Knowledge and Response of Rural Women in Nigeria to COVID-19: A Cross-Sectional Study

Friday Okonofua (✉ feokonofua@yahoo.co.uk)
Centre of Excellence in Reproductive Health Innovation, University of Benin

Lorretta Favour Ntoimo
Federal University Oye Ekiti

Sanni Yaya
University of Ottawa

Brian Igboin
Women's Health and Action Research Centre, Benin City

Chioma Ekwo
Women's Health and Action Research Centre, Benin City

Wilson Imongan
Women's Health and Action Research Centre, Benin City

Research Article

Keywords: COVID-19, Nigerian women, Knowledge, Risk perceptions, Preventive behavior

Posted Date: February 8th, 2021

DOI: https://doi.org/10.21203/rs.3.rs-154767/v1

Abstract

Background

Nigeria has experienced COVID-19 pandemic as in nearly 200 countries around the world. The objective of this study was to investigate the knowledge, risk perceptions, and preventive practices among rural women in Edo State, Nigeria to identify the social circumstances under which women respond to COVID-19 in the community.

Method

The study design was cross-sectional and consisted of face-to-face interviews with 1,411 women in 20 rural communities in Edo state, south-south Nigeria using a structured questionnaire. Questions consisted of socio-demographic characteristics, the knowledge of COVID-19, its symptoms and prevention method, and the women's compliance with the prevention guidelines recommended by the Nigerian Centre for Disease Control. Some of the questions and formats were adapted from the survey tool and guidance for monitoring knowledge, risk perceptions and preventive behavior by the WHO Regional Office for Europe. The data were analyzed with univariate, bivariate and multivariable statistical techniques.

Results

The results showed relatively high knowledge of COVID-19 but low perceptions of risk, and inadequate self-reported compliance with the recommendations for prevention, use of face mask, and handwashing. The most prominent determinants of lack of knowledge of COVID-19, the symptoms, and preventive measures; perception of COVID-19 as no health threat; and poor preventive behavior include less exposure to the media, being in a polygynous and consensual marriage, illiterate, age, and not having a mobile phone.

Conclusions

We conclude that although rural women in Nigeria have relatively high knowledge, low-risk perception and adoption of preventive measures for COVID-19 are grossly inadequate. These deficits are attributable to illiteracy, poor access to information, and the pervading poverty in rural communities. Appropriate policies and programs that address these challenges will prevent COVID-19 pandemic and its consequences in rural Nigeria.

Introduction

It is now well known that the COVID-19 infection which was first reported in the Wuhan District of China in December 2019, has now spread to over 200 countries and territories around the world [1]. Africa has similarly been affected with nearly all countries in the continent reporting cases and deaths from the disease over the past several months. Nigeria was one of the first five countries in Africa to experience the virus, with the first proven case reported in March 2020 [2, 3]. As of January 25, 2021, there are 121,566

confirmed cases of COVID-19 infection, and 1,504 deaths have been reported in the country by the Nigerian Centre for Disease Control (NCDC) [2]. However, these data are likely to be under-reporting of the actual numbers due to the relative lack of testing mechanisms in the country, and the reluctance of individuals and groups of persons to be tested[4, 5]. The low testing rate has been attributed to low-risk perceptions by individuals, and the poor understanding of the nature of the virus in the country [6]. To date, most test reports of COVID-19 in Nigeria have tended to cover residents in urban locations, while many rural locations have remained untested. Furthermore, the available prevention mechanisms including the palliatives and information about prevention have tended to concentrate largely on urban areas, with limited evidence that rural and some of the hardest to reach communities in the country have ever been proactively reached with related information and services.

More worrisome is the fact that there is yet no substantive evidence that some of the most vulnerable persons in the country have ever been reached with prevention and treatment services. To date, there are reports of increasing numbers of unexplained deaths in various communities in the country [7], but the extent to which these are related to the COVID-19 pandemic has not been systematically investigated. We particularly do not understand how various at-risk and disadvantaged groups in the country perceive individual and group risks for the virus, and how they have responded to various interventions designed to mitigate the infection.

Various studies including reports from the NCDC has reported that men, especially older men are at greater risks of acquisition and mortality from the virus as compared to women [8]. Despite this, women have their specific vulnerabilities and risks, which warrant their classification as a high-risk group worthy of special considerations. Women are not only the managers of the home-front taking care of children and all persons in the home, they are also the custodians of palliatives and commodities that enable the prevention and curtailment of the virus. With higher rates of poverty in rural households, it is the women who bear the brunt of managing scarce resources to deal with the challenges posed by the virus.

Some studies investigated the knowledge, attitude, perceptions and preventive behaviour about COVID-19 in Nigeria [9–11]. However, these studies were online surveys which are limited by a highly skewed population consisting mainly of urban residents and literate persons. There has been no systematic investigation of the knowledge, risk perceptions, and behavioral assessment of rural women in Nigeria with regards to COVID-19. To extend COVID-19 response to rural and marginalized communities is a matter of equity and social justice. We hypothesized that if a good understanding of the social circumstances of the COVID-19 is to be obtained in rural communities in Nigeria, it is important to focus on women as the first gatekeepers of social entrepreneurship in rural areas. Women can provide insights that represent their understanding as vulnerable groups, but their reactions can enable a better interpretation of those of the broader society as well. The objective of this study, therefore, is to investigate the knowledge, risk perceptions, and practices of rural women in Edo State, Nigeria towards COVID-19. We believe the results of the study will be relevant to identify the social circumstances under which women respond to COVID-19 in the community, and for designing appropriate policies and

programs for restraining COVID-19 in rural communities and other vulnerable populations not only in Nigeria but in other parts of the world.

Methods

Study Design/setting

This was a cross-sectional study conducted in twenty communities in Esan South East and Etsako East Local Government Areas (LGAs) in Edo State, Nigeria. Both LGAs are rural and located in the riverine areas of the state, adjacent to River Niger – with Estako East in the northern part of the Edo State part of the river, while Esan South East is in the southern part. Edo State is one of Nigeria's 36 federating States with an estimated population of 4,235,595 in 2016 [12] and has 18 LGAs. Each LGA is made up of 10 political/health wards, and the wards consist of several communities or villages.

Study Population and sample size

The data were collected using the opportunity of an end survey of interventional research in the two LGAs. The study was conducted among ever married women age 15-45 years. Two wards were randomly selected from the 20 wards in the two LGAs. The two wards comprised of 31 villages, out of which twenty villages were randomly selected for the study. A total of 3116 households were listed in the 20 communities. All ever married women in the selected villages who were 15-45 years old were eligible for recruitment into the study. The sample size was determined using the following formula: $n_1 = \{[p_1q_1 + p_oq_o]) (Z_{\alpha/2} + Z_{\beta})^2\}/ (p_1\text{-}po)^2$ at a 95% confidence interval, assuming 50% and 45% satisfactory knowledge and practice in Esan South East and Etsako East LGAs, respectively. A sample size of 1,318 was obtained and to adjust for non-response, 10% was added to obtain a final sample size of 1,450 (725 per LGA).

A total of 1,411 questionnaires were completed at the end of the survey. About 71 women were selected from each of the twenty communities.

Ethical Approval

This study was conducted in accordance with the general principles of the declaration of Helsinki concerning research involving human subjects. Ethical approval for the interventional study obtained from the National Health Research Ethics Committee (NHREC) of Nigeria – protocol number NHREC/01/01/2007 – 10/04/2017. Consent was obtained from the heads of individual households identified for the study. The participating women were informed of the purpose of the study, and individual written informed consent was obtained from them to conduct the study. They were assured of the confidentiality of information obtained, and that such information would only be used for the study and not for other purposes. No names or specific contact information were obtained from the study participants. Only women that agreed to participate in the fully explained study were enlisted in the study.The interviews were conducted using the NCDC recommended prevention guidelines including

handwashing, use of sanitizer, and social distancing, with only the interviewer and interviewee being present, with both wearing masks.

Data Collection

The survey was conducted between June 24 and July 6, 2020, through Computer-Assisted Personal Interview using an interviewer-administered questionnaire. The data collectors were trained in quantitative data collection. The questionnaire contained sections on the respondents' sociodemographic characteristics and 18 questions on coronavirus. The questions on coronavirus include whether the respondent has heard of the virus, the source of information, knowledge of the symptoms, and preventive measures and whether the respondent knows that there is no drug or vaccine for coronavirus. Risk perception was elicited with a question on whether the respondent considers coronavirus a health threat to her and her family members. The respondents were also asked if they have ever been infected or knows someone who has been infected, and the frequency of going out of their houses per week, and what takes them out. The questions on preventive behavior include hand washing, and wearing a face mask. All the questions were fielded in English, Nigerian Pidgin English, and the local language as appropriate. Some of the questions and formats were adapted from the survey tool and guidance for monitoring knowledge, risk perceptions and preventive behavior by the World Health Organization (WHO) Regional Office for Europe [13].

Variables and measures

There were eight outcome variables categorized into three broad themes of knowledge, risk, and preventive behavior. The knowledge outcomes were knowledge of coronavirus; knowledge of the symptoms, and knowledge of the preventive measures. The risk outcome variables included risk perception and risk exposure; and preventive behavior outcomes were self-reported adherence to the recommendations by the NCDC on prevention of the spread, hand washing and wearing of a face mask. The NCDC recommends the following: wear mask properly, wash hand with soap and running water, avoid crowded places, cough/sneeze into your elbow/disposable tissue, and frequently disinfect high contact surfaces [2].

The knowledge of coronavirus was measured with ever heard of coronavirus. The response was yes coded 0 and no coded 1 for analysis. The respondents who have ever heard about coronavirus were asked to identify the symptoms of coronavirus. They were free to select as many as they knew from a prepared list. Ten symptoms were listed which included fever, cough, shortness of breath, sore throat, runny or stuffy nose, muscle or body aches, headaches, fatigue, diarrhea, and loss of taste or smell. The response options were related, not related, and do not know. The responses were aggregated to generate a single variable for knowledge of the symptoms of coronavirus. Knowledge of one or none was coded 1 whereas knowledge of two to ten symptoms was coded 0. The respondents were also asked to identify how coronavirus can be prevented. A list of ten preventive measures was provided with a Yes and No response option. Multiple responses were expected. The ten preventive measures were limited movement (only go out when necessary), regular handwashing with soap, wear a face mask when you go out, avoid

handshake, do not hug anyone, use hand sanitizer, avoid crowded places, avoid touching your eyes, nose and mouth with unwashed hands, stay at home when you feel sick, and cover your mouth and nose when you cough or sneeze. The responses to the 10 items were aggregated to generate a variable for knowledge of the preventive measures. Knowledge of one or none was coded 1 whereas knowledge of more than one measure was coded 0.

Risk perception was measured with the response to a question on whether the respondent considered coronavirus a health threat to her and her family members. The response options were yes coded 0, and no coded 1. Further analysis of risk was conducted by aggregating the responses to ten questions which included ever heard about coronavirus, considered the virus a health threat, knowledge of the symptoms, knowledge of the preventive measures, knowledge of the existence of drug or vaccine for coronavirus, adherence to recommendations by the authorities to prevent spread, frequency of going out in a week, practice handwashing, ownership and wearing of face mask by the respondents and members of her family whenever they go out. The respondents were considered at risk if they have never heard of coronavirus; do not consider the virus a health threat to them and their family members; knows one or no symptom; know one or one preventive measure; do not know there is no drug or vaccine for coronavirus; do not follow the recommendations by authorities on prevention; go out every day; do not practice hand washing; do not own and mask wear mask when going out, and their family members do not own and wear a mask whenever they go out. At risk was coded 1 whereas no risk was coded 0. The least expected score was 0 and the highest was 10. No risk was a score of 0 in all the ten indicators. Only 8 respondents scored 0 in all the ten questions and none scored 10. For multivariable analysis, 0-1 was grouped as less risk (coded 0) and 2-9 was more risk (coded 1).

Preventive behavior was self-reported adherence to recommendations on preventing the spread of the virus, hand washing and wearing a face mask. Adherence to the recommendations was measured with a question on whether the respondent follows the recommendations by authorities on preventing the spread of the virus. The response options were not at all, not all, and very much so. Not at all and not all were put into one category and coded 1 while very much so was coded 0. The respondents were asked whether they washed their hands every time they come into their houses from outside. The response was yes coded 0 and no coded 1. Wearing of a face mask was measured with a question on whether the respondent has a face mask, and if she wears it whenever she goes out. The response options were yes and no. Those who had no face mask and those who had a face mask but do not wear it whenever they go out were categorized into one group and coded 1 whereas those who had a face mask and wear it whenever they go out were categorized into one group and coded 0.

The explanatory variables include factors that are potential predictors of the outcomes. This included residence measured with LGA, age categorized into five-year groups, literacy (can read a whole sentence, can read only a part of a sentence, and cannot read at all), and exposure to the media measured with the frequency of listening to the radio and television. An index of exposure to the media was generated and categorized into more exposure, less exposure and no exposure. Other variables included religion (Catholic, Other Christian, and Islam/Other religions). Religious beliefs influence attitude and actions

about health [14–16]. Other variables were indicators of the type and size of the family a respondent resides in - marital status categorized into married, living together (consensual union), and formerly married (divorced, separated and widowed), number of children, and number of cowives. Ownership of a mobile phone was also included as a potential explanatory variable. Other explanatory variables were knowledge of the existence of drug or vaccine, and availability of a handwashing facility in the respondent's house.

Data analysis

The characteristics of the study population were described using frequency, percentage and summary statistics in a few cases. The description of knowledge, risk perception, exposure to risk, and preventive variables were presented using frequency and percentage. Bivariate analysis was conducted to examine the relationship between handwashing, face mask wearing and selected characteristics of the respondents. Chi-square test of association was used except for handwashing facility where fishers exact test was used due to cases fewer than 5 in some cells. Due to rounding to one decimal place, some of the total percentages are not equal to 100. Multivariable analysis was conducted using logistic regression to examine the predictors of knowledge, risk, and preventive behavior. All the analyses were conducted with Stata 13. Alpha was set at 0.05, and all p values were two-sided. The analysis for knowledge included all the respondents whereas the analysis for risk perception and preventive behavior were among those who know about the pandemic.

Results

The description of the study population is presented in Table 1. The mean age of the respondents was 31.9±8.1 with about a quarter aged 40-45. Less than one-fifth can read a whole sentence, and 28.5% were not exposed to the media. Most of the respondents were affiliated to other Christian denominations (non-Catholic), married (54.4%), and have had 4 children on average, and were in union with no cowife. Many of the respondents owned a mobile phone (75.6%).

Table 1. Description of the study population

Characteristic	Frequency	Percent
LGA		
Esan South East	710	50.3
Etsako East	701	49.7
Age		
15-19	70	5.0
20-24	196	13.9
25-29	292	20.7
30-34	284	20.1
35-39	225	16.0
40-45	344	24.4
Mean 31.9 SD 8.1		
Literacy		
Can read whole sentence	248	17.6
Can read only a part	567	40.2
Cannot read at all	596	42.2
Exposure to the media		
More exposure	409	29.0
Less exposure	600	42.5
No exposure	402	28.5
Religion		
Catholic	379	26.9
Other Christian	971	68.8
Islam/Other	61	4.3
Marital status		
Married	768	54.4
Living together	557	39.5
Formerly married	86	6.1
Number of children		
0-2	462	34.3

3-4	429	31.9
5+	456	33.9
Mean 3.7 SD 2.1		
Number of cowives		
None	885	62.7
1 cowife	348	24.7
2-6 cowives	178	12.6
Own a mobile phone		
Yes	1,066	75.6
No	345	24.6

Knowledge of Coronavirus

Table 2 presents the knowledge of coronavirus, the symptoms and preventive measures. Slightly more than 1 in 10 (12.4%) of the respondents have never heard of coronavirus. Among those who have heard, the most common source of information was the radio, while the least common source was through a relative. The other source category includes social media, phone call, internet, text message, Church, market, town crier, and workplace. Close to 2 in 10 of the respondents who have heard of coronavirus (19.3%) could not mention one symptom of coronavirus, only 17% mentioned 5, and less than 1% mentioned all the ten symptoms. The most mentioned symptoms were fever (70.7%) and cough which was mentioned by 58.7%, whereas the least mentioned were fatigue, diarrhea, and loss of taste or smell. About 21% of the respondents do not know any of the ten preventive measures, but 39.2% mentioned all the 10. Eight of the preventive measures were mentioned by 70 to 75% of the respondents, and 22.1% knew none or just one preventive measure. The least known preventive measures include staying at home when sick which was mentioned by 53.3% and covering of mouth and nose when coughing and sneezing mentioned by 57.9%. Only 19.8% knew there is no drug or vaccine for coronavirus.

Table 2. Knowledge of coronavirus, the symptoms and preventive measures

Variable	Frequency	Percent
Heard of coronavirus		
Yes	1,236	87.6
No	175	12.4
Source of information		
Television	86	7.0
Radio	563	45.5
Friend	149	12.1
Neighbour	360	29.1
Relative	61	4.9
Other (	17	1.4
Number of symptoms known		
0	239	19.3
1	169	13.7
2	348	28.2
3	79	6.4
4	96	7.8
5	210	17.0
6	19	1.5
7	23	1.9
8	40	3.2
9	5	0.4
10	8	0.7
Frequency of mention of a symptom		
Fever	997	70.7
Cough	828	58.7
Shortness of breath	480	34.0
Sore throat	401	28.4
Runny or stuffy nose	305	21.6
Muscle or body aches	95	6.7

Headaches	76	5.4
Fatigue	53	3.8
Diarrhoea	13	0.9
Loss of taste or smell	8	0.6
Knowledge of the symptoms		
Mean (SD)	2.3(2.2)	
Knows none or one	408	33.0
Knows >1	828	67.0
Number of preventive measures known		
0	258	20.9
1	15	1.2
2	5	0.4
3	9	0.7
4	8	0.7
5	9	0.7
6	25	2.0
7	39	3.2
8	114	9.2
9	270	21.8
10	484	39.2
Knowledge of preventive measures		
Mean (SD)	7.1(3.9)	
Knows none or one	273	22.1
Knows >1	963	77.9
Frequency of mention of preventive measures[1]		
Limit movement - Only go out when necessary	867	70.2
Regular handwashing with soap	922	74.6
Wear a face mask when you go out	922	74.6
Avoid handshake	913	73.9
Do not hug anyone	870	70.4

Use hand sanitizer	905	73.2
Avoid crowded places	929	75.2
Avoid touching your eyes, nose and mouth with unwashed hands	909	73.5
Stay at home when you feel sick	782	53.3
Cover mouth and nose when you cough or sneeze	715	57.9
Knows there is currently no drug or vaccine for coronavirus		
No/don't know	991	80.2
Yes	245	19.8

Note: 1 – Multiple responses

In Table 3, the results of the regression analysis that estimated the likelihood of knowledge of coronavirus, the symptoms and preventive measures are presented. The lack of knowledge of coronavirus was significantly higher in Etsako East LGA (OR 2.05 CI:1.25-3.38) than Esan South East, among respondents who had no exposure to the media (OR 3.90 CI:2.26-6.74) than those who had more exposure, and those who had 2 or more cowives (OR 2.05 CI:1.31-3.18) than those who had no cowife. The odds of no knowledge were significantly less among respondents who have 5 or more children (OR 0.35 CI:0.20-0.61) compared to those who had 0-2 children. The likelihood of not knowing any symptom and just one was significantly higher among women who can read only a part of a sentence (OR 1.77 CI: 1.19-2.64), and those who cannot read at all (OR 2.26 CI: 1.49-3.43). Respondents in Etsako East were 33% less likely than those in Esan South East to lack knowledge or know only one of the preventive measures. Respondents who were aged 40-45 were more likely to have no/or poor knowledge of the preventive measures compared to younger women age 15-19 years. Relative to the respondents who were highly exposed to the media, no knowledge of preventive measures was significantly higher among women who had less (OR 1.49 CI:1.01-2.21) or no exposure (OR 2.14 CI:1.38-3.33) to the media. Respondents who lived together with a partner (consensual union) were more likely to have little or no knowledge of the preventive measures (OR 1.49 CI: 1.02-2.17) than those who were married. Being in a marital union where there is one cowife predicted lower odds of not knowing the preventive measures or knowing just one (OR 0.27 CI:0.18-0.40) compared to those in a monogamous union. The odds of not knowing the preventive measures or knowing only one increased for women who do not own a mobile phone (OR 1.80 CI: 1.24-2.60) relative to those who owned a phone.

Table 3. Odds of knowledge of coronavirus, the symptoms and preventive measures

	Knowledge of coronavirus	Knowledge of symptoms	Knowledge of preventive measures
Variable	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**
LGA			
Esan South East (Ref)			
Etsako East	2.05(1.25-3.38)**	0.67(0.47-0.92)8	0.19(0.12-0.29) ***
Age			
15-19 (Ref)			
20-24	1.58(0.49-5.11)	1.66(0.77-3.55)	2.57(0.76-8.71)
25-29	2.05(0.64-6.57)	1.28(0.60-2.73)	2.58(0.78-8.50)
30-34	2.63(0.81-8.54)	1.31(0.59-2.89)	2.78(0.82-9.42)
35-39	3.24(0.97-10.8)	1.52(0.67-3.42)	3.01(0.88-10.3)
40-45	2.2490.64-7.78)	1.16(0.51-2.63)	4.44(1.31-15.1) *
Literacy			
Can read whole sentence (Ref)			
Can read only a part	0.98(0.55-1.75)	1.77(1.19-2.64) **	1.58(0.96-2.59)
Cannot read at all	1.71(0.96-3/03)	2.26(1.49-3.43) ***	1.61(0.96-2.69)
Exposure to the media			
More exposure (Ref)			
Less exposure	1.33(0.76-2.33)	1.00(0.74-1.35)	1.49(1.01-2.21) *
No exposure	3.90(2.26-6.74)***	0.74(0.52-1.06)	2.14(1.38-3.33) **
Religion			
Catholic (Ref)			
Other Christian	0.72(0.48-1.09)	0.84(0.63-1.12)	1.16(0.81-1.66)
Islam/Other	1.40(0.68-2.91)	1.62(0.81-3.26)	0.63(0.17-2.35)
Marital status			
Married (Ref)			
Living together	0.98(0.60-1.60)	1.28(0.94-1.74)	1.49(1.02-2.17) *

Formerly married	1.02(0.48-2.17)	1.56(0.90-2.70)	1.40(0.75-2.64)
Number of children			
0-2 (Ref)			
3-4	0.80(0.50-1.26)	1.00-0.70-1.44)	0.99(0.63-1.55)
5+	0.35(0.20-0.61)***	1.21(0.82-1.78)	1.28(0.80-2.03)
Number of cowives			
None (Ref)			
1 cowife	0.32(0.17-0.60)***	1.28(0.96-1.70)	0.27(0.18-0.40)***
2-6 cowives	2.05(1.31-3.18)**	0.87(0.57-1.34)	0.87(0.53-1.44)
Own a mobile phone			
Yes (Ref)			
No	1.36(0.92-2.02)	1.08(0.80-1.46)	1.80(1.24-2.60) **

Note: OR-odds ratio; CI: confidence interval; ***p<0.001; **p<0.01; *p<0.05

Risk perception and exposure to risk

Many (75.2%) of the respondents who have heard of coronavirus considered coronavirus a health threat to them and their families (Table 4). Exposure to the risk of infection as measured with ten indicators revealed that less than one percent of the respondents were exposed to no risk as well as 9 of the ten risk indicators. The majority were exposed to 2 -4 risks. Categorizing the number of risks into less (0-1 risk) and more risk (2-9 risks) shows that 91.7% were exposed to more risks. Only 6 respondents have ever been infected, and 3 knew someone who had been infected.

Table 4. Perception of coronavirus as a health threat and exposure risk

Variable	Frequency	Percent
Perceives coronavirus as a health threat		
Yes	930	75.2
No	306	24.8
Number of risks exposure		
0	8	0.7
1	95	7.7
2	276	22.4
3	215	17.4
4	218	17.7
5	167	13.5
6	137	11.1
7	73	5.9
8	35	2.8
9	11	0.9
Risks exposure		
Less risk	103	8.3
More risk	1,132	91.7
Ever infected		
Yes	6	0.5
No	1,151	93.1
Don’t know	79	6.4
Know someone infected		
Yes	3	0.2
No	653	52.8
Don’t know	580	46.9

The predictors of risk perception and exposure to risks are presented in Table 5. Perception of coronavirus as no health threat to the respondent and her family was significantly lower in Etsako East compared to Esan South East (OR 0.36 CI:0.24-0.52). Compared to the respondents who had high exposure to the

media, the odds of perceiving coronavirus as no health threat were 48% higher among respondents who had less exposure to the media (OR 1.48 CI 1.04-2.12), and 52% higher among those who had no exposure to the media (OR 1.52 CI 1.01-.28). The respondents who were living together with a partner were significantly more likely to perceive coronavirus as no health threat relative to the married (OR 1.73 CI:1.22-2.44). The likelihood of considering coronavirus as no threat was significantly higher among respondents who had one cowife compared to those who had no co-wife (OR 1.46 CI: 10.3-2.08). The odds of not considering coronavirus a health threat increased for respondents who do not own a mobile phone compared to those who own a phone (OR 1.45 CI: 1.04-2.03). The respondents who knew there is no drug or vaccine for coronavirus were 82% less likely to consider coronavirus as no threat (OR 0.12 CI 0.07-0.22).

Exposure to the risk of coronavirus was significantly higher in Etsako East than in Esan South East (OR 4.69 CI:2.52-8.71). Less exposure to the media (OR 1.72 CI 1.03-2.85), and no exposure to the media (OR 2.11 CI:1.06-4.17) predicted higher odds of more exposure to the risk of being infected compared to more exposure to the media. Respondents who live with a partner were significantly more likely than the married to be more exposed to the risk of coronavirus (OR 2.38 CI:1.40-4.07). The odds of more exposure to coronavirus risk increased for respondents who live in large households with five or more children (OR 2.02 CI: 1,05-3.90) relative to those who had 0-2 children. Relative to the respondents who had no cowife, exposure to more risks decreased by 69% for respondents who had one cowife and by 60% for respondents who had 2 or more cowives. Respondents who do not have a mobile phone were significantly more exposed to coronavirus than those who had a mobile phone (OR 2.14 CI:1.07-4.25).

Table 5. Odds of risk perception and exposure to risks

Variable	Risk perception OR (95% CI)	Exposure to risks OR (95% CI)
LGA		
Esan South East (Ref)		
Etsako East	0.36(0.24-0.52) ***	4.69(2.52-8.71) ***
Age		
15-19 (Ref)		
20-24	0.98(0.4-.29)	0.50(0.06-4.33)
25-29	0.95(0.41-2.19	0.26(0.03-2.08)
30-34	0.68(0.28-1.62)	0.47(0.05-4.08)
35-39	0.76(0.31-1.87)	0.38(0.04-3.36)
40-45	0.94(0.39-2.30)	0.48(0.05-4.18)
Literacy		
Can read whole sentence (Ref)		
Can read only a part	0.90(0.59-1.37)	1.32(0.72-2.42)
Cannot read at all	0.91(0.58-1.42)	1.02(0.53-1.98)
Exposure to the media		
More exposure (Ref)		
Less exposure	1.48(1.04-2.12) *	1.72(1.03-2.85) *
No exposure	1.52(1.01-2.28) *	2.11(1.06-4.17) *
Religion		
Catholic (Ref)		
Other Christian	0.88(0.63-1.22)	1.04(0.64-1.70)
Islam/Other	1.85(0.87-3.96)	0.87(0.19-4.06)
Marital status		
Married (Ref)		
Living together	1.73(1.22-2.44) **	2.38(1.40-4.07) **
Formerly married	1.27(0.67-2.41)	2.61(0.86-7.95)
Number of children		
0-2 (Ref)		

3-4	1.27(0.84-1.92)	1.60(0.90-2.83)
5+	1.51(0.97-2.37)	2.02(1.05-3.90) *
Number of cowives		
None (Ref)		
1 cowife	1.46(1.03-2.08) *	0..31(0.19-0.51) ***
2-6 cowives	1.34(0.83-2.15)	0.40(0.19-0.83) *
Own a mobile phone		
Yes (Ref)		
No	1.45(1.04-2.03) *	2.14(1.07-4.25) *
No drug or vaccine for coronavirus		
No/Don't know (Ref)		
Yes	0.12(0.07-0.22) ***	

Note: OR-odds ratio; CI: confidence interval; ***p<0.001; **p<0.01; *p<0.05

Preventive behavior

Descriptive results of preventavive The respondents were asked if they followed the recommendations from the authorities to prevent the spread of the novel coronavirus. Less than half of the respondents reported that they followed the recommendations very much (Table 6), others neither adhered to all the recommendations (34.4%) or not at all (17.1%). Many of the respondents go out every day, and the most common activity that takes them out of their houses is to buy food. Hand hygiene was common among them, 77.2% reported that they washed their hands every time they come into their houses from outside. However, one-quarter (20.1%) do not have a handwashing facility, and the most common handwashing facility was handwashing bowl and soap. More than half of the respondents (51.8%) do not have a face mask. Among those who have a face mask, 12.1% do not wear it whenever they go out. In all, the percentage of the respondents who have a face mask and wear it is 42.4% whereas those do not have a mask and those who have but do not wear it is 57.6%. Slightly more than half (51%) of the members of the respondents' families do not have a face mask and 9% of the family members who have a mask do not wear it.

The percentage distribution of the respondents who do not wash hand every time they come into their houses from outside, by selected characteristics is presented in Figure 1. The higher prevalence of poor hand hygiene was among respondents in Esan South East, those who cannot read at all, aged 15-19, perceived coronavirus as no health threat, had no exposure to the media, affiliated to other Christian denomination, and had no handwashing facility. About 31% of those who had no handwashing facility in their homes reported washing hand whenever they come into their houses from outside (Table not

shown). Among those who had handwashing facility, 37.5% of those who had only water and 13% of those who had handwashing bowl and soap did not wash hand whenever they come in from outside. The relationship between each characteristic and handwashing was statistically significant except religion.

Table 6. Preventive behavior

Variable	Frequency	Percent
Adherence to recommended preventive measures		
Not at all	211	17.1
Not all	425	34.4
Very much	600	48.5
Frequency of going out in a week		
Every day	640	45.4
Every other day	194	13.7
Rarely	522	37.0
Never go out	55	3.9
Activities that take respondents out of the house	N=2846	
To buy food	1,327	46.6
Work	622	21.9
Visit friends and relatives	400	14.0
Meetings	271	9.5
Religious service	224	7.9
Others (social event and farm)	2	0.1
Handwashing every time you come into your house from outside		
Yes		
No	1,088	77.2
	322	22.8
Handwashing facility		
None	284	20.1
Running water and soap	399	28.3
Only water	48	3.4
Handwashing bowl and soap	675	47.9
Hand sanitizer	4	0.3
Have a face mask		
Yes	680	48.2
No	731	51.8

Wear a mask whenever you go out		
Yes	598	87.9
No	82	12.1
Face mask		
Have and wear	598	42.4
Have and don't wear/have none	813	57.6
Household members have a mask		
Yes	720	51.0
No	691	49.0
Household members wear a mask		
Yes	655	91,0
No	65	9.0

The percentage distribution of respondents who do not have a mask and those who own a mask but do not wear it, by selected characteristics is presented in Figure 2. Wearing a face mask was not common, between 41.6% and 80% of the respondents either had no mask or had a mask but do not wear it whenever they go out. The higher prevalence was among respondents in Etsako East, respondents who cannot read at all, age 15-19 years, do not perceive coronavirus a health threat, had no exposure to the media, and those affiliated to Islam and other religions. The highest percentage (80%) of respondents who did not wear mask were adolescents aged 15-19. The association between the characteristics and wearing of a mask was statistically significant except religion.

In Table 7, the odds of not adhering to the recommendation of by the authorities on preventing the spread, hand washing and wearing face mask are presented. The odds of not following the recommendations at all or partially was significantly lower among respondents aged 25-29 (OR 0.39 CI:0.19-0.82), and 35-39 (OR 0.41 CI:0.18-0.90). Compared to those who can read a whole sentence, respondents who can only read a part of a sentence and those who cannot read at all were 44% and 58% more likely to report that they did not follow the recommendations, respectively. Those who had no exposure to the media were significantly less likely to report that they did not follow the recommendations. Affiliation to other Christian denomination predicted higher odds of not following the recommendation at all or partially (OR 1.37 CI: 1.02-1.83), compared to Catholics. Respondents who lived together with a partner compared to the married (OR 1.44 CI:1.06-1.96), and those who had one cowife compared to those who had none (OR 2.61 CI:1.91-3.56), were more likely to report that they did not follow or partially followed the recommendations. Compared to the respondents who did not know there is no drug or vaccine for coronavirus, those who know were more likely to follow the recommendations

partially or not at all (OR 2.48 CI:163-3.77). the respondents who went out every day were significantly less likely to report that they followed the recommendations partially or not at all (OR 0.52 CI:0.39-0.70).

The likelihood of not washing hand was significantly lower among respondents who knew there is no drug or vaccine for coronavirus than those who did not know (OR 0.17 CI: 0.07-0.41). Compared to those who considered coronavirus a health threat, the respondents who did not consider it a threat were more likely to enter their houses from outside without washing hand (OR 1.77 CI:1.12-2.78). The likelihood of not handwashing was lower among respondents who have a handwashing facility compared to those who do not have (OR 0.05 (0.03-0.08). The odds of not washing hand were higher among the respondents who could not identify handwashing as a preventive measure compared to those who identified it correctly (OR 5.25 CI:3.21-8.59).

Not wearing a mask was significantly higher in Etsako East than in Esan South East (OR 3.98 CI: 2.72-5.84). The odds of not wearing a mask declines significantly with age. The respondents who were aged 20-45 were all significantly less likely not to wear a mask than their younger counterparts aged 15-19 years. The likelihood of not wearing a face mask was 85% higher among the respondents who were not exposed to the media compared to those who had more exposure to the media. Compared to the married, women living together with a partner were more unlikely to wear a face mask (OR 1.81 CI: 1.27-2.58). Respondents who had 3 or more children were significantly more unlikely to wear a face mask compared to those who had 0-2 children. On the contrary, having one cowife significantly reduced the odds of not wearing a face mask by 51%.

The respondents who do not own a mobile phone were more unlikely to wear a face mask compared to those own a phone (OR 1.96 CI:1.37-2.80). Those who knew there is no drug or vaccine for coronavirus were 56% less likely not to wear a mask compared to those who did not know. The odds of not wearing a face mask was higher among respondents who could not identify wearing a face mask as a preventive measure (OR 4.54 CI: 2.96-6.96), and those who did not wash hand whenever they come into their houses from outside (OR 3.06 CI:1.97-4.75).

Table 7 Odds of preventive behavior

Variable	Follow recommendations by authorities	Hand washing	Mask wearing
	OR (95% CI)	OR (95% CI)	OR (95% CI)
LGA			
Esan South East (Ref)			
Etsako East	1.35(0.94-1.94)	0.80(0.45-1.41)	3.98(2.72-5.84) ***
Age			
15-19 (Ref)			
20-24	0.71(0.34-1.49)	0.85(0.31-2.35)	0.66(0.29-1.54)
25-29	0.39(0.19-0.82) *	0.45(0.16-1.28)	0.43(0.19-1.00) *
30-34	0.52(0.24-1.11)	0.64(0.22-1.92)	0.41(0.17-0.99) *
35-39	0.41(0.18-0.90) *	0.41(0.13-1.30)	0.32(0.13-0.80) *
40-45	0.57(0.26-1.28)	0.49(0.15-1.55)	0.34(0.14-0.84) *
Literacy			
Can read whole sentence (Ref)			
Can read only a part			
Cannot read at all	1.44(1.00-2.07) *	0.98(0.53-1.80)	0.86(0.58-1.28)
	1.58(1.07-2.34) *	1.74(0.93-3.24)	1.05(0.68-1.60)
Exposure to the media			
More exposure (Ref)			
Less exposure	0.95(0.70-1.29)	1.02(0.63-1.67)	1.29(0.92-1.81)
No exposure	0.70(0.49-0.99) *	0.65(0.37-1.14)	1.85(1.26-2.73) **
Religion			
Catholic (Ref)			
Other Christian	1.37(1.02-1.83) *	0.94(0.59-1.50)	1.08(0.78-1.49)

Islam/Other	1.05(0.51-2.14)	0.96(0.31-2.95)	0.85(0.41-1.76)
Marital status			
Married (Ref)			
Living together	1.44(1.06-1.96) *	1.48(0.90-2.42)	1.81(1.27-2.58) **
Formerly married	1.47(0.84-2.58)	1.17(0.47-2.87)	1.20(0.61-2.37)
Number of children			
0-2 (Ref)			
3-4	1.15(0.80-1.64)	1.38(0.78-2.44)	1.85(1.23-2.77) **
5+	1.24(0.84-1.84)	1.13(0.60-2.11)	1.68(1.08-2.62) *
Number of cowives			
None (Ref)			
1 cowife	2.61(1.91-3.56) ***	0.82(0.47-1.40)	0.49(0.35-0.69) ***
2-6 cowives	0.82(0.54-1.23)	1.17(0.63-2.19)	0.75(0.47-1.19)
Own a mobile phone			
Yes (Ref)			
No	1.11(0.81-1.50)	1.44(0.91-2.26)	1.96(1.37-2.80) ***
No drug or vaccine for coronavirus			
No/Don’t know (Ref)			
Yes	2.48(1.63-3.77) ***	0.17(0.07-0.41) ***	0.44(0.29-0.69) ***
Consider coronavirus a health threat			
Yes (Ref)			
No	1.14(0.82-1.58)	1.77(1.12-2.78) *	1.27(0.88-1.84)
Frequency of going out			

Rarely/never (Ref)			
Every other day	1.28(0.83-1.97)		
Every day	0.52(0.39-0.70) ***		
Knowledge of symptoms			
Knows >1 (Ref)			
Knows none or one	0.90(0.67-1.20)		
Knowledge of preventive measures			
Knows >1 (Ref)			
Knows none or one	0.76(0.51-1.12)		
Have facility for washing hand			
None (Ref)			
Have facility		0.05(0.03-0.08) ***	
Know handwashing as a preventive measure			
Yes (Ref)			
No/Don’t know		5.25(3.21-8.59) ***	
Know mask wearing as a preventive measure			
Yes (Ref)			
No			4.54(2.96-6.96) ***
Wash hand every time you come into your house			
Yes (Ref)			
No			3.06(1.97-4.75) ***

Note: OR-odds ratio; CI: confidence interval; ***p<0.001; **p<0.01; *p<0.05

Discussion

The objective of the study was to determine the knowledge, risk perception, and preventive behavior of COVID-19 among rural women in Nigeria. Rural women being a vulnerable group, it is important to establish their knowledge and vulnerability profile to inform the design of policies and programs for addressing the pandemic in rural communities. The results on knowledge showed that nearly 88% of the women have heard of COVID-19, an impressive proportion given their location in far-away communities with limited access to information. However, to determine the quality of information they had about COVID-19, we asked them to choose from a list of ten signal symptoms drawn from a WHO list [13], which they knew were related to the disease. The symptoms presented to them included fever, cough, shortness of breath, sore throat, runny or stuffy nose, muscle or body aches, headaches, fatigue, diarrhea, and loss of taste or smell. The results showed that less than 1% of the women correctly identified all the ten signal symptoms, while 19% failed to point out any of the symptoms. This suggests that although a significant proportion of the women may be aware of COVID-19, only a small proportion had quality knowledge to enable them to deal with the disease.

The results showed that the most common source of information about COVID-19 was the radio reported by about 46% of the respondents; other sources included friends, neighbors, and relatives. This is not surprising since the radio has repeatedly been reported by previous studies as being the most common form of media information in rural areas [17]. Although about 76% of the respondents have a telephone, it was of interest that only 8 respondents mentioned the social media, internet, text message and phone call as being the source of information.

The results of multiple regression analysis on knowledge showed that the independent predictors of no knowledge of COVID-19, and poor knowledge of the symptoms were inability to read or write (low level of education), being in Etsako LGA, older persons, less exposure to the media, and being in a consensual marital union, and having 2 or more cowives. Although a significant proportion of the women had access to the radio, the results of this study suggest that low level of education and illiteracy may preclude the women from processing information from the radio or read and understand text message from NCDC even when they have a telephone. It is therefore important that policymakers and health communicators explore alternative methods of dissemination of the related messages to rural communities, e.g., through the translation of messages to the local languages on the radio or through traditional and culturally appropriate methods of message dissemination.

Women in Etsako LGA were less knowledgeable about COVID-19 than those in Esan South, possibly because Etsako is more rural. The results suggest that Edo State must focus its dissemination activities on COVID-19 on women in most rural communities, and to the less literate, older persons and those who live alone in those communities.

The perception of risk (also known as risk vulnerability) determines the extent to which citizens consider themselves at risk, and therefore adhere to recommended prevention and treatment options. We investigated risk perceptions by asking the women whether they considered themselves or their relatives

at risk of the virus. Slightly over 75% answered in the affirmative. We further measured the risks independently by aggregating the responses to ten questions which included ever heard about coronavirus, considered the virus a health threat, knowledge of the symptoms, knowledge of the preventive measures, knowledge of the existence of drug or vaccine for coronavirus, adherence to recommendations by the authorities to prevent spread, frequency of going out in a week, practice handwashing, ownership and wearing of face mask by the respondents and members of her family whenever they go out. The results showed that more than 99% of the women were exposed to one or more risks. However, six respondents reported that they had themselves been infected with the virus, while three reported that they knew someone who had had the virus.

Multivariable analysis showed the determinants of higher risks to be in women in Esan South East, those with less or no exposure to the media, and those who lived consensual union, and in large households. By contrast, women with one or no cowife had reduced odds for being at risk of the virus. These results have implications for the design of policies and programs that address COVID-19 in rural areas. It means that dissemination activities must not only address increased knowledge about the virus but must also contain information that builds individual resilience on ways to counter the disease particularly for women in informal marital union and large households. Due to the low commitment associated with the informal consensual union, women in such unions are more vulnerable to poor health than those in married union [18–20], and a large number of persons living in a household relative to the capacity of the dwelling spaces increases the risk of infectious disease transmission [21–23].

A third perspective we considered in this study was how women complied with recommendations on the prevention of the virus. Since substantive treatment is not yet available for COVID-19 compliance with recommendations on prevention remains the most logical option. We specifically asked the women how they complied with official guidelines on handwashing, staying at home, and use of face masks as recommended by the WHO and the NCDC [2]. The results showed that less than half of the women reported that they regularly complied with the recommendations, while about 17% did not comply. The odds of following the recommendation were low even among those who were exposed to the media and knew there is no vaccine for coronavirus. This confirms previous anecdotal reports which suggest low compliance with guidelines on COVID-19 in Nigeria. Hand hygiene is a recommended preventive Despite the importance of handwashing for the prevention of coronavirus infection [24–26], close to one-quarter of the respondents did not wash hand, and one-fifth did not have any hand washing facility. The likelihood of not washing hand whenever they come in from outside was high among respondents who did not know there is no vaccine for coronavirus, those who did not consider the virus a health threat, those who had no handwashing facility, and could not identify handwashing as a preventive measure. This result calls for the intensification of communication about the virus and the preventive measures.

The effective wearing of a mask reduces infection and death from coronavirus [27, 28]. About 52% of the respondents did not have a face mask, but among those who had a mask, a significant proportion reported wearing it. The significant determinants of self-reporting of not wearing masks included being from Etsako East LGA, not being exposed to the media, living with partners, those with more children,

those not having mobile phone, who do not know that wearing a mask is a preventive measure and do not wash hand.

When the results are aggregated, it is evident that three main factors may be associated with the women reporting non-compliance with the recommended guidelines on COVID-19 prevention. These include illiteracy (lack of knowledge, low level of education), low perception of risks, and poverty (which may be responsible for not washing hands or wearing masks). It is therefore evident that any policy guidelines designed to restrain COVID-19 in rural Nigeria should address these elements to reach the most vulnerable populations. This would possibly include the free distribution of handwashing devices, sanitizers, and face masks, and increased access to running water, in addition to regular public health education on ways to use them. Handwashing as a sign of washing off bad luck or omen is common in many Nigerian as well as other African cultures [29]. This culture can be leveraged on to encourage more people to wash their hands.

Strengths and Weaknesses

The major strength of this study was the use of a representative sample of women through face-to-face interviews. We conducted the interviews in the homes of the women after the easing of the COVID-19 lockdown in the LGAs. The interviews were conducted using the recommended prevention guidelines including handwashing, use of sanitizer, and social distancing, with only the interviewer and interviewee being present, with both wearing masks. We considered that the alternative of using online completion of the questionnaires would exclude women who have no access to internet connectivity. This we considered would be a problem in the rural communities we identified for the study. Thus, the study has substantive external validity in the context of the communities studied, but also has implications for other rural communities in Nigeria and other parts of the developing world. To the best of our knowledge, this is one of the first studies during this COVID-19 pandemic where truly representative face-to-face interviews have been conducted.

The weakness of the study is our inability to verify the authenticity of the responses provided by the women – especially because women who have more knowledge of the virus without evidence to confirm that they implemented the answers they provided in real life. We were also not able to determine the deeper reasons for some of the answers provided by the women, which would allow the design of specific interventions. This would have been possible with the addition of qualitative methods. Our exclusion of men and urban women also did not allow us to make comparisons based on gender and place of residence. However, this study was specifically designed to explore the specific experiences of women, especially because we believe they are social gatekeepers in rural communities in Nigeria.

Conclusions

We conclude that many rural women in Nigeria have low knowledge of the symptoms and preventive measures, low risk perception, and inadequate adoption of preventive measures for COVID-19. These deficits are attributable to illiteracy, poor access to information, and the poverty in the rural communities.

Appropriate policies and programs will help address these challenges and prevent the COVID-19 pandemic in rural Nigeria.

List Of Abbreviations

NCDC - Nigerian Centre for Disease Control

LGA – Local Government Area

WHO – World Health Organization

OR – Odds Ratio

CI – Confidence Interval

Declarations

Ethics approval and informed consent

Ethical approval for the interventional study was obtained from the National Health Research Ethics Committee (NHREC) of Nigeria – protocol number NHREC/01/01/2007 – 10/04/2017.

The communities were contacted through lead contact persons, and permission to undertake the study was obtained from the Heads (Odionwere) of the communities. Consent was also obtained from the heads of individual households identified for the study. The participating women were informed of the purpose of the study, and individual written informed consent was obtained from them to conduct the study. They were assured of the confidentiality of information obtained, and that such information would only be used for the study and not for other purposes. No names or specific contact information were obtained from the study participants. Only women that agreed to participate in the fully explained study were enlisted in the study.

Consent for publication

Not applicable

Data availability

The data associated with this manuscript is available on request from the corresponding author.

Competing interest

The authors have no competing interests to declare

Funding

This research received no funding.

Authors' contributions

FEO conceived the study, developed the methodology and wrote sections of the paper and revised the final draft. LFCN supervised the data collection, analyzed the data and wrote sections of the paper. SY contributed to the conception of the study, and methodology. IB, CE facilitated data collection and organization. WI contributed to the study design and supervised data collection. All authors approved the final version of the paper.

Acknowledgements

The data for this research were collected using the opportunity of the end survey for a project sponsored by the International Development Research Centre (IDRC), Global Affairs Canada (GAC) and Canadian Institute for Health Research (CIHR) under the Innovating for Maternal and Child Health in Africa (IMCHA) (Grant #108041). We acknowledge their support. They played no role in the design of the study, data collection and analysis, interpretation of data and in the writing of the manuscript.

We thank Francis Igberaese, who coordinated data collection and Mary-Jane Emiowele, Precious Ntulu, Abumere Beverly, Endurace Imhanobe, Idididi Jeffery, Odaze Daniel, Sarah Eilegbogun, Victor Agbormikhe and others who were data collectors in the two LGAs.

References

1. World Health Organization. WHO Coronavirus Disease (COVID-19) Dashboard. 2020. https://covid19.who.int. Accessed 23 Nov 2020.
2. Nigeria Centre for Disease Control (NCDC). Coronavirus disease (COVID-19) pandemic. 2021. https://covid19.ncdc.gov.ng/.
3. Okonofua FE, Eimuhi KE, Omonkhua AA. COVID-19: Perspectives and Reflections from Africa. African Journal of Reproductive Health. 2020;24:10–4.
4. Ilesanmi O, Afolabi A. Perception and practices during the COVID-19 pandemic in an urban community in Nigeria: a cross-sectional study. PeerJ. 2020;8:e10038.
5. Kavanagh MM, Erondu NA, Tomori O, Dzau VJ, Okiro EA, Maleche A, et al. Access to lifesaving medical resources for African countries: COVID-19 testing and response, ethics, and politics. The Lancet. 2020;395:1735–8.
6. Olorunda R, Fatusi AO. Covid-19 in Nigeria: An analysis of the early epidemiological trend of the infection and response efforts. Proceedings of the Nigerian Academy of Science. 2020;13:23–31.
7. Adebayo B. Over half of April's unexplained deaths in Nigeria's Kano State due to the coronavirus, health minister says. 2020. edition.cnn.com/2020/06/09/Africa/Nigeria-spike-in-deaths-covid/indexhtml. Accessed 12 Nov 2020.

8. Elimian K, Ochu C, Ilori E, Oladejo J, Igumbor E, Steinhardt L, et al. Descriptive epidemiology of coronavirus disease 2019 in Nigeria, 27 February–6 June 2020. Epidemiology & Infection. 2020;148.
9. Iorfa SK, Ottu IF, Oguntayo R, Ayandele O, Kolawole SO, Gandi JC, et al. COVID-19 knowledge, risk perception and precautionary behaviour among Nigerians: A moderated mediation approach. Frontiers in Psychology. 2020;11:566773.
10. Reuben RC, Danladi MM, Saleh DA, Ejembi PE. Knowledge, attitudes and practices towards COVID-19: an epidemiological survey in North-Central Nigeria. Journal of community health. 2020;:1–14.
11. Hager E, Odetokun IA, Bolarinwa O, Zainab A, Okechukwu O, Al-Mustapha AI. Knowledge, attitude, and perceptions towards the 2019 Coronavirus Pandemic: A bi-national survey in Africa. PloS one. 2020;15:e0236918.
12. National Bureau of Statistics (NBS). 2017 Demographic Statistics Bulletin. Abuja, Nigeria: National Bureau of Statistics; 2018.
13. World Health Organization. Survey Tool and Guidance: Rapid, simple, flexible behavioural insights on COVID-19. 2020.
14. Agadjanian V. Religious denomination, religious involvement, and modern contraceptive use in Southern Mozambique. Studies in family planning. 2013;44:259–74.
15. Demir E, Yıldırım E. The effect of religious belief on the attitudes of pregnant's toward the fetal health. Journal of religion and health. 2019;58:2313–23.
16. Levin JS, Chatters LM, Taylor RJ. Religious effects on health status and life satisfaction among Black Americans. The Journals of Gerontology Series B: Psychological Sciences and Social Sciences. 1995;50:S154–63.
17. Mohammed BB, Garaba F. An investigation on the forms of information sources and services utilised among rural dwellers from public libraries in the North-West zone of Nigeria. South African Journal of Information Management. 2019;21:1–13.
18. Holt-Lunstad J, Birmingham W, Jones BQ. Is there something unique about marriage? The relative impact of marital status, relationship quality, and network social support on ambulatory blood pressure and mental health. Annals of behavioral medicine. 2008;35:239–44.
19. Kiecolt-Glaser JK, Newton TL. Marriage and health: his and hers. Psychological bulletin. 2001;127:472.
20. Waite LJ. Does marriage matter? Demography. 1995;32:483–507.
21. Adewoyin Y. A residential habitat quality model for population health vulnerability assessment in Urban Nigeria. International Journal of Scientific Reports. 2018;4:59–67.
22. Ali SH, Foster T, Hall NL. The relationship between infectious diseases and housing maintenance in Indigenous Australian households. International Journal of Environmental Research and Public Health. 2018;15:2827.
23. World Health Organization. WHO housing and health guidelines. 2018.

24. Cavanagh G, Wambier CG. Rational hand hygiene during the coronavirus 2019 (COVID-19) pandemic. Journal of the American Academy of Dermatology. 2020.
25. Centers for Disease Control and Prevention. Handwashing: Clean Hands Save Lives. 2020. https://www.cdc.gov/handwashing/when-how-handwashing.html.
26. Yang C. Does hand hygiene reduce SARS-CoV-2 transmission? Graefe's Archive for Clinical and Experimental Ophthalmology. 2020;:1–2.
27. Eikenberry SE, Mancuso M, Iboi E, Phan T, Eikenberry K, Kuang Y, et al. To mask or not to mask: Modeling the potential for face mask use by the general public to curtail the COVID-19 pandemic. Infectious Disease Modelling. 2020;5:293–308.
28. Ma Q, Shan H, Zhang H, Li G, Yang R, Chen J. Potential utilities of mask-wearing and instant hand hygiene for fighting SARS-CoV-2. Journal of medical virology. 2020.
29. Curtis VA, Danquah LO, Aunger RV. Planned, motivated and habitual hygiene behaviour: An eleven country review. Health Education Research. 2009;24:655–73.

Figures

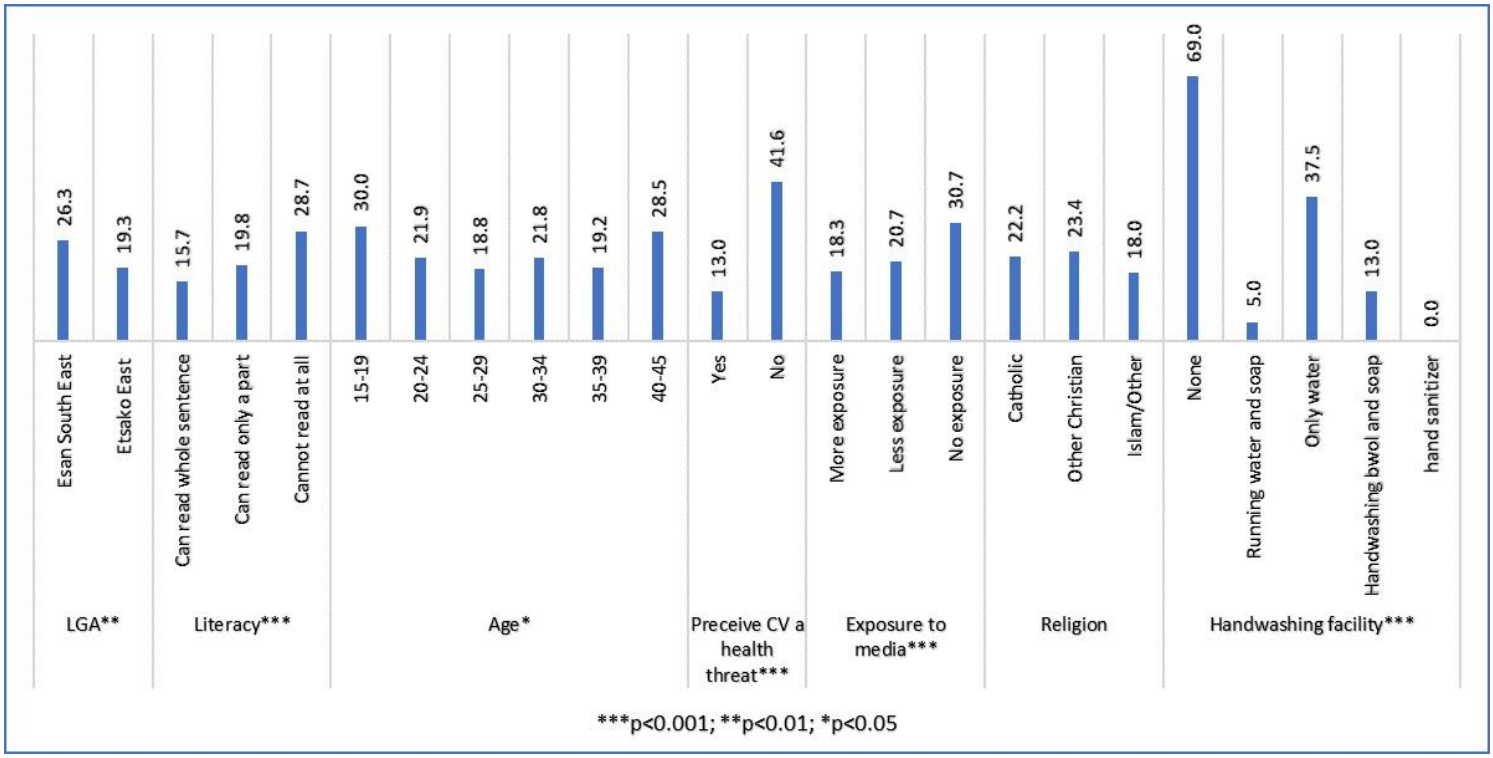

Figure 1

Percentage of women who do not practice handwashing by selected characteristics

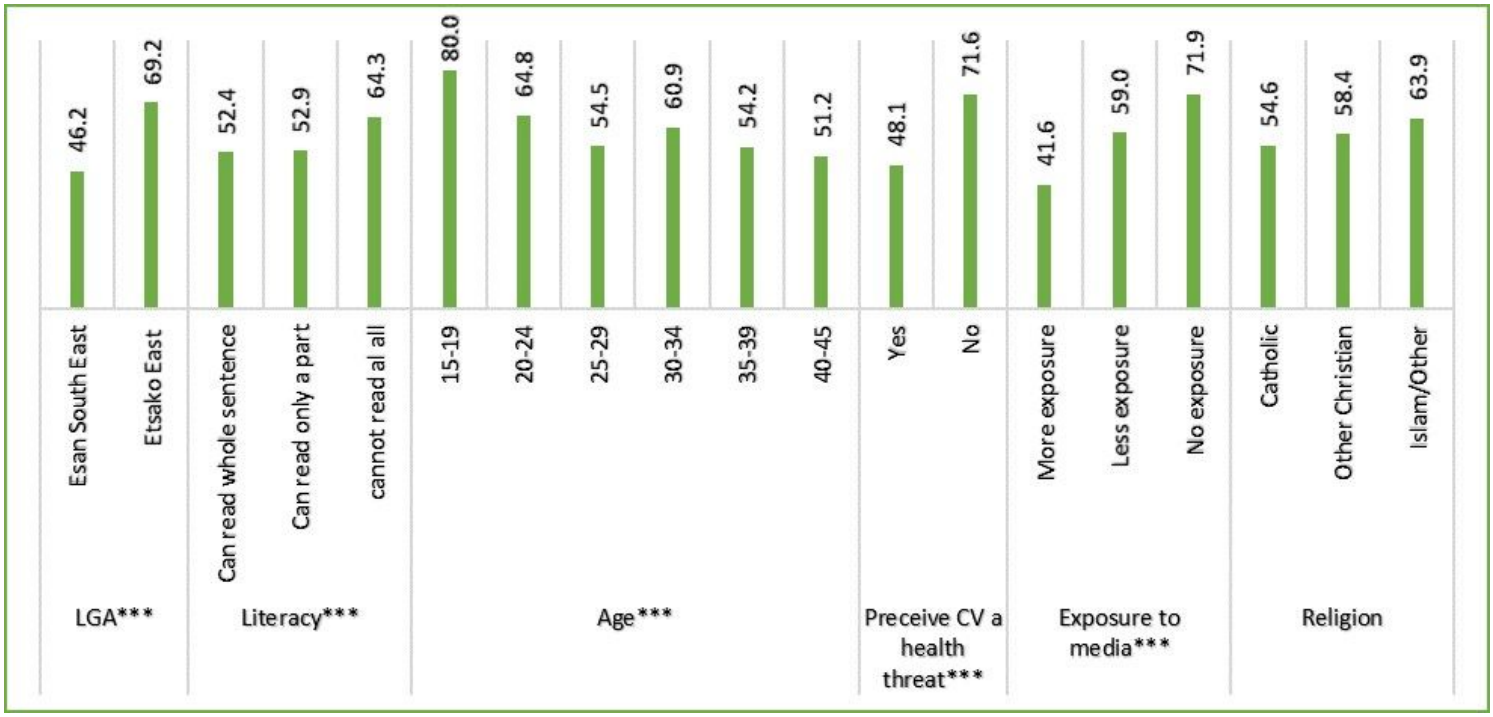

Figure 2

Face mask: Percentage distribution of respondents by selected characteristics