Original Article

Perceived Risk and Susceptibility to COVID-19 among Nurses: A Cross-sectional Study in the Early Phase of the Pandemic

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Abstract
Background: Widespread misconceptions about COVID-19 outbreak pose great challenges to control of the pandemic in Nigeria. Risk and susceptibility perception is an important step towards control and adoption of effective preventive measures especially in the early phase of the pandemic among nurses who are at the vanguard of preventive and promotive health care.
Objectives: This study assessed knowledge and perception about COVID-19, examined perceived risk and susceptibility to COVID-19 among nurses in southwest Nigeria.
Methodology: Study is a web-based cross-sectional study, conducted among nurses in southwest Nigeria during the month of May, 2020 during the early phase of COVID-19 outbreak. A 25-item questionnaire adapted from the World Health Organization's course guideline on emerging respiratory viruses and Effective Communication in Outbreak Management, ECOM's standard questionnaire on risk perception of an infectious disease outbreak was distributed to nurses through Google form using snowballing sampling technique. Data from 376 nurses was analyzed at univariate, bivariate and multivariate levels with significance taken at $p<0.05$.
Results: Findings showed that 91% **o**f the nurses had good knowledge about covid-19, 96.3% perceived COVID-19 as severe and highly infectious, 92.3% perceived themselves to be highly susceptible and at high risk for COVID-19, 94.4% of the nurses had high self-efficacy towards preventive measures. Regression analysis revealed significant association between highest level of education and nurses' knowledge about COVID-19 (p=0.002, OR=12.34, CI=2.52-60.42). Age (p=0.045, OR=0.07, CI=0.05-1.06), years of working experience (p=0.001, OR=0.004, CI=0.001-0.12), highest level of education (p=0.003, OR=0.06, CI=0.01-0.36), area of practice (p=0.01, OR=13.25, CI=1.85-95.17) and knowledge about COVID-19 (p=0.003, OR=26.17, CI=3.11-22.09) significantly influenced nurses' perceived risk for COVID-19.
Conclusion: Study concluded that advocacy towards control of highly infectious diseases such as COVID-19 should consider improvement in nurses' knowledge and level of education in various areas of nursing discipline and specialties.

Keywords: Nurses; Perceived risk; Perceived susceptibility; COVID-19; **Nigeria**

Introduction

A significant shift in the global record of infectious disease outbreak was reported towards the end of year 2019 when the whole world experienced an outbreak of a highly infectious disease named Coronavirus disease (COVID-19); an acute, occasionally severe, respiratory infection caused by a novel

coronavirus SARS-CoV2 (Cennimo & Bergman, 2020). This viral infection had its distinctive characteristics different from other members of the coronavirus family such as MERS-CoV which was discovered in 2012 as the cause of Middle East respiratory syndrome (MERS) and SARS-CoV acknowledged in 2003 as the cause of an outbreak of severe acute respiratory syndrome (SARS) that began in China near the end of 2002 (Tesini, 2020).

COVID-19 outbreak was first discovered in Wuhan, China, on December 31, 2019 and first reported in Africa in Egypt on February 14, 2020 (Achoki et al., 2020). The incubation period ranges between 5-14 days and mode of transmission could be through animal-to-human or human-to-human contacts. The virus could also be transmitted through droplets or faeco-oral means, thus making everybody in both developed and underdeveloped countries to be vulnerable (Backer et al., 2020).

Most individuals infected with the COVID-19 virus manifested mild to moderate respiratory symptoms and subsequently recover without any special medical management. Elderly individuals and those with certain medical problems like cardiovascular diseases diabetes, chronic respiratory diseases such as asthma and cancer were more at risk of developing serious forms of illness from COVID-19 (World Health Organization (WHO), 2020).

Virtually all nations of the world recorded unprecedented surge in the outbreak of the respiratory disease and in March 11, 2020, the WHO declared COVID-19 a global pandemic (World Health Organization (WHO), 2020). In the early months of the pandemic, global record of confirmed cases stood at 6,513,301 in more than 188 countries with the United State of America recording over 2 million cases making the country the world epicenter for COVID-19 while global record of deaths from COVID-19 as at the time of this study was 386,091 (World Health Organization, 2020).

Data available in Africa as at 21st October, 2020 showed that the number COVID-19 recorded cases was about 1.2 million and approximately 28,000 deaths with South Africa accounting for about 46% of recorded deaths. This was followed by Ethiopia with 14%, Algeria, 12% while Kenya accounted for 12% (World Health Organization, 2020). The WHO update further reported decrease of about 20% in the incidence of new cases recorded in several countries such as Botswana, Benin, Central African Republic, Congo, Cameroon, Cote d'Ivoire, Equatorial Guinea, Gambia, Gabon and Liberia. In Nigeria, confirmed cases and deaths from COVID-19 as at October, 2020 was about 61,000 with 1,129 deaths (Nigeria Centre for Disease Control (NCDC), 2020).

As at the time of this study, COVID-19 has no identifiable pre-immunity, effective preventive immunization and definitive management thus constituting a serious global public health emergency (Achoki et al., 2020), though several scientific researches were still ongoing. As a result of several challenges facing the control of the pandemic, the WHO, Centre for Disease Control (CDC) and Nigeria Centre for Disease Control (NCDC) (Nigeria Centre for Disease Control (NCDC), 2020) issued guidelines for the prevention and control of COVID-19 to all citizens of the country: these guidelines include regular and thorough hand hygiene either with an alcohol-based hand sanitizer or with soap and water, maintenance of physical and social distancing, avoidance of crowded places, avoid touching eyes, nose and mouth indiscriminately, maintaining respiratory hygiene (covering mouths and noses with bent elbow or tissue when coughing or sneezing), staying at home and self-isolate even with minor symptoms such as cough, headache, mild fever, until recovery and seeking medical care when develop fever, cough and difficulty breathing. All of these have been suggested to help reduce the chances of being infected or transmitting the infectious disease (WHO, 2020). Applying preventive measures are the most life-saving intervention in the control COVID-19 (Bhagavathula et al., 2020).

Furthermore, the World Health Organization recognized the important roles of the health care workers during this pandemic and have also documented that nurses and midwives account for nearly 50% of this health workers worldwide at the frontline of the health care system retorting to both epidemics and

pandemics. Similarly nurses are usually the first and sometimes the only health professional that people have direct contact with in all health care settings delivering direct patient-centered care in close physical proximity (World Health Organization (WHO), 2022). The above were in consistence with the declaration of International Council of Nurses (ICN) who established that nursing involves promotion of health, prevention of illness, and the care of ill, disabled and dying people (International Council of Nurses (ICN), 2023). This inevitably role places nurses at high risk of contracting any infection especially during this covid-19 pandemic. Studies have revealed that over 600 nurses globally have died from COVID-19 and about 230,000 health care workers have contracted the virus (International Council of Nurses (ICN), 2023).

In the first six months of the early phase of the pandemic in Nigeria, an estimated 1080 nurses have been quarantined sequel to exposure or contact with infected persons. Out of 469 nurses that have been are screened or tested, 90 nurses were positive, 2 deaths were recorded while provision of appropriate personal protective equipment (PPE) was at 54% (Ball et al., 2022; Mba et al., 2021). Initial studies associated with COVID-19 shows that the rate of infection with COVID-19 among health care professionals may even be more extensive given the fact that an infected health worker is capable of transmitting the infection at a higher rate (Huang et al., 2020; Theofanidis & Fountouki, 2021). Studies have however, suggested that preventive measures such as, regular hand hygiene with soap and water or alcohol based hand sanitizer, coughing into tissue or elbow, self-isolation when ill or when in contact with suspected individual, maintenance of physical and social distancing and encouragement of personal hygiene are effective preventive measures.

Risk perception is an important step towards control of a pandemic while susceptibility, defined as the possibility of an individual to experience a health risk is additionally vital phenomenon towards the adoption of effective preventive measures (El-toukhy, 2015). Widespread misbelieves and misconceptions in some quarters in Nigeria about the COVID-19 pandemic coupled with perceived low risk for COVID-19 posed major challenges to fight against the pandemic. The above underscored the relevance and application of Health Belief Model (Hochbaum, 1958) as an essential framework as applied in this study towards positive behavior change in the control of the COVID-19 pandemic. This model predicts the interplay between an individual's belief in a threat of an illness (perceived susceptibility), severity of the disease (perceived severity), the person's belief in the effectiveness of the recommended health behavior (perceived benefits), cue to action which is the stimulus needed to trigger a decision-making process to accept a recommended health action. Other construct of the model include self-efficacy which refers to the level of a person's confidence in his or her ability to successfully perform a behavior (Hochbaum, 1958). The theory proposes that an individual's course of action often depends on the person's perceptions about susceptibility, self-efficacy towards adopting preventive behavior, perceived benefits and barriers related to such behavior.

This study therefore aimed at assessing level of knowledge and perception about COVID-19 among nurses. Study also examined perceived risk and susceptibility to COVID-19 and identifying factors influencing nurses' knowledge and perception about COVID-19 in South-west Nigeria during the initial wave of the pandemic.

Methodology

Study design: This study was a web-based, cross-sectional study, conducted in the month of May, 2020. And involved nurses from various areas of nursing practices in South-west Nigeria. Data was collected from nurses in South-west Nigeria through questionnaire. The questionnaire was distributed through a link generated using Google form and sent to nurses in South-west Nigeria through social media (WhatsApp, Facebook, E-mails) and personal contacts of authors.

Study setting: The study was conducted among nurses in South-west sub-region in Nigeria. Nigeria is divided into six geo-political

region/zones namely: South-West, South-East, South-South, North Central, North-East and North-West. The south-West Nigeria where this study was conducted was sub-divided into six states namely: Ondo, Ogun, Osun, Oyo and Lagos states. The zone is made up of six States which are; Ekiti, The South-west Nigeria covers an area between longitude 20 31 and 60 001 East and latitude 60 21 and 80 371 N with a total land area of 77,818 km2. The zone has two distinct seasons which are rainy season (April-October) and dry season (November-March). The major occupation of the people is agriculture, other occupations by the people of South-west Nigeria include trading, art and crafts. The main language for informal communication in this region is Yoruba, which has different dialects.

In attempts to control and prevent the spread of COVID-19 in Nigeria, the Nigeria Centre for disease Control (NCDC) recommended the following preventive measures: everyone with recent travel to countries with COVID-19 outbreak should stay at home and isolate for 14 days; everyone with recent travel to countries with COVID-19 outbreak and subsequently develop fever, cough or breathing difficulty is encouraged to call the NCDC toll free phone number before proceeding to the hospital; everyone is encouraged to cover mouth, nose with bent elbow or tissue when coughing or sneezing; maintenance of at least 2 meters between someone sneezing or coughing; washing of hands with soap under running water or use of alcohol-based sanitizer if water is not available; avoid touching eyes, nose and mouth with unwashed hands. The above have been suggested to help reduce the chances of being infected or transmitting the infectious disease (WHO, 2020).

Research instruments: An adapted 25-item questionnaire was used to collect data. The questionnaire contained three sections: section A contain 7 items on socio-demographic characteristics of nurses, section B, adapted from both WHO's course guideline on emerging respiratory viruses including COVID-19 (WHO, 2020). This contained 8 items which assessed nurses' knowledge about COVID-19 while section C adapted from Standard questionnaire on risk perception of an infectious disease outbreak (Effective Communication in Outbreak Management, 2015) contained 10 items with 5-points Likert scale. This section examined nurses' perception about COVID-19, perceived seriousness of the infection, perceived risk for COVID-19, self-efficacy towards preventive measures, perceived motivating and inhibiting factors towards preventing measures. The 25-item questionnaire requires an average of 5-10 minutes to complete.

Validity of the Instruments: Face and content validity of the questionnaire was ensured by subjecting the instruments to scrutiny by experts in the field of Public Health Nursing, Demography and Social Statistics, Infectious Disease Prevention and Control experts. Each item of the instruments was reviewed to ensure their appropriateness and ability to meet the stated objective of the study. Necessary corrections were affected on the questionnaire before carrying out the research in the target population.

Reliability of the Instruments: Reliability of the questionnaire was determined by computing Cronbach's alpha value for internal consistency. The Cronbach's alpha of 0.86 was obtained

Eligibility criteria: Registered nurses with Nursing and Midwifery Council of Nigeria and practicing in any of the 6 states within the South-Western zones of Nigeria were eligible for the study.

Sample size determination and sampling: The sample size for this study was estimated using the Cochran formula for sample size estimation (Cochrane, 1977): $n=Z^2pq/d^2$, where n is the desired sample size, Z is the standard normal deviate at 95% confidence level (at 95% confidence level, Z=1.96), p=43% (being the proportion of nurses at risk of infectious disease outbreak by Hessels *et al*., 2019), q=1–p, q=1–0.43=0.57, d is the degree of accuracy, taken as 0.05. This resulted in n=376. Assuming a 10% non-response rate, an estimated sample of 412 nurses was obtained.

Data collection and scoring: Socio-demographic data about nurses were obtained using 7 items in section A of the questionnaire. Knowledge about COVID-19 among the nurses was assessed using the 8 items in section B of

the questionnaire which were close-ended with options. Each correct option was scored 1 point to give a total of 8 points. Nurses with total scores of 4-8 were categorized as having good knowledge while scores between 0-3 were categorized as poor knowledge. The 10 items in section C which were 5 points Likert scale examined nurses' perception about COVID-19, perceived risk for COVID-19, perceived self-efficacy towards preventive measures, perceived motivating and inhibiting factors towards preventing measures. The 10-item in the Likert scale in section C of the questionnaire include items on nurses' perception about COVID-19. Each of the on perception had options: 'very serious', 'serious', 'indifferent' not serious', 'not very serious. Perceived risk for COVID-19 was assessed using 4 items in section C each with options 'very high risk', 'high risk', 'indifferent', 'low risk' and 'very low risk'. Perceived self-efficacy of preventive measures were assessed using the remaining 2 items with options 'very high', 'high', 'indifferent', 'low', 'very low'. Perceived motivating and inhibiting factors towards preventing measures were assessed by 2 open-ended items. Responses were grouped and presented in the result section.

Data analysis: Data analysis was done using IBM SPSS software version 25 at univariate, bivariate and multivariate levels. Univariate analysis was performed using frequency and percentage distribution to present nurses' socio-demographic characteristics, level of knowledge and perceived risk for COVID-19 among the nurses. Bivariate analysis examined the relationship between the dependent variables (nurses' knowledge and perception about COVID-19) and independent variables (selected socio-demographic characteristics of the nurses) using chi-square statistic to test associations. Binary logistic regression analysis examined the simultaneous relationship between dependent variable and independent variables.

Ethical Considerations: The study was conducted following the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) guidelines and in accordance with the declaration of Helsinki declaration, 2013. The study questionnaires also contain consent section that clearly outlined the purpose of the study, objective of the study, consent for voluntary participation, declaration of confidentiality and anonymity. Participation in this survey was voluntary. Multiple participation was prevented by selecting 'only allow the survey to be taken once' button on the survey platform before the questionnaires were administered. To ensure confidentiality of respondents' personal data, only number was used to link a respondent to a questionnaire, respondents' name and addresses were not required to complete the survey. Items containing identifying information about respondents were deleted after responses from such individuals were entered into the analytical software.

Results

A total of 376 nurses completed the survey (91.3% response rate). Findings showed that the mean age for the nurses was 37 ± 9 years old. About 30 % of the nurses had only diploma certificates, 41.2% had Bachelor of Nursing Science degree, 22.3% had Master of Science degree while 5.9% had Doctor of Philosophy degree (Table1).

Knowledge about COVID-19, Perceived risk and Susceptibility to COVID-19

Finding also revealed that 91% of the nurses had good knowledge about COVID-19 while 92.3% of the nurses perceived themselves to be susceptible and at high risk for COVID-19 infection (perceived susceptibility), 96.3% perceived COVID-19 as severe and highly infectious disease (perceived severity) while 94.4% of the nurses had high self-efficacy towards preventive measures (perceived benefits) (Table2).

Factors influencing nurses' knowledge and perception about COVID-19

Bivariate analysis of factors influencing nurses' knowledge and perception about COVID-19 revealed that nurses' age (p=0.02), area of practice (p=0.04) were significantly associated with nurses' knowledge about COVID-19 (Table 3) while nurse's age (p=0.01), sex (p=0.001), highest level of education (p=0.03), nurses' area of practice (p=0.02), state of

practice and knowledge about COVID-19 significantly influenced nurses' perceived risk for CIOVID-19 (Table 4). These variables may ultimately influence nurses' 'cue to action' in undertaking recommended preventive measures against COVID-19 as recommended by WHO, 2020.

Regression analysis of factors influencing nurses' knowledge about COVID-19 (Table 5) however revealed that highest level of education (p=0.002, OR=12.34, CI=2.52-60.42) was statistically associated with nurses' knowledge about COVID-19. The odd that nurses who had Master of Science certificates (OR= 12.34) will have poor knowledge about COVID-19 was higher than the odd for nurses with bachelor of nursing science certificates (OR=2.40). The odd that nurses who had registered nurse/midwife certificates (OR=18.56) will have poor knowledge about COVID-19 was higher than the odd for nurses with other nursing certificates (OR=8.87). Furthermore, the odd that nurse educators (OR=0.18) will have poor knowledge about COVID-19 was lower than the odd for nurse clinicians.

Regression analysis also (Table 6) showed that age (p=0.045, OR=0.07, CI=0.05-1.06), years of working experience (p=0.001, OR=0.004, CI=0.001-0.12 and p=0.002, OR=0.01, CI=0.001-0.19), highest level of education (p=0.003, OR=0.06, CI=0.01-0.36), area of practice (p=0.01, OR=13.25, CI=1.85-95.17) and knowledge about COVID-19 (p=0.003, OR=26.17, CI=3.11-22.09) were significantly associated with nurses' perceived risk for COVID-19. The odd that nurses aged 30-39 years old (OR=0.007) will perceive themselves to be at low risk for COVID-19 was lower that the odd for nurses aged 20-29 years old. Similarly, the odd that nurses who had between 11-19 years working experience (OR=0.004) will perceive themselves to be at low risk for COVID-19 was lower than the odd for nurses who had between 20-29 years working experience (OR=0.01). Table 7 also showed that the odd for nurses with Bachelor of Nursing Science certificates (OR=0.06) will perceive themselves to be at low risk for COVID-19 was lower than the odd for nurses with Master of Science certificates (OR=0.32). Nurse educators also had higher odds (OR=13.25) for low perceived risk for COVID-19 than nurse administrators (OR=0.01). Nurses with poor knowledge about COVID-19 also had higher odd (OR=26.17) of low perception about risk for COVID-19 than nurses with good knowledge about COVID-19.

Table1: Socio-Demographic Characteristics of Nurses N=376

Variable	Frequency	%
Age at last birthday (years)		
Mean= 37± 9 SD		
20-29	33	8.8
30-39	110	29.3
40-49	187	49.7
50-59	46	12.2
Sex		
Male	81	21.5
Female	295	78.5
Marital status		
Married	330	87.8
Single	37	9.8
Divorced	5	1.3
Widow/Widower	4	1.1
Highest level of education		

*Diploma only	115	30.6
BNSc	155	41.2
MSc	84	22.3
PhD	22	5.9
Professional qualification		
Registered Nurse (RN)	67	17.8
Registered Nurse/Midwife (RN,RM)	217	57.7
**Others	92	24.5
Years of working experience		
≤ 10	106	28.2
11-19	145	38.6
20-29	105	27.9
30 years and above	20	5.3
Area of practice		
Nurse clinician	265	70.5
Nurse educator	91	24.2
Nurse administrator	20	5.3
State of Nursing practice in South-west Nigeria		
Ekiti	39	10.4
Lagos	82	21.8
Ogun	67	17.8
Ondo	49	13.0
Osun	88	23.4
Oyo	51	13.6

** Diploma include registered nurse ± other post-basic nursing certificates*
***Others include perioperative nurse, nurse anaesthetist, psychiatric nurse, public health nurse, paediatric nurse, Orthopaedic nurse, cardiothoracic nurse, intensive care nurse, ophthalmic nurse.*

Table 2: Nurses' Knowledge and Perception about COVID-19 N=376

Variables	Frequency	%
Knowledge about COVID-19		
Good	342	91.0
Poor	34	9.0
Perception about COVID-19		
Perceived COVID-19 as mild disease	14	3.7
Perceived COVID-19 as severe and highly infectious disease	362	96.3
Perceived Risk and Susceptibility to COVID-19		
Perceived to be susceptible and at high risk	347	92.3
Perceived to be at low risk	29	7.7

Self-efficacy towards preventive measures		
High self-efficacy	355	94.4
Low self-efficacy	21	5.6
Motivating factors towards preventive measures		
Am often ill, therefore need to carryout preventive measures	34	9.0
I may be at risk, therefore need to carryout preventive measures	119	31.6
I want to prevent contacting and transferring COVID-19	155	41.2
I trust the preventing measures will help in containing COVID-19	56	14.9
Other people in my environment will also carry out preventive measures	12	3.1
Inhibiting factors towards preventive measures		
I rarely fall ill	36	9.6
I do not think am at risk of COVID-19	197	52.4
I don't think I could transfer the virus	79	21.0
The measures may not work	27	7.2
People in my environment may not carry the measures out	37	9.8

Table 3: Factors influencing knowledge about COVID-19 among Nurses N=376

Variables	Knowledge about COVID-19			
	Good f (%)	Poor f (%)	Total f (%)	Statistic X^2, df, p
Age group (years)				9.63 3 0.02
20-29	33 (100.0)	0 (0.0)	33 (100.0)	
30-39	101 (91.8)	9 (8.2)	110 (100.0)	
40-49	171 (91.4)	16 (8.6)	187 (100.0)	
50-59	37 (80.4)	9 (19.6)	46 (100.0)	
Years of Working Experience				6.94 3 0.07
≤ 10	93 (87.7)	13 (12.3)	106 (100.0)	
11-19	137 (94.5)	8 (5.5)	145 (100.0)	
20-29	92 (87.6)	13 (12.4)	105 (100.0)	

30 years and above	20 (100.0)	0 (0.0)	20 (100.0)			
Sex				0.09	1	0.77
Male	73 (90.1)	8 (9.9)	81 (100.0)			
Female	269 (91.2)	26 (8.8)	295 (100.0)			
Highest level of education				7.10	3	0.07
Diploma only	107 (93.0)	8 (7.0)	115 (100.0)			
Bachelor of Nursing Science	142 (91.6)	13 (155)	155 (100.0)			
Master of Science	71 (84.6)	13 (15.5)	84 (100.0)			
Doctor of Philosophy	22 (100.0)	0 (0.0)	22 (100.0)			
Professional qualification				1.01	2	0.58
Registered Nurse (RN),	63 (94.0)	4 (6.0)	67 (100.0)			
Registered Nurse/Midwife(RN,RM)	195 (89.9)	22 (10.1)	217 (100.0)			
Others	84 (91.3)	8 (8.7)	92 (100.0)			
Area of practice				6.05	2	0.04
Nurse clinician	235 (88.7)	30 (11.3)	265 (100.0)			
Nurse educator	87 (95.6)	4 (4.4)	91 (100.0)			
Nurse Administrator	20 (100.0)	0 (0.0)	20 (100.0)			
State of Nursing practice in South-west Nigeria				2.57	5	0.77
Ekiti	35 (89.7)	4(10.3)	39 (100.0)			
Lagos	73 (89.0)	9 (11.0)	82 (100.0)			
Ogun	62 (92.5)	5 (7.5)	67 (100.0)			
Ondo	47 (95.9)	2 (4.1)	49 (100.0)			
Osun	80 (90.9)	8 (9.1)	88 (100.0)			
Oyo	45 (88.2)	6 (11.8)	51 (100.0)			

Table 4: Factors influencing Perceived Risk and Susceptibility to COVID-19 among Nurses

Variables	**Perceived Risk to COVID-19**		**Total**	**Statistic**		
	High Risk f (%)	**Low risk f (%)**	**f(%)**	**X^2,**	**df,**	**p**
Age group (years)				10.56	3	0.01
20-29	29 (87.9)	4 (12.1)	33 (100.0)			
30-39	106 (96.4)	4 (3.6)	110 (100.0)			
40-49	166 (88.8)	21 (11.2)	187 (100.0)			
50-59	46 (100.0)	0 (0.0)	46 (100.0)			
Years of Working experience	4.07	3	0.25			
≤ 10	94 (88.7)	12 (11.3)	106 (100.0)			
11-19	136 (93.8)	9 (6.2)	145 (100.0)			
20-29	97 (92.4)	8 (7.6)	105 (100.0)			
30 years and above	20 (100.0)	0 (0.0)	20 (100.0)			
Sex	10.08	1	0.001			
Male	68 (84.0)	13 (16.0)	81 (100.0)			

Female	279 (94.5)	16 (5.4)	295 (100.0)			
Highest level of education				9.39	3	0.03
Diploma only	104 (90.4)	11 (9.6)	115 (100.0)			
Bachelor of Nursing Science	150 (96.8)	5 (3.2)	155 (100.0)			
Master of Science	75 (89.3)	9 (10.7)	84 (100.0)			
Doctor of Philosophy	18 (81.8)	4 (18.2)	22 (100.0)			
Professional qualification				2.71	2	0.26
Registered Nurse (RN)	59 (88.1)	8 (11.9)	67 (100.0)			
Registered Nurse/Midwife(RN,RM)	204 (94.0)	13 (6.0)	217 (100.0)			
Others	84 (91.3)	8 (8.7)	92 (100.0)			
Area of Practice				8.24	2	0.02
Nurse clinician	249 (94.0)	16 (6.0)	265 (100.0)			
Nurse educator	78 (85.7)	13 (14.3)	91 (100.0)			
Nurse Administrator	20 (100.0)	0 (0.0)	20 (100.0)			
State of Nursing practice in southwest Nigeria				20.8	5	0.001
Ekiti	39 (100.0)	0 (0.0)	39 (100.0)			
Lagos	78 (95.1)	4 (4.9)	82 (100.0)			
Ogun	55 (82.1)	12 (17.9)	67 (100.0)			
Ondo	49 (100.0)	0 (0.0)	49 (100.0)			
Osun	82 (93.2)	6 (6.8)	88 (100.0)			
Oyo	44 (86.3)	7 (13.7)	51 (100.0)			
Knowledge about COVID-19				13.1	1	<0.001
Good	321 (93.9)	21 (6.1)	342 (100.0)			
Poor	26 (76.5)	8 (23.5)	34 100.0)			

Table 5: Regression analysis of Factors influencing knowledge about COVID-19 among Nurses

Variables	P value	Odd ratio (OR)	Confidence Interval (CI)
Age group (years)			
20-29	RC		
30-39	0.99	2.39	0.92-12.34
40-49	0.98	2.10	0.93-10.23
50-59	0.88	1.40	0.54-7.03
Years of Working Experience			
≤ 10	RC		
11-19	0.09	0.37	0.12-1.16
20-29	0.11	0.36	0.10-1.26
30 years and above	0.89	0.01	0.001- 0.23
Sex			
Male	RC		
Female	0.08	0.32	0.09-1.16

Highest level of Education			
Diploma only	RC		
Bachelor of Nursing Science	0.23	2.40	0.57-10.05
Master of Science	0.002	12.34	2.52-60.42
Doctor of Philosophy	0.98	0.12	0.03-6.32
Professional qualification			
Registered Nurse (RN)	RC		
Registered Nurse/Midwife(RN,RM)	0.01	18.56	1.86-185.21
Others	0.07	8.87	0.87-90.23
Area of Practice			
Nurse clinician	RC		
Nurse educator	0.02	0.18	0.04-0.78
Nurse Administrator	0.99	0.10	0.08-1.23
State of Nursing practice in southwest Nigeria			
Ekiti	RC		
Lagos	0.64	0.64	0.10-4.05
Ogun	0.93	0.92	0.15-5.51
Ondo	0.22	0.28	0.04-2.13
Osun	0.66	0.69	0.14-3.50
Oyo	0.80	1.25	0.23-6.92

Table 6: Logistic Regression analysis of Factors influencing Perceived Risk and Susceptibility to COVID-19 among Nurses

Variables	P value	Odd ratio (OR)	Confidence Interval (CI)
Age group (years)			
20-29	RC		
30-39	0.045	0.07	0.05-1.06
40-49	0.19	8.26	0.34-20.69
50-59	0.99	8.76	1.78-23.78
Years of working experience			
≤ 10	RC		
11-19	0.001	0.004	0.001-0.12
20-29	0.002	0.01	0.001-0.19
30 years and above	1.00	0.05	0.02-0.21
Sex			
Male	RC		
Female	0.51	0.01	0.001-0.09
Highest level of education			
Diploma only	RC		

Bachelor of Nursing Science	0.003	0.06	0.01-0.36
Master of Science	0.17	0.32	0.06-1.63
Doctor of Philosophy	0.06	0.04	0.002-1.15
Professional qualification			
Registered Nurse (RN)	RC		
Registered Nurse/Midwife(RN,RM)	0.10	0.22	0.04-1.32
Others	0.06	0.10	0.01-1.14
Area of practice			
Nurse clinician	RC		
Nurse educator	0.01	13.25	1.85-95.17
Nurse Administrator	0.98	0.01	0.001-0.14
State of Nursing practice in Southwest Nigeria			
Ekiti	RC		
Lagos	0.95	6.24	0.34-7.65
Ogun	0.87	4.50	0.47-6.34
Ondo	0.90	1.24	0.08-6.46
Osun	0.86	6.65	0.03-5.47
Oyo	0.79	1.85	0.12-6.67
Knowledge about COVID-19			
Good	RC		
Poor	0.003	26.17	3.11-22.09

Discussion

Findings from this study showed that 91% of the nurses had good knowledge about covid-19. A similar study among health care workers in United Arab Emirate however observed that 61% of had poor knowledge about COVID-19 (Bhagavathula et al., 2020) while an Iranian study observed that 55.6% of the nurses had good knowledge about COVID-19 (Nemati et al., 2020). Similar study conducted in Henan, China involving health workers also found that 89% of the health workers demonstrated sufficient knowledge of COVID-19. The above findings underscore the submission that knowledge is an essential requirement for establishing preventive thoughts, developing positive attitudes and promoting desirable effective preventive strategies towards control of infectious diseases (McEachan et al., 2016). The study by (McEachan et al., 2016) also found that 96.3% of the nurses perceived COVID-19 as severe and highly infectious disease, 92.3% perceived themselves to be susceptible and at high risk for COVID-19 while 94.4% of the nurses had high self-efficacy towards preventive measures (McEachan et al., 2016). Above submission is comparable with finding from a study on knowledge and perceptions of COVID-19 among health care workers in the United Arab Emirate where it was observed that significant proportion of health workers studied had positive perception towards prevention of COVID-19 (Bhagavathula et al., 2020). In a similar study among healthcare workers in Henan, China, founding showed that more than 85% of the workers perceived themselves to be susceptible to COVID-19 (Zhang et al., 2020; Theofanidis & Fountouki, 2022a). Perceived risk for COVID-19 which has been observed to be highly infectious is necessary for nurses and other health care providers in order to be motivated and proactively develop cue to action

towards prevention and control of the disease (McEachan et al., 2016).

Bivariate analysis of factors influencing nurses' knowledge and perception about COVID-19 revealed that nurses' age and area of practice) were significantly associated with nurses' knowledge about COVID-19 while nurse's demographic variables such as age, sex, highest level of education, area of practice and knowledge about COVID-19 significantly influenced nurses' perceived risk for CIOVID-19. These variables may ultimately influence nurses' 'cue to action' in undertaking recommended preventive measures against COVID-19 as recommended by (World Health Organization (WHO), 2020).

Further analysis at multivariate level revealed that highest level of education was significantly associated with nurses' knowledge about COVID-19. This corroborate the observation by (Saqlain et al., 2020) who in their study on knowledge, attitude and practice among healthcare professionals about COVID-19 in Pakistan found that age, job experience and nature of job were significantly associated with good knowledge and preventive practices towards control of COVID-19. Conversely, the study on nurses' knowledge about COVID-19 by Nemati & Ebrahimi in Iran observed that the total knowledge score of the nurses was not significantly influenced by nurses' age, education level and years of work experience (Nemati et al., 2020; Theofanidis & Fountouki, 2022b).

This study further observed that age, years of working experience, highest level of education, area of practice and knowledge about COVID-19 were statistically associated with nurses' perceived risk for COVID-19. This observation was consistent with findings from a study conducted in Henan, China where it was observed that heath workers' level of knowledge, work experience and job categories significantly influenced health workers' attitude and practices of preventive measures towards COVID-19 (Zhang et al., 2020). Age and types of profession were significantly associated with inadequate knowledge and a poor perception about COVID-19 among studied health care professionals (Bhagavathula et al., 2020).

Conclusions: Advocacy towards effective prevention and control of COVID-19 in Nigeria should focus improving nurses' knowledge about COVID-19, improvement in nurses' level of education in the various areas of nursing practices. These are essential towards developing positive perception about risk, prevention and control of COVID-19 pandemic in Nigeria.

Limitations of the Study: This study was a web based-cross-sectional study involving nurses in the South-West zone of Nigeria, in which self-reported responses could be subjective, sincerity and accountability of responses could also be limited. Study findings may therefore not be considered generalized. Despite these limitations, findings from this study may provide valuable information about all that are needed to be improved especially improvement in knowledge and perceptions of nurses during peak period of the COVID-19 pandemic.

Implication of Findings for Nursing Practices: The emerging challenges of infectious diseases such as the COVID-19 pandemic have underscored the need for nurses and other health professionals to equip themselves with adequate knowledge about the novel Coronavirus disease whose pathophysiology and other details are still emerging. Future research should therefore focus on preventive measures, improvement in knowledge about the coronavirus diseases and development in various areas of nursing practices towards effective control of the Covid-19 pandemic.

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