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Perceptions of COVID-19 transmission risk and testing readiness in rural Southwest Nigeria



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ABSTRACT

Although community screening and testing have been recommended by the World Health Organization, the extent of readiness and the associated factors among rural populations remain unknown. We investigated the factors associated with perception of the COVID-19 transmission risk and readiness for testing in rural areas of Southwest Nigeria.

Using a multistage cluster sampling technique, cross-sectional data was collected from 922 adults aged 18 years and above who were resident in rural communities selected across three States in the Southwest region between June and August 2020. Descriptive statistics and binary logit models with robust standard errors were utilized for analysis.

Mean age of respondents was 37.0 (SD = 15.8) years; 58.6% female; 46.5% had secondary education; and most were traders (33.2%) and artisans (29.9%). Only 149 respondents (16.2%) had an accurate perception of COVID-19 transmission risk. Adjusted logit models showed that independent factors associated with accurate perception of COVID-19 transmission risk include: age 18&19 years (OR = 0.50, CI: 0.34–0.73); exposure to electronic media (OR = 1.84, CI: 1.07–3.18); and being an in-migrant (OR = 3.38, CI: 2.44–4.68). Less than one-third (28.8%) were willing to test for COVID-19. Severe fear of COVID-19 (OR = 3.99, CI: 1.36–11.74) was associated with willingness to undergo COVID-19 testing. Socio-demographic predictors of testing readiness included: male sex (OR = 1.51, CI: 1.36–1.68); traditional religion (OR = 2.81, CI: 1.05–7.53); and exposure to electronic media (OR = 1.31, CI: 1.06–1.62). Awareness campaigns need to be scaled up to improve perception and preparedness to test for COVID-19.

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Background

The outbreak of COVID-19 pandemic in December 2019 has affected every continent with some countries witnessing a second, and third upsurge in number of cases after an initial decline. As at November, 2020, globally, over 44 million have been infected, with 1,166,240 deaths resulting in a case fatality rate of 1.4% [1]. Though there was a lag in the number of cases in sub-Saharan Africa (SSA), the continent is not spared, and this has worsened the healthcare services in a setting with very weak health systems and other perennial epidemics such as Ebola and Lassa fever. With supports from diverse partners, African countries responded to the pandemic within the limits of available resources [2].

The first confirmed case of COVID-19 in Nigeria was reported in Lagos on February 27, 2020. All the 36 States and the Federal Capital Territory have been affected. Published data on the epidemiology of COVID-19 revealed that 66% of positive cases were asymptomatic and males, while age 30–39 years has the highest frequency, mortality was highest in age 60 years and above [3]. Efforts have been made by Federal and State governments with support from private partners to improve public awareness and knowledge of COVID-19 through campaigns on electronic and social media. Studies have reported good knowledge of symptoms of the infection [4,5]. Also, knowledge about the mode of transmission and prevention was high in Nigeria [6]. Some negative perceptions were also common [7]. It's important to note that many of these studies utilized social media platforms such as WhatsApp and Facebook to reach participants. Though, this is a commendable innovation in this unprecedented pandemic, selection bias cannot be ruled out because many people with low or no formal education and without smart phones would have been excluded.

Though the initial cases of COVID-19 in Nigeria was traced to returnees from abroad or their primary contacts, community transmission has been on the rise due to poor compliance with prevention guidelines [8]. For effective control of community transmission, the World Health Organization (WHO) has regarded COVID-19 diagnostic testing as a critical matter because it will help to comprehend its epidemiology so as to improve case management and control strategies [9]. Without adequate testing, further spread of the infection may be over-estimated thereby causing unnecessary apprehension among the citizenry [10].

Also, most of the literature on COVID-19 testing in Sub-Saharan Africa has focused on the gaps in testing infrastructure, supply-side factors and how to address them [11–13]. However, for successful control, community testing will depend on the demand-side factors. This is an aspect where the people become critical. To overcome the uncertainty that may ensue from these scenarios, community screening, and testing coupled with contact tracing and behavioural change interventions are necessary [14,15]. The Nigeria Centre for Disease Control and Prevention developed a robust COVID-19 testing strategy in compliance with WHO recommendations [16]. However, not much is known about readiness for COVID-19 testing by the populace. Acceptability or readiness among the people is important for the success of community testing programme and ultimate scale-up of prevention strategies. The rural population is critical because they often have poor or limited access to timely health information that is necessary for them to protect themselves [17]. Also, risky practices such as absence of physical distancing and lack of water for handwashing are common [8].

Therefore, this study aims to address the following research questions: (i) what are the predictors of perception of COVID-19 transmission risk in rural Southwest Nigeria?; (ii) what is the extent of readiness for COVID-19 testing?; (iii) what is the relationship between perception of transmission risk, and readiness for COVID-19 testing?

The analytical framework for this paper was motivated by the Health Belief Model (HBM) which has been applied for several health behavioural change interventions [18]. The main tenets of the HBM is that socio-demographic factors and perceptions about a disease are key factors that affect uptake of health action/behaviour [19]. The model has been applied extensively in HIV prevention [20,21] and control of non-communicable diseases such as cancer [22].

Methodology

Study design and setting

The study was a community-based cross-sectional survey. The study setting was rural areas of Southwest Nigeria. The study population comprised adult men and women aged 18 years and above. These were mostly artisans, traders and farmers.

Sample size

With 95% confidence and 5% precision, design effect of 1.5, a sample size of 768 was estimated to be sufficient to address the study objectives. Adjusting for 15% non-response, the final sample size was 904. Data was successfully collected from 922 respondents out of 950 approached giving a response rate of 97%

Sampling method

The cluster design used for demographic and health surveys [23] in Nigeria was adapted for this study. Out of the six states in Southwest Nigeria, three states namely Ogun, Oyo and Ekiti States were purposively selected because they have the lowest maternal and child health indices in the region. For administrative purposes, states in Nigeria are divided into Local Government Areas (LGAs). The LGAs in the selected States were stratified into rural and urban based on the population size

and availability of social infrastructural amenities [23]. In each state, one rural LGA was selected by random sampling. Four enumeration areas (EAs) were randomly selected from each LGA. Fifty households were selected by systematic sampling from each EA. Each primary sampling unit or EA has an average of 500 households. Therefore, the sampling interval was estimated as 10 (500/50). Thus, every tenth household was selected. Eligible adults (aged 18 years and above) in selected households were interviewed.

Study instrument and data collection

Data was collected using a structured questionnaire that comprised the following nine sections: Household characteristics; individual background characteristics; COVID-19 knowledge, perceptions, and preventive practices; Health state descriptions; subjective wellbeing and quality of life; adult healthcare utilization; social capital; lifestyle and physical measurement; and under-five children healthcare utilization. The questionnaire was administered by fieldworkers who were trained on ethical issues, field procedures and interview techniques by the team of investigators.

Before data collection commenced, advocacy visits were paid to opinion leaders at the study sites. These included the Primary Healthcare Coordinator, Community Health Officer, and community leaders. In selected households, basic information about household characteristics and demographics of members was collected from the household heads. Subsequently, one male and female aged at least 18 years were randomly selected for interview.

Data were collected between June and August 2020. Interviewers used face masks and hand sanitizers in compliance with COVID-19 prevention guidelines. Study data were collected and managed using Research Electronic Data Capture (REDCap) tools hosted at College of Medicine, University of Ibadan. REDCap is a secure, web-based software platform designed to support data capture for research studies, providing an intuitive interface for validated data capture; and automated export procedures for seamless data downloads to common statistical packages [24,25].

Study variables

The two outcome variables were perception of COVID-19 transmission risk (accurate or poor) and readiness for testing (Yes or No). Before dichotomization, the following four questions with “Yes” or “No” response were used to assess perception of transmission risk: “COVID-19 can be transmitted through contact with infected persons (ii) COVID-19 cannot be transmitted by somebody without symptoms; (iii) COVID-19 can be easily spread in crowded places; (iv) COVID-19 can be spread via public transport”. Correct response to all four questions was classified as “accurate perception”, otherwise participant was rated as having “poor” perception of transmission risks. The second outcome variable- COVID-19 testing readiness was categorized as “Yes” or “No” based on response to the question “Are you prepared to undergo COVID-19 test”.

Also, data was collected on perceived fear of COVID-19 infection with responses coded as “mild, moderate or severe”. Similarly, participants were asked to rate their risk of contracting the infection. This variable was categorized as “low, medium or high”.

Socio-demographic variables included: age group [$< = 19, 20-29, 30-39, 40-49, 50-59, > = 60$]; sex [male, female]; education [none, primary, secondary, higher]; marital status [never married, married/cohabiting, previously married]; ethnicity [Yoruba, Other tribes]; religion [Christianity, Islam, Tradition]; exposure to electronic media [Yes, No]; and migration status [in-migrant, non-migrant]. In-migrant are respondents that were not born in the study location but moved in and had lived in the community for at least 12 months. Household wealth index was derived by principal component analysis of certain items possessed by households [26]. Component scores were ranked and categorized into tertiles [poor average and rich].

Data analysis

Data were summarised using frequencies and percentages. Cross-tabulation was done to assess the relationship between socio-demographic characteristics and perception of COVID-19 transmission risks. Binary logistic regression models were fitted to identify the determinants of perception because it was a dichotomous outcome coded as good (1) or poor (0). Unadjusted and adjusted Odds Ratios (OR) were estimated with 95% Confidence Intervals (95% CI). In tandem with HBM framework, two groups of variables were explored to identify factors associated with readiness for COVID-19 testing. These were socio-demographic factors and COVID-19 perception.

The following models were fitted for COVID-19 testing readiness:

$$\text{Univariate model I : } y_i = \beta_0 + X \beta + \varepsilon_i$$

$$\text{Model II : } y_i = \beta_0 + X_1 \beta_1 + \varepsilon_i$$

$$\text{Model III : } y_i = \beta_0 + X_1 \beta_1 + X_2 \beta_2 + \varepsilon_i$$

Where $y_i = \log\left(\frac{p_i}{1-p_i}\right)$ is the probability of testing readiness by i th respondent. X_1 and X_2 represent COVID-19 perceptions and socio-demographic variables, respectively. β_0 is the intercept while β_1 and β_2 represent the coefficients for COVID-19 perception and socio-demographic characteristics, respectively. ε_i is the error term which was assumed to follow the binomial distribution.

Table 1
Background characteristics of rural dwellers, Southwest Nigeria, 2020.

Variables	Frequency	Percentage
Sex		
Male	382	41.4
Female	540	58.6
Age group (Years)		
18&19	61	6.6
20–29	281	30.5
30–39	257	27.9
40–49	158	17.1
> = 50	165	17.9
Education		
None	99	10.8
Primary	237	25.7
Secondary	429	46.5
Tertiary	157	17.0
Marital status		
Never married	163	17.7
Married/Cohabiting	672	72.9
Single/widowed/divorced	87	9.4
Ethnicity		
Yoruba	808	87.6
Non-Yoruba	114	12.4
Household wealth index		
Poor	308	33.4
Average	308	33.4
Rich	306	33.2
Religion		
Christianity	607	65.8
Islam	309	33.5
Traditional	6	0.7
Exposure to TV/Radio		
Yes	650	70.5
No	272	29.5
Migration status		
In-migrants	453	49.1
Non-migrants	469	50.9
Mobility (last 12 months)		
Yes	261	28.4
No	661	71.6

We fitted univariate models from which unadjusted ORs were estimated. Subsequently, we fitted model I for the perception factors and in model II added socio-demographic variables. The sandwich estimator was employed to adjust standard error for measures of effect to adequately account for correlation of observations within the same cluster [27]. Stata MP version 14 was used for analyses.

Ethical considerations

Ethical approval for the study was obtained from the University of Ibadan/University College Hospital Institutional Review Committee (approval no: UI/EC/19/0479) in Ibadan, Nigeria. Respondents provided written informed consent before they were interviewed. Participation was voluntary and no identifying information was collected; as such privacy and confidentiality of study participants were assured. This study did not pose any risk to the health of the participants, their environment, and relatives. Respondents were provided with face masks to enhance their compliance with COVID-19 prevention guidelines.

Results

Background characteristics

As shown in Table 1, there were 382 men (41.4%) and 540 women (58.6%) with age ranging from 18 to 101 years and mean of 37.0 (SD = 15.8) years. Two hundred and eighty-one respondents were aged 20–29 years (30.5%) while 165 (17.9%) were aged 50 years and above. Almost half had secondary school education (46.5%). Majority (72.9%) were married. About half (49.1%) were in-migrants (Table 1). Only 28.4% had travelled out of the community in the preceding 12 months. Data for South West Nigeria in the Nigeria Demographic and Health Surveys also showed that 53.7% were females while 7% was below 20 years, 58.4% were aged 20–39 years and 15.4% aged 50 years and above. Educational profile was pri-

Table 2
COVID-19 perceptions and readiness for testing in rural Southwest Nigeria, 2020.

Variables	Frequency	Percentage
COVID-19 cannot affect rural people		
Yes	460	49.9
No	462	50.1
COVID-19 can be transmitted via contacts with infected persons		
Yes	906	98.3
No	16	1.7
COVID-19 cannot be transmitted by somebody without symptoms		
Yes	757	82.1
No	165	17.9
COVID-19 can be spread in crowded places		
Yes	906	98.3
No	16	1.7
COVID-19 can be spread via public transport		
Yes	904	98.2
No	17	1.8
Overall perception of COVID-19 transmission risk		
Good	149	16.2
Poor	772	83.8
Fear of COVID-19 infection		
Mild	154	16.7
Moderate	411	44.6
Severe	356	38.7
Self-perceived risk of COVID-19 infection		
Low	190	20.6
Medium	599	65.1
High	132	14.3
Readiness for COVID-19 testing		
Yes	265	28.8
No	656	71.2

mary(24.9%), secondary(42.9%), and tertiary(13%) Singles and Married constituted 18 and 70%, respectively, while 9.2% were divorced/widowed [30]. The NDHS 2018 did not provide any data about migrant status.

Perceptions of COVID-19 transmission risk

As shown in Table 2, half (49.9%) of respondents believed that COVID-19 cannot affect rural dwellers. Almost all participants opined that COVID-19 can be spread through contacts with infected people (98.3%); crowded places (98.3%) and public transport (98.2%) while 17.9% affirmed that it cannot be transmitted by somebody without symptoms. A moderate and severe fear of COVID-19 was reported by 44.6% and 38.7% of participants, respectively. As regards self-perceived risk of COVID-19 infection, 65.1% and 14.3%, respectively, rated themselves as having medium and high risk.

Only 149 respondents (16.2%) had an accurate perception of COVID-19 transmission risks. Table 3 shows the perception according to different background characteristics. There was no much difference between the percentage of male (14.9%) and female (17.0%) with accurate perception. Unlike age 19 years or less (8.2%), age groups from 20 years and above have similar proportions of participants with accurate perception (e.g. 20–29 yrs and 40–49 yrs had 14.6%; 30–39 yrs had 19.5%). Respondents with secondary (15.2%) and post-secondary education (18.5%) were not much better than those with no formal education (20.2%). Similarly, the percentage of Christians (16.0%) and Muslims (16.8%) with accurate perception was similar. Respondents exposed to electronic media (18.9%) had accurate perception than those who did not (9.6%). Further, in-migrants (24.5%) had greater proportion with accurate perception compared to non-migrants (8.1%). Similarly, higher percentage of those who have ever travelled out of the community in the last 12 months had accurate perception of COVID-19 transmission risks (Yes - 22.6% vs No - 13.7%).

Unadjusted models for factors associated with perception of COVID-19 transmission risks are also presented in Table 3. Participants aged 18&19 years were less likely to have accurate perception (OR = 0.40, CI: 0.33–0.50) compared to those aged 50 years and above. Other age groups were not significantly different from those aged 50 and above in terms of COVID-19 transmission risk perception. Respondents who lived in households with average (OR = 1.68, CI: 0.96–2.95) and rich wealth tertile (OR = 1.73, CI: 0.61–4.89) were more likely than those in poor households to have accurate perception. Respondents who were exposed to electronic media were two times as likely as those without exposure to have accurate perception (OR = 2.21, CI: 1.32–3.69). In-migrants were 4 times as likely as non-migrants (OR = 3.68, CI: 2.56–5.30) to have accurate perception.

Adjusted ORs showed that the independent factors associated with a perception of COVID-19 transmission risks include age 18 and 19 years (OR = 0.50, CI: 0.34–0.73), exposure to electronic media (OR = 1.84, CI: 1.07–3.18), and being an in-migrant (OR = 3.38, CI: 2.44–4.68).

Table 3
Background characteristics and perception of COVID-19 transmission risk in rural Southwest Nigeria, 2020.

Variables (n = 922)		Perception of COVID-19 transmission risk		
Sex	Total	Accurate	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Male	382	57 (14.9)	0.85 (0.64–1.13)	-
Female	540	92 (17.0)	1.00	-
<i>Age group (Years)</i>				
18&19	61	5 (8.2)	0.40 (0.33–0.50)*	0.50 (0.34–0.73)*
20–29	281	41 (14.6)	0.77 (0.52–1.14)	0.65 (0.40–1.05)
30–39	257	50 (19.5)	1.09 (0.66–1.79)	0.84 (0.41–1.72)
40–49	158	23 (14.6)	0.77 (0.33–1.81)	0.59 (0.25–1.44)
>=50	165	30 (18.2)	1.00	1.00
<i>Education</i>				
None	99	20 (20.2)	1.00	-
Primary	237	35 (14.8)	0.68 (0.26–1.83)	-
Secondary	429	65 (15.2)	0.71 (0.34–1.46)	-
Tertiary	157	29 (18.5)	0.89 (0.43–1.88)	-
<i>Marital status</i>				
Never married	163	22 (13.5)	1.00	-
Married/Cohabiting	672	108 (16.1)	1.23 (0.93–1.61)	-
Widowed/Separated/Divorced	87	19 (21.8)	1.79 (0.78–4.11)	-
<i>Ethnicity</i>				
Yoruba	808	131 (16.2)	1.00	-
Non-Yoruba	114	18 (15.8)	0.97 (0.63–1.49)	-
<i>Household wealth index</i>				
Poor	308	36 (11.7)	1.00	1.00
Average	308	56 (18.2)	1.68 (0.96–2.95)	1.29 (0.67–2.47)
Rich	306	57 (18.6)	1.73 (0.61–4.89)	1.36 (0.52–3.58)
<i>Religion</i>				
Christianity	607	97 (16.0)	1.00	-
Islam	309	52 (16.8)	1.06 (0.91–1.24)	-
Traditional	6	0 (0.0)		
<i>Exposure to Media (TV/Radio)</i>				
Yes	650	123 (18.9)	2.21 (1.32–3.69)*	1.84 (1.07–3.18)*
No	272	26 (9.6)	1.00	1.00
<i>Migration status</i>				
In-migrants	453	111 (24.5)	3.68 (2.56–5.30)*	3.38 (2.44–4.68)*
Non-migrants	469	38 (8.1)	1.00	1.00
<i>Mobility (last 12 months)</i>				
Yes	261	59 (22.6)	1.85 (0.72–4.75)	-
No	661	90 (13.7)	1.00	-

* $p < 0.05$.

Readiness for COVID-19 testing

Less than one-third (28.8%) were ready for COVID-19 testing. Table 4 shows the distribution of COVID-19 testing readiness according to selected variables. As regards fear of COVID-19 infection, 48% of those with severe fear compared to 21.9% with moderate fear were ready for testing. A similar pattern was observed for self-perceived risk which shows that 48% and 20% of those who rated themselves as having a high and low chance, respectively, of contracting COVID-19 expressed readiness for testing.

More males (33.8%) than females (25.2%) were ready to undergo COVID-19 test while there was no much age differential apart from the youngest age group (≤ 19) who had the highest percentage (37.7%) while the older age groups ranged between 23.5% in age 20–29 to 31.9% in age 40–49 years. Similarly, there was no obvious difference in readiness for testing across educational attainment. The percentage ready for COVID-19 testing among previously married respondents (17.2%) (widowed, divorced, and separated) was lower than singles (32.5%) and currently married/cohabiting (27.4%). Readiness for testing was more common among respondents who were exposed to electronic media (Yes - 31.1% vs No - 23.3%). Similarly, in-migrants (32.2%) had higher proportions ready for COVID-19 testing than non-migrants (25.4%).

In the univariate models, respondents who held the view that COVID-19 cannot affect rural people were less likely to be ready for testing (OR = 0.61, CI: 0.42–0.87). In contrast, those with severe fear (OR = 3.67, CI: 1.58–8.53) and medium self-perceived risk were more likely to test. Males were 1.5 times as likely as females to be ready for COVID-19 testing (OR = 1.51, CI: 1.38–1.65). The likelihood of testing readiness was 50% lesser among previously married participants compared to the currently married (OR = 0.50, CI: 0.26–0.98). Those who were exposed to electronic media were more likely to be ready for testing compared to those not exposed (OR = 1.49, CI: 1.2 – 1.85). Similarly, in-migrants were 1.4 times as likely as non-migrants to be ready for COVID-19 testing (Table 4).

Model I (Table 4) shows the adjusted associations between perception and readiness for COVID-19 test. The only statistically significant factor was fear of COVID-19. Participants with severe fear were 4 times as likely as those with mild fear to be ready for COVID-19 test (OR = 3.68, CI: 1.28–10.62). In the final model, with further adjustment for socio-demographic

Table 4
Factors associated with COVID-19 testing readiness among rural dwellers in Southwest Nigeria, 2020.

Perceptions	COVID-19 testing readiness			
	Yes ^a : n (%)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	
COVID-19 cannot affect rural people			Model I	Model II
Yes	109 (23.7)	0.61 (0.42–0.87)*	0.79 (0.53–1.18)	0.85 (0.51–1.43)
No	156 (33.8)	1	1.0	1
<i>Knowledge of COVID-19 transmission risk</i>				
Poor	235 (30.4)	1	-	-
Good	30 (20.3)	0.58 (0.21–1.61)	-	-
<i>Fear of COVID-19 infection</i>				
Mild	71 (37.4)	1	1.0	1
Moderate	131 (21.9)	0.72 (0.29–1.81)	0.86 (0.34–2.16)	0.92 (0.36–2.36)
Severe	63 (47.7)	3.67 (1.58–8.53)*	3.68 (1.28–10.62)*	3.99 (1.36–11.74)*
<i>Self-perceived risk of COVID-19 infection</i>				
Low	31 (20.1)	1	1.0	1
Medium	63 (15.3)	0.47 (0.28–0.79)*	0.57 (0.31–1.02)	0.59 (0.51–1.42)
High	171 (48.0)	1.53 (0.68–3.43)	1.40 (0.72–2.72)	1.51 (0.81–2.83)
Background characteristics				
<i>Sex</i>				
Male	129 (33.8)	1.51 (1.38–1.65)*	-	1.51 (1.36–1.68)*
Female	136 (25.2)	1	-	1
<i>Age group (Years)</i>				
18&19	23 (37.7)	1.52 (0.47–4.91)	-	-
20–29	66 (23.5)	0.77 (0.54–1.11)	-	-
30–39	79 (30.7)	1.11 (0.82–1.51)	-	-
40–49	50 (31.9)	1.16 (0.78–1.74)	-	-
>=50	47 (28.5)	1.00	-	-
<i>Education</i>				
None	27 (27.3)	1	-	-
Primary	70 (30.0)	1.12 (0.79–1.59)	-	-
Secondary	121 (28.2)	1.05 (0.99–1.11)	-	-
Post-secondary	47 (29.9)	1.14 (0.92–1.40)	-	-
<i>Marital status</i>				
Never married	53 (32.5)	1.16 (0.72–1.86)	-	1.03 (0.68–1.54)
Married/Cohabiting	197 (29.4)	1	-	1
Previously married	15 (17.2)	0.50 (0.26–0.98)*	-	0.56 (0.26–1.22)
<i>Ethnicity</i>				
Yoruba	234 (29.0)	1	-	-
Non-Yoruba	31 (27.2)	0.91 (0.43–1.94)	-	-
<i>Household wealth index</i>				
Poor	85 (27.7)	1	-	-
Average	86 (27.9)	1.01 (0.84–1.21)	-	-
Rich	94 (30.7)	1.16 (0.87–1.54)	-	-
<i>Religion</i>				
Christianity	173 (28.6)	1	-	1
Islam	89 (28.8)	1.01 (0.78–1.32)	-	0.88 (0.59–1.32)
Traditional	3 (50.0)	2.50 (1.40–4.46)*	-	2.81 (1.05–7.53)*
<i>Exposure to Media (TV/Radio)</i>				
Yes	202 (31.1)	1.49 (1.20–1.85)*	-	1.31 (1.06–1.62)*
No	63 (23.3)	1	-	1
<i>Migration status</i>				
In-migrants	146 (32.2)	1.39 (1.06–1.84)*	-	1.31 (0.92–1.89)
Non-migrants	119 (25.4)	1	-	1
<i>Mobility (last 12 months)</i>				
Yes	78 (30.0)	1.07 (0.70–1.64)	-	-
No	187 (28.4)	1	-	-

* $p < 0.05$.

^a The totals in this column represent the no of participants who expressed willingness to undergo COVID-19 testing (265) but models were fitted to the total sample ($n = 922$).

and other background variables, severe fear (OR = 3.99, CI: 1.36–11.74) was independently associated with COVID-19 testing readiness. The key socio-demographic predictors of testing readiness included: male sex (OR = 1.49, CI: 1.19–1.86); traditional religion (OR = 2.81, CI: 1.05–7.53) and exposure to electronic media (OR = 1.31, CI: 1.06–1.89).

Discussion

This study aims to provide evidence on perception about COVID-19 transmission risks as well as readiness of a rural population for COVID-19 testing and identified some of the associated factors. Demographic characteristics of the respon-

dents showed a higher preponderance of females in reproductive age group, 20–39 years. In addition, majority had at least secondary education. This background profile is consistent with the demography of rural Southwest Nigeria as documented in different rounds of the Nigeria Demographic and Health Surveys [28–30]. Another feature of the study sample worth commenting upon was the percentage of in-migrants who constituted about 50% of the sample. This pattern is consistent with previous evidence that rural migration among Yorubas in southwest Nigeria is predominantly rural-rural and largely motivated by economic reasons [31,32].

Less than one-fifth was found to have accurate perception of COVID-19 risks. This is in sharp contrast to findings by some previous studies in Nigeria which showed that respondents had correct perception about COVID-19 [4,6,7]. As revealed by a scoping review [33], there are previous studies where perception has been found to be relatively good. In the study, papers published on COVID-19 knowledge, perceptions and preventive practices in sub-Saharan Africa between December 2019 and October 2020 were reviewed. Main findings showed relatively good knowledge about COVID-19 but average good perception and compliance with prevention guidelines. Most of the studies in the review were conducted among health workers or patients on admission at a health facility. This may explain the relatively average level of good perception and prevention compliance. This can be viewed as further extension of these previous efforts because it assessed the relationship between perception of transmission risks and readiness to undergo COVID-19 testing. Furthermore, the findings in our study may have differed from those of the scoping review and other previous studies in Nigeria for some reasons. First, the questions used to assess perception are often not the same. Secondly, in this study, we assessed perception of transmission risks unlike previous studies that focused on perception about symptoms. The third reason is that participants in most previous studies included undergraduate students, urban dwellers [7], social media and internet-savvy persons [6]. These categories of respondents were more likely to be better informed than the rural dwellers interviewed in our study. Our focus on rural population was deliberate so that the perception in this important group can be documented and serve as evidence-base for intervention programmes targeted at rural dwellers.

This study also reveals that age, exposure to media and being an in-migrant were significantly associated with an accurate perception of COVID-19 transmission risks. Although electronic media has been found to improve knowledge and perceptions [34–37], social media is also known to be a purveyor of misinformation [38,39]. Our finding about the role of electronic media is in tandem with existing studies on the usefulness of media for health promotion [36,40]. In our study context-rural areas, the commonest electronic media is the radio which was massively used for information dissemination during the early outbreak of the pandemic in Nigeria. This may explain the significant association between media exposure and accurate perception about COVID-19 in our study sample. Poor perception of COVID-19 transmission risks among the young people is surprising because younger people tend to be more knowledgeable due to better education and access to internet [7]. It is speculated that the better perception in the elderly may be because older people are at higher risks of COVID-19 complications hence they took more interest in information about the disease and thereby had a relatively more accurate perception about its transmission risks.

Migration status influenced perception of transmission risks. Usually, in-migrants have very strong socio-cultural networks and meetings where they share information to enhance their safety and security in their host communities [17]. Such networks may have provided fora for discussions on COVID-19 and how to avoid the infection. Also, in-migrants tend to follow current affairs through traditional media and disseminate any vital information among their kin. Further descriptive exploration of our data revealed that 75% of in-migrants have exposure to electronic media compared to 64% of non-migrants. Though this would have been controlled in the multivariable models, it implied that in-migrant had some other unobserved advantages that enhanced their more accurate perception.

Most of the rural populations were not ready for COVID-19 testing and this was associated with fear of COVID-19, male sex, religion, and media exposure. For a novel disease with so many misconceptions, a low level of testing readiness is expected. The factors associated with testing readiness aligned quite well with the Health Belief Model [18] which was the underlying theoretical framework for the analyses. The HBM theorized that “perceived threats” is a key factor in adoption of health behaviour/action [19]. Accordingly, our results showed that those with severe fear of COVID-19 infection were more likely to be ready for testing. These results agreed with the extant literature on motivations for testing in infectious diseases control and prevention [41,42].

Men were found to be more likely of readiness for COVID-19 test. This is encouraging because in the study setting, men are generally known to have poorer health seeking behaviour compared to women. It may also reflect the epidemiology of the disease in Nigeria which indicated that 66% of positive cases were males [3]. This is not to say that men are more susceptible to COVID-19 infections. Rather, they possibly have greater exposure to risks of infection because they often must go out in search of income and resources to cater for their families. Therefore, if men assessed their exposure to risks of infection and therefore had greater odds of testing readiness, then it is a good attitude that should be encouraged. Another possible explanation may be related perceived capability about the means of going for the test. For any form of test, people tend to believe they have to pay. Ability to pay will be stronger among men than women and this may also be a latent reason for greater likelihood for men to be ready for COVID-19 testing.

During data collection, we did not probe for reasons why rural residents were not ready for testing. This could have helped to unravel barriers and disincentives to testing and ultimately provide some clues on how such can be overcome. Given the reality that COVID-19 is just emerging and there is much to be understood from the social science and public health perspectives, these limitations can be easily tackled by future research on the subject matter. A key strength of this

study is the provision of evidence about perception of COVID-19 transmission risks and testing readiness in rural settings – a subgroup which most previous studies rarely covered.

Conclusions and implications of the findings

This study shows that perception of COVID-19 transmission risk is poor in rural areas of Southwest Nigeria. In addition, only about one fifth was willing to undergo COVID-19 testing. Some background characteristics such as gender, media exposure, and fear of COVID-19 were significantly associated with readiness for testing.

Although COVID-19 vaccine has been introduced, the current reality is that prevention efforts need to be sustained. This is a better approach because preventive behaviour adopted against COVID-19 would also be helpful to combat other emerging variants and re-emerging infectious diseases in the study setting. For instance, Lassa fever, monkey pox and cholera are threats to public health in the study areas. The effectiveness of prevention efforts will depend on accurate perception about transmission risks. Therefore, awareness campaigns need to be scaled up so that people can be adequately informed about transmission risks for COVID-19 and other infectious diseases.

Even though community screening and testing has been advocated for COVID-19 control, the rural population would need to be adequately sensitized so that they can present themselves when necessary. It is one thing for government and other stakeholders to make testing available, uptake by the rural population is another challenge that requires proper education and innovation. Lessons from HIV testing come readily to mind. Despite the availability of free testing, it took some time for voluntary testing to be common. Strategic behavioural change communication and other interventions deployed in the past can also be adapted for COVID-19 control and prevention.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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