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Adherence to COVID-19 Preventive measures among Pregnant Women in Nigeria: An Initiative towards Safe Motherhood in an Emerging Global Health Priority

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ABSTRACT

Background & aim: Reducing the rate of COVID-19 transmission and infection has remained as a major public health priority in pregnancy, while the Safe Motherhood Initiative aims at attaining optimal maternal and new-born health, reduction in maternal mortality and morbidity. This study was conducted to assess knowledge and level of adherence towards COVID-19 preventive measures as well as identifying the factors influencing the level of adherence among pregnant women in Nigeria.

Methods: This study adopted a descriptive cross-sectional design involving 442 pregnant women who attended antenatal clinic between August 15th and September 30th, 2020 in a tertiary health facility in South West Nigeria. Respondents were selected through a two-stage sampling technique and answered to an interviewer-administered questionnaire. Data obtained from 431 pregnant (97.5% response rate) were analyzed using SPSS software version 25 with descriptive and inferential statistics.

Results: Findings showed that 31.6% of the pregnant women had good knowledge about COVID-19 prevention, 48.0% had fair knowledge and 20.4% had poor knowledge. Also, 78.0% had high level of adherence to COVID-19 preventive measures and 14.2% moderately adhere while 7.9% had low level of adherence to COVID-19 preventive measures. Regression analysis revealed that high level adherence to COVID-19 preventive measures was significantly associated with Hausa (p=0.03, RRR=0.03, CI=0.001-0.76) and Igbo ethnicity (p=0.01, RRR=0.05, 0.005-0.51), while moderate adherence was significantly associated with secondary education (p=0.04, RRR=5.25, CI= 1.06-26.18).

Conclusion: Improving adherence to preventive measures against COVID-19 among pregnant women requires advocacy that prioritize women's education and address various forms of ethnic and cultural misconceptions about COVID-19 infection.

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Introduction

The ongoing global pandemic of the highly infectious disease named Coronavirus disease (COVID-19) which has been described as an acute, occasionally severe, respiratory infection caused by the novel coronavirus SARS-CoV2 (1) remain significant public health challenge. The detailed pathophysiology of COVID-19 infection is still evolving, studies on viral respiratory infections prior COVID-19 pandemics have however equipped researchers with a framework of references regarding the pathophysiology of respiratory viral infections in pregnancy (2, 3).

The COVID-19 viral infection is characteristically different from other members of the coronaviruses including MERS-CoV, discovered in 2012 as the cause of the Middle East Respiratory Syndrome (MERS) and the SARS-CoV which was acknowledged in 2003 as the etiology of Severe Acute Respiratory Syndrome (SARS) outbreak in China in 2002 (4).The COVID-19 pandemic was discovered first in Wuhan, China, on the 31st December, 2019 and was first observed in Egypt, Africa on the 14th February, 2020 (5).

Since the virus was discovered late 2019, the world has recorded the second and third waves of infections from COVID-19 despite efforts and successes recorded in vaccine discoveries, though several uncertainties remain with regards to efficacy and efficiencies of vaccines globally. Some of the approved vaccines for use by global health regulators include the AstraZeneca vaccine, the Pfizer and BioNTech vaccine, the Modena vaccine and the Johnson-Johnson vaccines, though major challenge facing vaccine development include the discovery of new variants of the virus such as the Alpha variants in the United Kingdom, the Beta variants (South Africa), the Gamma variant (Brazil) and the Indian Delta variants (6) and recently, the highly mutated Omicron variant detected in South Africa but now found in United Kingdom, Israel, Netherlands, Botswana, Belgium, Hong Kong and other countries. Nigeria recorded a total of 16,300 cases as at 23rd August, 2021 while total death recorded was 2,268. The southwestern state of Lagos recorded the greater proportion of this infection with about 70,600 cases compared to other states in the country (6, 7).

Majority of individuals infected with the COVID-19 viral infection manifest mild to moderate respiratory symptoms and could subsequently recover without any specific medical management. Elderly and individuals with certain medical conditions such as kidney diseases, cardiovascular diseases, individuals with low immune status including diabetes, chronic respiratory diseases such as asthma and individuals with underlying malignancies are however at higher risk of developing serious forms of the illness. In addition, pregnant women have also been suggested to be at higher risk of contracting the severe form of the viral infection (8). This is partly because the prenatal period is characterized by changes in immune status thus making a pregnant woman more vulnerable to virus related infections (9). Presently COVID-19 has no definitive pre-immunity and there are worldwide uncertainties about vaccine efficacy. There are no definitive globally acceptable effective management modalities thus constituting a serious global public health emergency (10).

As a result of this, the World Health Organization (WHO), Centre for Disease Control (CDC) and Nigeria Centre for Disease Control (NCDC) (9, 11), issued guidelines for the prevention and control of COVID-19: these guidelines include regular hand hygiene with either alcohol-based hand sanitizer or with soap and water, maintenance of physical and social distancing, avoidance of crowded places, avoid touching of eyes, nose and mouth indiscriminately, respiratory and oral hygiene such as covering mouths and noses with bent elbow or tissue when coughing or sneezing, 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 (8). The above measures and several other preventive measures against infectious diseases have been suggested to be critical and most life-saving intervention in the control COVID-19 in pregnancy and in all situations (2, 12). Similarly, reducing the rate of infectious disease transmission and infection in pregnancy remain a major public health burden

and outmost priority while adherence to COVID-19 prevention and its control measures are important to prevent transmission between infected pregnant women and transmission to the unborn child. The above submission corroborates the ideals of the Safe Motherhood Initiative which aims at attaining optimal maternal and new born health, reduction in maternal mortality and morbidity and enhancement of the health of new born (13).

Consequently, adherence to preventive measures such as increase in community-based awareness and among pregnant women about safety practices such as personal and hand hygiene, cough etiquette, social and physical distancing, staying home when sick and disinfecting contaminated surfaces are also critical in COVID-19 prevention and control (2). This study was conducted to assess knowledge and level of adherence and its influencing factors towards COVID-19 preventive measures as well as identifying the factors influencing the level of adherence among pregnant women attending antenatal clinic in Obafemi Awolowo University Teaching Hospital, Ile-Ife, Osun state, southwest Nigeria.

Materials and Methods

This study adopted a descriptive cross-sectional design using quantitative data collection method and–was conducted among pregnant women attending antenatal clinic in Obafemi Awolowo University Teaching Hospital, Ile-Ife, Osun state, South West Nigeria, between August 15th and September 30th, 2020. The Obafemi Awolowo University Teaching Hospital is one of the first generation Teaching Hospitals established in 1967 by the Federal Government of Nigeria to provide quality health care. The hospital was founded on Ife philosophy, which focuses on integrated healthcare delivery system approach with emphasis on comprehensive healthcare services. Primary healthcare services are provided to the community through three Primary Health Care Centers (PHCs): two urban and one rural health care centers at Ife, Ilesa and Imesi-Ile, respectively, while secondary and tertiary health care services are provided through the three major hospital facilities in Ife Hospital Unit (I.H.U), Wesley Guild Hospital Unit, Ilesa and Dental Hospital unit of the Obafemi Awolowo University Teaching Hospital, Ile-Ife, south-west Nigeria.

Study was conducted among pregnant women attending antenatal clinics in Ife hospital unit and Wesley Guild hospital unit of the Obafemi Awolowo University Teaching Hospital, Osun state, south-west Nigeria.

Booked pregnant women (attended at least one antenatal clinic) at the selected hospitals were included in the study while unhooked pregnant women were excluded from the study.

Sample size for this study was estimated using Cochran formula (14) for sample size estimation: $n = Z^2pq / d^2$ where n = desired sample size, Z= standard normal deviate at 95% confidence level (at 95% confidence level, Z=1.96), p = 50%, (there are no known data on the proportion of pregnant women with COVID-19 as at the time of this study). q = 1 – p, q = 1 – 0.5 =0.5,

d = degree of accuracy taken as 0.05, n = 384.2. With 15% non-response, estimated sample was 442.

A total of 442 pregnant women attending antenatal clinics at Obafemi Awolowo University Teaching Hospitals Complex were selected for the study through a two-stage sampling technique: Stage one involves purposive selection of Ife hospital unit (IHU) and Wesley Guild hospital unit of Obafemi Awolowo University Teaching Hospitals Complex because preliminary observation showed that Ife hospital unit and Wesley Guild hospital unit have the highest number of women attending antenatal clinic compared to other units of the Obafemi Awolowo University Teaching Hospitals Complex. In the second stage, eligible pregnant women were selected by convenience sampling technique. Selection of eligible women continued daily at the antenatal clinics of selected hospitals until the estimated sample size was attained.

Data was collected using semi structured interviewer-administered questionnaire. The questionnaire consists of three sections: Section A elicited information on demographic and socio-economic characteristics of pregnant women, section B obtained information on knowledge about COVID-19 among pregnant women (15), section C elicited information on

adherence to preventive measures against covid-19 among pregnant women (16).

Face and content validity of the research instrument was done by subjecting the instrument to review by experts in Nursing and Midwifery, Public Health, Demography and Social Statistics, Obstetrics and Gynecology. Each item of the instruments was reviewed to ensure their appropriateness and ability to meet the stated objective of the study. Necessary corrections was effected on the research instruments after review by experts.

The reliability of the questionnaire was assessed through test-retest method to access stability of the research instruments. This involved administering the questionnaire to pregnant women in a health facility within the study area. This was repeated two weeks apart while internal consistency of questionnaire was examined by calculating Cronbach's alpha value (Cronbach's alpha value = 0.82) for the questionnaire.

The outcome variable in this study was adherence to preventive measures against COVID-19' and this was examined using the 11 items on adherence to preventive measures against COVID-19 in section C of the questionnaire (16). Each correct option in this section was scored '1' point while incorrect option was scored '0'. Maximum point was '11 while minimum score was '0'. Scores between 9 and 11 was categorized as 'high adherence', scores of 6-8 was categorized as 'moderate adherence' while scores below 6 points was categorized as 'low adherence'.

Independent variables in this study included knowledge about COVID-19 among pregnant women and selected demographic, socio-economic and obstetric characteristics of pregnant women.

Knowledge about COVID-19 among pregnant women was assessed using 10 items in section B of the questionnaire. Each correct option was scored '1' point while incorrect response was scored '0' point. Total score ranged from 0-10, score 0-4 was categorized as 'poor knowledge', score 5-7 was categorized as 'fair knowledge' while scores 8-10 were categorized as 'good knowledge' (15).

Data obtained were processed and analyzed using IBM Statistical Product and Service Solutions (SPSS) software version 25. Analysis was done at univariate, bivariate and multivariate levels: Findings at univariate level were presented using frequency and percentage distribution. Chi-square statistic examined relationship between dependent variable and the independent variables at bivariate level, multinomial logistic regression analysis was done to assess simultaneous influence of independent variables on dependent variable. P-value of less than 0.05 was considered significant.

Ethical permission (Number: ERC /2020 /10/01) was obtained from the Ethics and Research Committee of Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, Nigeria. Verbal and written consent were also obtained from pregnant women prior to data collection.

Results

A total of 431 responses were analyzed giving 97.5% response rate. Finding revealed that 51 (11.8%) pregnant women were aged 16-25 years old, 70 (16.2%) were aged 36-45 years old while 310 (71.9%) were aged 26-35 years old while the mean age at last birthday was 31 years ± SD 4. In addition, 24 (5.6%) pregnant women were single, 407 (94.4%) were married, 138 (32.0%) were nullipara, 154 (35.7%) were primipara and 139 (32.3%) were multipara, 348 (80.7%) were Yorubas, 8 (1.9%) were Hausa, 29 (6.7%) were Ibos while 46 (10.7%) belong to Urhobo and Itsekiri tribes. Fifteen (3.5%) pregnant women had primary school certificates, 66 (15.3%) had secondary education and 350 (81.2%) had tertiary education certificates (Table 1).

Findings also showed that 136 (31.6%) pregnant women had good knowledge about COVID-19 Prevention, 207 (48.0%) had fair knowledge while 88 (20.4%) had poor knowledge about COVID-19 prevention (Table2). Furthermore, 336 (78.0%) pregnant women had high level of adherence to COVID-19 Preventive Measures, 61 (14.2%) moderately adhere to COVID-19 preventive measures while 34 (7.9%) had low level of adherence to COVID-19 preventive measures (Table2).

Table 1. Demographic and Socioeconomic Characteristics of Pregnant Women

Variables	Frequency (%)
Age group (years)	
16-25	51 (11.83)
26-35	310 (71.93)
36-45	70 (16.24)
Marital status	
Married	407 (94.43)
Single	24 (5.57)
Parity	
Nullipara	138 (32.02)
Primipara	154 (35.73)
Multipara	139 (32.25)
Ethnicity	
Yoruba	348 (80.74)
Hausa	08 (1.86)
Igbo	29 (6.73)
Others (Urhobo, Itsekiri)	46 (10.67)
Religion	
Christianity	332 (77.03)
Islam	99 (22.97)
Highest level of education	
Primary	15 (3.48)
Secondary	66 (15.31)
Tertiary	350 (81.21)
Employment status	
Not employed	40 (9.28)
Self employed	218 (50.58)
Government employed	105 (24.36)
Employed by private sector	68 (15.78)
Average monthly income	
< 30,000 naira	223 (51.74)
≥ 30,000 naira	208 (48.26)

*30,000 naira was the minimum wage in Nigeria as at the time of this study

Regarding factors influencing adherence to COVID-19 preventive measures among pregnant women, bivariate analysis revealed significant relationship between adherence to COVID-19 preventive measures and ethnicity (χ^2 = 18.42, df= 3, p=0.01) (Table 3).

Multinomial logistic regression analysis (Table4) further revealed that high level adherence to COVID-19 preventive measures was significantly associated with Hausa ethnicity (p=0.03, RRR=0.03, CI=0.001-0.76) and Igbo ethnicity (p=0.01, RRR=0.05, 0.005-0.51). The relative risk ratio (RRR) for women of hausa ethnicity having high level of adherence to COVID-19 preventive measures (RRR=0.03) is lower than the relative risk ratio for women of Igbo ethnicity (RRR=0.05) relative to low level adherence.

Table 2. Knowledge and Adherence to COVID-19 Preventive Measures among Pregnant Women

Variables	Frequency (%)
Knowledge	
Good	136 (31.45)
Fair	207 (48.03)
Poor	88 (29.42)
Level of Adherence	
High	336 (77.96)
Moderate	61 (14.15)
Low	34 (7.89)

Multinomial logistic regression analysis also revealed shows significant relationship between moderate adherence to COVID-19 prevention and secondary education (p=0.04, RRR=5.25, CI= 1.06-26.18). The relative risk ration for women with secondary education having moderate level of adherence to COVID-19

prevention (RRR=5.25) is higher than the relative risk ratio for women with primary education (RRR=0.41) and higher that the RRR for women with tertiary education relative to low adherence level.

Table 3. Bivariate Analysis of Factors Influencing Adherence to COVID-19 Preventive Measures

Variables	Adherence to COVID-19 Preventive Measures			Statistic		
	Low adherence N (%)	Moderate adherence N (%)	High adherence N (%)	χ^2	df	p
Age at last birthday (years)				5.60	2	0.23
16-25	07 (13.73)	05 (9.80)	39 (76.47)			
26-35	19 (6.13)	47 (15.16)	244 (78.71)			
36-45	08 (11.43)	09 (12.85)	53 (75.71)			
Marital status				0.76	1	0.68
Married	31 (7.62)	58 (14.25)	318 (78.13)			
Single	03 (12.50)	03 (12.59)	18 (75.00)			
Parity				5.71	2	0.22
Nullipara	8 (5.80)	27 (19.57)	103 (74.64)			
Primipara	14 (9.09)	17 (11.04)	123 (79.87)			
Multipara	12 (8.63)	17 (12.23)	110 (79.14)			
Ethnicity				18.42	3	0.01
Yoruba	25 (7.18)	52 (14.94)	271 (77.87)			
Hausa	02 (25.00)	02 (25.00)	04 (50.00)			
Igbo	06 (20.69)	05 (17.24)	18 (62.07)			
Others (Itsekiri, Ijaw)	01(2.17)	02 (4.35)	43 (93.48)			
Religion				0.26	1	0.88
Christianity	25 (7.53)	47 (14.16)	260 (78.31)			
Islam	09 (9.09)	14 (14.14)	76 (76.77)			
Highest level of education				3.78	4	0.44
Primary	2 (13.33)	1 (6.67)	12 (80.00)			
Secondary	3 (4.55)	13 (19.70)	50 (75.76)			
Tertiary	29 (8.29)	47 (13.43)	274 (78.29)			
Employment status				1.86	3	0.93
Not employed	03 (7.50)	05 (12.50)	32 (80.00)			
Self employed	14 (6.42)	31 (14.22)	173 (79.36)			
Employed by Government	10 (9.52)	16 (15.24)	79 (75.24)			
Employed by private sector	07 (10.29)	09 (13.24)	52 (76.47)			
Average monthly income				0.80	1	0.67
< 30,000 naira	19 (8.52)	34 (15.25)	170 (76.23)			
≥ 30,000 naira	15 (7.21)	27 (12.98)	166 (79.81)			
Knowledge about COVID-19 prevention				6.51	2	0.16
Poor	04 (4.55)	07 (7.95)	77 (87.50)			
Fair	20 (9.66)	33 (15.94)	154 (74.40)			
Good	10 (7.35)	21 (15.44)	105 (77.21)			

Table 4. Multinomial Regression Analysis of Factors Influencing Adherence to COVID-19 Preventive Measures

Variables	Moderate adherence			High level adherence		
	p-value	RRR	Confidence Interval (CI)	p-value	RRR	Confidence Interval (CI)
Age at last birthday (year)						
16-25 years	0.07	0.17	0.03-1.13	0.25	0.41	0.09-1.88
26-35 years	0.79	1.20	0.32-4.46	0.83	1.13	0.39-3.27
36-45 years	RC	1		RC	1	
Marita status						
Married	0.41	2.46	0.29-20.69	0.51	1.76	0.32-9.68
Single	RC	1		RC	1	
Ethnicity						
Yoruba	0.79	0.71	0.06-8.85	0.14	0.21	0.03-1.67
Hausa	0.96	1.10	0.02-62.38	0.03	0.03	0.001-0.76
Igbo	0.46	0.34	0.02-5.82	0.01	0.05	0.005-0.51
Others (Urhobo, Itsekiri)	RC	1		RC		1
Religion						
Christianity	0.64	1.30	0.43-3.95	0.57	1.31	0.52-3.30
Islam	RC	1		RC	1	
Highest level of education						
Primary	0.61	0.41	0.01-12.06	0.60	1.95	0.16-23.19
Secondary	0.04	5.25	1.06-26.18	0.14	3.02	0.69-13.18
Tertiary	RC	1		RC	1	
Employment status						
Unemployed	0.57	1.85	0.23-15.11	0.31	2.44	0.43-13.91
Self-employed	0.30	1.99	0.54-7.39	0.23	1.93	0.66-5.71
Employed by Government	0.52	1.62	0.37-7.04	0.96	0.97	0.29-3.23
Employed by private	RC	1		RC	1	
Average monthly income						
< 30,000 naira	0.89	0.93	0.32-2.65	0.30	0.63	0.26-1.53
≥ 30,000 naira	RC	1		RC	1	
Parity						
Nullipara	0.06	3.76	0.93-15.28	0.49	1.54	0.45-5.23
Primipara	0.73	0.81	0.25-2.61	0.74	0.85	0.33-2.19
Multipara	RC	1		RC	1	
Knowledge about COVID-19 prevention						
Poor	0.72	0.74	0.15-3.69	0.43	1.70	0.45-6.40
Fair	0.84	0.90	0.32-2.54	0.64	0.81	0.33-1.96
Good	RC	1		RC	1	

Model statistics: n=431, p = 0.04, R square = 0.11, Note: Base outcome = Low adherence, RRR=Relative risk ratio, CI = Confidence interval at 95%

Discussion

About a third of the pregnant women (31.6%) had good knowledge about COVID-19 prevention, 48.0% had fair knowledge while 20.4% had poor knowledge about COVID-19 prevention. Similarly, in their study among pregnant women in Uganda (17) observed that 32.8% of the pregnant women had good knowledge about COVID-19 outbreak. A Nigerian study involving 284 pregnant women however observed that 60.9% of the pregnant women had adequate knowledge about COVID-19 preventive measures (18). Similarly, a Syrian study involving 400 participants observed that majority of study participants demonstrated moderate knowledge about COVID 19 (19). A study involving 644 participants in southern Ethiopia observed that 63.51% of study participants had good knowledge about COVID-19 preventive measures (20).

This study observed that majority of the pregnant women (78.0%) had high level of adherence to COVID-19 preventive measures,

14.2% moderately adhere to COVID-19 preventive measures while 7.9% had low level of adherence to COVID-19 preventive measures. Above finding however contrast the observation made in a study in Ethiopia which found that 12.3% of studied participants in southern Ethiopia adhere to recommended COVID-19 preventive measures (20) while a study conducted in Ghana found that 18.0% of pregnant women studied complied with face mask, 31.7% practiced handwashing while 22.0% complied with social distancing (21). Similarly, a study conducted in Uganda observed that 88.6% of the pregnant women studied in Uganda reported low adherence to preventive behavior against COVID-19 infection (17). The Centre for Disease Control and Prevention (22) however recommended that preventive measures against COVID-19 infection include regular hand washing, avoidance of excessive outdoor activities, crowded places, public gatherings, isolation of infected individuals. Similarly, asserted that preventive measures against COVID-19 infection during pregnancy entails strict adherence to recommended preventive measures by relevant authorities (23). Similarly, the Royal College of Obstetrics and Gynaecology (2) recommends risk assessment for pregnant workers in addition to modification of working environment for pregnant women as a preventive measures against COVID-19 infection.

Analysis of factors influencing adherence to COVID-19 preventive measures revealed that high level adherence to COVID-19 preventive measures was significantly associated with ethnicity while moderate adherence to COVID-19 prevention was significantly associated with pregnant women's educational status. Above findings corroborate the observation from a study in Ghana which concluded that knowledge of COVID-19 infection, transmission and preventive measures were significantly associated with adherence to preventive measures against COVID-19 infection among pregnant women in Ghana (21) while similar study in Ethiopia concluded that urban residence, positive attitude and concerned about COVID-19-related stigmatization were significantly associated with adherence with COVID-19 preventive measures (20). This finding was corroborated by a study in their study in Mozambique which found that age, level of education and working as health professionals are associated with higher odds for adherence with COVID-19 prevention (24).

This study was conducted in southwest Nigeria, findings may therefore not be generalized. Despite these limitations, findings from this study provide valuable information about level of adherence to preventive measures against COVID-19 and related factors among pregnant women which is considered vital towards optimal maternal and child health.

Ensuring optimal maternal and new born health, reduction in maternal mortality and morbidity and favourable pregnancy outcomes are the main aim of prenatal services. Nurses and midwives should therefore priotize promotion of preventive measures against COVID-19 and other communicable diseases in order to achieve favourable and optimal pregnancy outcomes for the mother and the newborn. Priotizing the promotion of preventive measures against COVID-19 among pregnant women remain vital initiative towards safe motherhood in this emerging global health emergency.

Conclusion

Improving adherence to preventive measures against COVID-19 infection among pregnant women requires advocacy that prioritize and address various forms of ethnic and cultural misconceptions about transmission, symptoms and prevention of COVID-19 infection. Improvement in women education is essential towards increasing the coverage and practices of preventive measures against COVID-19 infection among pregnant women.

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Conflicts of interest

Authors declared no conflicts of interest.

References

1. Cennimo DJ, Bergman SJ. Coronavirus Disease 2019 (COVID-19). Medscape. 2020.

https://emedicine.medscape.com/article/2500114-overview
2. COVID-19 virus infection and pregnancy: occupational health advice for employers and pregnant women during the COVID-19 pandemic. Royal College of Obstetrics and Gynaecology. 2020. Available at: www. rcog.org.uk
3. Safe Motherhood and COVID-19. International Federation of Gynaecology and Obstetrics, FIGO. 2020. Available at: https://www.figo.org.
4. Tesini BL. Coronaviruses and Acute Respiratory Syndromes (COVID-19, MERS and SARS). MSD manual. 2020.
5. Achoki T, Alam U, Were L, Gebremedhin T, Senkubuge F, Lesego A, et al. COVID-19 pandemic in the African continent: Forecasts of cumulative cases, new infections, and mortality. MedRxiv. 2020. https://doiorg/10.1101/2020.04.09.20059154.
6. Varrella, S.Coronavirus (COVID-19) cases in Nigeria 2021, by status. Health, Pharma & medtech. 2021. https://w ww.statista. >statistics
7. Update on COVID-19 outbreak in Nigeria. Nigeria Centre for Disease Control, NCDC. 2021. Available at: https://www.ncdc.gov>covid-2
8. Emerging respiratory viruses, including COVID-19: methods for detection, prevention, response, and control. World Health Organization (WHO). 2020. Available at: https:// openwh o.org/co urse s/introduction-to-ncov.
9. Rasmussen SA, Smulian JC, Lednicky JA, Wen TS, & Jamieson DJ. Coronavirus disease 2019 (COVID-19) and pregnancy: what obstetricians need to know. Am J Obstet Gynecol. 2020.222(5): 415-426.doi; 10. 1016/j.ajog.2020.02.017. Epub2020 Feb 24.PMID:32105680; PMCID: PMC7093856.
10. Achoki T, Alam U, Were L, Gebremedhin T, Senkubuge F, Lesego A, Liu S, Wamai R, Kinfu Y. COVID-19 pandemic in the African continent: Forecasts of cumulative cases, new infections, and mortality. MedRxiv. 2020. https://doi.org/10.1101/2020.04.09.20059154
11. World Health Organization. COVID-19 situation update for the WHO African region: External situation report 34. https://reliefweb.int/ites/reliefweb.int/files/resources /S IT REP _COVID-19_WH OAFRO _2020 1021-eng.pdf. Published September, 2020.
12. Bhagavathula AS, Aldhaleei WA, Rahmani J, Mahabadi MA, Bandari DK. Novel Coronavirus (COVID-19) Knowledge and Perceptions: A Survey on Healthcare workers. MedRxiv. 2020. https://doi.org/10.1101/2020.03.09.20033381
13. World Health Organization (1998). Safe motherhood initiative. https: //www .who.in t>whd98
14. Cochrane WG. Sampling techniques (3rd edition). Wiley; ISBN: 978-0-471-16240-7. https://www.wiley.com. Published 1977
15. Erfani A, Shahriarirad R, Ranjbar K, Mirahmadizadeh A & Moghadami, (2020). Knowledge, attitude and practice towards the novel Coronavirus (COVID-19) outbreak: a population-based survey in Iran. https:// www.who.int.>bulletin
16. World Health Organization, WHO, 2020: Survey tool and guidance; Rapid, sinple, flexible behavioural insights on COVID-19. https: //www .euro.who.int>
17. Theuring S, Kengonzi A, Hafermann L, Herrmann C, Kabwama,SN, Rubaihayo J. Repercussions of the COVID-19 response in pregnant women in western Uganda: Knowledge, behavior, and emotional state after the first lockdown in 2020. International journal of environmental research and public health. Int. J. Environ. Res. Public Health. 2020. https://doi.org/10.3390/ijerph18157817
18. Nwafor JI, Aniukwu JK, Anozie BO, Ikeotuonye AC, Okedo-Alex IN. Pregnant women's knowledge and practice of preventive measures against COVID-19 in a low-resource African setting. Int J Gynecol Obstet. 1-3. 2020. DOI: 10.1002/ijgo.13186
19. Labban L, Thallaj N, Labban A. Assessing the Level of Awareness and Knowledge of COVID 19 Pandemic among Syrians. Archives of Medicine. 2020; 12(2). DOI: 10.36648/1989-5216.12.2.309
20. Bante A, Mersha A, Tesfaye A, Tsegaye B, Shibiru S, Ayele G. et al. Adherence with COVID-19 preventive measures and associated factors among residents of Dirashe district, southern Ethiopia. Patient Preference and Adherence (Dovepress). 2021; 15: 237–249. www. Dovepress.com
21. Apanga PA, Kumbeni MT. Adherence to COVID-19 preventive measures and associated factors among pregnant women in Ghana. Tropical Medicine and International Health. 2021. doi:10.1111/tmi.13566
22. Centers for disease control and prevention. Coronavirus disease 2019 (COVID-19) situation summary. Available from: https:// www.cdc.gov/coron aviru s/2019-nCoV/summa ry.html.
23. Kirigia C. Corona virus disease among pregnant women: A systematic scoping review. Open journal of obstetrics and gynecology: 10, 671-677. 2020. https://www.scirp.org/journal/ojog
24. Juniour A, Dula J, Mahumane S, Koole O, Enosse S, Fodjo, JNS. et al. Adherence to COVID-19 preventive measures in Mozambique: Two consecutive online surveys. Int. J.Environ. Res. Public Health. 2021, 18, 1091. https://doi.org/10.3390/ijerph18031091