

EXAMINING THE KNOWLEDGE, ATTITUDES, AND HESITANCY TOWARDS COVID-19 VACCINES IN SUB-SAHARAN AFRICA: A CROSS-SECTIONAL STUDY

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Abstract

The present study examined the knowledge, attitudes, and hesitancy towards COVID-19 vaccines among internet users in Sub-Saharan Africa. Data were collected online using Google form among four hundred and thirty (430) social media users across these African countries; Nigeria, Ghana, and Cameroon. Their ages range from 18 to 61 years, $M = 31.05$; $SD = 6.96$ and data collection lasted from September to November 2021. Instruments used in data collect included; the General Knowledge of COVID-19 Vaccine Questionnaire, the Attitudes towards COVID-19 Vaccines Questionnaire, and the COVID-19 Vaccine Hesitancy Scale (COVID-19-VHS). The results showed that good knowledge of COVID-19 vaccines was recorded among internet users in Ghana (31.5%), Cameroon (34.8%), and Nigeria (33.7%). Positive attitudes towards COVID-19 vaccines were recorded among internet users in Ghana (54.2%), and Cameroon (35.6%), while Nigerian internet users recorded negative attitudes towards the vaccines at 10.2%. COVID-19 vaccines acceptance was recorded higher in Ghana (41.9%), while participants in Nigeria (39.1%), and Cameroon (19.0%) had lower outcome in both acceptability and possible to be vaccination. This indicates that internet users in Ghana had the will to be vaccinated, while internet users in Nigeria and Cameroon had low or no zeal to accept vaccination. Lastly, among all the participants, both general knowledge of COVID-19 vaccines and the attitudes towards COVID-19 vaccines significantly predicted COVID-19 vaccination compliance ($B=.37$, $t=8.24$, $p=0.5$; and $B=.14$, $t=3.25$, $p=0.5$). Conclusively, since negative attitudes and low vaccine acceptability pose great danger to public health, the researchers suggest proper health-reorientation by various health agencies and ministries in collaboration with psychologists across Africa to avert impending pandemics and psychological challenges.

Keywords: COVID-19, Pandemic, Vaccines, Attitudes, Africa, Hesitancy.

INTRODUCTION

Background of the study

Notwithstanding that the spread of the Corona Virus Disease of 2019 (COVID-19) may have been contained, its effects are still wreaking havoc across the globe. The virus is believed to be transmitted through person-to-person contact, such as hugging or kissing, sneezing, or coughing by the carrier when droplets are released into the air. The virus' symptoms include sneezing, watery diarrhea, exacerbated asthma, a cold or flu that starts 2-4 days after infection, coughing, a runny nose, a sore throat, and/or fever in rare cases (Unhale et al., 2020). Iran, France, Belgium, the United States of America, Canada, Spain, Italy, Germany, the United Kingdom, China, Turkey, the Russian Federation, and Brazil were the countries hardest hit by the virus at its peak (World Health Organization (WHO)-COVID-19, 2020). Africa as a continent recorded fewer cases when compared to other continents (Moore et al., 2020). The spread of the virus in Sub-Saharan Africa (SSA) has been linked to limited access to health facilities, poverty, and poor healthcare services (Osseni, 2020). Previous studies have reported that people in the SSA region were noncompliant with the safety measures mapped out by WHO (Nwagbara et al., 2021), and this attitude can be associated with misinformation and ignorance (Olum et al., 2020).

Nigeria was among the first African countries to prepare for the infectious disease through the training of Rapid Response Teams (RRT) across the 36 states of the federation and the federal capital tertiary by the Nigerian Center for Disease Control [NCDC] (Amzat et al., 2020). However, Nigeria recorded her index case on February 27th, 2020, from an Italian traveler, and 22 months later, the country recorded about 214,513 confirmed cases, 4,130 active cases, 207,403 discharged cases, and 2,980 death cases. Lagos, Abuja, and the Rivers occupy the first, second, and third positions in states with the highest death rate (NCDC, 2021).

After 30 days, the NCDC discovered that 40% of the confirmed cases were from European countries with a high rate of the infectious disease, and one of the NCDC's measures was a ban on passengers from these foreign countries (Amzat et al., 2020). The ban was extremely beneficial because health professionals were only dealing with confirmed cases while attempting to track down individuals who had contact with the returnees before they were diagnosed.

However, Ghana was among the countries to record the highest cases of COVID-19. The first case was reported on March 12th, 2020, and since then, from the 1,264,190 samples tested, a total of 95,476 laboratory-confirmed cases have been reported (Ghana's Outbreak Response Management [GORM], 2021). Not minding the 9.6 positivity rate recorded in Ghana, there have been reports of low (0.8%) fatalities, with about 795 deaths, which can be linked to a 97.7% recovery rate. Also, Ghana has recorded great success in vaccine administration, having administered over 1,232,876 vaccine doses to its estimated 30.42 million population (GORM, 2021b). With the help from WHO and Ghana Health professionals, the Ministry of Health (MoH) rolled out emergency

preparedness, responses, guidelines for pandemic management, and antigen testing (MoH, 2020). Some of the precautionary measures include, but are not limited to, the use of Personal Protective Equipment (PPE), safe corpse handling, safe injection procedures, and decontamination of the environment and equipment (MoH, 2020b). A statement from the Annual Regional Health Review shows that health experts in Ghana engaged in supervision and monitoring at all hospital entries, isolation of suspected cases, and body temperature checks (Agbozo & Jahn, 2021).

Cameroon, like all other countries, implemented a variety of interventional policies to mitigate the risks associated with the emergence of COVID-19, according to the International Labor Organization (ILO) (2020). In a detailed article, the organization (ILO) reported that Cameroon recorded its first COVID-19 case on March 6, 2020, and three months later, the country was among the seventh most affected countries in Africa. In a bid to reduce the spread of the pandemic, the government of Cameroon implemented some preventive measures such as land and air border closures, the closure of schools, and the closure of places of mass gathering such as hotels, malls, etc. (ILO, 2020).

The measures imposed numerous hardships and unanticipated difficulties on the people's economic strength. Before the emergence of the pandemic, the unemployment rate in the country was high, but the number tripled when business activities were seized, the ILO added. The closure of borders led to reduced labor, production, and enterprise turnover. In other African countries like Ethiopia, studies show that participants in the country had full knowledge of the disease mode of transmission, clinical symptoms, and perilous outcome of contracting the virus (Kebede et al., 2020). This may be a result of the high mortality rate recorded across Europe. Parallel to this study outcome, other studies in Africa have recorded incongruence in the level of knowledge, attitude, and practice towards COVID-19 (Elnadi et al., 2021).

Vaccines can be seen as one of the greatest achievements of humans in public health, but that doesn't make them risk-free, as there are adverse effects that are reported most of the time (WHO, 2013). A vaccine is a biological groundwork that provides acquired immunity against a particular infectious disease (Iowa Administrative Code [IAC], 2019). Vaccination, according to International Travel and Health [ITH], (2012), is the administration of agent-specific, but nontoxic, antigenic components that induce protective immunity against the resulting infectious agent in vaccinated individuals. From recent studies conducted in the UK, it has been found that having 2 doses of the vaccine is effective in preventing COVID-19 in 65–95% of people. The vaccination program has recorded tremendous success in some parts of the world. As of October 2021, the overall vaccination rate (doses 1 and 2) in England was 65.5% and 60.4%, respectively (UK Health Security Agency [UK-HAS], 2021). Also, on the basis of the antibody testing from blood donors, it was discovered that 98.0% of the adult population had antibodies to COVID-19 from vaccination or infection, while antibodies from only infection stood at 18.7% (UK-HAS, 2021b).

After the trials and approval of the vaccines for COVID-19, one of the challenges facing them was the acceptance or willingness to be vaccinated. Vaccine hesitancy describes

the likelihood of people having little to no desire to be vaccinated. It is also the feeling of uncertainty in vaccines as a result of a single belief or reason (Larson et al., 2016). The refusal or delay in accepting vaccination can be caused by vaccine hesitancy or reduced confidence (MacDonald et al., 2015). The acceptability of a vaccine is determined by three factors: confidence, convenience, and compliancy (Al-Mohaithef & Padhi, 2020). Confidence describes trust in the safety and effectiveness of the vaccine, trust in policymakers' decisions, and trust in the delivery system (French et al., 2020).

The convenience of vaccination indicates the ease in terms of accessibility, affordability, and availability (MacDonald et al., 2015), while the compliance of vaccination is the perceived low-risk of the vaccine-preventable disease, which leads to a negative perception towards the vaccine (Neergaard & Fingerhut, 2020). To effectively control and prevent the contracting and spreading of COVID-19, the general public needs to have suitable knowledge regarding the disease, which will positively influence their attitudes towards its vaccines and vaccination. Due to the lack of scientific knowledge in this regard, this study became necessary and sought to ascertain;

1. What is the knowledge of the COVID-19 vaccine among people in sub-Saharan Africa?
2. What is the attitude of people in sub-Saharan Africa towards the COVID-19 vaccine?
3. What is the COVID-19 vaccine hesitancy level among people in sub-Saharan Africa?
4. Will knowledge and attitudes predict hesitancy toward COVID-19 vaccines?

Hypotheses

1. There will be good knowledge of COVID-19 vaccines among internet users in sub-Saharan Africa.
2. There will be positive attitudes among internet users in sub-Saharan Africa towards the COVID-19 vaccine.
3. There will be a high level of acceptance of the COVID-19 vaccine among internet users in sub-Saharan Africa.
4. Knowledge and attitudes toward COVID-19 vaccines will significantly predict hesitancy towards vaccination.

METHOD AND MATERIALS

The current study adopted a cross-sectional design, while Google Forms software was used to recruit 430 social media users across three (3) African countries, namely, Nigeria, Ghana, and Cameroon. The online survey was shared across different platforms, such as Facebook, WhatsApp, and email lists, with the help of research assistants in each of these countries. The inclusion criteria include; a participant must be resident of any of the countries, must be an internet user, and must be 18 years and above, while the exclusion criteria were non-residents of the named countries, individuals without access to the internet, and younger than 18 years. The researchers adopted online means of data

collection due to the second phase of COVID-19 lockdown and social distancing rule. This became most appropriate as researchers and their assistants couldn't engage participants one-on-one.

All participants in this study gave their consent and indicated their willingness to participate by checking the "I consent" box in the online survey. The duration of the data collection was from May 2021 to June 2021. The study demographic variables include; age, gender, marital status, occupation, and level of education. In total, 175 (40.7%) were females, and 255 (59.3%) were males. Their ages ranged from 18 to 61, with a mean of 31.05 and a standard deviation of 6.96.

INSTRUMENTS

The following instruments were used in data collection;

The general knowledge of COVID-19 vaccine questionnaire, developed by Mannan and Farhana (2020), is a 16-item, self-administered questionnaire used in assessing COVID-19 vaccine knowledge with a three (3) response format of True, False, and Don't know. Some of the items include; Are antibiotics an effective treatment for COVID-19? Taking vitamin C or other vitamins will protect you from COVID-19? There is no evidence that vaccines against pneumonia will protect you against the COVID-19? and regular rinsing your nose with saline water will protect you against the COVID-19? The Attitudes towards COVID-19 vaccines questionnaire developed by Mannan et al., (2020), is a 10-item scale used in assessing individuals' attitudes towards vaccines of COVID-19, with three (3) response formats namely; Strongly Agree, Neutral, and Strongly Disagree.

Some of the items includes; Worries about unforeseen impacts? Pharmaceutical companies are going to develop safe and effective COVID-19 vaccines? General mistrust of vaccine benefit COVID-19 vaccines made in Europe or America are safer than those made in other world countries? And lastly, the COVID-19 Vaccine Hesitancy Scale (COVID-19-VHS) is a 14-item questionnaire developed by the researchers. The scale accesses the general Covid-19 hesitancy level with three (3) response formats, namely; 1-Yes, 2-No, and 3-Don't Know, some of the items in the questionnaire include; "Do you trust pharmaceutical companies to provide safe and effective COVID-19 vaccine? I'm convinced that my government purchases the highest quality COVID-19 vaccine available? Did you ever have the impression your government/health care provider did not provide you with the best COVID-19 vaccine in the market? Have you ever felt healthcare professionals or government is pushing you into COVID-19 vaccination which you don't fully support? And Have you or someone you know ever had a bad reaction to COVID-19 vaccine which made you reconsider getting the vaccine? The scale can be administered both online and one-on-one.

Procedure

With the help of research assistants in the three African countries, the researchers shared the link to the Google form. Before then, the researchers gave a brief description of themselves and the essence of the study. The participants who willingly consented to participate in the study by checking the "I consent" button were given access to the

questionnaires. Only participants who answered the questions correctly were scored, and their responses serve as the data for this study. At the end of the data collection, the researchers debriefed and thanked the participants through a mail survey.

Design/Statistics

This is a cross-sectional study and hierarchical linear regression analysis was adopted, while the Statistical Package for Social Science (SPSS) version 20 was the statistical tool used.

Results

The table shows the description of participants' demographics

	N	Minimum	Maximum	Mean	Std. Deviation
Gender	430	1.00	2.00	1.4070	.49184
Edu	430	1.00	2.00	1.2140	.41057
Mstatus	430	1.00	2.00	1.4395	.57922
Age	430	18.00	61.00	31.0488	6.96411
Country	430	1.00	3.00	1.7674	.83449
Valid N (listwise)	430				

Table 1: summary of the study demographic variables

The table 1 above indicates gender (M=1.41, SD= .49), educational status (M=1.22, SD=.41), marital status (M=1.44, SD=.58), age range from 18-61 years (M=31.05, SD=6.96), and country (M=1.77, SD=.84).

The table describes the frequency of the participants' demographics

	FREQUENCY	PERCENT	VALID PERCENT	CUMULATIVE %
GENDER				
Male	255	59.3	59.3	59.3
Female	175	40.7	40.7	100.0
Total	430	100.0	100.0	
RELIGION				
Christian	341	79.3	79.3	79.3
Muslim	85	19.8	19.8	99.1
Others	4	.4	.9	100.0
Total	430	100.0	100.0	
EDUCATION				
Tertiary	338	78.6	78.6	78.6
Secondary	92	21.4	21.4	100.0
Total	430	100.0	100.0	
OCCUPATION				
Working	272	63.3	63.3	63.3
Not working	158	21.4	21.4	100.0
Total	430	100.0	100.0	
MARITAL STATUS				
Single	255	59.3	59.3	59.3
Married	166	38.6	38.6	97.9
Widowed	4	.9	.9	98.8
Divorced	5	1.2	1.2	100.0
Total	430	100.0	100.0	
COUNTRY				
Nigeria	211	49.1	49.1	49.1
Ghana	108	25.1	25.1	74.2
Cameroon	111	25.8	25.8	100.0
Total	430	100.0	100.0	

Table 2: summary of the participants' demographics frequency

The table 2 above shows the frequency of the study participant's demographics, indicating that 255 male and 175 female participated in the study, 341 were Christians, 85 were Muslims, while 4 fall under other religion. 338 of the participants hold tertiary education, and 92 attended only secondary education, 272 working, 158 not working, 255 single, 166 married, 4 widowed, 5 divorced. While country of origin indicate that 211 are Nigerian, 108 Ghanaians, and 111 Cameroonians.

The table shows percentage of true, false, and don't know responses to knowledge of COVID-19 vaccines

Statements	TRUE	FALSE	Don't know
There is an effective medicine available for treating COVID-19	73.6	11	15.4
There are ways to help slow the spread of COVID-19	68.2	16.1	15.7
Currently there is no vaccine to protect against COVID-19	27.3	62.7	10
The ordinary flu vaccine will protect me from COVID-19	13.2	81.6	5.2
Antibiotics are an effective treatment for COVID-19	17	22	61
Taking vitamin C or other vitamins will protect you from COVID-19	11	16.8	72.2
There is no evidence that vaccines against pneumonia will protect you against the COVID-19	30.7	28.1	41.2
Regular rinsing your nose with saline water will protect you against the COVID-19	51.8	29	19.2
To date, no one in your country has died from COVID-19	23.7	69.6	6.7
To date, no one in your country who was infected with COVID-19 passed it on to infect another person	18.3	72	9.7
There is no evidence that eating garlic will protect you against the COVID-19	30.1	47	22.9
The health effects of COVID-19 appear to be more severe for people who already have a serious medical condition	82.3	6.7	11
There are other strains of COVID-19 that can infect humans, including those that cause the common cold	17	22.1	60.9
Packages or letters can spread the virus	50.9	19.1	30
The virus was genetically engineered as part of a biological	16.8	47	36.2
The virus was human-made and deliberately released	17	60.9	22.1

Table 3: knowledge of Respondents towards COVID-19 Vaccines

Nigeria	Ghana	Cameroon
33.7%	31.5%	34.8%

In the table 3 above, participants' statement scores were summed up and every individual scoring mean score of 1.7 and above was classified as positive attitude while less score indicated negative attitude. Study participants from Ghana had highest positive attitude towards COVID-19, followed by Cameroon at 35.6%, and lastly Nigeria at 10.2%.

The table shows percentage of strongly agree, neutral, and strongly disagree responses to attitudes towards COVID-19 vaccines

Statements	Strongly Agree	Neutral	Strongly disagree
Is it important to get vaccine to protect the people from COVID-19?	81.4	14.3	4.3
Do you have worries about unforeseen impacts?	48.1	41.9	10.0
Do you think that pharmaceutical companies are going to develop safe and effective COVID-19 vaccines?	62.9	30.0	7.10
Do you have general mistrust of benefits of COVID-19 vaccine?	17.6	30.0	52.4
Do you think COVID-19 vaccines made in Europe or America are safer than those made in other world countries?	23.8	42.9	33.3
Do you have concerns on commercial profiteering?	38.1	38.3	23.3
Do you believe the side effects will prevent you from taking a vaccine for the prevention of COVID-19?	33.3	24.8	41.9
Do you have preference for natural immunity?	41.9	39.0	19.0
Do you believe most people will refuse to take COVID-19 vaccines once licensed in your country?	45.7	30.0	24.3
Do you believe the government of your country will make the vaccine available for all citizens for free?	53.8	28.6	17.6

Table 4: Attitude of Respondents towards COVID-19 Vaccines

Nigeria	Ghana	Cameroon
10.2%	54.2%	35.6%

In the table 4 above, participants' statement scores were summed up and every individual scoring mean score of 1.7 and above was classified as positive attitude while less score indicated negative attitude. Study participants from Ghana had highest positive attitude towards COVID-19, followed by Cameroon at 35.6%, and lastly Nigeria at 10.2%.

The table shows percentage of strongly agree, neutral, and strongly disagree responses to hesitancy towards COVID-19 vaccines

Statements	Strongly Agree	Neutral	Strongly disagree
There is an effective medicine available for treating COVID-19	73.6	11	15.4
There are ways to help slow the spread of COVID-19	68.2	16.1	15.7
Currently there is no vaccine to protect against COVID-19	27.3	62.7	10
The ordinary flu vaccine will protect me from COVID-19	13.2	81.6	5.2
Antibiotics are an effective treatment for COVID-19	17	22	61
Taking vitamin C or other vitamins will protect you from COVID-19	11	16.8	72.2
There is no evidence that vaccines against pneumonia will protect you against the COVID-19	30.7	28.1	41.2
Regular rinsing your nose with saline water will protect you against the COVID-19	51.8	29	19.2
To date, no one in your country has died from COVID-19	23.7	69.6	6.7
To date, no one in your country who was infected with COVID-19 passed it on to infect another person	18.3	72	9.7
There is no evidence that eating garlic will protect you against the COVID-19	30.1	47	22.9
The health effects of COVID-19 appear to be more severe for people who already have a serious medical condition	82.3	6.7	11
There are other strains of COVID-19 that can infect humans, including those that cause the common cold	17	22.1	60.9
Packages or letters can spread the virus	50.9	19.1	30
The virus was genetically engineered as part of a biological weapons program	16.8	47	36.2
The virus was human-made and deliberately Released	17	60.9	22.1

Table 5: Respondents' hesitancy towards COVID-19 Vaccines

Nigeria	Ghana	Cameroon
39.1%	41.9%	19.0%

The table 5 above shows the participants' scores for hesitancy level. Individuals who scored 1 were considered to have hesitancy towards COVID-19 vaccines. While those who scored 0 were considered to have no hesitancy to COVID-19 vaccination. The general hesitancy analysis among the three countries indicates that internet users in Ghana had no hesitancy towards COVID-19 vaccination and were interested in encouraging friends and family to get vaccinated.

		Coefficients ^a				
Model	Model B	Std. Error	B	T	Sig.	
1	(Constant)	14.741	1.191		12.381	.000
	GKC	.342	.041	.374	8.345	.000
	(Constant)	11.610	1.521		7.631	.000
2	GKC	.335	.041	.366	8.244	.000
	ATC	.188	.058	.144	3.250	.001

Table 6: The coefficients table

a. Dependent Variable: VHS

The table 6 above shows that among the internet users in Nigeria, Ghana, and Cameroon, both general knowledge of COVID-19 vaccines and the attitudes towards COVID-19 vaccines significantly predicted COVID-19 vaccination compliance ($B=.37$, $t=8.24$, $p=0.000$; and $B=.14$, $t=3.25$, $p=0.001$).

Summary of the Major Findings

Good knowledge of COVID-19 vaccines was recorded among internet users in sub-Saharan Africa. This indicates that all the internet users across the three countries had good knowledge of COVID-19 vaccines. Positive attitudes towards COVID-19 vaccines were recorded among internet users in Ghana and Cameroon while Nigerian internet users recorded negative attitudes towards the vaccines. This shows that participants in both Ghana and Cameroon had good level of trust towards the vaccines, the government, and the pharmaceutical companies in their countries, while Nigeria participants recorded showed mistrust towards the vaccines, the government, and the pharmaceutical companies in their country. COVID-19 vaccines acceptance was recorded only in Ghana, while participants in Nigeria and Cameroon had lower outcome in both acceptability and possible vaccination. This indicates that Ghana participants had the will to be vaccinated, while participants in Nigeria and Cameroon had low or no zeal to accept vaccination. Among all the participants, both general knowledge of COVID-19 vaccines and the attitudes towards COVID-19 vaccines significantly predicted COVID-19 vaccination compliance.

DISCUSSION

The study was undertaken to examine the knowledge, attitudes, and hesitancy towards covid-19 vaccines among internet users in Sub-Saharan Africa. The findings of this study reveal that a good knowledge of COVID-19 vaccines was recorded among internet users in sub-Saharan Africa. This indicates that all the internet users across the three countries had good knowledge of COVID-19 vaccines. This finding is in line with the previous studies, Vaccine hesitancy trends vary across the globe. A systematic review of vaccine acceptance rates found general COVID-19 acceptance rates greater than 70% among adult populations (Sallam, 2021). Similarly, Solís et al., (2021) observed that a few studies

explicitly focus on acceptance rates in the poorest countries. Assembling an amalgamation of data samples with different sources, sampling methodologies and coverage, one study finds generally high acceptance rates in 10 LMICs in Asia, Africa and South America. Again in their study, Lazarus et al., (2021) reported that a cross-country study of 19 countries with samples obtained from commercial online panel providers found 71.5% of respondents willing to be vaccinated against COVID-19 with a rate of 65.2% in Nigeria as the only low-income country.

The finding of this study also shows that positive attitudes towards COVID-19 vaccines were recorded among internet users in Ghana and Cameroon while Nigerian internet users recorded negative attitudes towards the vaccines. This shows that participants in both Ghana and Cameroon had good level of trust towards the vaccines, the government, and the pharmaceutical companies in their countries, while Nigeria participants recorded showed mistrust towards the vaccines, the government, and the pharmaceutical companies in their country. Kanyanda et al., (2021) in their study, observed that acceptance rates are lower than what they find in Burkina Faso (66.5%, national phone sample obtained by random digit dialing) and Nigeria (76.2%, random sample of residents of one state from telephone list), close in urban Uganda (76.5%, random sample of households in Kampala) and very similar in rural Uganda (85.8%, non-random sample of women in 13 districts). In their study () reported that 89% of our respondents had average knowledge of COVID-19, with the Central African region having the least COVID-19 knowledge score compared to the other regions. The moderate COVID-19 knowledge is unexpected as most of our participants had a university first degree, which would have inadvertently affected the knowledge reserve. This is comparable to what was obtained in Bangladesh and Ecuador (ZannatulFerdous et al., 2020; Bates et al., 2020) but lower than that obtained in an Indonesian, China, or US study (Geldsetzer, 2020; Yanti et al., 2020). Again the result of the study hold that COVID-19 vaccines acceptance was recorded only in Ghana, while participants in Nigeria and Cameroon had lower outcome in both acceptability and possible vaccination. This indicates that Ghana participants had the will to be vaccinated, while participants in Nigeria and Cameroon had low or no zeal to accept vaccination. The reason could be as a result of what Geldsetzer, (2020) observed in his study that his respondents were mostly internet surfers hugely biased towards social media platforms such as Facebook, Twitter, WhatsApp, etc. This is more where social media misinformation can negatively impact mitigation against this pandemic as observed in a US study, where more than half of the respondents opined that not eating from a Chinese restaurant was an effective way of preventing SARS-CoV-2 transmission. Since information on these various platforms is often uncertified and unverified (C R, DC K, KD B-K, 2019), with false health information being circulated in most cases, it is imperative for governments and health organizations to utilize these platforms to disseminate accurate and reliable information. Similarly the finding of Olapegba et al., (2020) obtained in Nigeria where more than half of the West African respondents originate. Finally the finding of this study show that among all the participants, have both general knowledge of COVID-19 vaccines and good the attitudes towards COVID-19 vaccines significantly predicted COVID-19 vaccination compliance. This is in line with the remarks of Al-Hanawi et al., (2020), and Singh et al., (2011) which

hold that the success of preventive measures towards the COVID-19 pandemic is largely dependent on public knowledge and adherence to these measures. This also agrees with the findings of Pal et al., 2020 and Obi et al., (2022) which noted that the level of Attitude towards COVID-19 showed that the respondents had a high attitude towards COVID-19. 93.9% of them believe they can protect themselves from COVID-19. The stuff disseminated during this period, both written works and video passed a lot of informed and the response given to the COVID-19 including closing down places of worship and social gather sends strong message to the people which provokes both conscious and unconscious response to deepening awareness general knowledge of COVID-19 among the populace.

LIMITATIONS OF THE STUDY

One limitation is this study is the small number of participants. This is as a result of fear of getting entangled with scam. As the study is online survey during the data collection process, most persons were unwilling to click on the link, hence reducing the number of respondents. Besides, because it is an online survey form persons without internet service or smartphones were unable to participate in the survey. Finally, the result should be viewed within the context of the limitations posed by the method and sample size.

STRENGTHS OF THIS STUDY

The strength of this study is evident in its target population as this is one among the pioneer multi-national studies to examine the knowledge, attitudes, and hesitancy towards Covid-19 Vaccines in Sub-Saharan Africa. We recognized knowledge, attitudes, hesitancy and seeks their implication towards COVID-19 among Sub-Sahara Africans. The finding of this study reveals the power of internet and calls for effort to ensure that right information are always transmitted for the consumption of the populace.

CONCLUSION

This research was embarked upon to study the knowledge, attitudes, and hesitancy towards Covid-19 Vaccines in Sub-Saharan Africa. The participants drawn were online using Google form among Four hundred and thirty (430) social media users across these African countries; Nigeria, Ghana, and Cameroon. Their age range from 18 to 61 years, and data collection lasted from September to November 2021. The General Knowledge of COVID-19 Vaccine Questionnaire, the Attitudes towards COVID-19 Vaccines Questionnaire, and the COVID-19 Vaccine Hesitancy Scale (COVID-19-VHS) were used for data collection. The results showed that good knowledge of COVID-19 vaccines was recorded among internet users in Ghana (31.5%), Cameroon (34.8%), and Nigeria (33.7%). Positive attitudes towards COVID-19 vaccines were recorded among internet users in Ghana (54.2%), and Cameroon (35.6%), while Nigerian internet users recorded negative attitudes towards the vaccines at 10.2%. COVID-19 vaccines acceptance was recorded higher in Ghana (41.9%), while participants in Nigeria (39.1%), and Cameroon had lower outcome in both acceptability and possible vaccination. This indicates that Ghana participants had the will to be vaccinated, while participants in Nigeria and

Cameroon (19.0%) had low or no zeal to accept vaccination. Lastly, among all the participants, has both general knowledge of COVID-19 vaccines and the attitudes towards COVID-19 vaccines significantly predicted COVID-19 vaccination compliance and Since negative attitudes and low vaccine acceptability pose as great dangers to public health, the researchers suggest proper health-reorientation by various health agencies and ministries in collaboration with psychologists across Africa to avert impending pandemics and psychological challenges. Besides, since most people gain a lot knowledge awareness through internet it important that government agencies on health and orientation should work to see that information found on internet are properly guided to avoid misleading. It is plausible that these findings have come from a particular data set, yet the present study gives a direction for the necessity of more integrated research in this field.

Author's contributions

All authors had full access to all of the data in the study, studied and approved the final manuscript and take responsibility for the integrity of the data and the accuracy of the data analysis. First and second authors were responsible for its conception and design, the third author was responsible for literature review, data acquisition was by the fourth author, data analysis was done by the fifth author, and the sixth and seventh authors were responsible for the discussion.

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Consent to participate: A brief introductory letter was attached to the questionnaire that was used in this study. All the participants filled the consent form before filling and returning the questionnaire.

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