

Towards the Easing of Restrictions During an Infectious Outbreak: A Cross-Sectional Online Survey to Assess the Knowledge, Misperceptions, Attitudes and Behaviour of Ghanaians on the COVID-19 Pandemic

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Abstract

Background: Ghana's COVID-19 caseloads stretched to 32,437 with 161 deaths. After the first COVID-19 case recorded in March, the Government of Ghana imposed several restrictions on the life of citizenry to prevent the spread of the infection. However, it is imperative to assess and track the knowledge, misperceptions, attitudes and behaviour of Ghanaian on this public health emergency that is moving fast and not well understood before lives are restored to normalcy. This study investigated the knowledge, misperceptions, attitudes and behaviour of Ghanaians on the COVID-19 pandemic through a rapid online survey system.

Methods: The Cochran sample size determination formula was used to estimate a representative sample of adult Ghanaian residents (n = 420) for the cross-sectional survey. An online questionnaire (eQuestionnaire) designed with Google Form was administered to the participants who consented to be part of this study. SMS and popular social media handles were used for the distribution of the eQuestionnaire URL to the participants. The survey commenced on July 5th 2020 through to July 15th,2020. Socio-demographic data of participants were gathered on age, gender, religion and level of education. Data collected were analysed using summary and inferential statistics.

Results: A total of 475 adult Ghanaian participants completed the eQuestionnaire. Some Ghanaians believed that the COVID-19 pandemic is a myth (95% CI 25.6%-48.1%) and it does not have any effect on a Ghanaian (African) because of the hot temperate we experience. Majority of the participants (78.2%) thought that older adults were at high risk of death when disease-ridden with COVID-19 pandemic. The majority of the participants (81.5%) were poise that Ghana can successfully manage the COVID-19 pandemic. About 31.5% of the participants indicated they did not wear facial or nose masks when going out of their homes. The participants (81.9%, 389/475) approved that the government should ease the COVID-19 restrictions for life to return normalcy.

Conclusion: Although Ghanaians have appreciable knowledge, positive attitude and appropriate behaviour in response to COVID-19 pandemic, a well-coordinated effort is needed to ensure stringent compliance with healthcare protocols toward the easing of COVID-19 restrictions in Ghana.

Background

COVID-19 is a pandemic disease caused by the most recently discovered coronavirus [1] which is affecting many countries globally making it a worldwide health concern [2]. The COVID-19, which emerged in Wuhan, China around December 2019, and has since been recognized as a zoonotic coronavirus, identical to SARS coronavirus and MERS coronavirus [3-5]. The commonest clinical symptoms include fever, hack, intense respiratory pain, diminished or ordinary white platelets, weakness and inability to determine in more than 5 days of anti-infection treatment [6]. The World Health Organization (WHO) declared the COVID-19 a general health crisis of worldwide worry on January 30,

2020 [7]. As in, COVID-19 flare-up was exceptional regarding high pathogenicity and mortality contrasted with the past infections by coronaviruses [2,9-10].

Africa affirmed its first case in Egypt on the 14th day of February 2020[11]. The total case count recorded in Africa as of June 23, 2020, is 232,215 with 5,117 deaths [13]. The irregular spread and importation of COVID-19 into many African countries is due to ill-readiness and weakness in preparation [11]. Some countries in Africa, including Ghana, were delegated as countries with moderate hazard, variable limits and high vulnerability [12] at the start of the COVID-19 outbreak. From there on, these countries have seen an irregular expansion in imports and nearby transmission, with 1 on Feb 14, 2020, to 4,702 affirmed cases on the 2nd day of April 2020[12]. Practical procedures were executed to forestall and control the importation of cases from remote countries, in any case, these measures fizzled [13]. Globally, there have been 8,993,659 confirmed cases, 469,587 deaths and 529,000 recovered from COVID-19 [13] as of June 23, 2020.

On 14th March 2020, Ghana recorded 2 instances of COVID-19; a lockdown was imposed on two major cities in Ghana on 30th March 2020 for six weeks. After the lockdown, there have been over 32,000 confirmed caseloads of COVID-19 outbreak with 161 deaths [13] which prompted the Government of Ghana to issue an executive instrument (E.I 164) outlawing the non-wearing of facial or nose marks in public places. Notwithstanding, the Government trusts that the lives of Ghanaian must return to normalcy, hence, the restrictions implemented to thwart the spread of the infection must be eased. These included allowing public transport to feel to capacity; increasing the number of public gathering to a maximum of 100 people; opening Junior High Schools, Senior High Schools and University students (all final year students); and finally, easing restrictions on non-contact sporting activities to go on. It is, therefore, expedient to conduct a comprehensive assessment of the knowledge and misconceptions, attitudes and behaviour of Ghanaians concerning the COVID-19 pandemic before the easing of restrictions are initiated. Jian-Bin et al. [14] affirmed that appreciable knowledge, positive attitude, and judicious behaviour together with dynamic social support have been seen as significant in the control of highly infectious diseases such as COVID-19. Information, chance recognition and readiness to react to COVID-19 among Ghanaians are important to prevent the infection [14-16] from deteriorating in Ghana. Moreover, the rate at which COVID-19 is spreading in Ghana and worldwide demands fast assessments of the populace knowledge, attitude and behaviour [17- 19] of Ghanaians toward the infection and the easing of restrictions.

This study describes a cross-sectional online survey designed to gauge knowledge and misperceptions, attitude and behaviour of the general adult population in Ghana vis-à-vis COVID-19 pandemic and the easing of restrictions by the government of Ghana. Geldsetzer [19], Clements [20] and Zhong et al [21] investigated the level of knowledge, attitudes, behaviour and public misperceptions about COVID-19 pandemic fatality in the UK and US, and in China. This study quintessentially replicates the questions from the earlier studies to assess the public's sensitivity to COVID-19 outbreak and the observation of current protocols concerning the decision of the government easing the COVID-19 restrictions.

Methods

Study Participants: A cross-sectional online eQuestionnaire was used to gather data from adult Ghanaians who are keen on taking an interest in the online study. The survey was conducted from July 5th to July 25th, 2020. Data were collected online using an eQuestionnaire [23 - 25], designed and administered with Google Forms because it was not reasonable to do a nationwide sampling survey [21] in the wake of recording many cases in the COVID-19 pandemic. Google Forms is an online survey administration tool that allows researchers to collect data from respondents via a personalized survey [26]. The data is then collected and automatically connected to a spreadsheet which is populated with the survey responses [27]. A short URL was generated for eQuestionnaire and shared on social media groups (Religious and Secular) populated with Ghanaians. WhatsApp, Telegram, Twitter, Facebook and LinkedIn group accounts were the main source of dissemination for the eQuestionnaire. The URL was also administered via SMS and emails. The participants who initially received the URL via online groups were entreated to share the URL to their contacts and various networks (unknown to the researchers) to reach a wide population. The participants were restricted to only one response to the eQuestionnaire. The survey considered resident adult Ghanaians who are 18 and older eligible for this study if they were willing to participate [21]. Besides, the participants had to have indicated their fluency in English [19] and responded to the consent question by answering an agree-disagree question at the commencement of the survey before responding to the first question [20].

Sample size estimation: To ascertain a representative sample size for the study, the Cochran sample size determination formula was used based on the information from a previous study [28]. According to Cochran's formula, given that Z (at 95% confidence interval) is 1.96, p (proportion with good knowledge) is 0.5, q (1-p) is 0.5 and e (margin of error) is 0.05, 385 participants were required. Besides, we considered a 10% non-response rate during the collection of data. In total, 424 responses from the participants were needed for the data analysis. However, 475 participants responded to the eQuestionnaire.

Data Collection: The study adapted survey questionnaires from preceding studies on similar subjects [19-21] on the COVID-19 pandemic. The survey questionnaires measured relevant areas including the cause, status quo, and future development of the COVID-19 epidemic; the risk of a fatal infection course; knowledge of signs and recommended healthcare-seeking behaviour; preventive measures; and the awareness of the risk posed by individuals in Ghana but originating from countries with high COVID-19 caseloads [22].

The eQuestionnaire comprised 3 sections. Section 1 solicited data on socio-demographic characteristics of participants (Gender, Age, Ethnicity, Level of education, Profession, Region of residence, and Total household income). Section 2 of the eQuestionnaire consisted of items from existing questionnaires [20, 21]. The section had 12 items which assessed the participants on clinical presentations (KQ1-KQ4), transmission routes (KQ5-KQ7), and prevention and control (KQ8-KQ12) of the COVID-19 pandemic. One point was assigned to each correct knowledge-based item, with a total score ranging from 1 to 12 points. A low score indicated less appreciable knowledge and higher scores indicated appreciable knowledge

about COVID-19. In section 3, the participants were questioned whether they believed some falsehoods to determine the extent to which dis- and misinformation about COVID-19 has biased their general beliefs [19-21]. Participants were asked if joining a public transport, buying from a Chinese shop or deliveries from China poses infection menace, and whether the use of hand dryers, taking antibiotics, residing in hot and humid climates, taking a hot bath, and immunising against pneumonia are effective conducts to prevent a COVID-19 infection as indicated on the myth busters website of the WHO [29]. Besides, variables such as drinking hard liquor (“Akpeteshi”), smoking cannabis (“Wee”), drinking herbal concoctions (Neem Tree leaves), and being highly religious were introduced to the study to determine the public’s misperceptions about COVID-19. The additional variables were not part of the listings on the WHO’s myth buster website. Additional questions were asked to measure participants' attitudes (A1-A2) and specific behaviour (B1-B3) towards the COVID-19 pandemic. The attitude items inquired about the ability of the Ghana Health Service (GHS) to manage the COVID-19 infection and the reliance of Ghana successfully eradicating the infection.

The behaviour items looked at whether the participants have engaged in any activity violating the Executive Instrument (E.I 164) issued by the Government of Ghana: visiting a public gathering with more than 100 people, and the wearing of facial or nose mask when leaving home. Finally, the participants answered a question to indicate their satisfaction on the Government of Ghana easing the COVID-19 restrictions with options (“Yes” and “No”). The eQuestionnaire was developed with Google Forms [25]. Text input Fields which expected numerical responses were validated to reject non-numeric entries (e.g. entries such as 1a, a, or 12 year were not acceptable in numeric text fields).

Data analysis: Data for the study were analysed using parametric and non-parametric test methods. Data entries were downloaded from Google forms as comma-separated values (CSV) and imported into Jamovi statistical package version 1.22.2 for analysis. Measures of central tendencies and dispersion (Mean and standard deviations), frequency, proportion and percentages were used to represent binary and categorical responses obtained from the participants. The Agresti-Coull method was used to estimate the binomial confidence interval for the binary variables. Besides, the analysis involved a comparison between demographic characteristics of respondents and their knowledge score (correct knowledge answers), attitudes, and behaviour response, and finally their perception about the easing of the restrictions. One-way analysis of variance (ANOVA), Independent-samples T-test, and multiple regression test was used for the analysis where necessary. The confidence interval for all statistical tests was 95% (CIs) and the statistical significance level was less than 5% ($p < 0.05$, two-sided) in this study.

Ethical consideration: The study was compliant with the Helsinki Ethical Principles for Medical Research declaration [28, 30]. Participants below 18 years were considered as minors and were, consequently, excepted from the study [29]. The researchers followed the CHERRIES (Checklist for Reporting Results of Internet E-Surveys) guidelines to present the findings of the study [31]. The participants who admitted to looking for an answer online for an item specific were excepted for that item during the analysis [19].

Results

Socio-demographic characteristics

A sum of 475 participants took an interest in this survey; majority, 135/475 (28.5%) were within 18-24 years and more were female 252/475 (53.2%). We had a representation for major ethnicities in Ghana. The Majority (268/475, 56.4%) of the participants were residing in the southern sector (region) of Ghana. About two-thirds (382/475, 80.4%) of the participants had at least a university-level education. With regards to occupation, 130/475 (27.4%) of the participants were students. Table1 illustrates the socio-demographic characteristics of the sampled Ghanaian participants in the study.

Table 1 Demographics of study participants (N=475)

Characteristics		Number of participants (%)
Gender, n (%)	Male	223 (46.8)
	Female	252 (53.2)
Age cohort (years), n (%)	18-24	136 (28.6)
	25-34	185 (31.7)
	35-44	102 (18.1)
	45+	52 (11.6)
Education, n (%)	High school and below	52 (11.0)
	Associate's degree	101 (22.3)
	Bachelor's degree	207(43.6)
	Master's degree and above	115 (24.2)
Occupation, n (%)	Student	130 (27.4)
	Employed	206 (43.4)
	Unemployed	71 (15.0)
	Other	68 (14.3)
Marital status, n (%)	Married	241 (50.7)
	Single	162 (34.1)
	Others	72 (15.2)
Religion	Christian	251 (52.8)
	Muslim	152 (32.0)
	Other	72 (15.2)
Region of current residence, n (%)	Southern sector	208 (43.8)
	Middle sector	167 (35.2)
	Northern sector	100 (21.1)

“Others” comprised of re-married, cohabiting, divorced, separated, and widowed; African traditional religion, Eckankar, Hari Krishna, Buddhism

Knowledge scores of participants about COVID-19 pandemic

Table 2 exhibits the results of a comparison between the knowledge scores obtained by participants and their demographic characteristics. The mean score ($m=10.6$, $SD=1.14$, 88.3%, range 0-12) obtained by the

participants on the COVID-19 knowledge items suggests that the participants had all-inclusive knowledge of issues regarding the pandemic. The overall mean score ($M=10.6/12$, 88.3%) for this study, in the region of 4 months into the pandemic, was between the correct percentage rates reported by Clement [20] and Zhong [21] in their sample of United State and Chinese citizens respectively. The data also showed statistically significant differences between the correct knowledge score and the demographics (independent variables) of participants ($p<0.05$): "Age group", "Education", "Participant's Occupation", and "Region of current residence". However, "Gender", "Marital Status" and "Religion" were not statistically significant ($p>0.05$).

Table 2 COVID-19 Knowledge score by demographic characteristics (N=475)

Characteristics		Correct Knowledge score (mean, standard deviation)	t/F	p
Gender	Male	10.5 (1.14)	1.04	0.299
	Female	10.6(1.14)		
Age cohort (years)	18-24	10.4(1.7)	4.15	<0.001
	25-34	11.35(1.2)		
	35-44	11.10(1.9)		
	45+	10.7(1.5)		
Education	High school and below	9.5 (2.1)	3.34	<0.001
	Associate's degree	10.3 (1.9)		
	Bachelor's degree	11.0 (1.7)		
	Master's degree and above	11.3 (1.3)		
Occupation	Student	10.8 (1.8)	4.98	0.008
	Employed	10.6 (1.3)		
	Unemployed	10.7 (1.3)		
Marital Status	Married	10.5 (1.8)	2.26	0.107
	Single	10.7 (1.9)		
	Other	10.5 (1.4)		
Religion	Christian	10.9(1.1)	2.12	0.158
	Muslim	10.3(1.6)		
	Other	9.7 (2.1)		
Region of current residence	Southern sector	11.5 (1.6)	5.17	<0.001
	Middle sector	10.7 (1.8)		
	Northern sector	10.9 (1.8)		

Others” comprised of re-married, cohabiting, divorced, separated, and widowed; African traditional religion, Eckankar, Hari Krishna, Buddhism

Causes, Status Quo, and Subsequent Occurrences of the COVID-19 pandemic in Ghana

The data revealed an interesting result concerning what Ghanaians believed could potentially be the cause (on a 7-point Likert scale) of the COVID-19 pandemic. The majority of the participants (85%, 95% CI 71.2%-91.5%) selected "extremely unlikely" and "moderately unlikely" which implies that they did not believe the infection could be a bioweapon. This result goes contrary to the finding of [19] where 23% (95% CI 22.4%-25.5%) of US and 18% (95% CI 17.1%-19.9%) of UK participants believed the infection was a bioweapon when they were asked the same question. The participants estimated a range of 10,000 to 13,000 infections in Ghana. The estimate by the participants corresponds to a median of 11,000 infections. The participant also thought that the rate of COVID-19 infection in Ghana is likely to extend beyond 20,000 cases by the end of 2020.

COVID-19 Infection and mortality rate among Ghanaians

With regards to the rate of infection and associated risk, 10.5% (50/474, 95%CI 7.0%-21.0%) of participants thought persons infected with the COVID-19 are likely to develop a lethal illness and possibly die. Besides, 91.7% (95% CI, 88.6% -97.7%) of the participants thought that older adults (60 and above) are more susceptible to the COVID-19 infection than children and young adults. When asked "Are those with other health problems more likely to die from an infection with the new coronavirus disease than those without any other health problems?", 94.8% (95% CI 92.8%-97.0%) of the participants acknowledged that the mortality of individuals (adults) with health complications are higher than those without any other health complications [19].

Awareness of COVID-19 Symptoms, and attitude toward Health Care and Information Seeking among Ghanaians

Most of the participants (86.9%, 413/475) acknowledged COVID-19 as a viral infection and also originated from China (97.7%, 464/475). More than half of the participants (54.4%, 259/475) of the participants responded that the incubation period of the COVID-19 infection ranges between 2-14 days. Fever (80.6%, 383/475), difficulty in breathing (74%, 351/475), dry cough (71.8%, 341/475) and sore throat (67.5%, 321/475) are the four most-cited symptoms of COVID-19 among the participants.

When asked, "if you exhibit any of the above symptoms and recently visited a COVID-19 hotspot, or spent time with an individual who did, what would be the appropriate steps to take?" 34.2% (95% CI 32.9%-36.5%) of the participants acknowledged the recommended healthcare-seeking protocol of self-isolation and contacting the emergency health care team. However, 31.1% (95% CI, 27.3%-33.3%) of the participants responded that the COVID-19 infection was treatable. Furthermore, 66.5% (95% CI, 63%-69%) of the participants recognized that there was no vaccine for immunization against the COVID-19 infection.

With regards to COVID-19 information seeking among participants, the majority (73.4%, 349/475) received information through the Television; 28.8% (95%CI, 24%-32%) indicated that the information received was not adequate to make decisions vis-à-vis the COVID-19 infection [28]. The participants (59.5%, 283/475) recognized the sources of information on the COVID-19 infection as reliable. Besides,

the majority (55.7%, 95% CI, 53.4%-58.1%) responded to knowing COVID-19 emergency contacts and isolate facilities in Ghana.

Etiquettes for preventing the spread of COVID-19 Infection

The results showed that the participants are well acquainted with the COVID-19 prevention etiquettes. Majority of the participants (95%, 95% CI, 92%-97%) acknowledged that wearing of facial or nose mask; washing of hands with medicated soap more than 3 times per day; the use of sanitizers to disinfect hands regularly, and avoiding touching of the face with unwashed hands are the influential etiquette for preventing COVID-19 infection.

Even though the majority of the participants recognized the good practices towards the prevention of COVID-19, a large percentage of the participants had disinformation about the infection. The participants also thought that being highly religious or spiritual (53.4%, 95% CI 47.9%-56.1%), living in hot and humid climates (49%, 95% CI 44.5%-52.8%), taking a hot bath (37%, 95% CI 35.4%-39.1%), drinking hard liquor ("Akpeteshi") (36% 95% CI 34.5%-39.3%), smoking cannabis ("Wee") (31%, 95% CI 28.6%-35.7%), and drinking herbal concoctions - Neem Tree leaves - (29%, 95% CI 25.7%-33.4%) were equally good practices for preventing the COVID-19 infection.

Majority of the participants (91%, 95% CI, 89.3%-93.4%) acknowledged that the main mode of COVID-19 transmission is when infected individual coughs or sneezes and the droplet settles on a surface or suspends in the air for an amount of time. When asked, "Older adults are the only individuals that can be infected with the COVID-19." with options "True" or "False", 99% (470/475) of the participants selected "False" showing their variance with the statement. All of the participants (100%) thought that Ghana's borders should remain closed to all countries; however, Ghanaians who want to return from abroad should be made to self-isolate for the 14 days as stipulated by the World Health Organization (WHO).

Attitudes of participants towards the COVID-19 pandemic

Generally, the attitude of the participants towards the success in the cases management and reliance on eradicating COVID-19 showed significant associations. The majority of the participants (81.5%, 387/475) acknowledged that the protocols implemented by the Government of Ghana can ultimately assist in successfully managing the COVID-19 pandemic 18.5% (88/475) of the participants reported otherwise. The results also showed a statistically significant difference with genders, education levels, occupation categories, marital status and region of current residence ($P < 0.05$) with regards to participants' attitude towards the successful management of COVID-19 pandemic. In Table 3, the participants who responded "I Disagree" had significantly lower COVID-19 knowledge scores than those who responded "I Agree" (OR: 0.79, $p < 0.001$).

In the context of gender, the female participants had 100% (2.00, 0.046) increased odds compared to the male participants of success in managing the COVID-19 pandemic in Ghana. Participants from the Northern sector had 31% (0.69, 0.001) decreased odds of success in managing the COVID-19 pandemic

in Ghana juxtaposed with Southern and Middle sector participants. The smallest effect of all the analyses illustrated that participants within the 18-24 years cohort had 60% (0.40, 0.013) decreased odds of success in managing the COVID-19 pandemic in Ghana juxtaposed with the other age categories. Finally, for every unit of COVID-19 knowledge scores, the odds of the government of Ghana successfully managing the pandemic decreased by 21% (0.79, 0.001).

The majority of the participants (77.13%, 366/475) had the reliance that Ghana can defeat the COVID-19 pandemic while 22.9% (109/475) were pessimistic. With regards to the reliance of eradicating COVID-19, there was statistical significance ($P < 0.05$) across all the demographic variables. Significantly, participants who scored lower COVID-19 knowledge scores expressed less reliance on winning than those who had higher scores ($P < 0.001$). For every COVID-19 knowledge score, the odds of participants' reliance that the pandemic would be eradicated from Ghana decreased by 26% (0.74, 0.001).

Table 3: Multiple binary logistic regression attitude outcomes of participants (N=475)

Characteristics		Success in Managing, OR (95% CI), p-value	Reliance of eradicating, OR (95% CI), p-value
Gender	Male	1.61 (1.11, 1.78), <0.001	1.67 (1.19, 2.49), <0.001
	Female	2.00 (1.01, 3.96), 0.046	2.15 (0.21, 4.11), 0.036
Age cohort (reference: 18-24)	25-34	1.13 (0.99, 2.37), 0.048	1.55 (1.01, 2.37), 0.003
	35-44	1.45 (0.73, 1.99), <0.001	1.55 (1.01, 2.37) <0.001
	45+	1.23 (0.51, 2.31), 0.006	1.55 (1.01, 2.37) 0.014
Education (reference: High school and below)	Associate's degree	1.99 (1.31, 3.01), <0.001	4.89 (2.63, 8.91), <0.001
	Bachelor's degree	1.56 (1.03, 3.17), 0.009	3.55 (1.69, 6.10), <0.001
	Master's degree and above	1.25 (0.63, 2.31), 0.005	2.56 (1.13, 4.14), <0.001
Occupation (reference: Student)	Employed	1.73 (1.41, 2.21), 0.032	1.95 (1.62, 2.59), 0.004
	Unemployed	0.78 (0.57, 1.03), 0.039	0.73 (0.53, 0.99), 0.043
Marital Status (reference: other)	Married	1.91 (1.01, 3.96), 0.047	1.78 (0.54-3.12), 0.003
	Single	1.31 (0.20-3.63), 0.009	1.87 (0.58-3.21), 0.041
Religion (reference: Other)	Christian	2.21 (0.81, 4.73), <0.001	1.79 (1.00, 3.53), 0.015
	Muslim	1.45 (0.71, 2.67), 0.003	1.56 (0.77, 4.11), 0.006
Region of current residence (reference: Northern sector)	Southern sector	2.46 (0.99, 4.65), 0.001	2.06 (1.10, 3.65), 0.001
	Middle sector	1.75 (1.49, 3.11), 0.003	2.35 (1.62, 4.67), 0.00

Knowledge score	0.79 (0.75, 0.90), 0.001	0.74 (0.69, 0.86), <0.001
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“Others” comprised of re-married, cohabiting, divorced, separated, and widowed; African traditional religion, Eckankar, Hari Krishna, Buddhism

Behaviour of participants with regards to the COVID-19 pandemic

In Table 4, the results indicate the predictors of each of the 3 behavioural outcomes. The binary logistic regression analysis results indicated a significant association between participants buying more goods and COVID-19 knowledge scores (OR: 0.69, <0.001). This implied that the odds of reporting unusual buying behaviour decreased by 31% for a unit increase in knowledge scores. Participants' responses to purchasing behaviour increased by 65, 54% and 68% for the cohorts of 25-34 years, 35-44 years, and 45 and above years, respectively, juxtaposed with the 18-24 years cohort. In the context of education, participants with high school and below qualification were associated with increased buying behaviours. Moreover, the odds of reporting unusual buying behaviour decreased by 22% (0.78, 0.039) among participants in the unemployed category. Finally, those who reside in the Northern sector had decreased odds of uncommon purchasing behaviour.

In the context of participants attending a public gathering, the odds decreased by 9% (0.91, 0.001) for every unit increase in COVID-19 knowledge scores. The female gender had 58% (1.58, 0.038) increased odds of attending a public event than their male counterparts. Finally, participants with a Master's degree and above had higher (1.63, 0.003) odds of attending a public gathering than others in the education category.

The results also show that for every unit increase in COVID-19 knowledge scores, the odds of a participant wearing a nose or facial mask outside the home decreased by 35% (0.65, 0.001). In the context of education, the participant with Master's degree and above and Bachelor's degree reported 441% (5.41, 0.001) and 276% (3.76, 0.001), respectively, increased odds of wearing a nose or facial mask outside the home juxtaposed with the other education categories (Table 4). Besides, participants who reside in the Northern sector reported 2% lower odds compared to participants in the Southern sector (336%) and the Middle sector (252%). Moreover, the lowest effect of all the analysis showed that the male gender had 50% (0.50, 0.001) decrease odds of wearing a nose or facial mask outside the home juxtaposed with 53% (1.53, 0.001) increase odds for the female gender.

Table 4: behaviour outcomes of participants (N=475)

Characteristics		Purchase more goods, OR (95% CI), p-value	Crowd of more than 100 people, OR (95% CI), p-value	Wore mask, OR (95% CI), p-value
Gender	Male	1.00 (0.65, 2.33), <0.001	1.41 (1.10, 1.85), 0.023	0.50 (0.39, 2.59), <0.001
	Female	1.58 (0.76-1.58), 0.038	0.71 (0.49-1.12), <0.001	1.53 (0.99-2.67), <0.001
Age cohort (reference: 18-24)	25-34	1.65 (1.10-2.61), <0.001	1.23 (0.72-2.42), <0.001	1.25 (0.61-2.46), 0.015
	35-44	1.54 (1.05-2.77), <0.001	1.66 (0.56-2.99), 0.045	1.38 (0.28-2.42), 0.031
	45+	1.68 (1.45-4.15), <0.001	0.76 (0.55-1.21), <0.001	1.31 (0.88-1.98), <0.001
Education (reference: High school and below)	Associate's degree	1.76 (1.08-2.77), <0.001	1.48 (0.85-2.53), <0.001	1.34 (1.01-5.97), <0.001
	Bachelor's degree	1.54 (1.01-2.36), 0.048	1.22(0.78-1.90), 0.008	3.76 (1.42-5.39), <0.001
	Master's degree and above	2.21 (1.19-3.44), 0.001	1.63(1.34-3.99), 0.003	5.41 (1.71-11.02), <0.001
Occupation (reference: Student)	Employed	1.41 (0.97-2.14), <0.001	1.04 (0.68-1.59), <0.001	1.21 (0.69-2.11), <0.001
	Unemployed	1.45 (1.03-2.36), <0.001	1.22 (0.78-1.90), 0.001	0.76 (0.42-1.39), 0.014
Marital Status (reference: Other)	Married	2.97 (1.46, 6.08), 0.003	0.81 (0.50-1.46), 0.003	1.35 (0.39-1.83), <0.001
Religion (reference: Other)	Christian	1.01 (0.63, 3.33), 0.045	1.09 (0.44, 2.91), <0.001	2.23 (0.71, 4.05), <0.001
	Muslim	1.20 (0.76, 2.81), 0.008	0.99 (0.47, 1.88), <0.001	1.50 (0.91, 3.11), <0.001

Region of current residence (reference: Northern sector)	Southern sector	1.32 (0.91-2.42), 0.008	1.51 (0.68-2.11), 0.013	4.36 (1.52-6.07), 0.048
	Middle sector	1.54 (0.91-2.77), <0.001	0.93 (0.53-1.64), <0.001	3.52 (1.15-5.34), <0.001
Knowledge score		0.69 (0.46-1.00), <0.001	0.91 (0.85-2.13), <0.001	0.65 (0.50-0.83), <0.001

“Others” comprised of re-married, cohabiting, divorced, separated, and widowed; African traditional religion, Eckankar, Hari Krishna, Buddhism

Approval of participants vis-à-vis the easing of COVID-19 restrictions

The participants had a diverse opinion about the easing of the COVID-19 restriction in Ghana. The majority of the participant (81.9%, 389/475) were gratified with the government of Ghana’s decision to ease the COVID-19 restriction for life to return to normalcy. The findings from a binary logistic regression analysis indicated the major predictors of participants approval towards the ease of COVID-19 restrictions. Participants' self-reports of approval toward ease of restrictions had a negative association with COVID-19 knowledge. For every unit of increase in COVID-19 knowledge score, the odds of the participants’ approval of the government of Ghana's decision to ease the COVID-19 restriction increased by 220% (Table 5). In the context of the age cohort, the odds of reporting approval towards the easing of COVID-19 restrictions increased by 238% and 453% for “25-34 year” cohort and “35-44 year” cohort respectively, compared to “18-24 year” cohort. Moreover, the odds of approval towards the easing of the restrictions increased by 78%, 245% and 571% for participants with associate's degree, bachelor's degree and master's and above respectively, compared to participants with high school and below qualifications. In the context of religion, the odds of participants reporting approval towards the easing of COVID-19 restrictions 598% and 176% for Christians and Muslims respectively, compared to the other regions. Finally, participants residing in the southern sector and middle sector of Ghana reported increased odds of approval towards the easing of COVID-19 restrictions.

Table 5 Determinants of approval toward easing COVID-19 restrictions (N=475)

Characteristics		Easing COVID-19 restrictions, OR (95% CI)	p-value
Gender	Male	2.56 (1.00, 4.78)	0.002
	Female	1.03 (0.67, 3.01)	<0.001
Age cohort (reference: 18-24)	25-34	3.38 (1.50, 7.21)	<0.001
	35-44	5.53 (2.59, 10.67)	<0.001
	45+	0.74 (0.59, 3.98)	0.039
Education (reference: High school and below)	Associate's degree	1.78 (1.00, 3.06)	<0.001
	Bachelor's degree	3.45 (1.89, 9.01)	<0.001
	Master's degree and above	6.71 (3.39, 11.53)	<0.001
Occupation (reference: Student)	Employed	3.78 (1.08, 7.67)	<0.001
	Unemployed	5.98 (2.19, 9.77)	0.003
Marital Status (reference: Single)	Married	2.26 (0.89, 4.73)	0.001
	Other	1.08 (0.56, 2.78)	<0.001
Religion (reference: other)	Christian	6.98 (2.90, 9.45)	<0.001
	Muslim	2.76 (1.00, 3.66)	0.008
Region of current residence (reference: Northern sector)	Southern sector	5.17 (1.34, 7.39)	<0.001
	Middle sector	4.12 (2.00, 8.23)	<0.001
Knowledge score		3.20 (1.01, 7.92)	<0.001

Declarations

The WHO ultimately declared COVID-19 as a global pandemic [29, 32, 33]. Ghana recorded and confirmed the first-two imported COVID-19 caseloads on the 12th of March 2020. The caseloads have steadily worsened, claiming over 161 lives and creating agitations among Ghanaians [28]. The Greater Accra leads the 16 regions in the country, as the region receives a huge inflow of people from international communities through air and land ports, making its inhabitants more vulnerable to the COVID-19 infection [13,19]. This study, to the best of my knowledge, is the initial study examining the knowledge, misperceptions, attitudes and behaviour of the Ghanaian populace towards the COVID-19 pandemic during the government's effort to ease the COVID-19 restrictions. Also, this study confirms the feasibility of conducting a Survey in a short time frame to assess participants' perception and knowledge of COVID-19 [20] using eQuestionnaire disseminated via social media channels.

Majority of the study participants were female, aged between 25-34 years. The studies by [19-21] reported similar results with a higher number of female respondents. Hypothetically, the implications from the literature suggest that the female gender tends to respond to online surveys more than the male gender. All the participants were literate with the least having SHS education. Moreover, related results showed that the majority of the participants knew about the COVID-19 outbreak. Barely 5 months after Ghana confirmed the first COVID-19 case, this study recorded a mean knowledge score of 10.6 (88.3%, SD = 1.14) out of 12 points for the participants selected for the study. The findings showed that Ghanaians are well informed about the COVID-19 pandemic. The high correct rate of COVID-19 knowledge score in Ghana was expected since a lot of campaigns had been initiated by the Ghana Health Service (GHS) via myriad media platforms (Social Media, TV and radio). A study by [19-21, 33] to assess the knowledge and perceptions of COVID-19 among people in the China, United States, Mexico, Paraguay and United Arab Emirates found an association with high average knowledge (ranged between 70% to 90%) among the study population though the findings were recorded at earlier stages of the pandemic.

The Ghanaian public had several misconceptions about COVID-19 pandemic. With regards to the rate of infection and associated risk, the participants believed that children and older adults infected with the COVID-19 are likely to experience a lethal disease and possibly die. However, the current literature [34,36-38] debunk these misconceptions. The participants also held the belief that the most effective way to protect yourself from the COVID-19 pandemic is when individuals wear a face shield or a non-medical mask (fabric mask). According to WHO [39], surgical or medical masks can protect people wearing it from getting COVID-19 infection; however, [19] reported the wearing of surgical masks as a misconception which is not in concordance with WHO's directives. Ghanaians thought that persons of Chinese descent, as well as Italians and other individuals of COVID-19 prone ethnicity, should not be allowed into public spaces or allowed to join public transport. It is expedient that the GHS and the mass media take into account the knowledge base and current misconceptions of the Ghana populace to champion the communication and information dissemination about the COVID-19 pandemic. Such a campaign should inform the populace to refrain from stigmatizing individuals of and from COVID-19 prone ethnicity, and the idea of the heightened risk of mortality with regards to children infected with COVID-19. Besides, a great number of the participants appear to believe that prayer, smoking cannabis and the drinking of hard liquor are effective protection measures against the COVID-19 infection. The information campaign should debunk this mis- and disinformation that circulates on social media [40-42] and emphasize the use of medical masks rather fabric masks, and also encourage the populace to observe the COVID-19 protocols which include regular hand washing of hand with soap under running water, and observing physical and social distancing with individuals. Although the majority of the participants seem knowledgeable about COVID-19 symptoms, one of the crucial campaign messages is the healthcare-seeking action to take when experiencing COVID-19 symptoms [19].

The participants held a positive attitude towards successful case management and reliance on eradicating COVID-19 pandemic in Ghana. The majority of participants (81.5%) held the credence that the COVID-19 pandemic in Ghana will finally be managed successfully. Though 22.9% of the participants were pessimistic about the chances of Ghana winning the fight against the COVID-19 pandemic, the

majority of the participants (77.1%) believed otherwise. The self-report of the pessimistic participants may be attributable to the accentuating numbers (700+) in the COVID-19 caseloads recorded daily in Ghana [13, 29]. Notwithstanding, among the participants, 95.3% avoided public gathering and 79.1% wore facial or nose masks when exiting the home in the light of COVID-19 case counts increasing in Ghana. We did not discover unusual purchasing behaviour among the participants. The current buy behaviour may imply that the citizenry is learning to live with the COVID-19 infection though the caseloads in Ghana are accentuating. The finding also indicated significant associations between the demographic characteristics of the participants and their knowledge, attitude and behaviour. These findings are concerning recent literature [19-21]. Also, the findings are relevant for Ghana Health Service and frontline workers towards the identification of potential COVID-19 hotspots and also the designing of specific health education and prevention policies [21].

Several reports [13, 29] show that the COVID-19 pandemic is not abating anytime soon, and people must learn to live with it by observing the necessary protocols. The government of Ghana also believes that the life of the Ghanaian populace must return to normalcy. The findings of this study indicate that majority of participants are in support of the easing of the COVID-19 restrictions. There was a significant association between the demographic characteristics and participants' approval towards the easing of COVID-19 restrictions. The highest odds of approval were recorded among the participants of the Christian faith (OR: 6.98, 2.90-9.45). However, the self-reports of older adults (45+ cohort) was negatively associated with the approval towards the easing of COVID-19 restrictions. The disapproval towards the COVID-19 restrictions by the older adults may be attributable to reports that indicate their vulnerability to the COVID-19 pandemic [19]. Finally, these findings on the approval and disapproval towards the easing of COVID-19 restriction could inform the government of Ghana to draw an effective COVID-19 restriction easing strategy going forward.

The statistical power of this study lies in the short period used to collect the data from a large number of respondents at peak of the COVID-19 pandemic, and the sample representation of women considering the population statistics of Ghana [42]. However, the study experienced some challenges: Firstly, there was an over-representation of participants with higher education and high employment status which may have accounted for some variation of characteristics between the participants and the entire Ghanaian population [19]. These variations in characteristics may have influenced the decision of some participants not to partake in the e-Survey, and besides, correlate participants' perceptions and knowledge of the COVID-19 pandemic with their characteristics [19-21]. Secondly, using social media platforms as the main channel for the dissemination of the eQuestionnaire may have prevented people who have not subscribed to any of these platforms or are digital immigrants from participation. Moreover, the authentication process did not allow the researchers to paint a reflective picture of Ghanaians concerning their knowledge and perception of the COVID-19 infection as participants with Gmail accounts could respond to the eQuestionnaire. Limitations in access to the eQuestionnaire, online information resources and internet prevented the researchers from collecting data from older adults and people residing in rural communities who are more likely to have low knowledge, pessimistic attitudes, and inappropriate preventive behaviour towards the COVID-19 pandemic [12]. Currently, in Ghana, older adults and people

residing in rural communities are seen as more vulnerable to the COVID-19 infection; hence, extensive research is required to ascertain their knowledge, attitude and behaviour of the COVID-19 pandemic.

Conclusion

Ghana joined the global community in the battle against COVID-19 pandemic since her first case was recorded in March, however, the caseloads of the infection keep rising daily. A quick online cross-sectional survey was needed to evaluate and track the knowledge, misperception, attitudes and behaviour of Ghanaians during the COVID-19 infectious outbreak concerning the government's effort towards the easing of COVID-19 restrictions. Such assessment was expedient to ascertain the level of knowledge, reduce the rates of infection, and finally prevent case fatalities among the Ghanaian populace. This study, to the best of knowledge, is the first attempts to define influences of public knowledge and misperceptions, attitudes and behavioural response to the COVID-19 pandemic in Ghana during the government's resolution to ease the COVID-19 restrictions. The findings suggest that Ghanaians have had appreciable knowledge, positive attitudes, and maintain cautious behaviour towards COVID-19 pandemic despite the rapid upsurge of the infectious outbreak. Hence it is a step in the right direction for the government of Ghana to ease the COVID-19 restrictions for the populace activities to return to normalcy. However, precaution must be taken towards the easing of the COVID-19 restrictions as enough research have not been conducted on the uneducated populace in the Ghanaian society. Such studies will shape up the government's decisions to implement an all-inclusive easing policy.

Declarations

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Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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Contributions

HBE conceived and designed the study, supervised data collection, performed analysis, and interpretation of data and drafted the manuscript. The first draft of the manuscript was written by EY and ATM. MO supervised the design, analysis, and interpretation of data and reviewed the draft of the manuscript. All authors were involved in the review of previous versions of the manuscript. All authors have read and approved the final draft of the manuscript.

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Ethics declarations

Ethics approval and consent to participate

The study etiquette was revised and accepted by the institutional research and development committee of University Hospital, Kwame Nkrumah University of Science and Technology. Participation was voluntary and participants showed consent by signing a consent form after adequate information was provided on the purpose of the study, its possible benefits, and their role in the study. Besides, participants were informed they could withdraw from the study at any time. Satisfactory time was allowed for participants to decide whether to participate in the study. The authors ensured discretion of the study data and maintained the anonymity of the study participants.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Abbreviations

COVID-19: coronavirus disease 2019

GHS: Ghana Health Service

WHO: World Health Organization

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