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Knowledge and level of adherence to COVID-19 preventive measures: a web-based cross-sectional survey

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ABSTRACT:

— ***Objective:*** *The outbreak of the coronavirus disease 2019 (COVID-19), has thrown the world into panic as the pandemic continues to spread. The World Health Organization has maintained a close partnership with the governments of the world to design a global strategy against the spread of the disease.*

— ***Patients and methods:*** This study aims to assess the knowledge of Nigerians about COVID-19 and measure the level of adherence to the prevention guidelines. We conducted a cross-sectional survey of a selected portion of the populace, and we designed questions that would reflect a holistic fulfillment of our aims.

— ***Results:*** Five hundred and twenty-seven Nigerians participated in the study with a mean knowledge score of 6 out of 9, which was majorly gained through the media (45.2%). The modal age bracket of participants was between ages 18 to 30, with 86% of them being educated to at least the university level. Only 4.8% of the respondents lived in rural areas, and most (79.5%) lived in the Southwestern part of the country. 12% of the respondents thought the virus was not real, 80.8% did not personally know anyone who had the virus, but that did not stop a majority percentage of 63.8% from observing social distancing rules.

— ***Conclusions:*** In general, the study indicated a good level of knowledge about COVID-19 among the respondents, and satisfactory adherence to the prevention guidelines of wearing masks, washing hands, and social distancing. The media, religious leaders, and the government have helped ensure the health and safety of the citizens, especially during the pandemic.

— ***Keywords:*** *COVID-19, Knowledge, Adherence, Social distancing, Prevention.*

INTRODUCTION

The novel coronavirus disease (COVID-19) is caused by a Baltimore class IV positive-sense single-stranded RNA virus, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)[1]. The CoV-2 is the successor to CoV-1, which caused the SARS outbreak in 2002. However, while CoV-1 was largely limited to East Asia, CoV-2 is a global pandemic with cases recorded in nearly every single country of the world and has resulted

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in over 1.4 million deaths as of the end of November 2020 – less than a year after the first case was reported in Wuhan China in December 2019[2].

COVID-19 symptoms are of varying degrees, but usually include fever, loss of taste and smell, headache, cough, fatigue, and shortness of breath. In severe cases, infected persons may develop difficulty in breathing, persistent chest pain, acute respiratory distress syndrome, kidney failure, and ultimately death[3,4]. The high human-to-human transmission rate of the disease facilitates its global spread. About one in five people who have been infected with COVID-19 do not develop noticeable symptoms[5], and they still retain the ability to infect others with the disease[6]. While young healthy people can also become severely affected, COVID-19 poses more risk to the elderly and immune-compromised individuals with co-morbidities like diabetes, hypertension and cardiovascular diseases[7,8].

Since COVID-19 is a relatively novel disease to humans, there has not been an effective treatment regimen designed as a cure. However, remdesivir has been approved for the management of the disease, while further research continues to be carried out to aid a better understanding of the disease[9]. The best solution to all diseases always has been vaccination, especially for viral diseases, and several vaccines[10] are already recommended or in different stages of trial[11]. However, the new B.1.1.7 variant, which has spread across 33 countries, has brought up the question of vaccine evasion and efficacy. Therefore, the most suitable remedy mankind can employ at this time is adherence to the preventive guidelines. Right from the onset of the disease, there has been a lot of public education around the world, urging people to adhere to the necessary preventive measures towards limiting the spread of COVID-19.

In Nigeria, a country classified as a third world nation with a relatively poor healthcare structure, citizens were already living in fear of how to cope amidst the pandemic long before the pandemic hit the nation. On February 27, 2020, the first confirmed case was announced when an Italian tested positive in Lagos State, Nigeria, despite the government's announcement of strengthening surveillance at the major airports before that time[12]. Thus, the events which led to the outbreak of COVID-19 throughout the country began. The government encouraged citizens to adhere to the World Health Organization (WHO) guidelines and stop the spread of the disease by staying at home, observing social distancing, correctly wearing facemasks in public places, washing hands thoroughly, avoiding frequent touching of their nose, eyes and mouth with unwashed hands, and practicing good hygiene[12].

Nigerians' response towards government directives has not been fully positive. However, since measures designed to prevent epidemic diseases are always dependent on public or general adherence, rather than personal, it is imperative to determine the adherence and knowledge of Nigerians towards the COVID-19 pandemic. Behaviors like underestimation, panic emotions, myths or misinformation, stigmatization, and false preventive measures negatively impact the fight against diseases. Our recent report[13] reviewed the level of knowledge and adherence to the public health guidelines against COVID-19 among the North and South American population and found relatively good knowledge and fair adherence, especially among the educated individuals. The present study aims to investigate the knowledge and adherence of Nigerians towards the guidelines for the prevention of COVID-19, as well as assess the public's awareness of the disease.

PATIENTS AND METHODS

Study Design

The present study utilized a cross-sectional questionnaire with responses collected between October and November 2020 in Nigeria. During this period, 527 respondents completed the questionnaire online through social media platforms, and through personal interviews where social distancing could be maintained. Respondents' participation in the study was optional; those surveyed filled an informed consent form prior to completing the survey. We forwarded the invitation through social media channels to the authors' personal social media networks with an invitation to share it. Nigerians aged 18 or over who were interested in participating in the survey were asked to click the link to an online description of the study.

Study Participants and Sampling

Inclusion criteria include adults >17 years, across different educational levels who willingly participated. To determine sample size due to the novelty of our study, we hypothesized that 50% of respondents would have a good knowledge of the COVID-19 at 95% confidence level and 5% limit of precision. With the aid of the Open-Source Epidemiologic Statistics for Public Health, v.3.01, the least required sample size was 385 respondents. We then added a contingency of 36.8% to equate the sample size to be 527 respondents. For a start, respondents from major cities, Oyo and Lagos state were recruited before spreading the questionnaire to other major states. A complete paper-based questionnaire would not be possible due to the current global realities of the coronavirus pandemic, so we resorted to using an online-based questionnaire for most of the data collection. This meant that most of the participants were Nigerians with internet access, keeping in mind Nigeria's internet penetration rate of 61.2%.

Ethical Consideration

Respondents were informed of the aims of the study, voluntary participation, anonymity, and safety of information gathered via a short introduction before completing the survey. We sought informed consent from

all respondents by providing a quiz as the first option to ascertain their willingness to participate. The e-mail and mobile number of the principal investigator were also supplied for any related inquiry or withdrawal of data. This study adhered to the World Medical Association Declaration of Helsinki's Ethical principles.

Questionnaire Design

The online-based questionnaire (accessed via https://bit.ly/2HzpSCR) designed in English (Nigeria's official language), using Microsoft form was pre-validated by an expert reviewer. Initially, experts in the field of Epidemiology and Microbiology assessed the relevance of the questionnaire in measuring the knowledge and adherence of the Nigerian public regarding COVID-19. The first draft of the questionnaire was then modified to reflect the realities of the country based on suggestions made by the professionals. This was then pre-tested on twenty respondents (these were not included in the analysis). The scale reliability tests showed adequate internal consistency reliability (with Cronbach's alpha = 0.72 and the intra-class correlation coefficient was 0.96). The questionnaire consists of six major parts as seen in the ***Supplementary Table I***:

a. Socio-demographic information of the respondents
b. Knowledge of the novel coronavirus infection
c. Adherence to COVID-19 social and public health guidelines
d. Role of media and major source of information about the pandemic
e. Role of Government and social groups (religious bodies, medical associations, peers, and social societies) in ensuring adherence to the preventive measures.
f. Effect of the pandemic and instituted policies on respondent's finance, school, education or job and social interaction.

Statistical Analysis

Responses were downloaded from Microsoft form as a Microsoft Excel spreadsheet. Collated data were imported and then analyzed using the Statistical Package for the Social Sciences (SPSS) software, v.20. Respondent's socio-demographic data were summarized using descriptive statistics. Total knowledge and adherence score was summated using a numbering scoring pattern. The dependent variables were summated and binned into equal percentile (33.33%) based on mean scores to categorize the knowledge and adherence level. Respondents with numeric scores greater than the mean scores were classified as good knowledge level and vice-versa. The association between the demographics (independent variables) and the dependent variables was tested using crosstabs. Preliminary analyses were performed to ensure no violation of the statistical test's assumptions, and where necessary, correlation analyses were performed to test for relationships. Chi-square test was used to test for associations between categorical variables, while significant variables ($p < 0.05$) were subjected to further significant tests.

RESULTS

Participants' Demographics

A total of five hundred and twenty-seven respondents were included in this study. The mean age of participants is 27.5 ± 6.99. Table 1 shows the demographics of the participants. Most participants (79.9%) were single (never married). Similarly, most of the respondents (86%) had at least a university degree, which would suggest that the study reflects the responses of the literate members of the Nigerian population. The sex distribution of the participants was generally evenly distributed (49% male and 51% female), and almost eighty percent

Table 1. Demographics of respondents used in this study (n = 527).

Variable		Number of respondents (%)
Sex	Female	269 (51 %)
	Male	258 (49 %)
Age (in years)	18-20	55 (10.4 %)
	21-30	365 (69.3 %)
	31-40	80 (15.2 %)
	> 41	27 (5.1 %)
Education	Up to secondary school	74 (14 %)
	Bachelors	305 (57.9 %)
	Postgraduate	148 (28.1 %)
Area of residence	Urban	355 (67.4 %)
	Sub-urban	146 (27.7 %)
	Rural	26 (4.9 %)
Marital status	Never married or single	421 (79.9 %)
	Ever married	106 (20.1 %)
Educational background	Medical	97 (18.4 %)
	Scientific	212 (40.2 %)
	Non-medical or non-scientific	218 (41.4 %)

were made up of young people (not older than 30). Most respondents (67%) lived in urban areas, and many of them (59%) had a scientific or medical background.

Coronavirus Knowledge and Adherence to Preventive Measures

From the measurement of the knowledge and adherence to preventive measures of the respondents, out of a maximum obtainable score of 9, most respondents (n = 282/527, 53.51%) had satisfactory knowledge (score of 6 to 9) about COVID-19. From a maximum obtainable score of 11, very few respondents had (n = 138/527, 26.19%) satisfactory level (score of 8 to 11) of adherence to COVID-19 preventive measures (Table 2). Although 464 (88%) respondents believe COVID-19 is real, only 374 (71%) believe the virus is in Nigeria. Majority (n = 270/527, 51.2%) of respondents believed COVID-19 is a hoax in Nigeria. Almost half of the respondents did not utilize face masks. In which, 239 (45.4%) do not use face masks in public places, and only 247 (46.9%) wash their hands with soap or alcohol-based hand-rub frequently. Some of the respondents (45.2%) got convinced of the realities of COVID-19 in Nigeria via reports from the WHO, Nigeria Centre for Disease Control (NCDC) and the media. Only 101 (19.2%) of respondents knew anyone who had been infected with the virus in Nigeria. Most respondents (265, 50.3%) were not satisfied with the effort of the Government in their response to the coronavirus outbreak.

Influence of Predictors on COVID-19 Knowledge and Adherence to Guidelines

The relationship between COVID-19 knowledge and respondent's adherence to the preventive guidelines was investigated using Pearson product-moment correlation

Table 2. Relationship between socio-demographic data and outcome variables.

Variable		Low score	Average score	High score	Total
Socio-demographic data and respondent's knowledge of coronavirus infection					
Gender	Male	124 (48.06%)	92 (35.66%)	42 (16.28%)	258
	Female	121 (44.98%)	112 (41.64%)	36 (13.38%)	269
Age range	18-20	28 (50.91%)	18 (32.73%)	9 (16.36%)	55
	21-30	163 (44.66%)	143 (39.18%)	59 (16.16%)	365
	31-40	38 (47.5%)	34 (42.5%)	8 (10%)	80
	> 41	16 (59.26%)	9 (33.33%)	2 (7.41%)	27
Education	Up to secondary	41 (55.41%)	22 (29.73%)	11 (14.86%)	74
	Bachelors	138 (45.25%)	124 (40.66%)	43 (14.1%)	305
	Postgraduate	66 (44.6%)	58 (39.19%)	24 (16.22%)	148
Residence	Urban	163 (45.92%)	140 (39.44%)	52 (14.65%)	355
	Semi-urban	73 (50%)	51 (34.93%)	22 (15.07%)	146
	Rural	9 (34.62%)	13 (50%)	4 (15.38%)	26
Marital status	Never married	193 (45.84%)	156 (37.06%)	72 (17.1%)	421
	Married	52 (49.06%)	48 (45.28%)	6 (5.66%)	106
Background	Medical	45 (46.39%)	37 (38.14%)	15 (15.46%)	97
	Scientific	89 (41.98%)	84 (39.62%)	39 (18.4%)	212
	Non-medical or Non-scientific	111 (50.92%)	83 (38.07%)	24 (11.01%)	218
Socio-demographic data and respondent's adherence to COVID-19 preventive measure					
Gender	Male	87 (33.72%)	104 (40.31%)	67 (25.97%)	258
	Female	95 (35.32%)	103 (38.29%)	71 (26.39%)	269
Age range	18-20	23 (41.82%)	17 (30.91%)	15 (27.27%)	55
	21-30	122 (33.42%)	146 (40%)	97 (26.58%)	365
	31-40	23 (28.75%)	34 (42.5%)	23 (28.75%)	80
	> 41	14 (51.85%)	10 (37.04%)	3 (11.11%)	27
Education	Up to secondary	33 (44.59%)	21 (28.38%)	20 (27.03%)	74
	Bachelors	104 (34.1%)	129 (42.3%)	72 (23.6%)	305
	Postgraduate	45 (30.41%)	57 (38.51%)	46 (31.08%)	148
Residence	Urban	123 (34.65%)	144 (40.56%)	88 (24.79%)	355
	Semi-urban	53 (36.3%)	53 (36.3%)	40 (27.4%)	146
	Rural	6 (23.08%)	10 (38.46%)	10 (38.46%)	26
Marital status	Never married	143 (33.97%)	161 (38.24%)	117 (27.79%)	421
	Married	39 (36.79%)	46 (43.4%)	21 (19.81%)	106
Background	Medical	28 (28.87%)	43 (44.33%)	26 (26.8%)	97
	Scientific	70 (33.02%)	77 (36.32%)	65 (30.66%)	212
	Non-medical or scientific	84 (38.53%)	87 (39.91%)	47 (21.56%)	218

Low score: (< 33.33 %), Average score: (33.33-66.66 %) and High score: (> 66.66 %)

coefficient. There was a strong, positive correlation between the two variables [r = 0.537, N = 527, p = 0.006] with a high number of participants having good knowledge about the disease also recording a correspondingly high level of adherence to the preventive measures. The coefficient of determination depicts that knowledge of COVID-19 helps to explain nearly 29% of the variance in respondents' adherence to the preventive measures. The correlation between COVID-19 knowledge and respondent's adherence to the preventive guidelines was very strong for both females (r = 0.523) and males (r = 0.552).

The proportion of males and female respondents do not differ (p = 0.328) in their knowledge of COVID-19. Likewise, respondents' educational levels (p = 0.458) do not differ in their knowledge of COVID-19. With an associated significant level of 0.01 and 0.03 ($p < 0.05$) respectively, respondents' knowledge of COVID-19 and adherence to the preventive measures differ according to their marital status. Respondents' belief in the importance of the regulatory policies was significantly associated (p = 0.023) with their knowledge of COVID-19 and adherence to the preventive measures. This shows a common trend (p = 0.01) to respondents who claim COVID-19 is a hoax or not in Nigeria. Perhaps, the reason for the poor compliance with the preventive guidelines.

DISCUSSION

Nigeria is the most populated country in Africa with more than 150 million citizens, and the high population could contribute to a high transmission rate of infectious diseases among the people, especially considering the country's poor healthcare system and citizens' low standard of living[14]. Every government of the world has instituted different measures to combat the transmission of the COVID-19, and the Federal Government of Nigeria reportedly spent billions of Naira (the Nigerian currency) to sensitize the populace about the disease and make sure those who are infected get treated for free. These efforts include warnings through the mass media, adverts on social media, and cautionary messages based on the WHO guidelines sent through text messages. The present study assessed Nigerian's knowledge and adherence level towards the COVID-19 guidelines released by the NCDC.

Participants generally had a good knowledge of the disease, despite 153 (29%) participants doubting the existence of the virus in Nigeria. This corroborates earlier reports[15-19] where Nigerians had good knowledge about the COVID-19 pandemic. This suggests that the massive sensitization programs embarked upon by the government yielded a positive result, as there was hardly any part of the country where the information about COVID-19 did not penetrate. On the other hand, only 101 (19.2%) participants knew first-hand, someone who had been infected with COVID-19. Due to an ineffective testing system in the country, and a consequent fear of discrimination in the case of positive testing, it was not surprising to find that a low number of people knew at least someone infected with COVID-19. However, this did not stop a high percentage of the participants from practicing social distancing and obeying other guidelines. Among the preventive measures, maintaining social distance was the most adhered to, and this might be due to the restriction put in place by the government against vehicular movements in many parts of the country. Moreover, since most of the participants (86%) were educated and had access to the internet, it was easier for them to observe what was happening throughout the world and realize the disease was a difficult problem.

Religion is pronounced in Nigeria, and more than 98% of the population identifies with one religion or the other[20]. Therefore, it was always expected that the churches and mosques, representing the two largest religions in the country, would play a role in teaching and convincing the citizens to follow the prevention guidelines[17]. It was pleasant to observe that most participants (93%) felt that the religious bodies had helped convince the people to practice the guidelines despite the closure of the places of worship during the lockdown. This is reflected in an earlier report[17], where 45.3% of the participants believed in the effectiveness of prayer in preventing COVID-19 infection. Some religious leaders in the country even went as far as contributing money to support the government in the fight against the disease, and many churches held their services online through the internet to adhere to the preventive guidelines.

About half of the respondents believed that the elderly and people with chronic health conditions would become severely affected by the disease. Meanwhile, our study where only 303 (57.5%) participants are confident that the media are presenting the proper news on the COVID-19 preventive measures corroborates an earlier report[17] where only 267 (45.3 %) are satisfied with the information on the media. This calls for a need to increase surveillance on the information spread in the media about the pandemic.

The spread of the COVID-19 disease in Nigeria was exponential in April 2020, and this spurred many states of the country into action as some prominent members of the society, including the Chief of Staff to the President, lost their lives to the disease. This made the citizens more convinced of the need to obey the health guidelines. However, since most Nigerians often practice self-diagnosis and treatment for most of their ailments, and the testing procedures put in place by the government were limited, a lot of the citizens never presented themselves to the health care centers even when they observed the COVID-19 symptoms. When asked if they had ever shown any of the COVID-19 symptoms, 36% of the respondents responded in the affirmative, and when asked what steps they took after observing these symptoms, less than 4% of them presented themselves for the test, 9% went into isolation, while 50% went ahead to self-administer drugs and herbs for themselves. As the Ministry of Health continues to encourage the people to always make sure they confirm their illnesses from certified health practitioners, it has again become evident that there is a lot of work to be done to

educate Nigerians about the pandemic. Recent reports identified a relatively good knowledge about COVID-19 in Africa and Nigeria inclusive, while the level of adherence to the preventive measures was poor. They recommended that the populace adhere to the laid down guidelines to ensure the spread of the virus is curbed as well as enhance the eradication of the pandemic[18].

Only 288 (54.6%) adhered to the use of face masks even though most participants (75.5%) believed that the use of face masks was effective in controlling the spread of the disease. In most parts of the world, strict adherence to the use of face masks in the public was quite difficult to practice, it was the same case with Nigerians. It was difficult for a lot of the citizens to form this new habit of covering their nose and mouth despite the willingness to do so as suggested by the data. Besides, since most of the respondents also stayed indoors due to the lockdown, it may be understandable why the use of face masks was not so strictly adhered to. 358 (68%) participants believed strict adherence to the preventive guidelines and personal hygiene is most effective in tackling the disease, while just 4% believed in the power of vaccines. Despite the good knowledge, the low level of adherence to the preventive guidelines in our study corroborates earlier reports[16,17,21]. This disparity indicates a lack of sufficient health education among the citizens, as the percentage suggests that while people understood the COVID-19 guidelines and were constantly being told about it in the media, preventive guidelines are not so adhered to. Furthermore, the low level of faith in vaccines may just be because of its absence as at the time this study was carried out and therefore a lack of first-hand authentication of the fact. It is hoped that once the COVID-19 vaccines become popular in the country, faith in them will also increase. The major limitation of the present study is the use of a web-based survey, which restricted participation mainly to only those who are literate and with internet accessibility.

CONCLUSIONS

Nigerians who participated in our study generally had a good understanding of COVID-19, since most of them were educated up to university level and could be considered literate. Once again, this study has lent further evidence to the necessity for proper education in society as a means of improving the health and general wellbeing of the populace. There was also an overall positive attitude towards the prevention guidelines, and the place of the media, religious leaders, and the government has been emphasized in ensuring the health and safety of the society, particularly during disease outbreak. The rural, less educated members of the society who do not have access to the internet and media would especially be helped by religious and community leaders. There remains a lot of work to be done by the government, and indeed academia towards improving the education, health, and wellbeing of the country. Furthermore, Nigerians can certainly do more in terms of adhering to the prescribed preventive measures and obeying the health guidelines in limiting the spread of diseases within the country

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The authors declare that they have no conflict of interests.

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