Olojede *et. al.* Babcock Univ. Med. J.2024 7(2):98-107
https://doi.org/10.38029/babcockuniv.med.j..v7i2.402
eISSN: 2756-4657

RESEARCH ARTICLE OPEN ACCESS

An assessment of awareness, knowledge and perception of monkeypox (mpox) disease among internet users in Nigeria: a cross-sectional survey

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Submitted: 5th February 2024
Accepted: 10th August 2024
Published: 31st December 2024
ID: Orcid ID

Abstract
Objectives: This study aimed to assess knowledge and perception of mpox among internet users in Nigeria.
Methods: This was a cross-sectional survey guided by the health belief model (HBM). We assessed participants' knowledge of mpox in three domains (transmission, signs and symptoms, prevention and treatment) and perception based on five constructs of HBM (susceptibility, severity, benefit, barriers and self-efficacy). We used Mann-Whitney U tests to identify factors associated with perception.
Results: We recruited 277 participants. Most (90.6%) were aware of mpox and social media (39.8%) was the most popular source of information. Across Northern and Southern Nigeria, most respondents (87.7% and 86.7% respectively) identified contact with the body fluid of an infected person (84.9%) as the means of transmission and fever (80.9%) as the most common symptom. More than half of respondents (52.2%) in both regions had good knowledge scores (≥ mean score of 10). Overall, most respondents perceived mpox to be a serious disease (94.8%) that may require hospitalization (94.2%) but over half (58.9%) believed they were unlikely to be infected. We found no significant relationship between knowledge of mpox and respondents' demographic characteristics (like age, gender, ethnicity, marital status, religion, income and occupation). However, perceived benefits of adherence to mpox preventive and control strategies were significantly higher among Christian respondents (p=0.014) while perceived self-efficacy was higher among respondents from the North (p=0.049).
Conclusion: Awareness of mpox does not translate to adequate knowledge and risk perception. We recommend intensifying efforts on mpox risk communication through social media.

Keywords: Mpox, Internet, ocial media, Perception, Infectious disease, Knowledge

Plain English Summary

We conducted this research to evaluate what internet users in Nigeria think and know of mpox disease. We believe the result of the study may help in the response and management of infectious disease outbreaks in the future. We shared the study questionnaire across several social media platforms and 277 respondents were recruited across the country.

Our findings revealed that most people who participated in the study have heard about mpox before and they were able to identify the symptoms of the disease and how it spreads in the human population. Overall, about half of them had 'good knowledge' of the disease.

Furthermore, we found that most respondents believed mpox is a serious disease, but many think they cannot be infected. Also, respondents' knowledge of mpox was not affected by their socio-demographic characteristics. However, we found that Christians had a better perception of the benefits of adherence

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to mpox preventive and control strategies while northern respondents had a better perception of self-efficacy to adhere to these strategies.
Finally, we conclude that awareness of mpox does not translate to adequate knowledge and risk perception. We recommend intensifying efforts on mpox risk communication through social media and other new media platforms.

Background

Monkeypox, now mpox (1) is a zoonotic and potentially life-threatening viral (2) disease commonly occurring in central and western Africa (3, 4) but with varying disease manifestations. Historically, the West African clade of the virus, which is responsible for cases in Nigeria is associated with milder disease, fewer deaths and limited human-to-human transmission (5). The first known case of mpox in Nigeria was reported in the early 1970s and there were sporadic cases until 1978 (4, 5, 6). However, in 2017, mpox re-emerged in Nigeria in an outbreak considered the largest documented outbreak of the disease in Africa at the time (3, 5, 7). Despite empirical evidence indicating increased human-to-human transmission (3, 4, 5) and possible endemicity of the disease in Nigeria (5), public awareness and knowledge of mpox are poorly studied.

Until recently, available evidence suggests mpox is mainly transmitted via contact with the blood or body fluids of infected wild animals (3, 4) or persons (8). However, most reported cases in the 2022 outbreak of the disease were among men who have sex with men (8, 9), indicating a higher risk of infection in this population. In addition, susceptibility to the disease has increased in recent years due to increased human interaction with forest animals (via deforestation, urbanisation and increased loss of wildlife natural habitat) and reduced herd immunity to smallpox (3, 4, 10). Although smallpox vaccines offer protection against the mpox virus (11). Nigeria has a relatively young population (median age of 16.9 years in 2020 (12) most of whom may be unfamiliar or unexposed to smallpox (declared eradicated in 1980) (13) or its vaccine. This implies that entire households may be susceptible to mpox. This elevated risk of infection further underscores the need for population-level evidence to guide emergency preparedness and prevention of future outbreaks.

In July 2022, the World Health Organisation (WHO) declared the most recent mpox outbreak as a public health emergency of international concern (PHEIC) (14) following reports of human-to-human transmission in countries with no previous documented mpox transmission or direct/immediate epidemiological links to the west and central Africa where the virus is believed to be endemic (1, 14). Although the outbreak was declared over in May 2023, over 90,000 confirmed cases and 157 deaths were recorded in 115 countries as of September 2023, with Nigeria accounting for over 40% of cases and deaths in Africa (15). The WHO considers a single confirmed case of mpox an outbreak, however, diagnosing the infection can be difficult as it presents with symptoms similar to other infections and laboratory investigations require a polymerase chain reaction (PCR)(16) which may be inaccessible in countries with weak health systems like Nigeria. This indicates that the true burden of the disease during the most recent outbreak, especially in Nigeria and Africa may be unknown as cases may have been underreported.

Past studies on mpox have focussed majorly on its epidemiology and clinical investigation with less emphasis on population knowledge and risk perception(2, 4, 5, 10, 17). There is therefore dearth of evidence on the knowledge and risk perception of the mpox virus in the general population. Evidence suggests that internet access is growing in Nigeria. Of the estimated 220m population, more than 55% have access to the Internet and 14.3% (over 31 million people) are using social media (18). A recent study on COVID-19 in Nigeria identified social media as a source of misinformation about the virus and the vaccine (19), yet, there have been few studies exploring the perception of the mpox virus among the general online community. Therefore, this paper presents findings on the level of awareness, knowledge and perception of mpox among Nigerians with access to the internet and social media.

Materials and methods

Study design

This was a cross-sectional study conducted online among internet users based in Nigeria. We conducted this study between January and August 2023.

Study setting

Nigeria is the most populous black nation in the world (20) with an estimated population of 213 million and population growth of 2.4% per annum as of 2021 (21). Nigeria has more than 300 culturally distinct ethnic groups across its six geopolitical zones. The major ethnic groups by population are Hausa/Fulani (predominantly in the North), Yoruba and Igbo (both occupying the southern parts of the country. Although internet penetration in Nigeria is reported to be slightly above 50%, (18, 22) about 109million people in

the country have access to the internet and 33million people use social media (23).

Study population
The study targeted all internet users who were aged 18 and above at the start of data collection and were based in Nigeria during the data collection period. Respondents were conveniently selected via an open survey. We focused on internet respondents because it is believed that this group of individuals has access to a wide range of information and misinformation through social media and other electronic outlets.

Sample size
We calculated sample size based on the formula for estimating a proportion: $n=Z\alpha^2 (p*(1-p)/d^2(23)$ where p (the level of awareness of mpox in Nigeria is taken as 0.92) (24). After adjusting for a 10% minimum non-response rate, we have a total minimum sample size of 126.

Data collection procedure
This online survey adopted a previously validated and pre-tested tool used by the researchers to obtain face-to-face information from community members and primary healthcare workers in three Nigerian states (Jigawa, Lagos and Oyo states) (25). The tool is a structured questionnaire developed using existing literature and the health belief model (HBM) as the conceptual framework (6, 16, 26). The model has six (6) key constructs (perceived susceptibility, perceived severity, perceived benefits, perceived barriers, perceived self-efficacy and cues to action). These constructs assess an individual's perceptions of the threats posed by a condition (susceptibility and severity) and the benefits of avoiding the threats. The model also considers factors that influence the decision to act in a way to avoid the threats. These are barriers, cues to action and confidence in individual ability to act (self-efficacy) (27).
The online questionnaire contains information on respondent's sociodemographic characteristics, knowledge and perception of Mpox. The adapted tool was converted into a web-based form using Google Forms and was circulated among research team members to ascertain face and content validity. Identified errors and discrepancies were rectified before data collection commenced. We used Facebook, Twitter (now X) and WhatsApp to reach eligible respondents throughout 3months for data collection.
A secure link to the questionnaire was shared widely across social media platforms and survey administration was self-administered. To ensure completeness, all questions were made mandatory but there were options for 'don't know' where applicable. We required respondents' email addresses during data collection to limit responses to one per respondent, but these were redacted and were not included in the dataset for final analysis. The link to the questionnaire was deactivated when the target sample size was reached.

Data management and analysis
We collected survey data on Google Drive and analyzed it in Stata 14. We measured knowledge by assigning 1 point to each correct answer (maximum score of 18 and mean score of 9), then categorized respondents as having "good knowledge" if they scored ≥9 or "poor knowledge" if they scored <9. We used descriptive and inferential statistics (chi-square and logistic regression) to examine the outcomes and their associations with sociodemographic variables. We also assessed the perception of mpox using the Health Belief Model (HBM), a framework that explains health-related behaviours based on six constructs: perceived susceptibility, severity, benefits and barriers to action, self-efficacy and cues to action (26). We asked questions under each construct using a 3-point Likert scale and scored 1 point for each response that aligned with the construct. We then computed the aggregate score for each construct and used the Mann-Whitney U test to identify associated factors.

Results
Participants' characteristics and awareness of mpox
A total of 283 responses were received from different parts of the country, stratified broadly into Northern and Southern Nigeria for clarity and simplicity. However, responses from 277 participants were included in the final analysis (Figure 1).

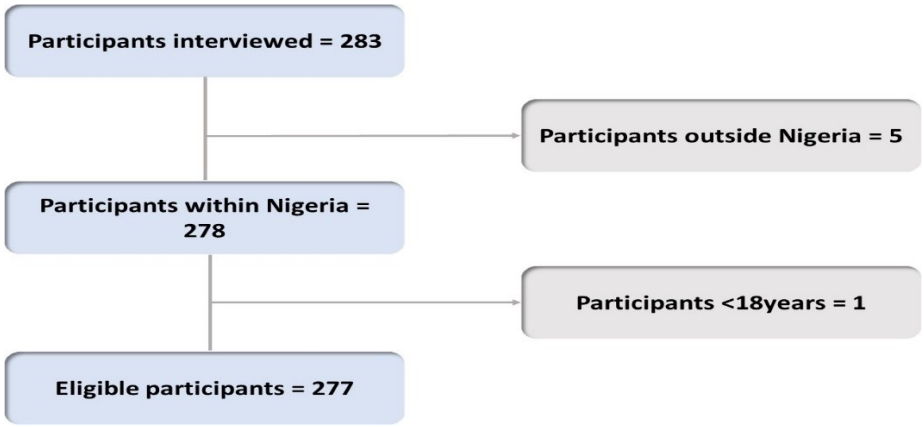

Figure 1: Participant's inclusion in the study

Respondents' socio-demographic characteristics are presented in Table 1 below. About two-thirds of the respondents (65.4%) were aged 18-29 years (70.1% and 63.2% for North and South respectively) and more than half (51.3%) were female. While the majority of respondents in both regions have tertiary-level education (72.9% and 88.5% for North and South regions, respectively), just about half (50.6% and 57.3% for North and South regions respectively) of the respondents earned up to the national minimum wage of ₦30,000 (28) (USD38.22 as of August 2023) (29). Overall, more than two-thirds (67.9%) of respondents were of Yoruba ethnicity, however, the predominant ethnic identity differed between the North and South. While the majority of respondents from the South were Yoruba (88%), most respondents from the North (77.6%) were Hausa/Fulani. Similarly, more than two-thirds of respondents (68.7%) were Christians, but Islam was the dominant religion in the North (69.4% of respondents) while Christianity was more common in the South (85.8% of respondents). In both regions, most of the respondents (85.9% and 92.7% for the North and South regions respectively) reported being aware of mpox and social media was reported to be the most popular source of mpox information (35.6% and 41.6% for North and South regions respectively). More respondents from the North (28.8% compared to 12.4% from the South) reported healthcare workers as their major source of information about mpox.

Table 1: Respondents' Characteristics and awareness of monkeypox (N= 277)

Respondent variables		North N (%)	South N (%)	Total N (%)
Total		85 (30.7)	192 (69.3)	277 (100.0)
Respondent Age*	18-29 years	54 (70.1)	103 (63.2)	157 (65.4)
	30-60 years	23 (29.9)	60 (36.8)	83 (34.6)
Highest Level of Education	Below tertiary	23 (27.1)	22 (11.5)	45 (16.3)
	Tertiary & above	62 (72.9)	170 (88.5)	232 (83.7)
Respondent ethnicity	Yoruba	19 (22.4)	169 (88.0)	188 (67.9)
	Non-Yoruba	66 (77.6)	23 (12.0)	89 (32.1)
Marital status	Never married	54 (63.5)	105 (54.7)	159 (57.4)
	Ever married	31 (36.5)	87 (45.3)	118 (42.6)
Respondent religion**	Christianity	26 (30.6)	163 (85.8)	189 (68.7)
	Islam	59 (69.4)	27 (14.2)	86 (31.3)
Gender	Male	34 (40.0)	101 (52.6)	135 (48.7)
	Female	51 (60.0)	91 (47.4)	142 (51.3)
Occupation	Skilled labour	9 (10.6)	19 (9.9)	28 (10.1)
	Business owner	18 (21.2)	36 (18.8)	54 (19.5)
	Professional	40 (47.1)	98 (51.0)	138 (49.8)
	Not working	18 (21.1)	39 (20.3)	57 (20.6)
Average Monthly Income	Less than 30,000	42 (49.4)	82 (42.7)	124 (44.8)
	30,000 and above	43 (50.6)	110 (57.3)	153 (55.2)

	Yes	73 (85.9)	178 (92.7)	251 (90.6)
Awareness of monkeypox	No	12 (14.1)	14 (7.3)	26 (9.4)
		n =73	n=178	n=251
	Radio/Television/News	13 (17.8)	42 (23.6)	55 (21.9)
Sources of information	Social media	26 (35.6)	74 (41.6)	100 (39.8)
	Internet search	10 (13.7)	27 (15.2)	37 (14.7)
	Health worker	21 (28.8)	22 (12.4)	43 (17.1)
	Others	3 (4.1)	13 (7.3)	16 (6.4)

*Missing respondent age (n=37); ** Missing respondent religion (n=2)

Knowledge of mpox among the respondents

Knowledge of mpox was similar in both regions. Contact with body fluids of an infected person was the most common means of mpox transmission identified by respondents in both regions (87.7% and 86.7% for the North and South regions respectively) while fever was the most common sign identified (84.9% and 80.9% in North and South regions respectively). Rashes were identified by 80.8% of respondents in the North whereas, 67.9% of respondents in the South reported rashes as a sign of mpox. Following healthcare workers' advice was the most common prevention and treatment method identified by respondents (66/73, 90.4% in the North and 172/178, 96.6% in the South), only a few (38/251, 15.1%) reported mpox may resolve spontaneously. Supplemental Table 1 presents respondents' knowledge of mpox in greater detail.

Respondents from the North had higher scores for each of the knowledge categories and in the overall score compared to their southern counterparts (Table 2). Overall, 45/85 (52.9%) of respondents in the North and 95/192 (49.5%) of respondents in the South had good knowledge scores (mean score ≥ 10) (p=0.595). Logistic regression showed no significant relationship between respondents' knowledge of mpox and their sociodemographic characteristics while adjusting for education and region (Supplemental Table 2).

Table 2: Respondents' mean knowledge scores by region

Knowledge scores	North Mean (SD)	South Mean (SD)	Total Mean (SD)	P-value
Knowledge of transmission (maximum possible score = 6)	3.26 (1.8106)	2.97 (1.7138)	3.05(1.7436)	
Knowledge of signs and symptoms (maximum possible score = 5)	3.09 (1.3140)	3.03 (1.4178)	3.05(1.3861)	
Knowledge of prevention and treatment (maximum possible score = 7)	3.36 (1.2964)	3.23 (1.2248)	3.27(1.2451)	
Overall, Knowledge of monkeypox (maximum possible score =18)	9.72 (3.6940)	9.24 (3.4531)	9.38(3.5243)	
	North, n (%)	South, n (%)	Total, N(%)	
Poor Knowledge	40 (47.1)	97 (50.5)	137 (49.5)	
Good Knowledge	45 (52.9)	95 (49.5)	140 (50.5)	p=0.595

Respondent's perception of mpox

The perception of respondents regarding mpox is presented in Supplementary Table 3. A high proportion of the respondents (69; 94.5% in the North and 156; 87.6% in the South) believed they are not immune against the virus but about 60% in both regions [41/73 (56.2%) from the North and 107/178(60.1%) from the South] also indicated that they are unlikely to contract it or die from it [43/73 (58.9%) from the North and 105/178 (59.0%) from the South]. Most of the respondents (94.8%) believed mpox is a serious disease, and that mpox may require hospitalization (94.2%) and 88.8% of the respondents felt it could stop their usual daily activities. Approximately 41.1% did not believe mpox infection can lead to death, while 97.2% believed their family would be safer if they protected themselves from mpox. Most respondents in the northern (86.3%) and southern (86.5%) regions identified stigmatisation as the major barrier to adhering to recommended preventive protocols.

As shown in Table 3 below, the perceived benefits of adherence to mpox preventive and control strategies were significantly higher among Christians (p=0.014) but perceived self-efficacy was higher among northern respondents (p=0.049).

Table 3: Association between perception and selected respondents' characteristics (N= 251)

Respondent variables		Perception of Susceptibility			
		Mean	±SD	Mean ranking	Index statistics
Region	North	5.49	1.93	135.09	z = 1.284
	South	5.11	2.04	122.27	p = 0.199
Highest Level of Education	Below tertiary	5.47	2.10	135.47	z = 0.855
	Tertiary & above	5.18	1.99	124.41	p = 0.392
Respondent religion	Christianity	5.17	2.00	122.5	z = -0.851
	Islam	5.39	2.05	130.91	p = 0.394
Gender	Male	5.28	1.99	127.83	z = -0.396
	Female	5.17	2.04	124.23	p = 0.691
Respondent variables		Perception of Severity			
		Mean	±SD	Mean ranking	Index statistics
Region	North	5.16	0.85	121.04	z = -0.747
	South	5.14	1.23	128.03	p = 0.455
Highest Level of Education	Below tertiary	5.05	1.26	123.20	z = -0.269
	Tertiary & above	5.14	1.12	126.47	p = 0.788
Respondent religion	Christianity	5.08	1.20	123.13	z = -0.678
	Islam	5.26	0.91	129.4	p = 0.497
Gender	Male	5.15	1.21	130.26	z = -0.983
	Female	5.10	1.05	121.91	p = 0.325
Respondent variables		Perceived benefits of adherence to mpox preventive and control strategies			
		Mean	±SD	Mean ranking	Index statistics
Region	North	0.94	0.23	122.62	z = -1.655
	South	0.98	0.13	127.38	p= 0.098
Highest Level of Education	Below tertiary	1	0	129.5	z = 1.096
	Tertiary & above	0.96	0.18	125.41	p = 0.273
Respondent religion	Christianity	0.98	0.11	127.07	z = 2.444
	Islam	0.93	0.25	120.08	p = 0.014
Gender	Male	0.96	0.20	124.39	z = 1.201
	Female	0.98	0.12	127.53	p = 0.229
Respondent variables		Perceived barriers to adherence to mpox preventive and control strategies			
		Mean	±SD	Mean ranking	Index statistics
Region	North	1.53	0.72	133.14	z = 1.076
	South	1.46	0.82	123.07	p=0.282
Highest Level of Education	Below tertiary	1.66	0.79	142.01	z = 1.542
	Tertiary & above	1.45	0.79	123.31	p = 0.123
Respondent religion	Christianity	1.42	0.79	120.13	z = -1.771
	Islam	1.59	0.79	136.51	p = 0.076
Gender	Male	1.48	0.80	125.0	z = 0.231
	Female	1.49	0.79	126.96	p = 0.817
Respondents' variables		Perceived self-efficacy towards mpox preventive and control strategies			
		Mean	±SD	Mean ranking	Index statistics
Region	North	1.90	0.29	135.11	z = 1.967
	South	1.78	0.45	122.26	p=0.049
Highest Level of Education	Below tertiary	1.86	0.42	132.64	z = 0.916
	Tertiary & above	1.81	0.41	124.89	p = 0.359
Respondent religion	Christianity	1.81	0.43	125.25	z = 0.133
	Islam	1.82	0.38	124.39	p = 0.893
Gender	Male	1.80	0.42	123.64	z = 0.779
	Female	1.83	0.41	128.26	p = 0.435

Discussion

Recent infectious disease outbreaks, notably COVID-19 and mpox, along with increasing reliance on the internet and social media as primary sources of health information, have underscored the need for an assessment of risk perception regarding infections among online respondents. In this study, we assessed the levels of awareness, knowledge and risk perception towards mpox among online

respondents in the Northern and Southern parts of Nigeria. We investigated the links between respondents' socio-demographic characteristics and their knowledge and risk perception of mpox. Despite a high level of awareness across regions, we found that risk perception was poor among the respondents. In addition, we observed differences in the signs of mpox identified by the respondents.

Our findings underscore the power of news media, particularly social media in creating awareness about public health issues and its limitation in creating adequate knowledge and positive perception among its users. Social media has previously been employed or viewed as a powerful health communication tool to create awareness (30, 31) due to its ability to remove barriers that naturally impede access to health information and resources (32). It is effective in creating awareness for cancer (33), mental health conditions (31) as well as humanitarian and public health emergencies (30). However, the impact of this awareness on actual behaviour change or positive health outcomes is negligible or insignificant in many studies (31, 34). Moreover, Hartley et. al. (35) reported that social media, concerning the COVID-19 pandemic, have the potential to compromise the efficacy of evidence-based interventions through misinformation and fake news (35). Similarly, Oyebanji *et. al.* (36) reported media reporting of the 2017 mpox outbreak was mostly sensationalised, leading to increased anxiety in the population (36). Internet searches and social media accounted for more than 50% of the most frequently used sources for health information in our study, yet perception and knowledge levels were inadequate. Other scholars have reported high levels of awareness in studies where respondents reported social media as their most frequently used information source (14, 37, 38). However, respondents who obtained information from family, friends and the NCDC websites have been reported to be more likely to have adequate knowledge and maintain a positive perception of mpox (14). These findings and ours underscore the importance of official government/public health channels as reliable sources of health information and the need for the government agency to ramp up public awareness programmes in its emergency response to infectious disease outbreaks. However, more implementation research is needed to harness the use of social media to improve health knowledge and risk perception during outbreaks.

Although, most of the respondents in our study acknowledged their lack of immunity to mpox and considered it a serious disease that may require hospitalization, more than half did not consider themselves susceptible to the virus. About 40% of respondents in our study did not perceive mpox as a fatal infection. While this is expectedly higher than the 27.4% reported by AbdulMumin et. al. (39) among healthcare workers in Southwest Nigeria (39). It is in congruence with the 48.7% that disagreed mpox is a dangerous and virulence disease as reported by Temsah et. al (40). Despite the majority acknowledging their lack of immunity to mpox, about 60% of participants in our study did not consider themselves susceptible to the virus. This indicates the subjectivity of risk perception due to individuals' characteristics, and the wider sociocultural systems influence how risks are perceived (41, 42). Thus, a better understanding of health risks may not necessarily lead to a uniform response or perception of such risks (41).

A study on mpox in Saudi Arabia found that respondents were more worried about COVID-19 than mpox (40). This suggests that mpox risk perception may have been affected by the lingering COVID-19 pandemic, which respondents may consider more severe. In addition, before the 2022 outbreak, available evidence suggests that the incidence of mpox infection is more common in rural areas (2, 3). Thus, most respondents in this online study, who are more likely to be urban dwellers, may have minimal exposure to mpox infection. This would explain the fact that an individual's perception of risk is personal and experiential (42). Furthermore, low-risk perception may be an expression of optimism (42), faith-based invulnerability or political disposition, as has been reported for HIV and COVID-19 infections (43, 44), or a reflection of respondents' self-efficacy in adhering to recommended preventive protocols, as evidenced in our study.

Our study found a statistically significant better perception of self-efficacy towards mpox prevention and control strategies among northern respondents. This agrees with Awoyomi *et. al.*'s (14). findings that the positive perception of mpox was higher among respondents in Northwest Nigeria (14). However, other scholars have reported significant associations between mpox perception and socio-demographic characteristics (such as age, level of education, years of experience (for healthcare workers), tribe and average monthly income (37, 39)) that were not found significant in our study. As these studies were conducted among healthcare workers and stakeholders in the health sector, more in-depth knowledge of the disease among the respondents might have also influenced perception. Therefore, our findings may be a better indication of mpox perception within the

general population, but this may require further exploration in future studies.

Limitations
This study has some limitations. Being an online survey, researchers had no control over participant inclusion. Secondly, respondents who did not have accounts with any of the online platforms the form was deployed to may not have access to participate in the study, therefore generalisability of this study is limited. Nevertheless, we had good coverage from different regions in Nigeria.

Conclusion
Social media is a source of awareness about mpox but there is a need for deliberate actions to harness its potential to improve users' knowledge and perception of mpox in Nigeria. Relevant public health agencies in Nigeria such as the NCDC should increase the use of social media in risk communication and information dissemination about mpox.

List of Abbreviations
COVID-19: Coronavirus Disease
HBM: Health Belief Model
Mpox: monkeypox
NCDC: Nigeria Centre for Disease Control
PCR: Polymerase chain reaction
PHEIC: Public Health Emergency of International Concern
WHO: World Health Organization

Declarations
Ethical approval and consent to participate
Before the commencement of the study, approvals were sought and obtained from the Oyo State Ministry of Health (Ref. No. AD13/479/44533A), Jigawa State Ministry of Health (JGHREC/2022/110), and Lagos State University teaching hospital ethics committee (REG. NO. NHREC04/04/2008.

Consent for publication
All the authors gave consent for the publication of the work under the Creative Commons Attribution- Non-Commercial 4.0 license.

Availability of data and materials
The data and materials associated with this research will be made available by the corresponding author upon reasonable request.

Competing interests
The authors declare that they have no competing interests.

Funding
Nil.

Author contributions
BAA, OOE and SAA conceived and designed the study. All authors were involved in data collection, and BDA and SAA were responsible for data analysis. OOE, with inputs from BAA and BDA, developed the first draft of the manuscript. OOE and BAA were responsible for the intellectual content of the manuscript and the authors approved the final draft of the manuscript.

Acknowledgement
Not applicable.

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