

RESEARCH ARTICLE

## Covid-19 in Ghana: Knowledge, Perception and Practice among Health Trainees

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**Citation:** Adu D.K., Gyan B., Kwame D.M., Addai R., Woli M.K., Baffoe A., Puplampu P., Ofori E., Boamah B., Bonsu A., Opoku-Adusei K. (2020) Covid-19 in Ghana: Knowledge, Perception and Practice among Health Trainees. Open Science Journal 5(4)

**Received:** 3<sup>rd</sup> August 2020

**Accepted:** 28<sup>th</sup> August 2020

**Published:** 6<sup>th</sup> October 2020

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**Funding:** The author received no specific funding for this work

**Competing Interests:** The author has declared that no competing interests exist.

### Abstract:

**Background:** COVID-19 is a contagious disease with increased morbidity and mortality particularly among the aged and people with underlying chronic health conditions. The study assessed the knowledge, perceptions, and practices among health trainees in Ghana regarding COVID-19.

**Method:** The survey was conducted through a Google form link shared on students' social media networks mainly through Facebook, and WhatsApp platforms. A total of 496 participants responded to the survey. Responses received were imported to SPSS version 24 for cleaning and analysis. Output measures were demonstrated in simple frequency and percentages, using tables and charts. Fisher's exact test was used to assess the effect of the potential covariate on the practice of preventive measures with their corresponding p-values.

**Results:** Twenty-five percent (25%) of respondents had good knowledge, 69% had moderate knowledge and 6% had poor knowledge on COVID-19. Regarding perception of health students on COVID-19, 8.5% indicated that drinking alcohol could protect them from the virus. More than 90% of participants practice the general preventive measures. Gender and level of the program of study was significantly associated with practice of preventive measures. Male students (54.6%) were more engaged in good preventive practices compared to female students (43.8%).

**Conclusion:** Majority of the healthcare trainees had necessary information and proactive practice towards COVID-19. Most trainees had an excellent perception on the disease; however, a

few still believe that drinking alcohol will prevent them from being infected with the disease. Gender and level of trainees are significant predictors of proactive practices towards COVID-19.

Keywords: Knowledge, Attitude, Practice, COVID-19, Ghana, Healthcare Trainees, Students, SARS-CoV-2

## Introduction

COVID-19 is a contagious disease caused by a newly identified coronavirus called Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) (1). The disease was first identified in Wuhan, China in December 2019 when the World Health Organization's (WHO) attention was drawn to an unknown case of pneumonia. Infected persons were identified with respiratory disease symptoms resulting in many deaths within days and a few weeks (2–4). The pathogen, which has a resemblance to SARS-CoV-1, was initially identified as novel Coronavirus (2019-nCov), and later named as SARS-CoV-2 by the International Committee on Taxonomy of Viruses (ICTV) (5).

Due to the rapid spread and high fatality rate of the virus, on 30th January 2020, WHO, declared the infection as a Public Health Emergency of International Concern (PHEIC). Despite stricter interventions to contain the spread of the virus, the infection continued to spread to several countries with high cases of mortality. The WHO thus, declared the infection a pandemic on 11th March 2020, calling on all countries to put in interventions to control and prevent the spread and fatal consequences of the virus (2,4).

The virus is transmitted mainly from person to person, directly through respiratory droplets and secretions. It may also be transmitted indirectly via surfaces contaminated with droplets or secretions from infected persons. Studies have shown that the virus survives at varying periods on surfaces, depending on the material type and other environmental conditions such as temperature and humidity (6,7).

Epidemiological data available suggests that 1-14 days' incubation period for COVID-19 and 97.5% of the patients' show specific symptoms within approximately eleven (11) days. Such information also reveals a significant number of infected people remain asymptomatic and highly infectious and can spread the virus (1,6)

The disease is characterized by typical symptoms such as fever, dry cough, fatigue and difficulty breathing (8,9). A study in China revealed that 18.5% of infected persons develop severe disease characterized by acute respiratory distress syndrome, septic shock, difficult-to-tackle metabolic acidosis and bleeding coagulation dysfunction (8). In severe cases, infected persons may develop pneumonia, multi-organ failure and may require ventilation for a minimum of eight (8) days. Gastrointestinal organs are also affected as angiotensin-converting enzyme 2 (ACE2) is expressed in the glandular cells of the duodenal, gastric and rectal epithelium as well as enterocytes of the small intestine and endothelial cells (1). Most people who develop the severe disease after infection are the elderly, immunosuppressed persons and those with underlying chronic illnesses such as diabetes and cardiovascular illness, which may be associated with Acute Respiratory Distress Syndrome (ARDS) and cytokine storm (9,10).

Currently, there is no known or acceptable treatment or effective vaccine for patient management and prevention of the disease. Available clinical data show that, the overall case fatality rate of COVID-19 ranges from 2-5% worldwide. This is much lower than those of SARS (9.5%), MERS (34.4%), and H7N9 (39.0%) (11). However, the pathogen continues to emerge and spread quickly to the population at risk, hence demanding an urgent responsiveness approaches in surveillance and control, which is most premised on proactive management of the infectious disease.

Adequate knowledge on the transmission of the virus proffers a more precise preventive guide as outlined by the WHO. These guidelines underline effective Infection Prevention and Control (IPC) measures, highlighting standard precaution (SP) guides and additional/transmission-based precautions on managing droplets and aerosols (9). Standard precautionary measures outlined by the WHO, such as social distancing, hand washing or applying alcohol rub may reduce the rate of infection and help flatten epidemic curves. However, herd immunity through natural infection and vaccination is required to slow the epidemic and control.

Comparable genetic characteristic studies indicate that the COVID-19 virus is susceptible to disinfectants with proven activity against enveloped viruses. Such compounds include sodium hypochlorite, 0.5%, hydrogen peroxide; quaternary ammonium compounds, and phenolic compounds if used according to the manufacturer's recommendations. Particular attention should be paid not only to the selection of the disinfectant but also the contact time, dilution, shelf-life and an expiry date after the working solution is prepared. SARS-CoV-2 virus and human coronaviruses, in general, persist on inanimate surfaces such as metal, glass or plastic for up to 72 h (12).

Since the first two cases were confirmed in Ghana on 12th March, 2020, there has been an exponential increase in the number of recorded cases. In less than a month, the recorded number of confirmed cases increased to 152 on 29th March, 2020. As a result, a ban on all public gatherings including festivals, workshops, funerals, church activities etc. were imposed by the government. Subsequently there was a partial lockdown in major cities across the country and all borders by land, sea and air were closed to human traffic. As at 29th August, 2020, the number of confirmed cases stood at 44,205 with 1152 active cases, 42,777 recoveries and 276 deaths(13). Due to the increased recovery rate, the government is gradually easing restriction in order to return lives back to normalcy.

The WHO, Ministry of Health (MoH) and Ghana Health Service (GHS) have since the detection of the virus in Ghana, published recommended guidelines on the preventive practices to help control the pandemic. Educational campaigns on several media platforms have been in place by various stakeholders in health, which seeks to create mass awareness on the COVID-19 regarding the source of infection, transmission and preventive practices. It is, however, unclear the level of knowledge acquired by the people living in specified geographical boundaries, including health students in spite of all these educational campaigns on the novel disease. This study, therefore assessed the level of knowledge, perceptions and practices on COVID-19 among health students at the College of Health and Well-Being (CoHK), Kintampo – Ghana.

## Methods

### *Study design and population*

A cross-sectional survey was designed for this study. It was conducted in May 2020 among health students attending the College of Health and Well-Being at Kintampo in the Bono-East Region of Ghana. Established by the Ministry of Health in 1969, the College has the mandate of training middle level multi-purpose health professionals in Ghana. Currently, the College is the most prominent health-training College. It runs fifteen (15) programs made up of certificate, Diploma and degree options with a student population of more than three thousand (3000).

### *Inclusion criteria*

Any student of both sexes, aged 18 years and above, offering a recognized program of study, at any level at the College of Health and Well-Being, Kintampo (CoHK), who consented to partake in the study were included.

### *Exclusion criteria*

Any person who is not a recognized student of the College of Health and Well-being, Kintampo was exempted. Also, students of the College of Health and Well-being who were either below 18 years or who did not consent to partake in the study were exempted.

### *Study tool (Questionnaire)*

An online-structured questionnaire was developed in English, which is the official communication language in Ghana to collect data from students. The questionnaire was designed into four (4) sections to cover the demographic characteristics, knowledge regarding COVID-19 infection, attitude or perceptions about the disease, and participants' adherence to preventive practices against COVID-19. In all, fifty-two (52) independent questions were answered; comprising eight (8) on demographic characteristics, twenty-nine (29) questions on knowledge, eight (8) questions on perceptions and seven (7) questions on preventive practices.

### *Review and pilot*

Before rolling out the study to participants, the questionnaire was run through a series of peer review pilot. The study tool was first reviewed by a total of six (6) health tutors and Lecturers drawn from the College of Health and Well-Being and the University of Energy and Natural Resources (UENR). Their inputs and recommendations were factored into the final tool. Another phase of pretesting and pilot was carried out among 20 students drawn from various programs of study at the College of Health, Yamfo that has similar characteristics to the College of Health and Well-Being, Kintampo. Their responses were adjudged excellent with minimal challenges in completing the survey online

### *Sample size*

The sample size for the study was determined by the Cochran's formula. Since many epidemiological data were currently not available on the novel disease, variables were premised on the assumption that 50% of the student population have good knowledge, positive attitude and adequately practice the recommended preventive practices based on their knowledge. Using a 95% confidence interval at a 5% margin error, and assuming 10% of the participants may default in participating, the sample size was estimated at 420. However, 496 responses were recorded on the last day of the survey.

### *Data collection*

The survey was conducted through a Google form link shared on students' social media networks mainly through Facebook, and WhatsApp platforms. The link generated was made available to students through their respective class representatives and leaders. Data was collected over a period of two (2) weeks, between 5th and 18th May 2020. To ensure compliance, the Google form was subsequently deactivated, on 18th May 2020 and no response could be further submitted. To reduce errors and challenges with missing data, all questions were marked as required fields, except optional follow-up questions such that, one could not proceed to the next page without providing answers to questions. On completion and submission, the responses were moved and saved to a Google drive on an excel sheet. Clear instructions were given alongside the questions to guide participants. Each participant was instructed to provide one (1) response only. Data were collected online using Google form during the period where all public gatherings and public events, including schools, were closed.

### *Statistical analyses*

Responses received were exported to Google drive in Excel format and subsequently downloaded for auditing and coding. The data were imported to SPSS version 24 for analysis. Output measures were demonstrated in simple frequency and percentages, using tables and charts. Each correct response to the knowledge variables was adjudged 1 point, while a wrong response was adjudged zero (0) points. Knowledge level was categorized and described as good, moderate or poor (Table 1). On a scale of 1-29, a score  $\geq 21$  described good knowledge, a score 12-20 described moderate knowledge while a score  $\leq 11$  described poor knowledge. Similarly, the practice of precautionary measures was scored either as poor practice (0-3 correct answers) or good practice ( $\geq 4$  correct answers). To determine the significant relationship between demographic variables and the practice of recommended preventive practices among the students, a non-parametric version of the Chi2 test (i.e. Fischer's exact test) was used since the counts in some of the cells were less than 5. P-value of 0.05 or less was considered statistically significant.

Table 1: Definition of operational variable

Score	Feature
Knowledge on COVID-19	
21-29 correct responses	Good knowledge
12-20 correct responses	Moderate knowledge
0-11 correct responses	Poor knowledge
Practice of Precautionary Measures	
≥ 4 of 7 Good practice	Good practice towards COVID-19 prevention
≤ 3 of 7 Poor practice	Poor practice towards COVID-19 prevention

## Results

### *Demographic Characteristics*

A total of 496 health students of the College of Health and Well-Being, Kintampo were recruited for the study. This comprised of males (56.3%) and females (43.8%). The mean age was  $24.5 \pm 4.5$  (mean  $\pm$  SD) with the majority (55.9%) of the participants being in the age groups 21-25 years. Christians were 418 (84.3%), Muslims 76 (15.3%) and Traditionalists 2 (0.4%) as shown in Table 2.

Table 2: Demographic Characteristics of Respondents (N = 496)

Variables	N	(%)
Age (mean = $24.5 \pm 4.5$ )		
Less than 21	72	14.5
21-25	277	55.9
26-30	85	17.1
31 and above	62	12.5
Sex		
Female	217	43.8
Male	279	56.3
Religion		
Christian	418	84.3
Muslim	76	15.3
Traditionalist	2	0.4
Programmes of study		
BSc Community Mental Health	14	2.8
Diagnostic Radiological Technology	18	3.6
Diploma Community Mental Health	9	1.8
Disease Control and Surveillance	99	20.0
Field Technician	75	15.1
Health Information Management	34	6.9
Health Promotion and Social Marketing	13	2.6
Health Records Management	43	8.7

Medical Laboratory Technology	77	15.5
Nutrition	63	12.7
Physician Assistant (Post Basic)	15	3.0
Physician Assistant (Direct)	24	4.8
Registered Dental Surgery Assistant	12	2.4

Most study participants (83.7%) indicated social media as their main source of information on COVID-19. This was followed by radio/television (81.9%), newspaper/magazines (36.5%), seniors/other colleagues (34.1%), posters and pamphlets (20.0%), seminars and workshops (14.3%) and other sources such as Ghana Health Service official website, community information centres and internet/blogs (1.8%) as shown in Table 3.

Table 3: Sources of Information on COVID-19 (N = 496)

Characteristics	Yes (%)	No (%)
Radio/Television	406 (81.9)	90 (18.2)
Social Media	415 (83.7)	81 (16.3)
Seminars/Workshops	71 (14.3)	425 (85.7)
Posters/Pamphlets	99 (20.0)	397 (80.0)
Newspapers and Magazines	181 (36.5)	315 (63.5)
Seniors and other Colleagues	169 (34.1)	327 (65.9)
Others	9 (1.8)	487 (98.2)

### *Knowledge on COVID-19*

Table 4 shows that participants' knowledge on the signs and symptoms of the virus ranged from fever (91.3%) as the highest indicated by participants, to other signs and symptoms (4.6%) being the least sign and symptom selected by participants. Majority of participants (90.9%) consider those with underlying chronic medical conditions, the aged (85.1%), children (32.3) and other conditions as people with a high risk of contracting and dying from this viral disease. Most participants know of hand washing protocols (95.8%), alcohol-based sanitizers (92.3%), wearing a face mask (91.3%), avoiding handshakes (89.5%), avoiding overcrowded places (90.9%), staying safe at home (93.2%), and other preventive measures such as coughing into tissues and avoiding unnecessary spitting.

Table 4: Knowledge of Main Signs and Symptoms, High-Risk Individuals and Preventive Measures of COVID-19 (N = 496)

Characteristics	Yes (%)	No (%)
Main Signs & Symptoms		
Fever	453 (91.3)	43 (8.7)
Fatigue	196 (39.5)	300 (60.5)
Dry cough	440 (88.7)	56 (11.3)
Shortness of breath	455 (91.7)	41 (8.3)
Myalgia	48 (9.7)	448 (90.3)
Diarrhoea	51 (10.3)	445 (89.7)
Vomiting	44 (8.9)	452 (91.1)
Others	23 (4.6)	473 (95.4)
Those at high risk		
Aged	422 (85.1)	74 (14.9)
Children	175 (32.3)	321 (64.7)
Those with underlying chronic medical conditions	451 (90.9)	45 (9.1)
Other people	9 (1.8)	487 (98.2)
Preventive Measures		
Hand washing with soap under running water	475 (95.8)	21 (4.2)
Using alcohol-based sanitizer	458 (92.3)	38 (7.7)
Wearing of face mask	453 (91.3)	43 (8.7)
Avoiding handshake	444 (89.5)	52 (10.5)
Avoiding overcrowded places	451 (90.9)	45 (9.1)
Staying at home	462 (93.2)	34 (6.9)
Not touching surfaces	395 (79.6)	101 (20.4)
Other preventive measures	22 (4.4)	474 (95.6)

Knowledge on the causes, transmission, testing and treatment ranged from spread through droplets (99.4%) being the most identified, to eating or contacting wild animals as a source of infection (39.7%) (Table 5). The majority (63.3%) indicated that test kit/RDT could be used to test for the virus, while 52.6% indicated that the polymerase chain reaction (PCR) could be used to test for the virus. More than 90% indicated that there is no effective vaccine, but treatment exists.



Table 5: Knowledge on Causes, Spread, Testing and Treatment of COVID-19 (N = 496)

Statements	Yes (%)	No (%)	Do not know (%)
COVID-19 is a viral infection	481 (97.0)	4 (0.8)	11 (2.2)
Sources of infection include eating/contacting wild animals	197 (39.7)	214(43.2)	85 (17.1)
Infected and asymptomatic people can spread the virus	479 (96.6)	9 (1.8)	8 (1.6)
Can be spread through droplets	493 (99.4)	1 (0.2)	2 (0.4)
Incubation period is 2-14 days	476 (96.0)	11 (2.2)	9 (1.8)
PCR can be used to test for COVID-19	261 (52.6)	137(27.6)	98 (19.8)
Test kit/RDT can be used to test for COVID-19	314 (63.3)	84 (16.9)	98 (19.8)
There is no effective vaccine but treatment exists	489 (98.6)	2 (0.4)	5 (1.0)
Isolation is effective in treating COVID-19 infection	489 (98.6)	4 (0.8)	3 (0.6)

In general, Figure 1 indicates that the majority (69%) of the participants had moderate knowledge on COVID-19, and 6% had poor knowledge.

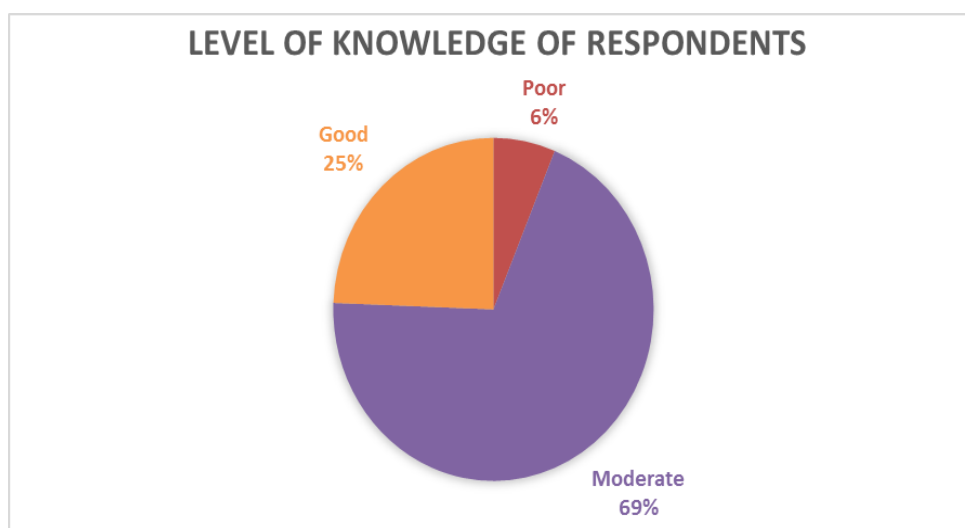


Figure 1: Level of knowledge of respondents

### *Perception on COVID-19*

Regarding the perception of health students on COVID-19, 42(8.5%) indicated that drinking alcohol could protect them from the virus. Majority of participants will prefer going to a health facility to seek health care when infected with the virus (Table 6). Also, most participants (90.9%) were of the opinion that they would become infected if they came into contact with the virus despite having a robust immune system. All participants (100%) were of the perception that emergency treatment should be given to severe cases of COVID-19 while most participants (97.8%) were of the view that universal precautions can help prevent the spread of COVID-19. Majority (84.2%) of the health students indicated that they would be willing to work on COVID-19 patients.

Table 6: Perception on COVID-19 (N = 496)

Statements	Yes (%)	No (%)	Do not know (%)
Drinking alcohol can protect you from the disease	42 (8.5)	430 (86.7)	24 (4.8)
Infected persons should not be stigmatized	42 (8.5)	430 (86.7)	24 (4.8)
Will you go to hospital if infected with COVID-19	445 (89.7)	33 (6.7)	18 (3.6)
Will you be infected if you come directly into contact with a case despite you having a robust immune system?	451 (90.9)	40 (8.1)	5 (1.0)
PPE must be worn when dealing with COVID-19 cases	472 (95.2)	17 (3.4)	7 (1.4)
Emergency treatment should be given to severe cases	496 (100.0)	0 (0.0)	0 (0.0)
Universal precautions can prevent COVID-19 infections	485 (97.8)	6 (1.2)	5 (1.0)
Would you like to work on COVID-19 cases?	417 (84.2)	78 (15.8)	0 (0.0)

### *Preventive Practices*

Table 7 shows that majority of participants' practice the general preventive measures, i.e. avoid going to crowded places (98.0%), practice social distancing if they happen to be at crowded places (97.8%), avoid shaking hands (96.6%), wash their hands with soap under running water or sanitize their hands regularly (97.4%) and wear a face mask in crowded places (94.4%).

Table 7: Preventive practices of students towards COVID-19 (N = 496)

Practices	Yes (%)	No (%)
Do you avoid handshake?	479 (96.6)	17 (3.4)
Do you wash your hands with soap or hand sanitizer regularly?	483 (97.4)	13 (2.6)
Do you cough or sneeze in tissues?	440 (88.7)	56 (11.3)
Do you wear facemask in crowded places or when leaving home?	468 (94.4)	28 (5.7)
Do you avoid going to crowded places?	486 (98.0)	10 (2.0)
Do you avoid touching nose, mouth and eyes as much as possible?	455 (91.7)	41 (8.3)
Do you practice social distancing in crowded places?	485 (97.8)	11 (2.2)

In general, Figure 2 shows that more than 95% of the study participants engaged in good practices towards the prevention of COVID-19.

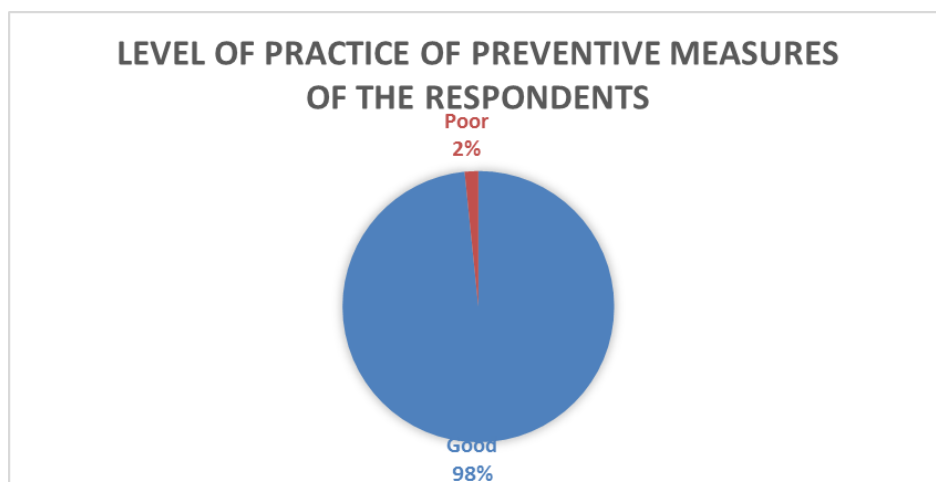


Figure 2: Level of practice of preventive measures of the respondents

Table 8 shows that more male students (54.6%) were engaged in good preventive practices compared to female students (43.8%). Also, students who are in level 100 were engaged in good preventive practices compared to those in levels 200, 300 and 400.

Table 8: Factors associated with the practice of preventive measures (N=496)

Variables	Practice		p-value
	Good (%)	Poor (%)	
Age (Years)			
Less than 21	71(14.3)	1(0.2)	0.467
21-25	272(54.8)	5(1.0)	
26-30	85(17.1)	0(0.0)	
31 and above	60(12.1)	2(0.4)	
Gender			
Female	217(43.8)	0(0.0)	0.012
Male	271(54.6)	8(1.6)	
Level / Year			
100	213(42.9)	1(0.2)	0.011
200	174(35.1)	5(1.0)	
300	78(15.7)	0(0.0)	
400	23(4.6)	2(0.4)	
Residential Status			
Non-Residential	328(66.1)	7(1.4)	0.447
Residential	160(32.3)	1(0.2)	
Religion			
Christian	412(83.1)	6(1.2)	0.376
Muslim	74(14.9)	2(0.4)	
Traditionalist	2(0.4)	0(0.0)	

## Discussion

Health students are involved in caring for patients at several levels of healthcare whiles in school and on clinical attachment in health facilities. They are thus, exposed to daring occupational health risk due to their inexperience and exposure to the infectious environment. In the community these personnel may serve as sources of information by community members and are perceived as being knowledgeable in health matters. Compliance to control measures is influenced by people's knowledge, attitude and practices on the infections (2,4).

Findings from this study indicate that majority of healthcare trainees (83.7%) utilized social media and radio or television (81.4%) as the primary source of information regarding COVID-19. This could partly be due to availability of smart phones and the restrictions that were placed on social gatherings. These findings are consistent with several other studies on COVID-19 (2,14,15). This reveals that healthcare trainees are much interested in obtaining information (knowledge) from these two sources, particularly social media, compared to other

sources of information. Social media is now one of the fastest and most convenient ways of sending information to target audience. Therefore, educating the public, particularly students using these platforms may ensure effective results.

### *Knowledge on COVID-19*

Of the students surveyed, 25% demonstrated good knowledge on COVID-19, 69% demonstrated moderate knowledge, and the remaining fell into the category of those who demonstrated poor knowledge on COVID-19. The percentage of those with good knowledge is lower as compared to the findings in other studies that reported a higher level of knowledge among medical students and healthcare workers (16–18). This could be due to the fact that Ghanaians, in general, did not anticipate that the country will record a case of COVID-19 and therefore did not take a keen interest in acquiring knowledge on the disease at the early stages.

More than 90% of the respondents indicated that fever and shortness of breath are the main signs and symptoms of the disease with about 88% indicating that dry cough is also one of the main signs and symptoms. This is a good indication that people appreciate the fact that when one becomes infected with the virus, the main signs and symptoms to look out for include fever, shortness of breath and dry cough. Further, it indicates that education on signs and symptoms are being understood by the majority of the public.

Also, our study revealed that majority of the students were aware that the aged and those with comorbidity are at increased risk of the infection and mortality from COVID-19. This finding is consistent with a study conducted among healthcare workers in Ethiopia (18).

Regarding knowledge on preventive measures, more than 90% had knowledge on the preventive measures as outlined by WHO. These preventive measures include hand washing with soap under running water, using alcohol-based sanitizers, wearing of nose masks in public places, avoiding handshakes and staying at home. This is consistent with a study conducted in Bangladesh which indicated that nearly all the study participants had knowledge on the preventive measure on COVID-19 (19).

Our study also revealed that over 90% of the respondents were aware that the disease is caused by a virus, and infected and asymptomatic people can spread the virus. Almost all of the respondents are also aware that the virus can be spread through droplet and isolation is effective in treating the infection. This is consistent with several studies that have been carried out on the knowledge on COVID-19 (18–21).

### *Perception on COVID-19*

The perception of the participants, as revealed by this study, shows that most participants had good perception regarding COVID-19. Notwithstanding, nearly 9% of the participants indicated drinking alcohol will protect them from getting infected with the virus. It is not surprising as people especially Ghanaians were made to understand in the course of education that the virus is harboured in the throat and upper respiratory tract of infected persons and also alcohol is capable of destroying the virus. As a result, some people conclude that if this is the case, then drinking alcohol will clear the throat of any virus.

On the issue of stigmatization, only a few participants (8.5%) think that COVID-19 patients should not be stigmatized. This finding is not different from the study conducted by Olum and his colleagues in 2020, which indicate that about 60% of healthcare workers in Uganda had avoided patients that showed symptoms suspicious of COVID-19. This could be because there is no known cure or a clinically tested vaccine for those at risk. The lack of adequate Personal Protective Equipment (PPE) available for healthcare workers to enable them to attend to COVID-19 patients could also form the basis for this stigmatization.

Majority of the respondents indicated that despite having a strong immune system, one could be infected by directly coming into contact with an infected person. The response is expected because as part of the education on COVID-19 in Ghana, boosting immune system is one of the ways of fighting the disease. The aspect of the education was better clarified by the president of the Republic of Ghana upon the advice of experts in the Ghana Health Service. In his statement, he noted that “local foods such kontomire, millets, cashew nuts, plantain and dawadawa, contains the necessary vitamins that fortify the immune system against the virus” (22).

Another interesting revelation from the study has to do with attending to COVID-19 cases. More than 80% of the respondents indicated that they would be willing to work on COVID-19 cases. This suggests that people are no longer scared of the disease because more information on the disease is now available on the internet and social media. Another reason for this response could be that the case fatality rate of the virus in Ghana is low (0.7%) (23) compared to the western world. Obviously, in regions where the case fatality remains low, people will be less scared of the virus compared to areas where the fatality rate is high.

### *Preventive practices*

Almost all participants (98%) were engaged in good preventive practices. This agrees with several other studies (16,17,24) that reported good practices among healthcare staff.

When students were asked whether they practised all or most of the preventive protocols as outlined by the WHO (i.e. avoiding handshake, wearing facemask in crowded places, social distancing and using alcohol-based hand sanitizers), over 90% of them responded positively to the questions posed. This result is similar to several other studies that sought to know whether study participants were practising the preventive measures (2,18,19,21,24). This is very encouraging because as more people exhibit a positive attitude towards the fight against this pandemic, the higher the chances of reducing the rate of infection.

Test for association was carried out to identify the factors that were associated with the practice of preventive measures related to COVID-19. Among the several factors looked for, we found that gender and level of study among participants were significantly associated with the practice of preventive measures. It was noticed that male students were more engaged in good preventive practices compared to female students (54.6% and 43.8% respectively). Also, students who are in level 100 were engaged in good preventive practices compared to those in levels 200, 300 and 400.

The association is similar to findings of studies conducted in other parts of the world (4,21). The results showed that demographic, social and technological factors are known to affect the level of knowledge, attitude, and practice toward disease and its prevention (14).

## Conclusion

Majority of the healthcare trainees had basic information and proactive practices towards COVID-19. It indicates that the present public health campaign in the fight against the disease is effective. Social media, television and radio served as the most effective means of educating the public as most of the basic knowledge acquired were through these three means. Majority of the trainees had good perception on the disease. However, a few still have the wrong perception that drinking alcohol will clear the throat and lungs of the virus. Our results also show that stigmatization is high. Gender and level of trainees were found to be significantly associated with proactive practices towards COVID-19.

The Ministry of Health should therefore consider regular updates on COVID-19 through official social media platforms. There is also a need for the Ministry of Communication to monitor the social media space to ensure that frivolous messages are dealt with as early as possible.

Future interventional and educational campaigns should critically look at ways of minimizing the stigmatization of affected persons.

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APPENDIX A: STUDY QUESTIONNAIRE

COVID-19 IN GHANA: KNOWLEDGE, PERCEPTION AND PRACTICE AMONG HEALTHCARE TRAINEES

This questionnaire is being administered to you by David Kwabena Adu on behalf of collaborators. The purpose is to collect data on the Knowledge, Perception and Practice of healthcare trainees towards the fight against COVID-19 in Ghana. We will be grateful if you could give truthful and honest response to the questions. You are allowed to stop answering the questions if you feel very uncomfortable. However, we would encourage you to try and respond to all the questions. Kindly give your consent or otherwise before proceeding.

A.I CONSENT TO PARTAKE IN THIS STUDY [ ]

B.I DO NOT CONSENT TO TAKE PART IN THIS STUDY [ ]

SECTION A: DEMOGRAPHIC CHARACTERISTICS				
S/N	INFORMATION	RESPONSE	CODING	SKIP TO
1	What is your age (years) at your last birthday.....			
2	What is your Gender	Male	1[ ]	
		Female	2[ ]	
3	What is your Religion	Christian	1[ ]	
		Muslim	2[ ]	
		Traditionalist	3[ ]	
		Others	4[ ]	
4	What is your Programme of Study, Please Specify.....			
5	What is your Level of Study	100	1[ ]	
		200	2[ ]	
		300	3[ ]	
		400	4[ ]	
6	What is your Ethnicity, Please Specify.....			
7	Have you heard of COVID-19?	Yes	1[ ]	
		No	2[ ]	IF NO, END OF QUESTIONNAIRE
	Sources of Information on COVID-19			
8	What is your source of information on COVID-19			
	Radio	Yes	1[ ]	
		No	2[ ]	
	Social Media	Yes	1[ ]	
		No	2[ ]	
	Television	Yes	1[ ]	
		No	2[ ]	
	Seminars or Workshop	Yes	1[ ]	
		No	2[ ]	
	Posters or Pamphlets	Yes	1[ ]	
		No	2[ ]	
	Newspapers or Magazines	Yes	1[ ]	
		No	2[ ]	
	Senior Colleagues	Yes	1[ ]	
		No	2[ ]	



	Other Sources, Please Specify.....			
SECTION B: KNOWLEDGE ON COVID-19				
Main Clinical Signs and Symptoms of COVID-19				
9	Fever	Yes	1   ]	
		No	2   ]	
10	Fatigue	Yes	1   ]	
		No	2   ]	
11	Dry cough	Yes	1   ]	
		No	2   ]	
12	Shortness of breath	Yes	1   ]	
		No	2   ]	
13	Myalgia	Yes	1   ]	
		No	2   ]	
14	Diarrhoea	Yes	1   ]	
		No	2   ]	
15	Vomiting	Yes	1   ]	
		No	2   ]	
16	Other signs and symptoms, Please Specify.....			
Groups at greater risk of COVID-19 and will develop severe disease				
17	The aged	Yes	1   ]	
		No	2   ]	
18	Children	Yes	1   ]	
		No	2   ]	
19	People with underlying chronic diseases	Yes	1   ]	
		No	2   ]	
20	Other People, Please Specify.....			
Preventive Measures				
21	Hand washing with soap under running water	Yes	1   ]	
		No	2   ]	
22	Using alcohol-based sanitizer	Yes	1   ]	
		No	2   ]	
23	Wearing of face mask	Yes	1   ]	
		No	2   ]	
24	Avoiding handshake	Yes	1   ]	
		No	2   ]	
25	Avoiding overcrowded places	Yes	1   ]	
		No	2   ]	
26	Staying at home	Yes	1   ]	
		No	2   ]	
27	Not touching surfaces	Yes	1   ]	
		No	2   ]	
28	Other Preventive Measures, Please Specify.....			
Knowledge on causes, spread, testing and treatment of COVID-19				
29	COVID-19 is a viral infection	Yes	1   ]	
		No	2   ]	
		Do not know	3   ]	
30	Sources of infection include eating/contacting wild animals	Yes	1   ]	
		No	2   ]	
		Do not know	3   ]	

31	Most infected persons are asymptomatic and can spread the virus to others	Yes	1	
		No	2	
		No	2	
		Do not know	3	
32	The COVID-19 virus spreads through respiratory droplets of infected individuals	Yes	1	
		No	2	
		Do not know	3	
33	Incubation period for virus is 2-14 days	Yes	1	
		No	2	
		Do not know	3	
34	PCR can be used to test for COVID-19	Yes	1	
		No	2	
		Do not know	3	
35	Test kit/RDT can be used to test for COVID-19	Yes	1	
		No	2	
		Do not know	3	
36	There is no effective vaccine but treatment exist	Yes	1	
		No	2	
		Do not know	3	
37	Isolation is effective in treating COVID-19 infection	Yes	1	
		No	2	
		Do not know	3	
<b>SECTION C: PERCEPTION ON COVID-19</b>				
38	Drinking alcohol can protect you from the disease	Yes	1	
		No	2	
		Do not know	3	
39	Infected persons should not be stigmatized	Yes	1	
		No	2	
		Do not know	3	
40	Will you go to hospital if infected	Yes	1	
		No	2	
		Do not know	3	
41	Will you be infected if you come directly into contact with an infected person (case) despite you having a strong immune system?	Yes	1	
		No	2	
		Do not know	3	
42	Personal Protective Equipment (PPE) must be worn when dealing with COVID-19 cases	Yes	1	
		No	2	
		Do not know	3	
43	Emergency treatment should be given to severe cases of COVID-19	Yes	1	
		No	2	
		Do not know	3	
44	Universal Precautions given by WHO can prevent spread of COVID-19 infections	Yes	1	
		No	2	
		Do not know	3	
45	Would you like to work on COVID-19 cases?	Yes	1	
		No	2	
		Do not know	3	
<b>SECTION D: PREVENTIVE PRACTICES TOWARDS COVID-19</b>				
46	Do you avoid hand shaking?	Yes	1	

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		No	2[ ]	
47	Do you wash your hands with soap or hand sanitizer regularly?	Yes	1[ ]	
		No	2[ ]	
48	Do you cough or sneeze in tissues?	Yes	1[ ]	
		No	2[ ]	
49	Do you wear facemask in crowded places or when leaving home?	Yes	1[ ]	
		No	2[ ]	
50	Do you avoid going to crowded places?	Yes	1[ ]	
		No	2[ ]	
51	Do you avoid touching nose, mouth and eyes as much as possible?	Yes	1[ ]	
		No	2[ ]	
52	Do you practice social distancing in crowded places?	Yes	1[ ]	
		No	2[ ]	