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Determinants of Public Acceptance of Testing and COVID-19 Vaccines in Cameroon: A Cross Sectional Study

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ABSTRACT

Introduction: COVID-19 disease still remains a nightmare in Cameroon. With the current vaccines present for its management, public acceptance of the vaccine is very significant. Understanding the determinants of COVID-19 testing and vaccine acceptance by the public is thus vital. This study aimed at exploring the determinants of acceptance of COVID-19 testing and vaccine by the population of Cameroon.

Methods: The study involved a three-month (September-December 2021) cross-sectional online survey, done with the use of a well-structured questionnaire administered through emails, WhatsApp and Facebook among the general population of Cameroon. The questionnaire focused mainly on determinants of COVID-19 disease testing and vaccine acceptance. A multivariate logistic regression model was incorporated to establish the determinant factors. Odds ratio with 95% CI was calculated to evaluate the strength and significance of these association.

Results: The study involved 1,750 participants spread amongst different sociodemographic groups. Using the multivariate logistic regression analysis, strong associations with vaccine acceptance were; high knowledge of COVID-19 infection (aOR=2.54, 95% CI: 2.16-2.99), high knowledge of COVID-19 vaccine (aOR=2.67, 95% CI: 1.75-4.18), and perception of vaccine benefit (aOR=1.91, 95%CI: 1.07-3.42). Trust in the government also significantly positively affected vaccine acceptance. Respondents high in government trust had higher percentage points acceptance of the COVID-19 vaccine compared with those having low level of trust (aOR=2.68, 95% CI: 1.72-4.18).

Conclusions: The low acceptance level of COVID-19 vaccine in Cameroon is driven by multiple factors. Findings from this study might help guide future efforts for policy makers and stakeholders to improve the COVID-19 vaccination rate in Cameroon.

Keywords: COVID-19, vaccine, acceptance, interventions, Cameroon

INTRODUCTION

It is more than two years since the COVID-19 (corona virus) disease was first detected in China. This disease which still remains a worldwide challenge has swept through out the globe [1]. Cardinal symptoms of the disease includes fever, fatigue, dry cough, shortness of breath, pneumonia, anosmia, and ageusia [2]. This pandemic being a nightmare has caused substantial morbidity, mortality and economic crises [3,4]. Earlier cases of the disease were detected in Cameroon in the month of April 2020, which later spread rapidly across all its regions. The high infectious rate of the disease, absence of vaccines and effective treatment methods made the government of Cameroon through the ministry of public health to step up health security and sanitary measures. Some of these measures included wearing of face mask in public, switching off face-to-face learning in institutions to online learning, work from home policies, practice of social distance in gatherings and closure of eateries, restaurants and other recreational facilities. Unfortunately, the implementation of some of these measures were faced with challenges and thus not well respected.

In April 2021, Cameroon received the first batch of the COVID-19 dose (Astra Zeneca and Sinopharm vaccine) from the World Health Organization (WHO). Though the vaccines were available in Cameroon, reports documented in September 2021 by the WHO showed that only about 1,024,333 vaccine doses have been administered in Cameroon, which represents barely 5% of the total population of Cameroon. Studies published in 2021 showed that the pooled prevalence of COVID-19 vaccine acceptance rate amongst adult in Africa stood at 57.44%, with Cameroon having one of the least acceptance rates; 15.45 %, coming after Egypt; 13.52% [5]. The study [6] on the awareness and attitudes of COVID-19 disease in Cameroon revealed that most of the participants had a good knowledge about the disease. Therefore, the reluctance of the public to take the vaccines was probably not related to knowledge and awareness of the disease, but of the vaccine itself.

Findings in [7] documented that absence of COVID-19 vaccine sensitization programs likely to pose a challenge in its vaccine acceptance. Other reports carried out in some developed countries like Holland, Poland, and France have highlighted decline in COVID-19 vaccine acceptance due to high levels of vaccine skepticism [8]. Misinformation and miscommunication regarding the vaccine also hinders its acceptance. During the influenza pandemic, misinformation by social networks and conspiracy theories regarding the influenza vaccines was shown to bring about a reluctance in the influenza vaccine uptake [9].

The low COVID-19 vaccine acceptance rate by the population has led to difficulties in controlling and curbing the spread of the disease in Cameroon. Currently, there is paucity in information regarding determinants influencing the testing of COVID-19 and acceptance of its vaccine in Cameroon. This information is very important in establishing strategies needed to increase the acceptability of the vaccine which is a long-term preventive measure.

Therefore, this study was set out to establish the determinants of public acceptance of COVID-19 testing and its vaccine in Cameroon. Acceptance of the vaccine was inferred if participants indicated that they had already received the vaccine or definitely will accept to be vaccinated.

Findings from this study will help the government of Cameroon to better understand the key factors contributing to public acceptance of the COVID-19 vaccine. This will thereby enable them to come up with strategies to boost up the public acceptance level of the vaccine, thereby curbing the spread of the disease.

METHODS

Study Design and Participants

Due to practice of social distancing to curb the spread of the disease, the research design involved a qualitative survey, with the questionnaire electronically structured. The questionnaire was disseminated with the use of online social and interactive platforms such as Facebook, WhatsApp, Twitter, and Gmail, to friends, colleagues, and relatives who also shared the questions to others. Participants in the study involved both genders in all age groups residing in Cameroon and having access to the used online platforms. Before assessing the questions, a consent form was provided with the option 'I agree to participate'. Clicking this option automatically redirected the participants to the questions. Inclusion criteria for study involved all those having access to the online platforms and willing to participate. Once the form was submitted from participants' electronic device, assess to the form was automatically closed, making it not possible for multiple submission of responses from the same device. Also, duplicate responses screening was performed by comparing each row (response) to the next 10 responses. Identical responses within a few-minute timeframe or within a range of 10 responses were considered duplicates and deleted. The duration of the study lasted for three months (September 2021-December 2021).

Study Variables & Construction of Research Instrument

A health belief model was incorporated as the framework in the construction of the questionnaire. This model is usually adopted to understand participants' vaccine reluctance or hesitancy and corresponding associated factors [10]. Study variables included gender, age, level of education, knowledge of COVID-19 testing and vaccine, vaccine conspiracy theories, benefits and vaccine health risk, and trust in government and health authorities. Knowledge of COVID-19 infection was evaluated based on its mode of transmission, symptoms, prevention and control while knowledge of COVID-19 vaccine was based on type of vaccine, its source, doses required, and interval for dose administration. In this study COVID-19 testing and vaccine acceptance was conceptualized to stem from factors, which centers on knowledge and belief towards the vaccine. Thus, the dependent variables in the study were COVID-19 testing and vaccine acceptance.

In the evaluation of knowledge of COVID-19 infection and its vaccine, a total of 15 items each were administered. This was divided into three levels or scales (low, moderate, and high), with low level being a score ranging from 0 to 4; moderate level being 5 to 10 and high level being score ranging 11 to 15. Using the health belief model, 6 items were incorporated in the questionnaire evaluating vaccine health risk beliefs and vaccine benefits. Factors evaluated under vaccine risk beliefs involved perceived side effects and safety. A three-level or score scale (low, moderate, and high) was used in evaluating the health believe model according to the summed scores. Additionally, a 0 to 1 scale score level involving 'Yes' or 'No' was also used in the evaluation of other factors such as religious constraints, myth or conspiracy theories towards the vaccine and awareness of misinformation.

The questionnaire was designed in both English and French as this are the official languages used in Cameroon for communication.

Pilot Study & Pre- Testing

Prior to the administration of the questionnaires, a pre-test was carried out to increase its validity and reliability. The pretesting involved testing for question variation, meaning, task difficulty, respondent interest/attention, and timing. Pre-testing of the questionnaire was conducted using 15 health personals selected from public and private health institutions. Those who participated in the pre-test were not part of the main study. Respondents gave comments and suggestions about the clarity of the instruments. These suggestions and comments were incorporated in the questionnaire.

Data Analysis

Descriptive statistics was used in the computations of proportions, percentages and frequency distribution. Pearson's Chi-squared test was used to verify whether the proportions of acceptance of COVID-19 test and vaccine differed across categories of socio-demographic variables. A multivariate logistic regression analysis was used to determine associations between the study variables with the acceptance of the COVID-19 vaccine. Unadjusted odds ratios and their 95% CI at statistical significance ($p < 0.05$) was calculated for each association. Results of analysis were then presented in the form of tables.

Ethical Considerations

The principles of informed consent, voluntary participation, and confidentiality was maintained throughout the research activity. Anonymity was maintained by not disclosing the identity of the respondents. Participation was voluntary and the respondents were informed that they could withdraw from the study at any stage, if they so desired without any penalty.

RESULTS

Sociodemographic Presentation of Participants

The total number of participants who completed the questionnaire was 1,750 (N=1,750), of which 997 were males (56.97%) and 753 females (43.03%) as shown in **Table 1**. A greater proportion of the participants (36.85%) were between the age group (20 to 30) while the older adult age group were the least (2.29%). Most of the participants (44.97%) had attained or were in tertiary level of education while a lesser proportion (20.74%) were at the basic or primary level of education. With regards to the employment category, a higher proportion of the participants were the unemployed (47.82%) while the least were the retired (3.31%).

Acceptance of COVID -19 Testing by Participants

Outcome of the study showed that a total of 582 (33.25%) respondents accepted COVID-19 testing of which 349 were males and 233 females (**Table 2**). The age group of 31 to 40 were the most accepting age-group for testing (57.04%), whereas those aged below 20 years showed the least acceptance of the COVID-19 test (16.00%, $p < 0.01$). With regards to educational attainment, participants who had had attained tertiary level of education had a higher COVID-19 testing acceptance rate (53.36%, $p < 0.01$), while a low

Table 1. Socio-demographic characteristics of participants

Socio-demographic characteristics of participants	Number of participants (n)	Percentage of participants (%)
Gender		
Male	997	56.97
Female	753	43.03
Age group in years		
<20	297	16.97
20-30	645	36.85
31-40	426	24.34
41-50	246	14.06
51-60	96	5.49
>60	40	2.29
Level of education		
Primary	363	20.74
Secondary	600	34.29
Tertiary	787	44.97
Employment status		
Employed (Health care worker)	127	7.26
Employed (Non-health care worker)	728	41.60
Retired	58	3.31
Unemployed	837	47.82

Table 2. Distribution of participants according to acceptance of COVID-19 testing

Socio-demographic characteristics of participants	Acceptance of COVID-19 testing	p-value
Gender		
Male	349/997 (35.00)	0.01
Female	233/753 (30.94)	
Age group in years		
<20	48/297 (16.00)	
20-30	141/645 (21.87)	
31-40	243/426 (57.04)	<0.01
41-50	97/246 (39.43)	
51-60	35/96 (36.46)	
>60	18/40 (45.00)	
Level of education		
Primary	34/363 (9.37)	
Secondary	128/600 (21.30)	<0.01
Tertiary	420/787 (53.36)	
Employment status		
Employed (Health care worker)	79/127 (62.20)	
Employed (Non-health care worker)	436/728 (59.89)	<0.01
Retired	32/58 (55.17)	
Unemployed	35/837 (4.18)	

acceptance rate was observed in participants who had basic or primary level of education (9.37%, p<0.01). Health care workers showed a higher proportion of COVID-19 testing acceptance (62.20%, p<0.01).

Table 3. Distribution of participants according to acceptance of COVID-19 testing

Socio-demographic characteristics of participants	Acceptance of COVID-19 testing	p-value
Gender		
Male	322/997 (33.00)	<0.01
Female	214/753 (28.42)	
Age group in years		
<20	61/297 (20.54)	
20-30	148/645 (22.94)	
31-40	194/426 (45.54)	<0.01
41-50	82/246 (30.00)	
51-60	33/96 (34.38)	
>60	28/40 (70.00)	
Level of education		
Primary	32/363 (8.81)	
Secondary	103/600 (17.16)	0.01
Tertiary	401/787 (50.95)	
Employment status		
Employed (Health care worker)	88/127 (69.29)	
Employed (Non-health care worker)	376/728 (51.65)	0.02
Retired	31/58 (53.45)	
Unemployed	41/837 (4.90)	

Acceptance of COVID-19 Vaccine by Participants

Results pointed that a total of 536 (30.63%) participants accepted to take the COVID-19 vaccine, of which 322 were males and 214 females (**Table 3**). Just as with the case of COVID-19 testing acceptance, the age group of 31 to 40 were most accepting for the vaccine (56.40%, p<0.01). Also, a higher proportion of males than females (33.00% vs. 28.42%, p<0.01) demonstrated willingness to take the vaccine.

As oppose to the findings for the COVID-19 test acceptance, where the age group of 31 to 40 were the most accepting, the age group of >60 showed were more willing to accept the vaccine (70.00%, p<0.01). The group below 20 years demonstrated least acceptance of the COVID-19 vaccine (20.54%, p<0.01). With regards to educational attainment, participants who had had attained a tertiary level of education had a higher COVID-19 vaccine acceptance rate (50.95%, p<0.01), while a lower rate was observed in participants who had basic or primary level of education (8.81%, p=0.01). Based on employment status, a higher rate of vaccine acceptance was observed with health care workers (62.20%, p<0.001).

Factors Associated with Acceptance of a COVID-19 Vaccine

Based on the multivariate logistic regression analysis carried out, factors that significantly associated with the acceptance

Table 4. Factors associated with the acceptance of COVID-19 vaccination among participants

Factor	Multivariate model	
	Adjusted odd ratio (95% CI)	p-value
Knowledge level of COVID-I9 infection		
Low	1.00 (reference)	
Moderate	1.44 (1.31-1.58)	0.05
High	2.54 (2.16-2.99)	0.01
Knowledge level of COVID-I9 vaccine		
Low	1.00 (reference)	
Moderate	1.75 (1.28-2.43)	<0.01
High	2.67 (1.75-4.18)	<0.01
Risk beliefs of vaccine		
Low	1.00 (reference)	
Moderate	0.82 (0.76-0.88)	<0.01
High	0.40 (0.35-0.44)	<0.01
Perceived vaccine benefit		
Low	1.00 (Reference)	
Moderate	1.83 (1.11-3.03)	0.03
High	1.91 (1.07-3.42)	0.04
Religious constraints		
No	1.00 (reference)	
Yes	1.05 (0.97-1.14)	0.35
Awareness of misinformation		
No	1.00 (reference)	
Yes	1.18 (1.07-1.30)	<0.01
Myths or conspiracy theories		
No	1.00 (Reference)	
Yes	1.14 (1.04-1.28)	0.11
Trust in government and health officials		
Low	1.00 (Reference)	
Moderate	1.77 (1.30-2.43)	<0.01
High	2.68 (1.72-4.18)	<0.01
Influenza vaccination history		
No	1.00 (reference)	
Yes	1.45 (1.31-1.60)	0.01

of COVID-19 vaccine in this model (**Table 4**) included; high knowledge score of COVID-19 infection (aOR=2.54, 95% CI: 2.16-2.99), moderate or high knowledge of COVID-19 vaccine (moderate: aOR=1.75, 95% CI: 1.28-2.43; high: aOR=2.67, 95% CI: 1.75-4.18), have history of influenza vaccination (aOR=1.45, 95% CI: 1.31-1.60), perceive moderate or high level of vaccine benefit (moderate: aOR=1.83, 95%CI: 1.11-3.03; high: aOR=1.91, 95% CI: 1.07-3.42), awareness of COVID-19 vaccine misinformation (aOR=1.18, 95%CI: 1.07-1.30), moderate to high trust level on the government and health authorities (moderate: aOR=1.77, 95% CI: 1.30-2.43; high: aOR=2.68, 95% CI: 1.72-4.18).

DISCUSSION

In Africa, due to absence the of well-developed digital and online systems, the population greatly depend on physical interactions in most activities such as marketing, education, health care. Lockdown and social distances cannot be well implemented in such settings in the control of the COVID-19 pandemic. To this effect, vaccination is just the most effective control method needed. However, the success of the vaccination process greatly relies on the acceptance of the vaccines by the public. This study examined the acceptance level of COVID-19 testing, acceptance level of COVID-19 vaccine and finally the factors influencing the acceptance of the available COVID-19 vaccine by the public in Cameroon. Till date this is the first ever study performed in Cameroon covering this topic.

COVID-19 Testing & Vaccine Acceptance by Participants

Based on the findings, out of 1,750 subjects that participated in the study, 582 (33.25%) demonstrated willingness of undergoing the COVID-19 test while 536 participants (30.63%) were willing to take the vaccine. Considering the severity of this disease and its rapid spread, this acceptance level for both testing and vaccine administration is low. Relatively, this acceptance level is lower compared to the level observed in other countries such as Malaysia (94.3%), the United States (70%), Denmark (80%), and 60% in France [11-14]. Thus, to rapidly curb the spread of this disease and its adverse effect, there is high need for the government of Cameroon and public health authorities to implement strategies and interventions aim at boosting the testing and vaccine acceptance level.

Results from the study demonstrated that males had a higher level of both COVID-19 testing (35.00% vs. 30.94%, p=0.01) and vaccine acceptance than females (33.00% vs. 28.42%, p<0.01). This was in concurrence with similar studies carried out in Malaysia [11] and in the United States [12], which recorded a higher value of acceptance of COVID-19 vaccines in males than females. In Cameroon, a higher proportion of workers in most sectors are males than females, and some of these sectors, typically health and aviation require a COVID-19 test and vaccine certificate for its workers. Based on age group, the group >60 years showed a higher acceptance level (70%, p<0.01) of the COVID-19 vaccine. This was also similar with the work [13], which documented a higher value of COVID-19 vaccine acceptance (64%) among the older age group in the United States. This high acceptance level could be justified by the facts that older adults are more vulnerable to experience COVID-19 related complications due to their relatively weaker immune system [15]. With regards to the employment category, health care workers had a higher testing (62.20 %, p<0.01) and vaccine acceptance rate (69.29%, p=0.02) compared to the others in the category. Health care workers are the shepherds or drivers with regards to public health so are given priority for the vaccine.

Determinants of COVID-19 Vaccine Acceptance

From the analysis, determinants of COVID-19 vaccine in Cameroon were knowledge of both COVID-19 infection and its available vaccine, benefits and health risk perception of the vaccine, prior exposure to influenza vaccine, trust in government and health officials, and conspiracy theories associated with the vaccine.

From the study participants with a high knowledge score of COVID-19 infection (aOR=2.54, 95% CI: 2.16-2.99) and its vaccine (aOR=2.67, 95% CI: 1.75-4.18) showed a high vaccine acceptance rate. High knowledge of a disease and its vaccine reduces the level of misinformation and myth about the disease, leading to a high level of acceptance of the prescribed vaccine. The research in [16] showed a strong correlation between knowledge of a disease and acceptance of its vaccine.

Participants who perceived high benefits associated with the vaccine were more willing to accept the vaccine (aOR=1.91, 95% CI: 1.07-3.42) than those who perceived lower benefits. This is in harmony with the health belief model of a vaccine which explains that individuals are more willing to accept a vaccine if they perceive the vaccine being beneficial [10]. It was also discovered that risk belief associated with the vaccine negatively influenced the rate of its acceptance. Those who perceived high health related risk associated with the vaccine showed a lower acceptability level towards the vaccine (aOR=0.40, 95% CI: 0.35-0.44). This result agrees with [9], which documented a lower COVID-19 vaccine acceptance level (28.9%) among adults in Kuwait perceiving vaccine health related risk, as oppose to a higher acceptance level (82.5%) by those who did not perceive any risk.

Trust in government and health authorities was also a key diver in the acceptance of the COVID-19 vaccine. Greater vaccine acceptance level was observed in participants with moderate to high trust in government and health officials (moderate: aOR=1.77, 95% CI: 1.30-2.43; high: aOR=2.68, 95% CI: 1.72-4.18). This finding is consistent with results obtained from similar studies that showed people with high trust in experts or scientists are more willing to vaccinate than those with low trust [17-19]. Analysis from a global survey in [8] documented highlighted government trust having a strong correlation on acceptance or rejection of vaccines among respondents.

Finally, results from the study also demonstrated that subjects who had history of receiving the influenza vaccine had a higher acceptance level for the COVID-19 vaccine (aOR=1.45, 95% CI: 1.31-1.60). This finding is also in accordance with the one in [9] that observed a higher COVID-19 vaccine acceptance rate amongst adult population in Kuwait that had received the influenza vaccine than those that had not. Scientist have hypothesized that seasonal influenza could circulate in parallel with COVID-19 disease.

CONCLUSION

With the fragile health structure of an underdeveloped country such Cameroon, it is obvious that testing and vaccine administration are key elements in the fight against infectious diseases. But this can only be achieved if the public massively accept to undergo the process of testing and vaccination. Therefore, government and public health officials need to develop strategies aimed at communicating transparently and sensitizing the public on the benefits of testing and vaccination and also help do away with conspiracy beliefs regarding the vaccine.

Recommendation

Gender-based vaccination campaigns should be carried out in Cameroon so as to improve the vaccine acceptance rate in females. Women have a central role in ensuring the health of a family especially children.

Limitation of the Study

Although the number of participants were high and suited the nature of the study, the design being web based favored those with smart phones, laptops, and available network. This introduced selection bias as there was an uneven distribution within study category, making the population skewed towards the younger age group (21-30, 31-40) who are considered more technologically inclined or adapted.

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