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RESEARCH ARTICLES

Perceived Risk and Associated Factors towards COVID-19 infection among the residents of Ondo State, Southwest Nigeria

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Abstract

Background

Perceived risk is an important factor in understanding why and how a population adopts health-prevention interventions. When diseases are perceived as low-risk, motivation to use and adhere to prevention interventions is low, which can aid the spread of highly infectious diseases such as COVID-19. In this study, we assessed risk perception and its associated factors towards COVID-19 infection among the residents of Ondo State, southwest Nigeria.

Methods

A community-based, cross-sectional study design using a multi-stage sampling technique was used to recruit 593 heads of households in three local government areas (LGA) in Ondo State. Data were collected using an interviewer-administered questionnaire which captured information on sociodemographic variables, knowledge of COVID-19 prevention, COVID-19 infection prevention and control practices, and risk perception from September 1 to 30, 2021.

Results

The respondents were mostly males 357 (60.2%). The mean age of respondents was 37.5±14.7 years with 409 (69%) between the age group of 20 to 40 years. Slightly more than one quarter of respondents were civil servants and 78.4% were of Yoruba ethnicity. More than three quarters, 522 (88%), of the respondents had good knowledge of COVID-19 and its preventive measures. The mean risk perception score was 49.0±12.1. Respondents who were civil servants, had good knowledge of COVID-19 and its preventive measures, had lower household income, and were of Yoruba ethnicity had significantly higher risk perception towards COVID-19 infection compared to other groups. Higher risk perception was associated with preventive measures, such as handwashing.

Conclusion

Our study shows a high-risk perception towards COVID-19 infection among residents in Ondo state, Nigeria. However, there were significant differences between varying knowledge levels, ethnic groups and civil versus non-civil servants. In view of this, we recommend intensified risk communication interventions targeting these groups to improve their risk perception to change health-protective behaviour towards COVID-19 infection.

Keywords: Perceived Risk, COVID-19 infection, Community, Ondo State, Nigeria

Introduction

The COVID-19 outbreak is still ongoing and has had a considerable impact on global morbidity and mortality [1]. Consequentially, the pandemic has triggered fear, chaos and anxiety, hence disrupting daily routines, global trade, and the education system [2].

The disease (COVID-19) is caused by a virus known as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), with a recent genetic mutation resulting in highly infectious strains [3]. The contagion could lead to severe respiratory problems or death, particularly among the elderly and persons with underlying chronic illnesses. However, some infected persons are carriers of the virus with no symptoms, while others may experience only a mild illness and recover easily [2]. There is currently no cure for COVID-19, although vaccines have been developed and distributed globally. During the early stage of the pandemic, medical treatments for COVID-19 were limited to supportive measures aimed at relieving symptoms [4]. However recently, emergency use authorizations (EUA) have been issued for certain antiviral medications and monoclonal antibodies to treat mild to moderate COVID-19 in people who are

more likely to get very sick [5]. While the antivirals target specific parts of the virus to stop it from multiplying in the body, helping to prevent severe illness and death, the monoclonal antibodies help the immune system recognize and respond more effectively to the virus [5]. They may be more or less effective against different variants of the virus that causes COVID-19 [5].

Nigeria is currently experiencing a third wave of the outbreak, with several states in the country recording high numbers of daily confirmed cases and deaths. As of 4th October 2021, a total of 206,279 confirmed cases and 2723 COVID-19 related deaths have been reported by the Nigeria Center for Disease Control (NCDC) [7].

Due to the contagious nature of the disease and its overwhelming influence on critical care and frontline healthcare staff, as well as the possibility of transmission by asymptomatic carriers, the Nigerian government through the NCDC has developed public health measures such as movement restrictions, social distancing, wearing of facemasks in public places, hand hygiene, and vaccination to curb the spread of the virus [6]. However, poor compliance of these precautionary measures by the public has been reported as the main cause of the recent waves of the COVID-19 outbreak recorded in Nigeria [2,7].

Compliance at the population level with precautionary measures is dependent on risk perception [7-8]. Risk perception refers to individuals' judgments about and evaluations of hazards to which they may be exposed, including the social phenomena related to exposure, the risk of disease, and how the perceived risk influences health behavior [7,9]. Perceived risk is an important factor in understanding why and how a population adopts health-prevention interventions [7, 10-11]. When epidemic diseases are perceived as low-risk, motivation to use and adhere to prevention interventions is low [7, 10], which can aid the spread of highly infectious diseases such as COVID-19 [7, 12].

Multiple factors affect risk perception and influence the decisions of whether to take preventive actions [7]. Hence, understanding the risk perception and associated factors towards COVID-19 infection among community residence in Nigeria will be crucial in designing appropriate behavioral change communication interventions to prevent the spread of COVID-19 during the pandemic in Nigeria.

Materials and Methods

Study Area and population

Nigeria is the most populous country in Africa, with an estimated population of over 160 million [13] and a growth rate of 3.8% per annum. Nigeria has six regional zones with varying ecologies, climates and population characteristics. The zones are divided into 36 states and the federal capital territory [14]. Ondo State has 18 local government areas (LGAs) with three senatorial districts; Ondo North, Central and South and a 2021 projected total population of about 5,361,003 based on the 2006 population census [15]. The climate of the areas is highly favoured for agrarian activities and crops such as cocoa, kola nut, palm tree and arable crops like maize and tubers such as yam and cassava are grown annually [16]. Most of the population consists of peasant farmers cultivating food and cash crops at a small-scale level. Hunters and livestock keeping is also a major occupation of the population of Ondo State who rear goats, sheep and fish. Other economic activities in the state include trading and civil service and other government-paid jobs [17].

Study participants

The study participants were heads of households in randomly selected settlements in three LGAs, Akure South, Owo and Odigbo.

Inclusion criteria

Household must have resided at least 6 months in the settlement prior to the study interview. The respondent must be 18 years and above and must have consistently visited public gatherings (religious gatherings, School, shopping malls, Market, workplace, Bank, social gathering such as ceremony, community meeting) seven days prior to the conduct of the study interview.

Exclusion criteria

Selected households were excluded if they met the inclusion criteria, but the head of the household was absent at the time of visit to the household or they refused to give informed consent.

Sample Size Estimation

To determine the sample size for the study, Fisher's formula [18] for estimating single proportions and estimation for minimum sample size was applied, resulting in an estimated sample size of 380.

Fisher's formula: $n = Z^2P(1 - P)/d^2$ where:

n = sample size;
Z = standard deviation for a 95% confidence level (Z = 1.96);
P = prevalence of the attribute (risk perception);
d = acceptable difference (if 5%, d = 0.05);
q = 1 – p.

The prevalence estimate was obtained from a previous study where 44.6% of community residents had good risk perception in Osun state, Nigeria [19].

Sampling Method

A multistage sampling technique was employed in this study. In stage 1, we divided the 18 LGAs into three categories using the senatorial districts (6 LGAs in Ondo North senatorial district, 6 LGAs in Ondo South senatorial district and 6 LGAs in Ondo Central

senatorial district) from which one LGA was randomly selected using balloting from each senatorial district (Owo LGA from Ondo North senatorial district, Odigbo LGA from Ondo South senatorial district and Akure South LGA from Ondo Central senatorial district). In stage 2, we selected 5 wards from the list of wards in each selected Local Government Area (LGA) using a simple random technique (balloting). In stage 3, 6 settlements out of an average of 30 settlements per ward were sampled by simple random technique (balloting). A total of 30 settlements were randomly selected from the list of settlements generated from each LGA. In stage 4, sampling of households from each selected settlement was done using a systematic sampling technique. The middle of each settlement was identified, then a pen was tossed. Sampling started from the house in the direction of the tip of the pen. For settlements with less than 20 houses, a house is skipped while two houses were skipped for settlements with more than 20 houses. Sampling was continued until the required sampling size expected for the settlement was reached [19]. Finally, in stage 5, heads of households or assigned adults older than 18 years in selected households were interviewed.

Study design and data collection

A community-based, descriptive, cross-sectional study design was used. A semi-structured questionnaire was administered to participants by research assistants. To ensure consistency in the way the questions were administered, research assistants with field experience in data collection were recruited, trained and deployed for data collection. Field supervisors were also recruited, trained and deployed to monitor the data collection process. The questionnaire captured information on socio-demographic variables, knowledge of COVID-19 prevention, COVID-19 infection prevention and control practices and risk perception. Also, some questions in the questionnaire were obtained from other studies and rephrased to reflect the objectives of the study [19]. The data were collected between September 1st to 30th, 2021. During the interview session of participants, probing questions through physical verification of handwashing practices (practical demonstration of handwashing with soap and water), availability of hand sanitizer, face masks reported by respondents and how to use face masks and hand sanitizer were conducted.

Operational definitions

Knowledge was defined as having an adequate understanding of COVID-19 symptoms, mode of transmission and preventive measures. Respondents were scored using a 22-item question. A point was assigned to the correct response to each question thereafter. The total score of each participant was divided by the total expected score (22 points) and multiplied by 100 to derive the percentage score. Respondents with scores of 50% and below were categorized as those with poor knowledge, while those with a score above 50% were selected as those with good knowledge.

Risk perception was defined as the agreement of the participants to the risks of being infected with COVID-19. A total of thirteen questions were used to assess the respondents on their risk perceptions. The responses to the questions were graded using a five-point Likert scale. The mean and standard deviation of the aggregate risk perception scores of 65 points was determined**.**Regular practice of handwashing and use of face masks was defined as self-reported handwashing practice and use of face masks by respondents every time in public gathering within seven days prior to the study interview. The occasional practice of handwashing and use of face masks was defined as self-reported handwashing and use of face masks by respondents in public gatherings two or three times within seven days prior to the study interview. Rarely practice hand washing and use of face mask was defined as self-reported handwashing and use of face mask by respondents in public gatherings only once and when compelled by enforcement authorities within seven days prior to the study interview.

A household was defined as a group of people living together daily in the same house and feeding from the same pot. A head of a household was defined as any person above 18 years of age, who is resident in the household, provides for the basic amenities and care of the household and exercises moral and financial authority over the members of the household.

Data Analysis

The data obtained were analyzed using frequency counts and percentages with IBM Statistical Package for Social Sciences version 20.0. For the knowledge score. A point was assigned to correct responses to each knowledge question. Respondents were scored using a 22-item question. A point was assigned to the correct response to each question thereafter. The total score of each participant was divided by the total expected score (22 points) and multiplied by 100 to derive the percentage score. Respondents with scores of 50% and below were categorized as those with poor knowledge, while those with a score above 50% were selected as those with good knowledge. Thirteen itemized questions on a Likert scale of 1 to 5 were used in the assessment of respondents' COVID-19 risk perception. The occupation of the respondents was re-categorized into a "civil servant" and "non-civil servant" to further gain insight into government intervention programs and their impact prior to our study. The mean and standard deviation of the aggregate risk perception scores of participants was determined. Factors associated with the risk perception of respondents were determined using the independent T-test and the level of significance set at $p<0.05$.

Ethical consideration

The study was conducted as part of an outbreak control investigation hence permission to conduct the study was obtained from the Akure South, Owo and Odigbo district primary Health Care Department in Ondo State. Also, informed consent was obtained from the respondents. They were made to understand that participation is voluntary and there was no consequence for non-participation. All information obtained was kept confidential.

Results

Socio-demographic characteristics of respondents

A total of 593 community members were assessed in this study. Sixty percent of participants were male and 409 (69%) participants were between the age group 20 to 49 years, with mean age (standard deviation) of 37.5 (14.7). About three-quarters of the respondents (n=444, 74.9%) practiced Christianity as their religion. Business owners (n=172, 29%) and civil servants (n=158, 26.6%) account for a high proportion of the respondents. The highest proportion (n=465, 78.4%) of respondents were Yoruba, with 200 (33.7%) of them each from Akure South and Odigbo LGAs (Table 1.1). About half of the respondents (n=282, 47.6%) had completed a tertiary level of education, and 436 (73.6%) had a monthly average family income of less than 50,000 naira (Table 1.2).

Knowledge of COVID-19 among respondents

Table 2 shows the knowledge of COVID-19 among the respondents. All respondents in this study reported to have heard about COVID-19, with radio (n=510, 86%) and television (n=470, 79.3%) as their source of information respectively. Most of the respondents were aware of fever (n=573, 96.6%), difficulty in breathing (n=570, 96.1%), cough (n=547, 92.2%) and headache (n=463, 78.1%) as the main symptoms of COVID-19 infection. A high proportion of the respondents knew that COVID-19 could be transmitted from human to human (n=585, 98.7%), through saliva and nasal secretions of an infected person (n=564, 95.1%) and traveling high-risk communities (n=463, 78.1%). Knowledge of COVID-19 preventive measures as reported by the respondents were washing hands with soap regularly (n=584, 98.5%) and using hand sanitizer/alcohol-based rub (n= 580, 97.8%). On aggregate, 522 (88%) of the respondents had good knowledge of COVID-19.

Risk perceptions towards COVID-19 among respondents

In Figure 1 below, a high proportion of respondents believed that COVID-19 could spread from person to person (n=377, 63.6%), hand washing would prevent COVID-19 (n=396, 66.8%), using face mask in public places would prevent COVID-19 infection (n=392, 66.1%) and washing your hands regularly or using hand sanitizer would prevent COVID-19 infection (n=374, 63.1%). The mean risk perception score of all participants was 49.0 with a standard deviation of 12.1**.**

COVID-19 Infection prevention and control practices among respondents

Table 3 below shows prevention and control practices among respondents. Most (95.6%) of the respondents had face masks, among whom 171 (30.2%) and 18 (3.1%) have surgical and N95 face masks respectively. More than a quarter (33.2%) of the respondents reported occasional use of face masks in public places, while 13 (2.2%) reported they have never used a face mask in public places. The main reasons reported by the respondent for occasional use or never used a face mask in public places were face mask was discomforting to use (n=112, 55.7%), health issues (n=37, 18.4%) and stigmatization (n=37, 18.4%). About a half (n=255, 43%) of the respondents reported rare or occasional hand washing practices using soap and water, with 125 (49%) reported that they do not feel it is necessary to wash hands regularly while 59 and 23.2% reporting that they had no access to hand washing device.

Association of risk perception with socio-demographic, knowledge and IPC factors among respondents

Table 4 shows the association between risk perception about COVID-19 scores and socio-demographic, aggregate knowledge of COVID-19 and IPC practices among respondents. Among these items, occupation, religion, ethnic group, monthly average family income, knowledge of COVID-19 and washing of hands with soap and water were significantly associated with risk perception of COVID-19. Respondents that were civil servants had higher risk perception (51.3±12.4) than non-civil servants (48.1±11.9) (p= 0.003). Likewise, those that were Christians had higher risk perception (49.6±12.3) compared to those that were non-Christian (47.1±11.2) (p= 0.029). The Yorubas had higher risk perception score (49.6±12.0) compared to other ethnic groups (46.8±12.2) (p=0.018). Respondents whose monthly average family income were less than 50,000 naira had higher risk perceptions (49.9±11.5) than those with monthly average family income 50,000 naira and above (46.4±13.2) (p= 0.002). The group that had good knowledge of COVID-19 had higher risk perception (51.5±10.2) compared to those that had poor knowledge of COVID-19 (48.7±12.3) (p=0.03). Higher risk perception (49.5±12.2) about COVID-19 was found among those who washed their hands regularly or occasionally compared to those who rarely wash their hands (46.4±11.1), (p= 0.023).

Table 1. Sociodemographic characteristics of respondents (N=593)

	Frequency	**Percentage**
LGA		
Akure south	200	33.7
Owo	193	32.6
Odigbo	200	33.7
Gender		
Male	357	60.2
Female	236	39.8
Age in years		
<20 (≥ 18)	62	10.5
20-29	147	24.8
30-39	144	24.3
40-49	118	19.9
50-59	63	10.6
≥60	59	9.9
Religion		
Christianity	444	74.9
Islam	141	23.8
Traditional	8	1.3
Occupation		
Civil servant	158	26.6
Student	149	25.1
Clergy	36	6.1
Business owner	172	29
Farming	23	3.9
Housemaker	8	1.4
Health worker	10	1.7
*Others	37	6.2
Ethnic group		
Yoruba	465	78.4
Igbo	69	11.6
Hausa	31	5.2
Urhobo	8	1.3
+Others	21	3.5
Marital status		
Single	212	35.8
Married	337	56.8
Divorced	11	1.9
Widow/widower	33	5.5
Highest level of education		
None	22	3.7
Primary	58	9.7
Secondary	231	39
Tertiary	282	47.6
Monthly average family income in naira		
No income	169	28.5
<10,000	43	7.3
10000-49999	224	37.8
50000 – 100000	109	18.4
>100000	48	8

* Retired, Banker, driver, security
+Edo, gbagi, idoma, igbira, ijaw, isoko, itsekiri, Tiv
Business owner: Respondent who do not have a government paid job but owns a personal business where they earn money
Civil servant: Respondent who are not health workers and have a government paid job

Table 2. Knowledge of COVID-19 among respondents (N=593)

	Yes (n(%))	**No (n(%))**
Ever heard about COVID-19 and its preventive measures		
Yes	593 (100.0)	0 (0.0)
No	0	0.0
Source of information about COVID-19 (multiple response allowed)		
Radio	510 (86.0)	83 (14.0)
Television	470 (79.3)	123 (20.7)
Internet/social media	284 (47.9)	309 (52.1)
Church	175 (29.5)	418 (70.5)
Mosque	85 (14.3)	508 (85.7)
Hospital	29 (4.9)	564 (95.1)
School	49 (8.3)	544 (91.7)
Newspaper	1 (0.2)	592 (99.8)
Symptoms of COVID-19 (multiple responses allowed)		
Fever	573 (96.6)	20 (3.4)
Headache	463 (78.1)	130 (21.9)
Diarrhoea	143 (24.1)	450 (75.9)
Nausea and Vomiting	199 (33.6)	394 (66.4)
Stiffness of neck	81 (13.7)	512 (86.3)
New loss of smell	335 (56.5)	258 (43.5)
New loss of taste	327 (55.1)	266 (44.9)
Difficulty in breathing	570 (96.1)	23 (3.9)
Inability to sleep	245 (41.3)	348 (58.7)
Cough	547 (92.2)	46 (7.8)
Rashes over the body	66 (11.1)	527 (88.9)
Bleeding	51 (8.6)	542 (91.4)
Mode of transmission of COVID-19 (multiple response allowed)		
Through rats or birds to human	93 (15.7)	500 (84.3)
Through human to human	585 (98.7)	8 (1.3)
Through saliva and nasal secretions of infected person	564 (95.1)	29 (4.9)
Through attending funeral of diseased COVID-19 patient	483 (81.5)	110 (18.5)
Through travel to community with large number of cases	463 (78.1)	130 (21.9)
Measures for prevention of COVID-19 (multiple response allowed)		
Washing hands with soap and water regularly	584 (98.5)	9 (1.5)
Sanitizing hands with hand sanitizer/alcohol based rob	580 (97.8)	13 (2.2)
Staying 1 meter away from other persons in public places	582 (98.1)	11 (1.9)
Attending birthday parties, other social and religious gatherings	178 (30.0)	415 (70.0)
Covering mouth and nose when coughing or sneezing	579 (97.6)	14 (2.4)

Figure 1. Risk perceptions towards COVID-19 among 593 respondents in Ondo State, Nigeria

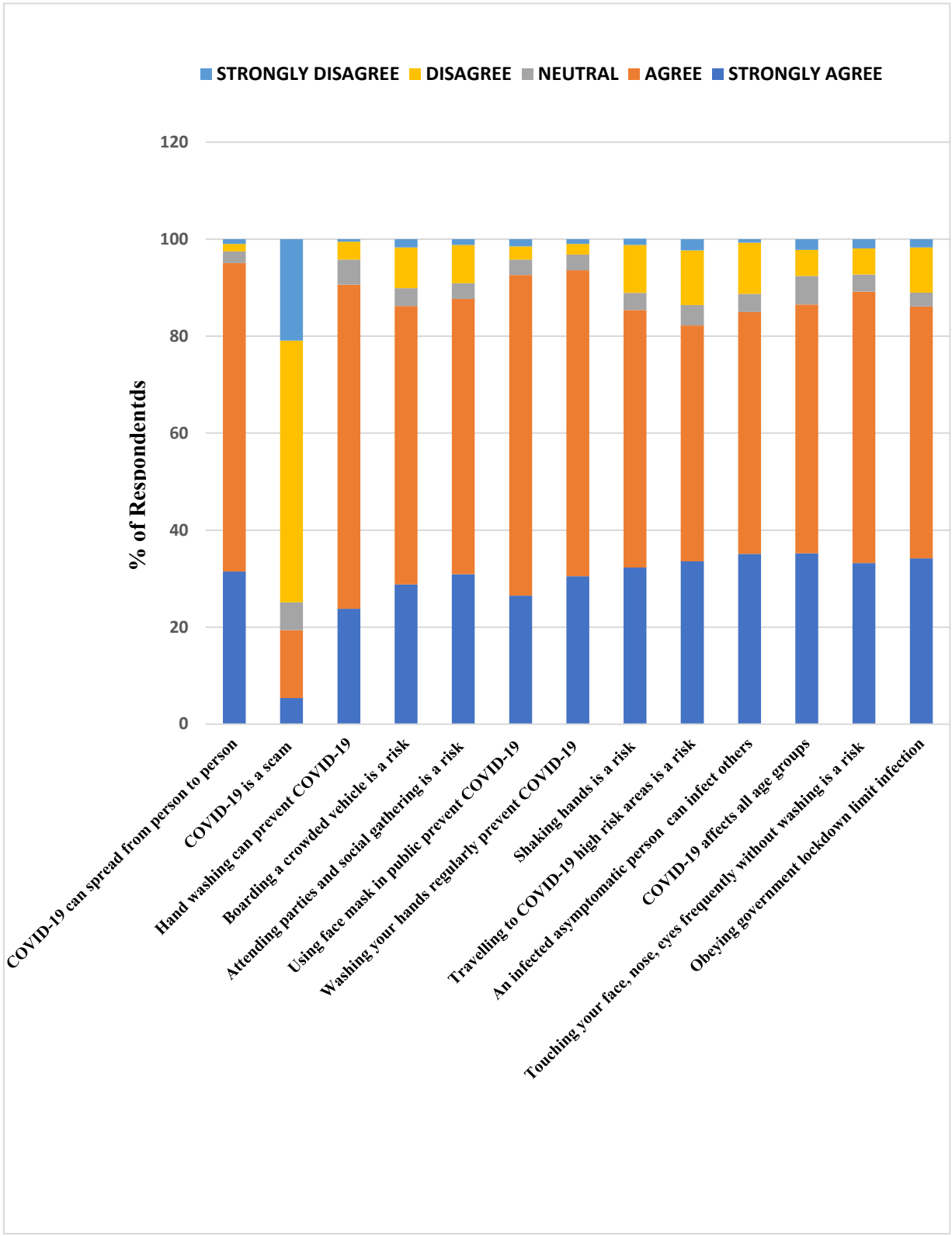

Table 3. COVID-19 Infection prevention and control practices among respondents (N=593)

	Frequency	**Percentage**
Know anyone who have had COVID-19 infection		
Yes	127	21.4
No	466	78.6
Person known to have had COVID-19 infection	N=127	
Family member	21	16.5
Friend	46	36.2
Neighbor	36	28.3
Political office holders	19	15.0
*Others	5	4.0
Do you have a face mask		
Yes	567	95.6
No	26	4.4
What type of face mask last used if available	N=567	
Surgical	171	30.2
Clothes	378	66.7
N95 Face mask	18	3.1
How often do you use face mask in public place	N=567	
Regularly	366	64.6
Occasionally	188	33.2
Never	13	2.2
Most appropriate reason face mask not available and used	N= 26	
Cannot afford to buy a face mask	5	19.2
Do not believe in COVID-19	15	57.7
Waiting for government to distribute face mask	6	23.1
Most appropriate reason face mask was never or occasionally used in public places even when available	N=201	
Face mask is discomforting to use	112	55.7
Health issues	37	18.4
Stigmatization	37	18.4
+Others	15	7.5
How often do you wash your hands with soap and water or use hand sanitizers		
Regularly	338	57.0
Occasionally	162	27.3
rarely	93	15.7
Most appropriate reason hands were never or occasionally washed		
Made used of hand sanitizer	71	27.8
No felt need	125	49.0
Hand washing device not available at working place/home	59	23.2

** Family friend, co-workers; +It is expensive, only used when going out of home, often forget to use it*

Table 4. Association of risk perceptions with socio-demographic, knowledge and IPC factors among respondents

	Risk perception score	**T value**	***p*-value**
	Mean±SD		
Gender			
Male	48.6±12.0	-1.1	0.266
Female	49.7±12.2		
Age in years			
< 40	49.7±12.0	1.6	0.105
≥ 40	48.0±12.2		
Occupation			
Civil servant	51.3±12.4	2.9	0.003
Non-civil servant	48.1±11.9		
Religion			
Christianity	49.6±12.3	2.2	0.029
*Other religion	47.1±11.2		
Ethnic group			
Yoruba	49.6±12.0	2.4	0.018
+Other ethnic group	46.8±12.2		
Marital status			
Married	49.0±12.3	0.0	0.995
Not married	49.0±11.9		
Highest level of education			
Tertiary	49.2±12.3	-0.3	0.757
Non-tertiary	48.9±11.9		
Average family income in naira			
< 50,000	49.9±11.5	3.1	0.002
≥ 50,000	46.4±13.2		
Knowledge of COVID-19			
Good	51.5±10.2	1.9	0.03
Poor	48.7±12.3		
Know anyone who has had COVID-19			
Yes	47.6±13.2	1.5	0.133
No	49.6±11.8		
Do you have a face mask			
Yes	49.0±12.2	-0.03	0.970
No	48.9±10.4		
How often do you wash your hands with soap and water			
Regularly/occasionally	49.5±12.2	2.3	0.023
rarely	46.4±11.1		

Discussion

In this study, we reported a higher proportion of male respondents than females. This is slightly contrary to what was reported by previous authors [20-21]. Fatiregun et al [20] and Olugbamila et al [21] reported a higher proportion of females than male respondents in their studies in Ondo state. However, our study protocol focused on interviewing heads of households whereby in a typical traditional African setting, males are regarded as heads of households because of the key roles they play in their families as required by society.

Furthermore, our findings of other sociodemographic distribution of respondents by marital status, religion, education, occupation, and average family income were consistent with the findings of the report of the integrated households survey in Ondo state as reported by previous authors [20-23].

Our study found that most respondents demonstrated a high level of awareness about COVID-19 and good knowledge of COVID-19 preventive measures. Previous studies in Nigeria have reported a high level of awareness and knowledge of COVID-19 among residents [19, 24]. Udomah et al, [25] in their study titled "knowledge and risk perception of Nigeria towards COVID-19" reported that 90.3% of their respondents had good knowledge about COVID-19. Also, Okon et al [26], in their study among residents of Makurdi, Benue state, Nigeria reported a very high proportion of their respondents demonstrating a good knowledge of COVID-19. The possible explanation for this finding

could be that most respondents in this study were educated and working-class citizens who could afford to access different forms of mass media or social media where information about the COVID-19 outbreak, its preventive measure and other public health advisory were regularly disseminated to the public by government public health authorities [26]. This is further reaffirmed by our finding that most respondents reported television, radio, internet/social media as their sources of information about COVID-19.

Our study shows high risk perceptions among the respondents. Respondents in this study agreed that obeying government lockdown policies, washing their hands regularly or using hand sanitizer, and using face masks in public places can prevent COVID-19 infection. Similar studies have reported high risk perceptions about COVID-19 among different groups of the population in other parts of Nigeria and the world [25-27].

Okon et al [26] reported a very high risk perception among their respondents in their assessment of the knowledge, risk perception and adherence to COVID-19 prevention advisory among police officers in Makurdi metropolis, Benue State, Nigeria. Also, Udomah et al [25] in their study on knowledge and risk perception of Nigerians towards COVID-19 reported a high risk perception among 57% of their respondents. Furthermore, Oyetunji et al [28] in their study on COVID-19-related risk perception, anxiety and protective behaviour among Nigerian adults reported that more than half (61.9%) of their respondents had high risk perceptions of COVID-19.

However, contrary to the findings in our study, Adenike et al [19] in their study "risk perception and community vulnerability to COVID-19 infection among residents in Osun state, Nigeria" reported a low risk perception among their respondents. The high risk perception reported among respondents in our study could be attributed to the risk communication interventions and efforts through different mass and social media channels implemented by the public health officials as a control strategy for COVID-19 in the state. All respondents in our study reported that they have heard about COVID-19 and its preventive measures either through radio jingles, television interactive programs, internet/social media, religious organizations, school, and hospital sensitization sessions.

Most importantly, more than half of the respondents reported they regularly use a face mask, wash their hands regularly with soap and water, or use hand sanitizers, which was in consonance with their high risk perception of COVID-19 infection. Individuals' behaviour toward safety measures have been linked to their level of the perceived risk of disease [29]. Adopting public health measures such as the use of a face mask in public areas and frequent hand sanitization can lead to successful control of air-borne infectious diseases such as COVID-19 [30].

In this study, we also found that occupation, religion, ethnic group, average family income, knowledge of COVID-19 and washing of hands with soap and water were significantly associated with risk perception of COVID-19 among our respondents. Respondents who were civil servants had a higher risk perception of COVID-19 infection than non-civil servants. This could be attributed to efforts by the government which includes training of civil servants, distribution of face mask and hand sanitizers, and instituting other infection prevention and control (IPC) measures within the civil service system to reduce the workplace transmission of COVID-19 among government-paid workers in the state. Respondents who were of the Yoruba ethnicity had a higher risk perception compared to other ethnic groups. This could be as a result that the major dialect of the state is Yoruba and most risk communication interventions were implemented using the local Yoruba dialect for easy acceptance and adoption by the local populace in the state. Furthermore, good knowledge of COVID-19 and its preventive measures was significantly associated with a high perception of the risk of COVID-19 infection among the respondents in this study. This finding from our study is consistent with other studies which reported a significant relationship between knowledge of infectious diseases and perceived disease risk [3, 19, 25, 27-28, 32-34].

The findings from this study implies that government-led COVID-19 preventive interventions in the state have had more impact among government paid workers and persons of Yoruba ethnicity. Hence, there is a need to evaluate the current risk communication strategies to target persons that are not government-paid workers, people of non-Yoruba ethnicity and other high-risk groups prone to COVID-19 infection in the state.

Limitations

The study has the following limitations. Firstly, there may be an information bias given some aspects of the collected data were self-reported. Also, the use of heads of household as respondents might have presented as a limitation as only one respondent per household was interviewed and this may not necessarily have answered the questions in the same way as other members of the same household. Another limitation of this study was the unavailability of updated statistics on the general demographic data of the study area to be able to ascertain the representativeness of our sample during the sampling process. However, the outcome of some recent community studies from the study area has shown a distribution in the general demographic profile that is consistent with the findings of our study [20].

In addition, social desirability bias might have occurred in some instances because respondents may respond to interview questions in a way that they believe is socially acceptable rather than being completely accurate. However, probing questions were asked to ensure correct responses where possible. Secondly, our study was cross-sectional design rather than longitudinal, which may lead us to be unable to estimate

changes in risk perception over time, making the relationship between variables and risk perception more tentative. However, the study can provide a reference for long-term study in the future and provide a theoretical basis for government health agencies to carry out effective prevention and control interventions for COVID-19.

Conclusion

Our study shows a high risk perception of COVID-19 infection among residents in Ondo State, Nigeria, which was associated with the frequency of preventive behaviors such as handwashing and the use of face mask in public gatherings. However, there were significant differences between ethnic groups, religious organizations, non-civil servants and COVID-19 knowledge levels. In view of this, we recommend intensified risk communication interventions targeting these groups to improve their risk perception and to boost health-protective behaviours towards COVID-19 infection to contain the ongoing outbreak.

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Competing interests

None declared.

Author's contributions

Author IEE. IA, AMA, ABS, ONE, AOT, FTO and FT conceived the study and statistical analysis plan. All authors contributed to the statistical analysis, interpretation of the results and writing of the first draft of the manuscript. All authors approved the final manuscript for publication.

Availability of data and materials

The datasets analyzed during the current study are available from the corresponding author on reasonable request.

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