

Research Article

Socio-demographic characteristics influencing knowledge, attitude and preventive practices of COVID-19 among Ghanaians: A cross-sectional study

Philip Apraku Tawiah^{1,2*}, Kingsley Arhin-Wiredu³, Kwabena Opong⁴, Bernard Nii Torgbor⁵, Phenehance Effah Konadu⁶ and Albert Abaka-Yawson⁷

¹School of Public Health, College of Health Sciences, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana, West Africa

²Department of Pharmacognosy and Herbal Medicine, School of Pharmacy, University of Health and Allied Sciences, Ho, Ghana, West Africa

³Municipal Health Directorate, Ghana Health Service, Sunyani, Ghana, West Africa

⁴Kumasi Centre for Collaborative Research in Tropical Medicine, Kumasi, Ghana, West Africa

⁵Volta Aluminum Company Ltd Hospital, Tema, Ghana, West Africa

⁶Disease Control Unit, Upper Denkyira East Municipal Health Directorate, Ghana Health Service, Dunkwa-On-Offin, Ghana, West Africa

⁷Department of Medical Laboratory Sciences, School of Allied Health Sciences, University of Health and Allied Sciences, Ho, Ghana, West Africa

Received: 20 October, 2021

Accepted: 11 November, 2021

Published: 12 November, 2021

*Corresponding author: Philip Apraku Tawiah, School of Public Health, College of Health Sciences, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana, West Africa, Tel: +233 242 164519; E-mail: ptawiah@uhas.edu.gh

ORCID: <https://orcid.org/0000-0003-0212-195X>

Keywords: SARS-CoV-2; COVID-19; Knowledge; Attitudes; Practices; Ghana

Copyright: © 2021 Tawiah PA, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

<https://www.peertechzpublications.com>



Abstract

Background: In recent times, the novel coronavirus disease is one of the most challenging public health burdens. Low-and-middle-income countries including Ghana have not been spared by the infection. Several measures are being undertaken by countries to control and prevent the future waves of the disease. Previous studies have established the importance of knowledge, attitude and practices towards an infection as a remedy for controlling the spread of such infection. However, further studies are required to ascertain the socio-demographic characteristics influencing the knowledge, attitude and preventive measures of COVID-19.

Methods: This study investigated the socio-demographic characteristics influencing knowledge, attitude and preventive practices towards COVID-19 among the Ghanaian population. A cross-sectional design was adopted to recruit 369 participants for the study utilizing convenience and snowball sampling methods. With the use of an electronic semi-structured questionnaire and social media platforms, an online survey was conducted from March 26 to May 1, 2020. Descriptive statistics, independent t-test, chi-square test, one-way analysis of variance (ANOVA) and linear regression were used to analyze data.

Results: The average mean percentage of good knowledge, positive attitudes and good preventive practices regarding the novel coronavirus disease was 83.2%, 88.2% and 69.2%, respectively. In relation to occupation, there was significant difference ($t = -2.984$, $p\text{-value} = 0.0030$) in COVID-19 knowledge. Income level was significantly associated with attitudes towards COVID-19. Male gender (vs female, $\beta = -1.276$, $p\text{-value} < 0.00001$), less than ₵500 income earners (vs above ₵1000, $\beta = -0.845$, $p\text{-value} = 0.017$) were associated with lower COVID-19 preventive practice score while being the 42-64 age category (vs 18-25-year group, $\beta = 1.128$, $p\text{-value} = 0.028$), health worker (vs non-health worker, $\beta = 0.816$, $p\text{-value} = 0.001$) and belonging to Ga ethnic group (vs Akan ethnic group, $\beta = 0.89$, $p\text{-value} = 0.027$) were associated with higher scores.

Conclusion: Although this study found higher knowledge and attitudes toward the novel coronavirus disease, it did not reflect in higher preventive practices towards the infection. In our fight against this infection in Ghana, COVID-19 preventive measure educational campaigns targeting the male gender and low-income earners should be considered and implemented.

List of abbreviation

COVID-19: Coronavirus Disease 2019; GoG: Government of Ghana; ANOVA: Analysis of Variance; KAP: Knowledge, Attitude and Practices

Introduction

Since the emergence of the novel coronavirus disease (COVID-19) in December 2019 from Wuhan city in China, it has spread to many other countries around the world including those on the African continent [1]. The World Health Organization (WHO) on January 30, 2020, declared the outbreak of the disease as a Public Health Emergency of International Concern, serving as a clarion call to the international community to provide political, financial and technical support to a public health emergency [2]. Subsequently, COVID-19 was declared as a pandemic on March 11, 2020, due to its widespread across the globe [3].

In Ghana, the Ministry of Health (MOH) in a release on March 12, 2020, announced the first two confirmed cases of COVID-19 [4]. After the pronouncement of these initial cases, the Government of Ghana (GoG) put in place numerous measures including the closing of borders, schools, churches, mosques and ban of all social gatherings [5]. Citizens were also advised by GoG to practice precautionary measures such as the washing of hands with soap, sanitizing, social distancing among others. Notwithstanding, as of May 1, 2020, Ghana was among the top African countries that had recorded most cases of COVID-19 with 2074 confirmed cases, 212 recoveries and 17 deaths [6].

The battle against COVID-19 by GoG and Ghanaians as a whole continued through various phases with strict measures such as partial lockdown in various parts of the country such as Greater Accra, Greater Kumasi and Kasoa Metropolis for three weeks. This was accompanied by the compulsory wearing of nose masks, particularly in the Greater Accra region. In the wake of all these measures put in place by GoG, people's adherence to these measures are significant and is chiefly affected by Knowledge, Attitude and Practices (KAP) towards COVID-19. This is per the KAP theory [7,8].

The second wave of the COVID-19 in India can be attributed to many factors including neglect of COVID-19 proper behaviour [9]. And it is obvious the Indians let their guards down and did not follow the protocols and guidelines of the previous wave of COVID-19. Lack of knowledge, bad attitudes and poor preventive practices towards COVID-19 among them may have also accounted for the violation of the COVID-19 appropriate behaviour. The knowledge, attitudes and practices of standard preventive measures are significant in the prevention of future waves in India and other parts of the world.

According to some studies [10,11]. Conducted during the SARS outbreak in 2003, knowledge and attitudes toward infectious diseases like COVID-19 have a causal connection with the level of panic emotion among the general population and can subsequently complicate the efforts made to prevent the transmission of the disease. So, some basic knowledge about

the COVID-19 and its modes of transmission as well as basic hygiene principles to reduce the panics related to the disease and its spread is essential.

In the specific case of the COVID-19 virus, SARS-CoV-2, the routes of transmission remains a paradox [12]. Hence, there is an urgent call globally to research to unravel these contradictory routes of transmission and other factors including demographic characteristics that may contribute to the transmission of COVID-19. These investigations are essential to inform policy, and consequently, policymakers and public health agencies may need to upgrade their precautionary approaches to disrupt all the probable modes of transmission based on new scientific evidence [12].

Currently, studies have been done in some countries such as China [13]. Egypt [14]. Iran [15]. Kenya [16]. On KAP towards COVID-19 among the general population. However, the situation in Ghana has not been adequately assessed, especially the investigation of socio-demographic characteristics influencing the knowledge, attitude and practices of the COVID-19 pandemic.

Given this and all the precautionary measures put in place by the GoG together with daily education on television, radio, print and social media platforms concerning COVID-19, the study investigated knowledge, Attitude and Practice towards the novel coronavirus disease among Ghanaians. It also ascertains the socio-demographic characteristics influencing the knowledge, attitude and preventive practices of the novel coronavirus disease in the country.

Methods

Study design

A cross-sectional study was conducted from 26 March to 1st May 2020. The study adopted an online survey approach among Ghanaians, due to the restricted movement imposed on Ghanaians during the COVID 19 pandemic period. Social network platforms such as WhatsApp, Facebook, Instagram and Twitter were used as the channels for reaching people to respond to the survey.

Study area

The study was conducted among Ghanaians through online social media platforms. Ghana is a West African Country bordered by the countries; Burkina Faso, Ivory Coast and Togo in the north, west and east respectively. However, the south is bordered by the Atlantic Ocean. Ghana is divided into 16 administrative regions with Accra as the national city. The population is estimated to reach 31,072,940 in the year 2020 with Akans and Christians forming 47.5% and 71.2% of the population correspondingly. The health system is manned by the Ghana Health Service offering primary, secondary and tertiary health care in various regions.

Sample size and sampling procedure

The Centre for Disease Control Epi Info Software 7.2.3.1 was used to compute the minimum sample size required for the

study. An expected frequency of 50% was used mainly because there was limited study quantifying the proportion of the population with knowledge on COVID-19. With an alpha value of 5% at a confidence level of 95%, a total sample size of 384 was computed. The study assumed a non-response rate of 5%, which resulted in a total sample size of 403. However, a total of 369 respondents took part in the study resulting in a response rate of 91.6%. Due to the national lockdown, respondents for the study were recruited through convenience and snowball sampling methods.

Inclusion criteria

- Ability to read and operate a smartphone
- Access to the internet and social media
- Eighteen (18) years and above
- Willingness to participate in the study

Exclusion criteria

- Below 18 years
- Unwillingness to participate in the study

Data collection technique

An online survey tool was designed with google forms comprising four sections. These sections included demographic characteristics, knowledge on COVID-19, attitudes and practices towards COVID 19 among the Ghanaian population. The tool was developed in the English language. The questionnaires were multiple choice and limited format. The data collection instrument was reviewed by professionals including medical officers, medical laboratory scientists and disease control officers to ascertain its reliability and validity. This was followed by a pretesting. The tool was shared with authors' social contacts on WhatsApp, Facebook, Twitter and Instagram. Respondents were also encouraged to share with their networks after completing the survey.

Data processing and analysis

Collected data from google sheet was exported to excel for cleaning and imported into Stata/IC 15 statistics/data analysis software for data analysis. Categorical variables were presented as frequencies and percentages. Analysis of the KAP was done using the scaler scoring method. Questions with multiple responses were assigned 1 point and 0 for unanswered questions. Other questions with three responses were assigned 0, 1 and 2. For each respondent, a maximum score of 22, 6 and 13 were awarded for correctly answering all questions on good knowledge, good attitudes and good practices in that order. Independent t-test, one-way ANOVA and chi-square test were used to analyze and compare demographic characteristics to knowledge, practices and attitude to know statistically significant variables at p values of 5%. The linear regression model was used to analyze factors associated with knowledge, attitude and practices on COVID-19.

Results

Demographic characteristics of respondents

The study received participation from three hundred and thirty-nine (369) people. Out of this, the majority, 231 (62.6%) were males. A greater number, 156 (42.3%) of participants were within the 26-33 age bracket while the least, 26 (7.1%) were in the 42-64 age category. More than half, 207 (56.1%) were not health workers. Almost all, 356 (96.5) were Christians and had attained tertiary education. Also, most, 221 (60.0%) and 215 (58.3) of study respondents earned an average income of more than ₵1000 and were Akans, respectively. Again, the majority, 123 (33.3%) respondents were residents of the Greater Accra region, this was followed by the Ashanti and Eastern region (Table 1).

Participants knowledge of COVID-19

The average mean of knowledge on COVID-19 among study participants was 18.3 ± 2.36 out of a maximum score of 22, showing a mean percentage of good knowledge of 83.2% (Figure 1). The correct answer rate of questions (K1-K12) relating to knowledge on COVID-19 ranged from 4.3-99.2%. However, the

Table 1: Demographic Characteristics of Respondents by occupational status.

Characteristics	Non-health worker	Health worker	Total
	207 (56.10%)	162 (43.90%)	369 (100.00%)
Gender			
Female	75 (36.23)	63 (38.89)	138 (37.40)
Male	132 (63.77)	99 (61.11)	231 (62.60)
Age			
18-25	56 (27.05)	36 (22.22)	92 (24.93)
26-33	84 (40.58)	72 (44.44)	156 (42.28)
34-41	56 (27.05)	39 (24.07)	95 (25.75)
42-64	11 (5.31)	15 (9.26)	26 (7.05)
Educational level			
Secondary	13 (6.28)	0 (0.00)	13 (3.52)
Tertiary	194 (93.72)	162 (100.00)	356 (96.48)
Religion			
Christianity	202 (97.58)	154 (95.06)	356 (96.48)
Islamic	4 (1.93)	6 (3.70)	10 (2.71)
Others	1 (0.48)	2 (1.23)	3 (0.81)
Income level (₵)			
> 1000	116 (56.04)	105 (64.81)	221 (59.89)
500-1000	41 (19.81)	32 (19.75)	73 (19.78)
< 500	50 (24.15)	25 (15.43)	75 (20.33)
Ethnicity			
Akan	126 (60.87)	89 (54.94)	215 (58.27)
Ewe	33 (15.94)	29 (17.90)	62 (16.80)
Ga	20 (9.66)	13 (8.02)	33 (8.94)
Others	28 (13.53)	31 (19.14)	59 (15.99)
Region of residence			
Ashanti	21 (10.14)	31 (19.14)	52 (14.09)
Bono	6 (2.90)	17 (10.49)	23 (6.23)
Central	16 (7.73)	12 (7.41)	28 (7.59)
Eastern	36 (17.39)	9 (5.56)	45 (12.20)
Greater Accra	85 (41.06)	38 (23.46)	123 (33.33)
Volta	14 (6.76)	26 (16.05)	40 (10.84)
Western	11 (5.31)	4 (2.47)	15 (4.07)
Others*	18 (8.70)	25 (15.43)	43 (11.65)

Others* refers to Ahafo, Bono East, North East, Northern, Oti, Savannah, Upper East, Upper West and Western North regions.

correct answer rate to questions (K1-K7) that required a single answer ranged from 89.4-99.2%. With regards to questions (K8-K12) that required more than one correct answer, the rate of identifying all correct answers ranged from 34.7-91.9% (Table 2).

Attitudes of the participant's towards COVID-19

The average mean of participant's attitude towards COVID-19 was 5.29 ± 0.88 out of a maximum score of 6, representing a mean percentage positive attitude of 88.2% (Figure 1). The majority, 61.5% of above ₵1000 per month income earners had good attitudes towards the novel disease (Figure 2). Based on the questions to ascertain attitudes towards COVID-19, a good attitude rate ranged from 75.1-99.7%. The majority of participants (77.0%) thought it was safe to get closer to a person who has previously suffered from COVID-19. Almost all (99.7%) participants claimed it was significant to observe the health guidelines. The majority, 91.3% and 90.2% of participants did not believe COVID-19 is a spiritual disease and deception, respectively. Many, 75.1% and 95.4% of the respondents also were confident the Government of Ghana could win the battle against COVID-19, and successfully control the pandemic correspondingly (Table 3).

Preventive practices against COVID-19 by study participants

The average mean of COVID-19 preventive practices was 9.0 ± 2.18 out of a maximum score of 13, making up a mean percentage of the good preventive practice of 69.2% (Figure 1). Also, 60.1% of males were involved in good practices towards the novel disease (Figure 3). Most participants, 179 (48.5%) and 299 (81.0%) always wore masks and avoided crowded places, respectively. The majority of participants, 359 (97.3%) washed their hands with soap under running water; nonetheless, only one-third, 123 (33.3%) did the washing of hands more than 10 times a day. Also, a little above one-third of the participants, 130 (35.2%) disinfected their hands with alcohol-based sanitizers more than 10 times daily. Again, many of the participants admitted they sometimes touched their face, nose and mouth (Table 4).

Association between practices / attitudes towards COVID-19 and demographic characteristics

In relation to demographic characteristics, gender was significantly (Pearson $\chi^2 = 7.34$, p -value = 0.007) associated with practices towards COVID-19, while income level of participants was also significantly (Pearson $\chi^2 = 8.48$, p -value = 0.007) associated with attitudes towards the COVID-19 pandemic (Table 5).

Differences between knowledge, attitudes and practices towards COVID-19 by socio-demographics characteristics

There was significant difference in knowledge on COVID-19 in relation to the occupation ($t = -2.984$, p -value = 0.0030) of study participants. Again, significant differences existed in attitudes with respect to income level ($F = 4.12$, p -value =

Table 2: Participant's knowledge of COVID-19.

Questions/Statements	N(%)
K1. COVID-19 spreads by breathing droplets containing the virus from an infected person	
No	19 (5.15)
Yes*	350 (94.85)
K2. A person who tests positive for COVID-19 but shows no symptoms cannot spread the virus	
True	39 (10.57)
False*	330 (89.43)
K3. It is not important for children and youth to measures to prevent COVID-19	
True	35 (9.49)
False*	334 (90.51)
K4. It is recommended that to stay safe, you must wash your hands frequently	
True*	366 (99.19)
False	3 (0.81)
K5. There is a specific approved antiviral treatment for COVID-19?	
Yes	26 (7.05)
No*	343 (92.95)
K6. Are there approved vaccines currently on the market to prevent COVID-19?	
Yes	19 (5.15)
No*	350 (94.85)
K7. Persons with COVID-19 cannot infect others with the virus if a fever is not present	
True	13 (3.52)
False*	356 (96.48)
K8. Which people are at risk of getting infected with COVID-19?	
Don't know	2 (0.54)
The aged and people with chronic disease*	28 (7.59)
Everyone**	339 (91.87)
K9. Common clinical symptoms of COVID-19 are	
Don't know	14 (3.79)
Fever*	16 (4.34)
Fever and fatigue**	40 (10.84)
Fever, fatigue and dry cough***	128 (34.69)
Fever, fatigue, dry cough and sore throat****	171 (46.34)
K 10. Critical cases of COVID-19 are common among	
Don't know	4 (1.08)
Elderly*	58 (15.72)
Elderly and people who are obese.**	219 (59.35)
Elderly, people who are obese and patients with chronic illness***	88 (23.85)
K 11. Clinical symptoms associated with severe cases of COVID-19 includes	
Don't know	5 (1.36)
Difficulty in breathing*	49 (13.28)
Difficulty in breathing and high fever**	133 (36.04)
Difficulty in breathing, high fever and pneumonia***	182 (49.32)
K 12. In your opinion, COVID-19 can be prevented by	
Don't know	6 (1.63)
Avoiding crowded places*	66 (17.89)
Avoiding crowded places and not greeting through handshaking**	138 (37.40)
Avoiding crowded places, not greeting through handshaking and not drinking alcoholic beverages***	159 (43.09)

*, **, *** and **** represents correct answers that were scored 1, 2, 3 and 4 respectively.

0.0169) and ethnicity ($F = 4.67$, p -value = 0.0032). Also, there was significant differences in practices towards the COVID-19 pandemic regarding gender ($t = 4.712$, p -value = 0.0001), occupation ($t = -3.320$, p -value = 0.0010) and income level ($F = 3.25$, p -value = 0.0400) (Table 6).

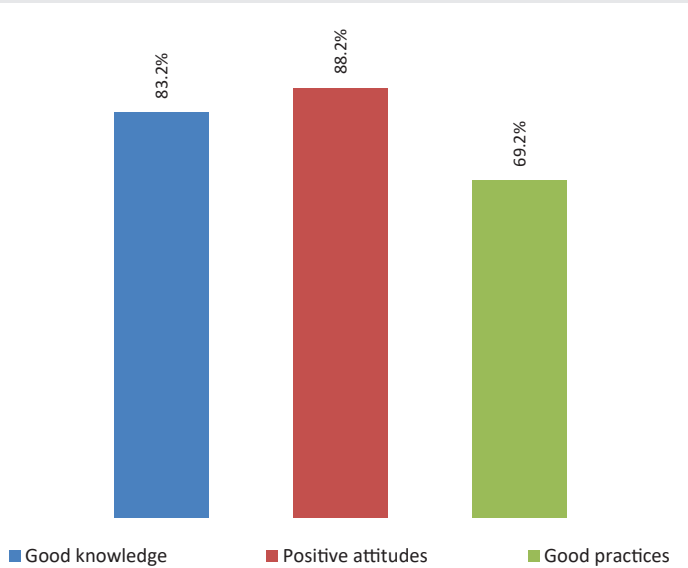


Figure 1: Percentage of adequate knowledge, positive attitude and good practices among participants.

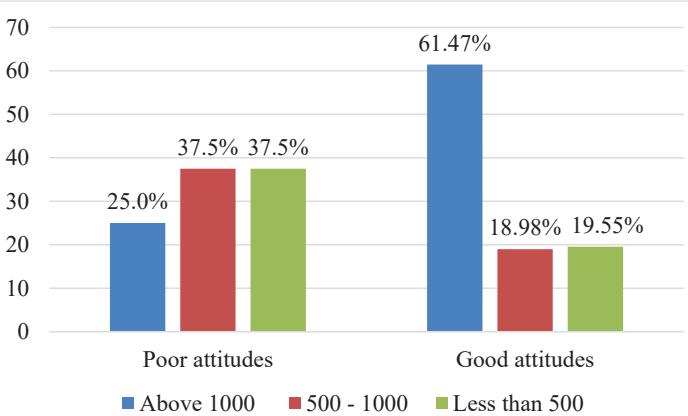


Figure 2: Level of participants' attitudes towards COVID-19 by income level.

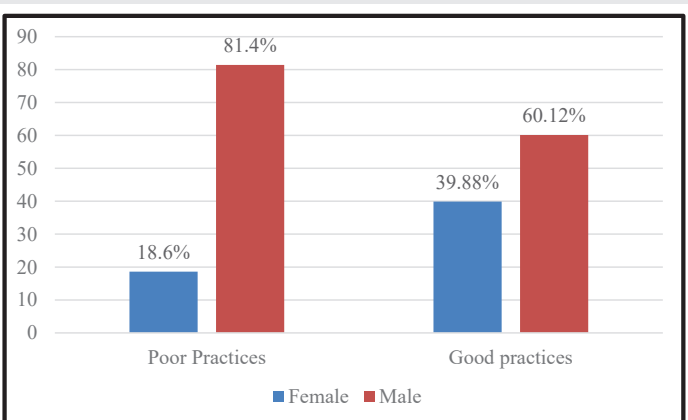


Figure 3: Level COVID-19 preventive practices among participants by gender.

Table 3: Attitudes of the participant's towards COVID-19.

Questions on attitudes toward COVID-19 (good attitudes rate, percentage of total sample %)	Options
A1. Do you agree that COVID-19 could be successfully controlled? (95.4)	Disagree, Agree*, don't know
A2. Do you have confidence that the Government of Ghana can win the battle against COVID-19? (75.1)	No, Yes*, don't know
A3. Do you think it is safe to get close to a person who suffered previously from COVID-19? (77.0)	No, Yes*, don't know
A4. Do you think it is important to observe the health guidelines (including social distancing and wearing of masks)? (99.7)	No, Yes*, don't know
A5. Is COVID-19 a spiritual disease? (91.3)	No*, Yes, don't know
A6. Is COVID-19 a hoax (deception)? (90.2)	No*, Yes, don't know

* corresponds to options perceived as a good attitude towards COVID-19.

Table 4: COVID-19 practices by study participants.

Questions/Statements	N(%)
P1. Do you wear masks when leaving home?	
Never	35 (9.49)
Sometimes*	155 (42.01)
Always**	179 (48.51)
P2. Do you wash your hands with soaps under running water for at least 20 seconds?	
No	10 (2.71)
Yes*	359 (97.29)
P3. How frequently do you disinfect your hands with alcohol-based sanitisers?	
None	17 (4.61)
1-4 times*	124 (33.60)
5-10 times**	98 (26.56)
Above 10 times***	130 (35.23)
P4. How often do you touch your face, nose and mouth?	
Not at all	42 (11.38)
Sometimes *	262 (71.00)
Most of the time**	65 (17.62)
P5. Do you avoid crowded places in recent times (social distancing)?	
Never	1 (0.27)
Sometimes*	69 (18.70)
Always**	299 (81.03)
P6. How many times in a day do you wash your hands?	
None	3 (0.81)
1-4 times*	116 (31.44)
5-10 times**	127 (34.42)
Above 10 times***	123 (33.33)

*, ** and *** represent good practices and were scored 1, 2 and 3 respectively.

Multiple linear regression on factors associated with COVID-19 practices

A multiple linear regression analysis depicted that male gender (vs female, $\beta = -1.276$, p -value = <0.00001), income level (ζ) of less than 500 (vs above 1000, $\beta = -0.845$, p -value =



Table 5: Association Between Practices, Attitudes towards COVID-19 and Demographic Characteristics.

Characteristics	Practices				Attitudes			
	Poor	Good	Chi2	p-value	Poor	Good	Chi2	p-value
Gender			7.34	0.007_a*			0.00	0.993 ^a
Female	8 (5.80)	130 (94.20)			6 (4.35)	132 (95.65)		
Male	35 (15.15)	196 (84.85)			10 (4.33)	221 (95.67)		
Age			4.66	0.197			7.87	0.066
18-25	14 (15.22)	78 (84.78)			8 (8.70)	84 (91.30)		
26-33	21 (13.46)	135 (86.54)			7 (4.49)	149 (95.51)		
34-41	6 (6.32)	89 (93.68)			1 (1.05)	94 (98.95)		
42-64	2 (7.69)	24 (92.31)			0 (0.00)	26 (100.00)		
Occupation			1.61	0.205 _a			2.43	0.132
Non-health worker	28 (13.53)	179 (86.47)			12 (5.80)	195 (94.20)		
Health worker	15 (9.26)	147 (90.74)			4 (2.47)	158 (97.53)		
Educational			0.21	0.540			0.61	1.000
Secondary	1 (7.69)	12 (92.31)			0 (0.00)	13 (100.00)		
Tertiary	42 (11.80)	314 (88.20)			16 (4.49)	340 (95.51)		
Religion			1.78	0.734			0.61	1.000
Christianity	43 (12.08)	313 (87.92)			16 (4.49)	340 (95.51)		
Islamic	0 (0.00)	10 (100.00)			0 (0.00)	10 (100.00)		
Others	0 (0.00)	3 (100.00)			0 (0.00)	3 (100.00)		
Income level (¢)			2.03	0.363 _a			8.48	0.007*
> 1000	22 (9.95)	199 (90.05)			4 (1.81)	217 (98.19)		
500-1000	9 (12.33)	64 (87.67)			6 (8.22)	67 (91.78)		
< 500	12 (16.00)	63 (84.00)			6 (8.00)	69 (92.00)		
Ethnicity			5.34	0.151			6.76	0.124
Akan	28 (13.02)	187 (86.98)			9 (4.19)	206 (95.81)		
Ewe	10 (16.13)	52 (83.87)			6 (9.68)	56 (90.32)		
Ga	1 (3.03)	32 (96.97)			0 (0.00)	33 (100.00)		
Others	4 (6.78)	55 (93.22)			1 (1.69)	58 (98.31)		
Residence			7.43	0.356			5.83	0.447
Ashanti	8 (15.38)	44 (84.62)			3 (5.77)	49 (94.23)		
Bono	4 (17.39)	19 (82.61)			2 (8.70)	21 (91.30)		
Central	2 (7.14)	26 (92.86)			3 (10.71)	25 (89.29)		
Eastern	6 (13.33)	39 (86.67)			1 (2.22)	44 (97.78)		
Greater Accra	9 (7.32)	114 (92.68)			4 (3.25)	119 (96.75)		
Volta	8 (20.00)	32 (80.00)			1 (2.50)	39 (97.50)		
Western	1 (6.67)	14 (93.33)			1 (6.67)	14 (93.33)		
Others	5 (11.63)	38 (88.37)			1 (2.33)	42 (97.67)		

Others* refers to Ahafo, Bono East, North East, Northern, Oti, Savannah, Upper East, Upper West and Western North regions.

0.017) were significantly associated with lower practice score (Table 7). However, 42–64 age category (vs 18–25-year group, $\beta = 1.128$, p-value = 0.028), health worker as an occupation (vs non-health worker, $\beta = 0.816$, p-value = 0.001) and belonging to an Ga ethnic group (vs Akan ethnic group, $\beta = 0.89$, p-value = 0.027) were significantly associated with higher practice score (Table 7).

Discussion

This study investigated the knowledge, attitudes and practices of Ghanaians towards the novel coronavirus disease through an online survey. Averagely, participants of this study showed a high knowledge of the disease. This finding was not different from a similar study conducted among the Egyptian population [14]. Additionally, an extremely higher mean score of knowledge was recorded in a study conducted among Chinese residents [17]. All these results show the concern that was attached to the disease. Besides, the high COVID-19 knowledge level may also have resulted from the educational level of participants who took part in the study [18].

Again, our study revealed that health workers had significantly higher knowledge scores compared to non-health workers. This result is expected since health workers are the front-liners in the fight against the coronavirus pandemic. However, a study conducted by Yue et al. showed that being a health care worker had a significant impact on COVID-19 knowledge, but there was no significant difference in knowledge of health workers and non-healthcare workers [19]. Significant differences in COVID-19 knowledge rather existed in age groups, marital status, gender and educational level [19].

The findings of our study depicted a high mean percentage attitude score of almost 90%. A similar result was reported in a population-based study done in Iran [20]. Further, both recent and previous studies conducted within Africa and other parts of the world within this pandemic period have reported high positive attitudes towards the novel coronavirus disease [17–19,21]. Knowledge is usually associated with attitudes. Therefore, the high COVID-19 knowledge among participants from different countries may have influenced the general attitude of people worldwide. A study conducted in Nigeria



Table 6: Differences between Knowledge, Attitudes and Practices towards COVID-19 by Socio-demographics characteristics.

Characteristics	Knowledge			Attitudes			Practices		
	Mean ± SD	t/F	p-value	Mean ± SD	t/F	p-value	Mean ± SD	t/F	p-value
Gender		-1.016	0.3105		-0.569	0.5701		4.712	<0.0001*
Female	18.10±0.2			5.25±0.1			9.71±0.2		
Male	18.36±0.2			5.31±0.1			8.63±0.1		
Age		1.36	0.2559		2.58	0.0534		1.86	0.1359
18-25	17.91±2.2			5.08±1.0			8.76±2.1		
26-33	18.30±2.3			5.33±0.9			8.92±2.3		
34-41	18.37±2.7			5.41±0.7			9.34±2.1		
42-64	18.88±2.0			5.31±0.6			9.62±2.4		
Occupation		-2.984	0.0030*		-1.131	0.2587		-3.320	0.0010*
Non-health worker	17.94±0.2			5.24±0.1			8.71±0.2		
Health worker	18.67±0.1			5.35±0.1			9.46±0.2		
Educational level		-1.007	0.3145		0.085	0.9321		-0.704	0.4818
Secondary	17.62±1.0			5.31±0.2			8.62±0.5		
Tertiary	18.29±0.1			5.29±0.1			9.05±0.1		
Religion		1.83	0.1623		0.24	0.7850		0.49	0.6136
Christianity	18.30±2.4			5.29±0.9			9.04±2.2		
Islamic	17.60±1.8			5.40±0.5			8.60±1.8		
Others	16.00±1.7			5.00±1.0			10.00±1.7		
Income level (¢)		2.30	0.1018		4.12	0.0169*		3.25	0.0400*
> 1000	18.47±2.4			5.39±0.8			9.16±2.2		
500-1000	18.10±2.2			5.14±1.0			9.23±2.1		
< 500	17.83±2.5			5.12±1.0			8.47±2.1		
Ethnicity		0.24	0.8660		4.67	0.0032*		2.58	0.0536
Akan	18.24±2.5			5.38±0.9			8.90±2.2		
Ewe	18.45±2.0			4.92±1.1			9.19±2.4		
Ga	18.03±2.5			5.36±0.7			9.97±2.0		
Others	18.27±2.2			5.29±0.6			8.85±1.9		
Region of residence		0.67	0.6992		0.31	0.9492		0.77	0.6141
Ashanti	18.25±2.1			5.25±0.9			8.79±2.2		
Bono	18.56±1.8			5.26±1.1			9.35±3.1		
Central	18.86±1.5			5.14±1.3			9.29±2.2		
Eastern	18.16±2.2			5.27±0.8			8.87±2.1		
Greater Accra	18.07±2.5			5.28±0.8			9.28±2.0		
Volta	18.55±2.2			5.33±0.8			8.80±2.5		
Western	18.67±2.6			5.40±0.8			9.20±2.1		
Others	17.98±3.0			5.42±0.7			8.63±1.9		

Others* refers to Ahafo, Bono East, North East, Northern, Oti, Savannah, Upper East, Upper West and Western North regions.

Table 7: Results of multiple linear regression on factors associated with COVID-19 practices.

Variable	Coefficient	Standard error	t	p-value
Gender (Male vs. Female)	-1.276	0.241	-5.29	<0.0001
Age (42-64 vs. 18-25)	1.128	0.511	2.21	0.028
Occupation (Health worker vs. Non-health worker)	0.816	0.235	3.48	0.001
Income in GH¢ (Less than 500 vs. Above 1000)	-0.845	0.353	-2.39	0.017
Ethnicity (Ga vs. Akan)	0.891	0.401	2.22	0.027

confirms a significant relationship between COVID-19 knowledge level and attitudes towards COVID-19 preventive practices [18].

Earlier modelling studies had predicted the severity of the novel coronavirus pandemic globally; the severity is expected to be intense in low-income settings and among people earning low income [22,23]. In our study, we found that attitudes towards COVID-19 were significantly associated

with the income level of participants. And, it was confirmed in our study that a positive attitude towards the COVID-19 was significantly higher among participants who received higher income compared to those who received lower income. Also, positive attitudes towards COVID-19 were found among the majority of above ₵1000 income earners. Therefore, it is obvious that negative attitudes among low-income earners may be contributed by the cost of COVID-19 preventive items, such as nose masks and sanitizers.

In a study [24]. Conducted among ethnic minorities in Hong Kong, participants expressed some misconceptions on the prevention of novel coronavirus disease; however, they had positive attitudes towards the approved preventive measures of the infection including wearing masks and social distancing. Though in our study, ethnicity was not associated with attitudes towards COVID-19, significant differences in attitude were among ethnic groups, implying that an ethnic group had better attitudes towards COVID-19 compared to the others. These findings are expected because earlier studies [25]. Have reported a relationship between ethnicity and the spread of



COVID-19. This observation suggests that the cultural and socio-economic characteristics of an ethnic group significantly affects their attitudes toward a disease; whether positive or negative.

The mean percentage of COVID-19 preventive practices in our study was found to be 69.2%. This outcome was similar to recent research in Nigeria that depicted an average percentage of 68.0% [18]. Nonetheless, a study published after a few months of the COVID-19 pandemic revealed that over 95.0% of study participants engaged in all COVID-19 preventive practices [17]. The discrepancies in the average practices may be due to the period, and countries where studies were conducted. The earlier study [16] and our study were conducted in West African countries during the national lockdown, which was many months into the COVID-19 pandemic; however, the latter was conducted in the early period of the epidemic in China.

Also, in this study, practices towards the novel coronavirus were significantly associated with gender. Besides, although our study found that the majority of males were found to be involved in good practices of COVID-19, female participants significantly adhere to COVID-19 preventive measures compared to their male counterparts. The findings of this study synchronize with another, which revealed that men were associated with the lower practice of COVID-19 preventive measures, including wearing nose masks and going to crowded places [17]. A study by Erfani et al. also confirms the high practice of COVID-19 preventive measures among females compared to males [20]. Additionally, research [26]. Conducted to study gender differences in COVID-19 linked beliefs and behaviour revealed that, generally, females perceived the pandemic as a serious health issue and subsequently comply with all the preventive measures compared to males. This accounts for the considerable difference in COVID-19 mortality cases between women and men.

This study found the occupation and income level of study participants to be significantly associated with COVID-19 preventive practices. As expected, health workers practiced COVID-19 preventive measures compared to non-health workers. Erfani et al. study [20]. On COVID-19 found results similar to our study, where being a health care provider was associated with adequate knowledge, attitude and preventive practices towards COVID-19 infection. The population working in healthcare-related facilities are at the forefront of the coronavirus virus pandemic; therefore, it is highly expected of these workers to practice COVID-19 preventive measures. According to a recent Chinese study, COVID-19 preventive measures were practiced by participants who earned higher income [24]. However, the results of this study revealed that participants who earned between ₵500-1000 as income practiced COVID-19 preventive measures compared to those who received less than 500 and above ₵1000. Furthermore, our study showed a strong association between the income level of above ₵1000 and lower practice scores. These results suggest the unpredictability of human behaviour, which may be affected by factors such as knowledge and complacency.

This study, finally, found out that being within the age category of 42-64 years and belonging to a Ga ethnic group were associated with a higher COVID-19 preventive practice score. The numerous data that churned out at the early stage of the COVID-19 pandemic revealed that the older age group were at high risk compared to the youth [27]. So, educational and preventive campaigns were all targeted at this age bracket. This may be the reason for the higher practice score among them [28]. The Ga ethnic group are inhabitants of Accra, the epicentre of the novel coronavirus in Ghana. In essence, it was expected that this group may adhere more to the preventive measures compared to the other ethnic groups in Ghana.

Limitation of the study

Due to the COVID-19 pandemic, the study was limited to only participants who could read and write, since the survey was made available on solely social media platforms.

Conclusions

In summary, our research suggests that knowledge and attitudes towards novel coronavirus disease were high among the Ghanaian population; however, preventive practices towards the infection was just above average. Occupation and income level had a significant relation with knowledge and attitudes towards COVID-19 infection, respectively. Also, COVID-19 preventive practices had a significant association with gender, income level, occupation, age and ethnic group. Educational interventions on COVID-19 should be targeted towards the population involved in non-health related occupations. Good attitudes towards the pandemic should be encouraged among the low-income earners of the population. The male gender and low-income earners should be admonished to practice measures towards the curbing of the novel coronavirus disease.

Declarations

Ethics approval and consent to participate: The Ghana Health Service Ethical Review Committee (GHS-ERC) guidelines and standard operating procedures exempt studies that present minimal risks such as online surveys, public behaviour observations and interviews from ethical review and clearance. Hence, the study did not require ethical approval. However, study participants' anonymity and confidentiality were ensured since the survey did not require any identity before partaking. An informed consent section was created as part of the questionnaire to seek consent before respondents proceeded to complete the online [Study Questionnaire](#).

Availability of data and material

The study data and materials will be provided upon request.

Authors' contributions

PAT designed the study and searched the literature. KAW, PAT and KO wrote the protocol and methods. PAT, KAW, KO, BNT, AAY, PEK designed the data collection tool and collected data. PAT, KAW and KO managed the preliminary statistical analysis and wrote the first draft of the manuscript. PAT, KAW and KO managed the final statistical analysis of the study and



wrote the final manuscript. All authors read and approved the final manuscript.

Acknowledgement

The authors express their utmost gratitude to all study participants who took time out of their busy schedules to complete the questionnaire for the survey hence making the study successful.

References

- Wang C, Horby PW, Hayden FG, Gao GF (2020) A novel coronavirus outbreak of global health concern. *Lancet* 395: 470–473. [Link: https://bit.ly/3DILBG5](https://bit.ly/3DILBG5)
- World Health Organization (2020a) COVID-19 Public Health Emergency of International Concern (PHEIC) Global research and innovation forum. [Link: https://bit.ly/3CahtvR](https://bit.ly/3CahtvR)
- World Health Organization (2020b) WHO announces COVID-19 outbreak a pandemic.
- Citi News Room (2020b) Two cases of coronavirus confirmed in Ghana. Citinewsroom.
- Citi News Room (2020a) Coronavirus: Government bans religious activities, funerals, all other public gatherings. Citinewsroom.
- Ghana Health Service (2020). COVID-19 Updates | Ghana.
- Ajilore K, Atakiti I, Onyenankeya K (2017) College students' knowledge, attitudes and adherence to public service announcements on Ebola in Nigeria: Suggestions for improving future Ebola prevention education programmes. *Health Education Journal* 76: 648–660. [Link: https://bit.ly/30kYzVZ](https://bit.ly/30kYzVZ)
- Tachfouti N, Slama K, Berraho M, Nejari C (2012) The impact of knowledge and attitudes on adherence to tuberculosis treatment: A case-control study in a Moroccan region. *The Pan African Medical Journal* 12 [Link: https://bit.ly/3wCYZmg](https://bit.ly/3wCYZmg)
- Choudhary OP, Priyanka, Rodriguez-Morales AJ, Singh I (2021) Second wave of COVID-19 in India: Dissection of the causes and lessons learnt. *Travel Med Infect Dis* 43: 102126. [Link: https://bit.ly/30cqDuV](https://bit.ly/30cqDuV)
- Person B, Sy F, Holton K, Govert B, Liang A, et al. (2004) Fear and stigma: The epidemic within the SARS outbreak. *Emerging Infectious Diseases*. 10: 358–363. [Link: https://bit.ly/30oSKXA](https://bit.ly/30oSKXA)
- Tao N, Sussman S, Nieto J, Tsukamoto H, Yuan JM (2003) Demographic characteristics of hospitalized patients with alcoholic liver disease and pancreatitis in los angeles county. *Alcoholism Clinical and Experimental Research* 27: 1798–1804. [Link: https://bit.ly/3qpoDi](https://bit.ly/3qpoDi)
- Priyanka Choudhary OP, Singh I, Patra G (2020) Aerosol transmission of SARS-CoV-2: The unresolved paradox. *Travel Medicine and Infectious Disease* 37: 101869. [Link: https://bit.ly/3onytKh](https://bit.ly/3onytKh)
- Zhong BL, Luo W, Li HM, Zhang QQ, Liu XG, et al. (2020a) Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: A quick online cross-sectional survey. *International Journal of Biological Sciences* 16: 1745–1752. [Link: https://bit.ly/3HnNIRB](https://bit.ly/3HnNIRB)
- Abdelhafiz AS, Mohammed Z, Ibrahim ME, Ziady HH, Alorabi M, et al. (2020) Knowledge, Perceptions, and Attitude of Egyptians Towards the Novel Coronavirus Disease (COVID-19). *Journal of Community Health* 45: 881-890. [Link: https://bit.ly/3F0Rdpi](https://bit.ly/3F0Rdpi)
- Erfani A, Shahriarirad R, Ranjbar K, Mirahmadizadeh A, Moghadami M (2020a) Knowledge, Attitude and Practice toward the Novel Coronavirus (COVID-19) Outbreak: A Population-Based Survey in Iran. WHO. [Link: https://bit.ly/3ksbkF0](https://bit.ly/3ksbkF0)
- Abuya T, Austrian K, Isaac A, Kangwana B, Mbushi F, et al. (2020) COVID-19-related knowledge, attitudes, and practices in urban slums in Nairobi, Kenya: Study description. [Link: https://bit.ly/3C34gop](https://bit.ly/3C34gop)
- Zhong BL, Luo W, Li HM, Zhang QQ, Liu XG, et al. (2020b) Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: A quick online cross-sectional survey. *International Journal of Biological Sciences* 16: 1745–1752. [Link: https://bit.ly/3Hb2uW4](https://bit.ly/3Hb2uW4)
- Reuben RC, Danladi MMA, Saleh DA, Ejembi PE (2021) Knowledge, Attitudes and Practices Towards COVID-19: An Epidemiological Survey in North-Central Nigeria. *Journal of Community Health* 46: 457–470. [Link: https://bit.ly/3ocRw9W](https://bit.ly/3ocRw9W)
- Yue S, Zhang J, Cao M, Chen B (2021) Knowledge, Attitudes and Practices of COVID-19 Among Urban and Rural Residents in China: A Cross-sectional Study. *Journal of Community Health* 46: 286–291. [Link: https://bit.ly/3DiDBVW](https://bit.ly/3DiDBVW)
- Erfani A, Shahriarirad R, Ranjbar K, Mirahmadizadeh A, Moghadami M (2020b) Knowledge, Attitude and Practice toward the Novel Coronavirus (COVID-19) Outbreak: A Population-Based Survey in Iran. [Link: https://bit.ly/3Hcj2wZ](https://bit.ly/3Hcj2wZ)
- Abbasi-Kangevari M, Kolahi AA, Ghamari SH, Hassanian-Moghaddam H (2021) Public Knowledge, Attitudes, and Practices Related to COVID-19 in Iran: Questionnaire Study. *JMIR Public Health and Surveillance* 7: e21415. [Link: https://bit.ly/3Hae4kd](https://bit.ly/3Hae4kd)
- Truelove S, Abraham O, Altare C, Lauer SA, Grant KH, et al. (2020) The potential impact of COVID-19 in refugee camps in Bangladesh and beyond: A modeling study. *PLOS Medicine* 17: e1003144. [Link: https://bit.ly/3n3Qq0M](https://bit.ly/3n3Qq0M)
- Walker P, Whittaker C, Watson O, Baguelin M, Ainslie K, et al. (2020) Report 12: The global impact of COVID-19 and strategies for mitigation and suppression. Imperial College London. [Link: https://bit.ly/3kuvG0F](https://bit.ly/3kuvG0F)
- Wong CL, Chen J, Chow KM, Law BMH, Chan DNS, et al. (2020) Knowledge, Attitudes and Practices Towards COVID-19 Amongst Ethnic Minorities in Hong Kong. *Int J Environ Res Public Health* 17: 7878. [Link: https://bit.ly/3qriAVC](https://bit.ly/3qriAVC)
- Pareek M, Bangash MN, Pareek N, Pan D, Sze S, et al. (2020) Ethnicity and COVID-19: An urgent public health research priority. *Lancet* 395: 1421–1422. [Link: https://bit.ly/2YCmijH](https://bit.ly/2YCmijH)
- Galasso V, Pons V, Profeta P, Becher M, Brouard S, et al. (2020) Gender differences in COVID-19 attitudes and behavior: Panel evidence from eight countries. *Proceedings of the National Academy of Sciences* 117: 27285–27291. [Link: https://bit.ly/3bZOHDo](https://bit.ly/3bZOHDo)
- Undurraga EA, Chowell G, Mizumoto K (2021) COVID-19 case fatality risk by age and gender in a high testing setting in Latin America: Chile, March–August 2020. *Infectious Diseases of Poverty* 10: 11. [Link: https://bit.ly/30atbsY](https://bit.ly/30atbsY)
- Kim JK, Crimmins EM (2020) How does age affect personal and social reactions to COVID-19: Results from the national Understanding America Study. *PLOS ONE* 15: e0241950. [Link: https://bit.ly/3omAGp0](https://bit.ly/3omAGp0)