the spread of the virus [12]. However, because this study was conducted in April 2020, the data may be out of date at this time. Furthermore, our study is the first in Quang Binh, which is heavily affected by COVID-19 with over 83,000 infections and over 2500 new cases per day. The findings of this study will be extremely useful to the government in gathering scientific information about COVID-19 to make appropriate policies.

The average knowledge score of Quang Binh residents about COVID-19 was moderate at 9.43 ± 1.251 (out of a maximum score of 12), with 80.5% being assessed as "good knowledge". We were not too surprised by this result, possibly due to the characteristics of the sample with 66.1% of the participants having a college/university degree or above. This is also confirmed in a student-based survey by Le *et al.* [10], the percentage of university students with good knowledge about COVID-19 was 86.6%. As demonstrated in several studies, highly educated people have a good knowledge of COVID-19 [13,14]. Furthermore, another cause could be the distribution of the questionnaire; in the context of the strong outbreak of the COVID-19 pandemic, we chose a convenience sampling method, so the above results may be higher than reality.

Figure 2. Barriers to practicing COVID-19 prevention measures.



Several studies conducted in other Asian countries also indicate a high level of knowledge about COVID-19 in the general population such as the study by Zhong *et al.* in China (90%) [15], the study by Al-Hanawi *et al.* in Saudi Arabia (80.5%) [13], a study by Azlan *et al.* in Malaysia (82.3%) [16]. However, due to differences in sampling methods, measurement, and scoring systems, we cannot accurately compare the knowledge level of participants in our study with these studies.

Multiple logistics regression analysis shows that Kinh people and those with college/university degrees or above had better knowledge about COVID-19 (Table 3), similar to previous studies [12,17,18]. Accordingly, our findings suggest that the government should promote public knowledge about the COVID-19 pandemic by targeting people with low education levels and ethnic minorities. In addition, the main information channels for people regarding COVID-19 are TV, the internet, and SMS received from the VMH (Table 1). Therefore, it is necessary to focus on developing the above information channels to increase the level of COVID-19 knowledge dissemination for the people. Currently, the government and technology companies have cooperated to create several mobile applications such as "Electronic Health Book", and "PC-COVID" to monitor individual health, register for vaccinations, and update daily COVID-19 pandemic information. This has contributed significantly to improving knowledge about COVID-19.

In terms of attitude, 78.2% of participants had a positive attitude, with a mean score was 29.15 ± 3,599. Attitudes towards COVID-19 did not differ significantly across demographic groups. This demonstrates that the people's attitude is the same in the context of this serious pandemic outbreak [19]. The positive attitude of the people is higher when compared to the results of studies in the period when the pandemic has not yet broken out strongly in Vietnam. Specifically, 68.6% of people have a positive attitude towards the study of Ha *et al.* [12] and 68.6% in the study of Le *et al.* [10]. The explanation could be that

when the pandemic broke out strongly in Vietnam, the Communist Party and Government of Vietnam immediately provided a large amount of data about COVID-19 through various channels to warn people about the severity of COVID-19 [20], which coincided with the rapid increase in the number of COVID-19 cases. As a result, people's attitudes toward COVID-19 are becoming increasingly positive.

In terms of practice, the majority of people practice quite well the measures to prevent COVID-19 recommended by the VMH, such as 96.6% avoiding going to crowded places, 98.5% always wearing a mask when going out, 88.6% avoiding shaking hands, this result is quite similar to the study of Zhong *et al.* [15]. However, only 75.5% of the participants took all COVID-19 prevention measures. The main barriers they reported were due to the demands of life and the specifics of work (Figure 2), which can significantly affect the implementation and maintenance of good practices. Besides, we found that people with good knowledge (OR = 2.42 (1.25-4.70), p = 0.009) and positive attitudes (OR = 2.77 (1.45-5.28), p = 0.002) are associated with good practice on COVID-19 prevention (Table 3). In addition, a positive correlation in scores between Knowledge - Practice (r = 0.196, $p < 0.001$) and Attitude - Practice (r = 0.099, p = 0.044) was found in this study (Table 4). Knowledge and attitudes are prerequisites for promoting the practice of pandemic prevention measures, as previously demonstrated in several studies [12,19,21].

It is worth noting here why people have a relatively high KAP score and the rate of people who have received two vaccines is 96.8%, whereas the COVID-19 pandemic is still spreading in the community, with more than 2,500 new cases reported every day. The following assumptions may help to explain this issue:

(1) The COVID-19 pandemic spreads quickly from person to person and has no symptoms in the early stages, with an average incubation period of 5 days [22], making early diagnosis and isolation difficult.

(2) Although 96.8% of participants received two doses of vaccine, the actual rate among Quang Binh residents aged ≥ 18 was 79.97 % [23]. Furthermore, only a small percentage of children aged 12 to 17 are vaccinated, and children under the age of 12 are unvaccinated [24]. As a result, vaccine protection is insufficient to protect the entire population.

(3) The government has implemented a "living with the COVID-19 pandemic" strategy, so restaurants, pubs, and karaoke have resumed normal operations, creating favorable conditions for COVID-19 to spread easily because people do not wear masks and keep a safe distance when communicating in these places.

(4) According to the findings of this study, 20% of people still do not have a good KAP about COVID-19. They may be at a higher risk of contracting COVID-19 and infecting others.

(5) Because of the barriers participants reported in Figure 2, even though people are aware of the COVID-19 prevention measures, they are forced to comply with those measures due to life needs or the specificity of the work.

To solve the above problems, the government needs a reasonable policy and appropriate actions. For example, strengthening the early diagnosis and treatment of COVID-19 patients, increasing the coverage of COVID-19 vaccines in the community, increasing communication to improve knowledge about COVID-19 for the people, understand and respond appropriately to their life needs.

Even though the fact that our study yielded remarkable results, it had some limitations. Firstly, the sampling method is convenience sampling, the choice of sample units is subjective to the researcher, so the accuracy and reliability are not high [25]. However, convenience sampling is the most appropriate in the context of the pandemic spreading widely and making travel between areas difficult. Second, the study was only conducted in one province of Vietnam, so the results may not be generalizable to other regions. Finally, the results may differ from reality because the study relies on a self-designed questionnaire that has not been standardized.

Conclusions

This is the first KAP study on COVID-19 in Quang Binh, Vietnam. According to our findings, Quang Binh residents have moderate KAP for COVID-19. Kinh ethnic people and those with a high level of education have a higher odds of having good knowledge. Furthermore, a positive correlation was discovered between Knowledge-Practice scores and Attitude-Practice scores. This study suggests that Quang Binh authorities strengthen health education programs to improve people's knowledge of COVID-19, with a focus on ethnic minorities and people with low levels of education.

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Authors' Contributions

Study conception and design: Yueming Jiang, Thanh-Tung Ho; Administrative support: Yueming Jiang; Collection and assembly of the research materials and data: All authors; Data analysis: Thanh-Tung Ho, Jing-Jing Luo; Writing the manuscript: Thanh-Tung Ho, Galal A. Al-Samhari, Jun-Jie Lin; Final approval of manuscript: All authors.

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