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Knowledge, Adherence Mapping of Covid-19 Preventive Measures Among Adults in Southwest Nigeria: A Cross-Sectional Study

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ABSTRACT

Background: COVID-19 preventive measures represent the largest public health interventions in human history. However, gap still exist in the knowledge and adherence towards the preventive measures of the disease. This study assessed the knowledge and adherence towards COVID-19 preventive measures among adults in selected communities of Ekiti state, Southwest Nigeria

Methodology: This is a cross-sectional analytical study with multi-stage sampling technique. A pre-tested, structured questionnaire was used to collect data. Statistical Package for the Social Sciences version 23 and ArcGIS version 10.5 were used for data analysis and adherence mapping respectively. Level of statistical significance was set at $p<0.05$.

Result: Majority, 593 (98.8%), knew the preventive measures of COVID-19 and more than three quarter demonstrated good knowledge, 460 (76.7%). Less than half, 269 (44.8%), had good adherence to the preventive measures of COVID-19. Age and higher educational status were found to be associated with knowledge while socio-economic status was associated with adherence ($p<0.05$). Marriage was found as a predictor of knowledge [(aOR=7.43 (0.85-65.01); p=0.038)] and female respondents were about twice likely than the males to have good adherence to preventive measures. [(aOR=1.78 (1.17-2.69); p=0.007)]. The rich respondents were three times more likely to adhere to preventive measures of COVID-19 [(aOR=3.15 (1.51-6.55); p=0.002)].

Conclusion: The knowledge of COVID-19 preventive measures was high, but adherence to it was poor. The government and other relevant stakeholders in the State need to institute various interventions like health awareness campaign to increase adherence to the preventive measures.

Key words: Knowledge, Adherence, Preventive measures, Mapping, COVID-19, Nigeria

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INTRODUCTION

Corona Virus disease-2019 (COVID-19) is a global public health problem ever since its debut in Wuhan, China in December, 2019.[1] It affects all ages and both sexes and transmission can occur through close contact with infected persons and through contact with infected respiratory droplets.[2,3] To control the transmission, various measures were put in place around the world.[4]

In Nigeria, like many other countries, these strategies consist of lockdown, restriction of movement across national and international borders and promotion of physical/social distancing, use of face-masks, respiratory etiquette and hand hygiene.[4] Also, countries/international organizations around the world put efforts into preventive measures, research activities focusing on definitive treatment and vaccines.[5] These COVID-19 containment measures are the largest public health interventions in human history.[4] However, with the dynamic changes in the treatment protocol and guidelines, gap still exist in the knowledge of the epidemiology of the disease.[6]

Similarly, perception determines health behaviour and individual perception, particularly adherence to preventive measures of COVID-19 has a critical role in the control of the disease.[7] In addition, while these containment measures have been recognized by the World Health Organization to halt the spread of the disease and decrease fear and anxiety, reluctance to adhere to these measures fuels community transmission of the disease.[8] However, different studies have shown that adherence to preventive measures is not satisfactory; and this is made worse by little knowledge on adherence to preventive measures of COVID-19. This increases the number of asymptomatic individuals, community transmission and worsened the socio-economic and psychological effect.

In the United States, a study among adults aged 18 years and above, showed a general decline in adherence to preventive measures of COVID-19 during the epidemic waves.[9] A cross-sectional study of adults in the Oromia region of Ethiopia found low adherence to preventive measures of COVID-19 as only 8.3% had good adherence.[8] Among pregnant women in Nabdam district, Northern Ghana, adequate knowledge and good COVID-19 preventive measures was found to be 85.6% and 46.6% respectively.[10] In Nigeria, an online study found that 84.1% lack self-perceived risk of contracting COVID-19 while less than half (47.1%) and just about a quarter (21.3%) avoid crowded places and use hand sanitizer regularly, reflecting poor adherence/low compliance to preventive measures.[11]

The spread of coronavirus disease-19 (COVID-19) has been unprecedented in speed and impacting negatively on economic activities.[12] Consequently, the health and psychosocial crisis created by the COVID-19 pandemic may also increase inequality, engender discrimination and global unemployment in the medium and long term. Despite this, COVID-19 is novel with limited information on its epidemiology, transmissibility, and clinical manifestations.[13] Even with the availability of the vaccines, the appearance and circulation of variants of SARS-CoV-2 might pose a threat to the efficacy of the vaccines, thereby, hampering the attainment of anticipated herd immunity.

Control, therefore, is premised on addressing transmission through adherence to preventive/containment measures; assessing knowledge of the disease; and identifying vulnerable populations.[12,13] Also, scaling-up the knowledge and prevention practice of COVID-19 by people through regular updates about COVID-19 is crucial. Adequate access to information sources will help upgrade knowledge which will inform adherence to preventive practices to prevent COVID-9.[14] Therefore, this study aims to determine the knowledge and level of adherence towards COVID-19 preventive measures among adult in selected rural and urban communities of Ekiti State, Nigeria.

METHODS

Setting: This study was carried out in Ekiti State, one of the six (6) states in southwest geo-political zone of Nigeria. In terms of geographical boundaries, Ekiti State lies south of Kwara and Kogi States, east of Osun State; and it is also bounded by Ondo State in the east and in the south.[15] The state has a projected population of 3,376,045 based on an annual growth rate of 3.2%. Ekiti State has three senatorial districts (Ekiti- South, Central and North) and 16 Local Government Areas (LGAs). The Ekiti State isolation and treatment centre is located in the capital city of Ado-Ekiti, and this is complemented by the treatment facility at the federal tertiary health institution located in the state. Multi-family indwelling housing, is a common sight in Ekiti State, even in the

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urban locations.[16] This is often populated by those in the low economic stratum, tends to be overcrowded, thereby aiding the transmission of respiratory pathogens, including SARS-COV-2. Despite the efforts of the Government on preventing spread of the disease, Ekiti State experienced cases of the disease with attendant mortality, suggesting spread which could be traceable to poor adherence to preventive measures.

Design: This was a community-based cross-sectional study

Population: This study was carried out among adults aged 18 years and above. It was conducted between December 2021 and June 2022.

Sample size determination: The minimum sample size for the study was determined using Fisher's formula for population greater than 10,000.[17] A design or cluster effect of 1.5[18,19] and a 10% non-response was used and the minimum sample size obtained was 600.

Sampling methodology: Multi-stage sampling technique was used to select respondents. Six LGAs (two from each senatorial district) selected using simple random sampling by balloting were used for the study. Twenty-four wards (twelve rural and twelve urban) were selected using simple random sampling by balloting. The selected political wards were stratified into clusters of settlement; and a total of 120 settlements (five per political ward) were selected for this study. Using a table of random numbers, simple random sampling using was used to select ten (10) houses from each settlement. One household from each of the 1,200 houses was sampled making a total of 1,200 households which served as the sampling frame. With the calculated minimum sample size of 600, a sampling interval of 2 was used in all sampled settlements until the overall/desired sample size was reached.

Study tools and data collection: A pre-tested, structured interviewer-administered questionnaire adapted from previous studies was used in this study. [16, 20-24] Content validity was assessed by experts in the field of community medicine and public health while reliability of the tools was conducted across time using the test-retest method and a reliability co-efficient, r=0.75, was obtained for this study, which is reliable ($r \geq 0.7$).[25]

To establish the adherence map, the GPS co-ordinates of all respondents' households were taken and mapped to reflect the level of adherence across rural and urban areas. The ESRI ArcGIS desktop version 10.5 was used as the primary program in plotting the coordinates to produce the adherence map and showcase disparities across rural and urban areas.

Data Analysis: Data analysis was done using IBM SPSS 23. In line with the objectives of this study, a progressive multi-level analysis was conducted. Level of statistical significance was predetermined at a p-value of < 0.05. Respondents' adherence to preventive measures of COVID-19 was assessed using fifteen (15) adapted questions using a four-point Likert scale: 0-never; 1-rarely; 2-sometimes and 3-always. [20, 23] The responses were summed up and the maximum score obtainable was forty-five (45); and the higher the score, the better the adherence to preventive measures. For the purpose of analysis, the summative interpretation of the Likert scale was achieved by reclassifying into three categories: poor, fair and good. A score of 0-15 was classified as poor, 16-30 as fair and 31-45 as good adherence.

The knowledge of preventive measures was assessed using 12 variables and the maximum score obtainable was 12. The knowledge was graded into poor (0-3) for respondents who got at most three correct answers; fair (4-7) for respondents with four to seven correct answers and good (above 7) for those respondents who got more than seven correct answers. Respondents with poor and fair knowledge were categorized as having inadequate knowledge, while those with good knowledge had adequate knowledge.[26] The relative household wealth index was created using the Principal Component Analysis (PCA). For the distribution of cut points, quintiles, (Q) was used and a respondent was assigned the wealth index score of the household. The quintiles were: Q1 = poorest, Q2= poor, Q3= average; Q4= rich; and Q5 = richest. [27,28]

Ethical consideration: Ethical approval (ERC/2021/03/02/489A; dated 10/03/2021) for this study was obtained from the Ethical committee of the Federal Teaching Hospital, Ido-Ekiti, Nigeria. Written informed consent, signed or with a thumb print was obtained from all subjects and confidentiality of findings was maintained. Participation was voluntary and the financial cost of the research was borne by the researcher.

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RESULTS

More than a quarter, 164 (27.3%), were in the age group 30-39 years and majority, 302 (51.0%), had tertiary education. While less than a tenth, 44 (7.0%) had no formal education, majority (66.7%) were married (Table 1)

Table 1: Socio-demographic Characteristics of Respondents

Variable	Freq.	(%)	N=600
Age (years)			
<20	23	(3.8)	
20-29	123	(20.5)	
30-39	164	(27.3)	
40-49	144	(24.0)	
50-59	73	(12.2)	
≥60	73	(12.2)	
Level of Education			
No formal education	44	(7.0)	
Formal education	556	(93.0)	
Occupation			
Business	170	(28.3)	
Farming	105	(17.5)	
Skilled manual worker	93	(15.5)	
Unemployed	82	(13.7)	
Government employee (non-health professional)	76	(12.7)	
Healthcare professional	74	(12.3)	
Marital status			
Ever Married	461	(76.8)	
Never married	139	(23.2)	

Table 2: Knowledge of Preventive Measures of COVID-19 among Respondents

Variable	Frequency	Percent (%)	N=600
Do you know COVID-19 preventive measures?			
Yes	593	98.8	
No	7	1.2	
If yes, what are the preventive measures? (n=593)			
Washing hands frequently with soap and running water	583	98.3	
Use of alcohol-based sanitizers if there is no soap/water	563	94.9	
Avoid touching of eyes, nose and mouth with hands	486	82.0	
Occasional wearing of face mask in public	451	76.1	
Covering mouth and nose when coughing or sneezing	532	89.7	
Maintenance of physical/social distancing	532	89.7	
Maintaining a distance of at least 1m from people	411	69.3	
Use of herbs and concoction always	179	30.2	
Staying at home except necessary to go out	406	68.5	
Use of un-prescribed drugs like antibiotics and vitamins	105	17.7	
Avoidance of crowded places	540	91.1	
Disinfecting frequently touched surfaces	343	57.8	
Respondents' scores on knowledge of preventive measures			
0-3 (Poor)	14	2.3	
4-7 (Fair)	126	21.0	
>7 (Good)	460	76.7	
Knowledge category			
Adequate	460	76.7	
Inadequate	140	23.3	

Mean score= 9.0±2.3; Highest score= 12; Lowest score= 0; Range =12

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Majority, 593 (98.8%), of the respondents knew the preventive measures of COVID-19. However, more than three quarters, 451 (76.0%), of them wore face masks occasionally as a preventive measure. Conversely, most, 583 (98.3%) of them knew that frequent hand washing with soap and running water was a COVID-19 preventive measure. More than three quarters, 532 (89.7%), also knew that covering mouth and nose when coughing or sneezing was a preventive measure of COVID-19. About two thirds each knew that maintaining social / physical distance (69.3%) and staying at home except when necessary to go out (68.5%) were preventive measures. In the knowledge score, about a quarter of the respondents demonstrated fair knowledge, 126 (21.0%), less than a tenth, 14 (2.3%) had poor knowledge while more than three quarters demonstrated good knowledge, 460 (76.7%), of preventive measures of COVID-19 (Table 2)

More than a quarter, 168 (28.0%), of the respondents always avoided visiting crowded places and social gatherings. While only about one third, 211 (35.2%), of the respondents observed physical distancing, more than half, 345 (57.5%) obeyed the lock down order imposed by the Government. Only about a tenth (14.0%) of the respondents do touch their face with their hands. Less than half, 269 (44.8%), of the respondents had good adherence to the preventive measures of COVID-19. About a tenth, 51 (8.5%), of the respondents had poor adherence to the preventive measures (Table 3)

Table 3: Respondents' Adherence to Preventive Measures of COVID-19

Variable	**Likert Scale**		**N=600**	
	Always n (%)	**Sometimes** n (%)	**Rarely** n (%)	**Never** n (%)
Not visiting crowded places/ go to social gatherings	168 (28.0)	325 (54.2)	54 (9.0)	53 (8.8)
Hand washing with soap under running water	282 (47.0)	244 (40.7)	45 (7.5)	29 (4.8)
Use of alcohol-based hand sanitizer if no water/soap	230 (38.3)	245 (40.8)	79 (13.2)	46 (7.7)
Not touching face with hands	186 (31.0)	212 (35.3)	118 (19.7)	84 (14.0)
Disinfecting your mobile phone	62 (10.3)	159 (26.5)	120 (20.0)	259 (43.2)
Disinfecting surfaces with heavy human traffic at home and or in office	86 (14.3)	142 (23.7)	136 (22.7)	236 (39.3)
Wearing face mask outside or when in crowded places	244 (40.7)	285 (47.5)	44 (7.3)	27 (4.5)
Cover mouth/face in crowded places	241 (40.2)	281 (46.8)	49 (8.2)	29 (4.8)
Observing physical distancing (≥1m)	211 (35.2)	254 (42.3)	83 (13.8)	52 (8.7)
Measure body temperature	75 (12.5)	82 (13.6)	115 (19.2)	328 (54.7)
Obeying lockdown order	345 (57.5)	159 (26.5)	54 (9.0)	42 (7.0)
Staying at home when sick	246 (41.0)	211 (35.2)	89 (14.8)	54 (9.0)
Cover mouth if coughs/sneezes	293 (48.8)	250 (41.7)	30 (5.0)	27 (4.5)
Washing hands after coughing or sneezing	202 (33.7)	210 (35.0)	72 (12.0)	116 (19.3)
Avoid handshakes with people	235 (39.2)	211 (35.2)	86 (14.3)	68 (11.3)
Respondents' scores on adherence to preventive measures				
Adherence score	**n**	**(%)**		
0-15 (Poor)	51	(8.5)		
16-30 (Fair)	280	(46.7)		
31-45 (Good)	269	(44.8)		
Mean Adherence Score- 28.4±9.5				

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Table 4: Socio-demographic variables and Knowledge of Preventive Measures of COVID-19 among Respondents

Variable	Knowledge of Preventive Measures				
	Poor (%)	Fair (%)	Good (%)	χ2	p value
Age (years)				**40.59**	**<0.001**
<20	0 (0.0)	10 (43.5)	13 (56.5)		
20-29	1 (0.8)	26 (21.1)	96 (78.0)		
30-39	1(0.6)	21 (12.8)	142 (86.6)		
40-49	2 (1.4)	31 (21.5)	11 (77.1)		
50-59	3 (4.1)	17 (23.3)	53 (72.6)		
≥60	7 (9.6)	21 (28.8)	45 (61.6)		
Sex				**9.69**	**0.008**
Female	1 (0.4)	64 (23.3)	210 (76.3)		
Male	13 (4.0)	62 (19.1)	250 (76.9)		
Level of Education				**87.01**	**<0.001**
No formal education	5 (11.4)	16 (36.4)	23 (52.2)		
Primary	2 (3.2)	26 (42.0)	34 (54.8)		
Secondary	5 (2.6)	59 (30.7)	128 (66.7)		
Tertiary/Postgraduate	2 (0.7)	25 (8.3)	275 (91.0)		
Occupation				**51.73**	**<0.001**
Business	1 (0.6)	38 (22.4)	131 (77.0)		
Farming	1 (0.9)	35 (33.4)	69 (65.7)		
Healthcare workers	1 (1.4)	4 (5.4)	69 (93.2)		
Skilled manual worker	4 (4.3)	18 (19.4)	71 (76.3)		
Government employee*	1 (1.3)	5 (6.6)	70 (92.1)		
Unemployed	6 (7.3)	26 (31.7)	50 (61.0)		
Marital status				**68.2**	**<0.001**
Married	5 (1.3)	66 (16.5)	329 (82.2)		
Single	0 (0.0)	27 (23.3)	89 (76.7)		
Widowed	8 (14.3)	22 (39.3)	26 (46.4)		
Divorced/Separated	1 (4.4)	8 (34.8)	14 (60.8)		
Cohabiting	0 (0.0)	3 (60.0)	2 (40.0)		
Income (Naira)				**22.22**	**<0.001**
<30,000	8 (4.2)	59 (30.9)	124 (64.9)		
≥30,000	6 (1.5)	67 (16.4)	336 (82.1)		
Nature of Work Environment				**34.22**	**0.001**
Home	5 (7.7)	17 (26.2)	43 (66.2)		
Face-face contact with clients	4 (1.7)	60 (25.8)	169 (72.5)		
Hospital Environment	3 (2.8)	13 (11.9)	93 (85.3)		
Office setting	0 (0.0)	5 (6.3)	74 (93.7)		
Outdoor	2 (1.8)	31 (27.2)	81 (71.0)		
Wealth Quintiles				**74.79**	**0.001**
Q1 (Poorest)	8 (5.1)	58 (37.2)	90 (57.7)		
Q2 (Poor)	5 (4.7)	28 (26.2)	74 (69.1)		
Q3 (Average)	1 (0.9)	25 (23.2)	82 (75.9)		
Q4 (Rich)	0 (0.0)	10 (8.3)	111 (91.7)		
Q5 (Richest)	0 (0.0)	5 (4.6)	103 (95.4)		

Non-health worker

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Those in the age group 20-39 and 40-59 years demonstrated good knowledge of preventive measures of COVID-19 than the other age groups. Consequently, younger respondents had good knowledge of preventive measures compared with the older respondents (p<0.001). Those with tertiary level of education had the highest proportion, 275 (91.0%), of those with good knowledge of COVID-19 preventive measures. The respondents' good knowledge of preventive measures COVID-19 increases as the level of education increases and this observed difference was found to be statistically significant (p<0.001). However, in both rural, 227 (75.6%), and urban areas, 233 (77.7%), respondents with good knowledge of preventive measures of COVID-19 were found in the majority with no significant difference in knowledge (p=0.782) (Table 4).

As shown in Table 5, a significantly higher proportions of younger respondents aged reported good adherence to preventive measures of COVID-19 than the older ones, ≥60 years (27.7%) and this was statistically significant (p<0.001). The higher the socio-economic status / wealth category, the better the adherence to the preventive measures of COVID-19 (p=0.001)

Table 5: Socio-demographic variables and Adherence to Preventive Measures of COVID-19 among Respondents

Variable	Adherence to Preventive Measures				
	Poor (%)	Fair (%)	Good (%)	χ2	p value
Age (years)				**58.69**	**<0.001**
<20	1 (4.3)	15 (65.2)	7 (30.4)		
20-29	7 (6.0)	58 (47.0)	58 (47.0)		
30-39	7 (4.3)	75 (45.7)	82 (50.0)		
40-49	7 (4.9)	64 (44.4)	73 (50.7)		
50-59	7 (9.6)	37 (50.7)	29 (39.7)		
≥60	22 (30.1)	31 (42.5)	20 (27.4)		
Level of Education				**148.33**	**<0.001**
No formal education	16 (36.4)	20 (45.5)	8 (18.1)		
Primary	15 (24.2)	39 (62.9)	8 (12.9)		
Secondary	13 (6.8)	116 (60.4)	63 (32.8)		
Tertiary/Postgraduate	7 (2.4)	105 (36.0)	180 (61.6)		
Occupation				**72.97**	**<0.001**
Business	14 (8.2)	86 (50.6)	70 (41.2)		
Farming	11 (10.4)	66 (62.9)	28 (26.7)		
Healthcare workers	2 (2.7)	14 (18.9)	58 (78.4)		
Skilled manual worker	6 (6.5)	49 (52.7)	38 (40.8)		
Government employee*	3 (3.9)	25 (32.9)	48 (63.2)		
Unemployed	15 (18.3)	40 (48.8)	27 (32.9)		
Marital status				**69.56**	**<0.001**
Married	26 (6.5)	179 (44.8)	195 (48.7)		
Single	4 (3.5)	53 (45.7)	59 (50.8)		
Widowed	19 (33.9)	27 (48.2)	10 (17.9)		
Divorced/Separated	2 (8.7)	17 (73.9)	4 (17.4)		
Cohabiting	0 (0.0)	4 (80.0)	1 (20.0)		
Family setting				**22.39**	**<0.001**
Monogamy	29 (6.5)	212 (47.1)	209 (46.4)		
Polygamy	21 (19.0)	51 (46.4)	38 (34.6)		
Single parent	1 (2.5)	17 (42.5)	22 (55.0)		
Income (Naira)				**6.84**	**0.033**
<30,000	23 (12.0)	94 (49.3)	74 (38.7)		
≥30,000	28 (6.8)	186 (45.5)	195 (47.7)		
Nature of Work Environment				**54.63**	**0.001**

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Home	7 (10.8)	29 (44.6)	29 (44.6)		
Face-face client interaction	22 (9.4)	122 (52.4)	89 (38.2)		
Hospital Environment	5 (4.6)	25 (22.9)	79 (72.5)		
Office setting	6 (7.6)	32 (40.5)	41 (51.9)		
Outdoor	11 (9.6)	72 (63.2)	31 (27.2)		
Wealth Quintiles				**110.38**	**0.001**
Q1 (Poorest)	31 (19.9)	85 (54.5)	40 (25.6)		
Q2 (Poor)	12 (11.2)	63 (58.9)	32 (29.9)		
Q3 (Average)	4 (3.7)	61 (56.5)	43 (39.8)		
Q4 (Rich)	1 (0.8)	47 (38.8)	73 (60.4)		
Q5 (Richest)	3 (2.8)	24 (22.2)	81 (75.0)		

Non-health worker

Table 6: Regression Models Showing Predictors of Knowledge and Adherence of COVID-19 Preventive Measures among Respondents

Variables	**Knowledge (Model 1)**				**Adherence (Model 2)**		
	B	**aOR (95%CI)**		**p value**	**B**	**aOR (95%CI)**	**p value**
Age (years)							
<20 **Ref (M1)**		1.00	-	-	0.54	1.72(0.42-7.01)	0.450
20-29	-0.74	0.48	(0.11-2.01)	0.312	0.06	1.06(0.41-2.73)	0.908
30-39	-0.04	0.96	(0.34-2.72)	0.939	0.04	1.04(0.45-2.42)	0.923
40-49	0.08	1.01	(0.43-2.76)	0.860	0.01	1.01(0.43-2.37)	0.975
50-59	-0.69	0.49	(0.20-1.22)	0.126	-0.08	0.92(0.37-2.29)	0.860
≥60 **Ref (M2)**	-0.31	0.73	(0.29-1.80)	0.499		1.00 -	-
Sex							
Female	-0.34	0.71	(0.44-1.17)	0.180	0.57	1.78(1.17-2.69)	0.007
Male **Ref**		1.00	-	-		1.00 -	-
Level of Education							
No formal education **Ref M2**	-1.31	0.27	(0.06-1.26)	0.096		1.00 -	-
Primary	-1.52	0.22	(0.05-0.91)	0.037	1.81	6.11(1.82-20.49)	0.003
Secondary	-1.28	0.28	(0.07-1.04)	0.056	2.15	8.59(2.79-26.48)	<0.001
Tertiary/Postgraduate **Ref M1**	1.00		-	-	1.05	2.86(1.32-6.22)	0.008
Occupation							
Business	0.39	1.49	(0.72-3.06)	0.283	-0.59	0.55(0.27-1.13)	0.104
Farming	0.03	1.04	(0.45-2.39)	0.936	-0.19	0.82(0.35-1.94)	0.651
Healthcare workers	0.84	2.32	(0.68-7.94)	0.180	-1.24	1.29(0.12-2.72)	0.008
Skilled manual worker	0.08	1.08	(0.48-2.44)	0.855	-0.533	0.59(0.27-1.29)	0.187
Government employee*	0.98	2.65	(0.85-8.26)	0.092	-1.15	0.32(0.13-0.77)	0.011
Unemployed **Ref**		1.00	-	-		1.00 -	-
Marital status							
Married **Ref M2**	2.01	7.43	(0.85-65.01)	0.038		1.00 -	-
Single **Ref M1**		1.00	-	-	-1.32	0.27(0.02-3.36)	0.308
Widowed	1.94	6.99	(0.82-59.78)	0.031	-0.98	0.37(0.03-4.59)	0.442
Divorced/Separated	1.78	5.92	(0.21-168.35)	0.298	-1.23	0.29(0.1-8.52)	0.474
Cohabiting	1.48	4.39	(0.42-46.11)	0.217	0.015	1.02(0.07-15.12)	0.991
Income (Naira)							
<30,000	-0.13	0.88	(0.53-1.44)	0.601	-0.68	0.51(0.31-0.84)	0.008
≥30,000 Ref		1.00	-	-			
Wealth Quintile							
Poorest **Ref M2**	-1.34	0.26	(0.09-0.77)	0.015		1.00	

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Poor	-1.37	0.25	0.09-0.75)	0.013	1.33	3.79(1.92-7.47)	<0.001
Average	-1.46	0.23	(0.08-0.69)	0.008	1.39	4.03(1.99-8.15)	<0.001
Rich	-0.29	0.74	(0.24-2.35)	0.612	1.15	3.15(1.51-6.55)	0.002
Richest **Ref M1**		1.00	-	-	0.48	1.62(0.86-3.10)	0.001

*Model fitting 1 coefficient, R^2= 0.304; Goodness of fit $\chi 2$= 6.84; p=0.554; aOR=adjusted Odds Ratio;*non-health*
*Model fitting 2 coefficient, R^2= 0.361; Goodness of fit= $\chi 2$= 14.32; p=0.074; aOR=adj Odds Ratio;*non-health*

Table 6 showed that respondents who were married were about seven times more likely to be more knowledgeable about the preventive measures than those who were single or never married [(aOR=7.43 (0.85-65.01); p=0.038)]. The poorest respondents were about 0.8 times less likely to have the knowledge of preventive measures of COVID-19 than those who were richest [(aOR=0.26 (0.09-0.77); p=0.015)]. Also, female respondents were about twice likely than the male counterparts to have good adherence to preventive measures of COVID-19 and this was significantly predictive [(aOR=1.78 (1.17-2.69); p=0.007)]. The respondents who were rich were about three times more likely to adhere to preventive measures than those in the poorest wealth category [(aOR=3.15 (1.51-6.55); p=0.002)] - Table 6
As shown in the adherence map, there is clustered distribution of respondents with poor adherence to preventive measures of COVID-19 in rural communities. Unlike Ekiti south where there was good adherence in the rural communities, a random distribution pattern showing poor adherence was however observed around rural locations in Ado-Ekiti (Ekiti Central) and in Ido-Osi (Ekiti North) (Figure 1).

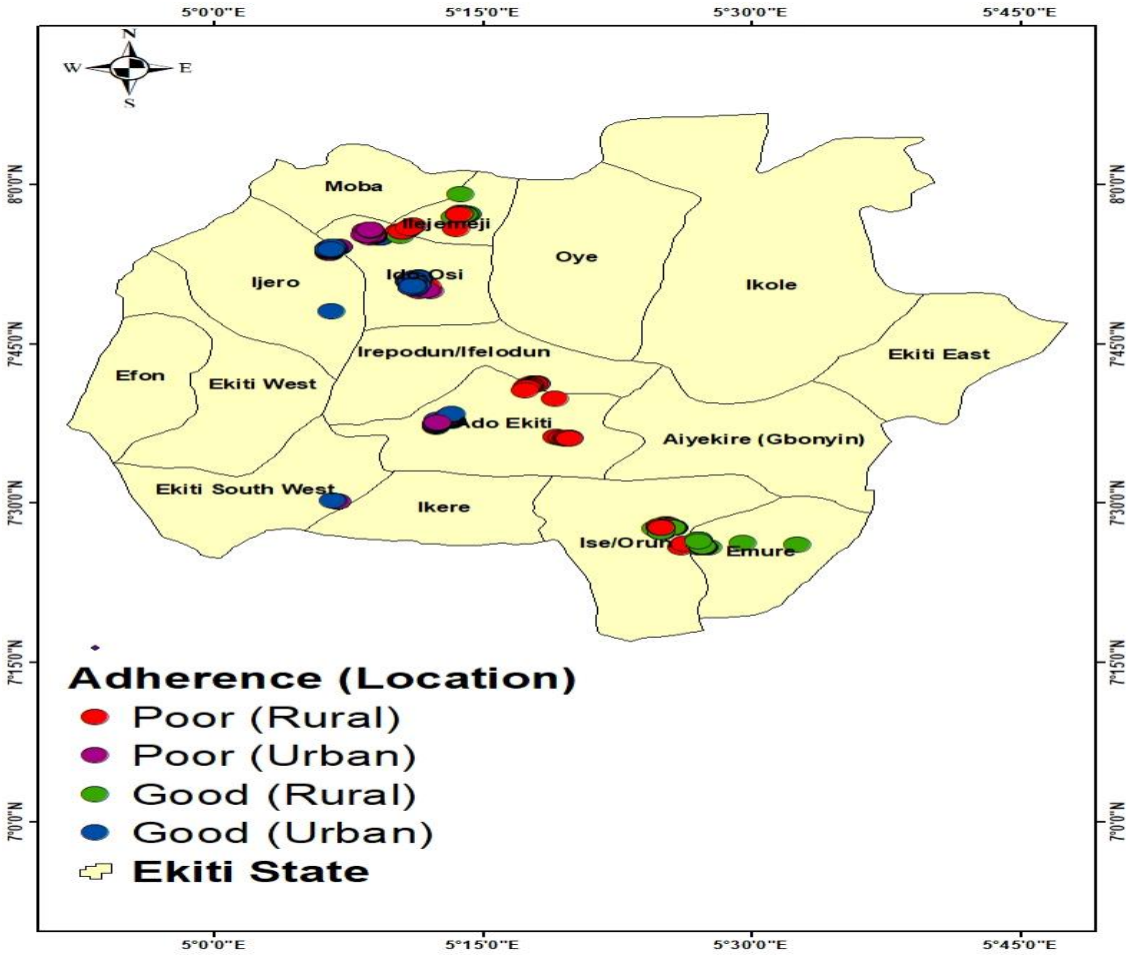

Figure 1: Rural-Urban mapping of adherence to preventive measures of COVID-19

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DISCUSSION

The study found a mean knowledge score of 9.0±2.3 out of a maximum score point of 12 and, more than three quarters was found to have good and adequate knowledge of preventive measures of COVID-19, but adherence to it was poor with a mean score of 28.4±9.5 and less than half having good adherence. The study found that age and higher educational status were associated with good knowledge while female sex is a good predictor of knowledge of COVID-19 preventive measures Furthermore; socio-economic status was associated with adherence to preventive measures of COVID-19 while being rich is a predictor for this adherence.

The good and adequate knowledge of preventive measures of COVID-19 found by this study is similar to what was obtained in another study in Enugu, Nigeria, where about two-thirds had adequate knowledge of COVID-19 .[29] This high knowledge of preventive measures obtained in this study might be attributed to the access to information on COVID-19 and the high educational attainment and if translated to practice and adherence, will go a long way to reduce transmission of the disease. In a multinational study involving healthcare practitioners, majority of the respondents demonstrated good knowledge of COVID-19 with an aggregate mean score of 13.18 (out of a maximum of 15).[30] This is a homogenous population of health care practitioners and the data from the study population were collected through phone, a reflection of the socio-economic and educational status of the people; and so having knowledge of COVID-19 preventive measures is not unexpected.

A similar study in Port Harcourt[31], Nigeria, found that about half (47.0%) of the respondents have poor knowledge of COVID-19 unlike this study where only 2.3% had poor knowledge. This difference might be due to the difference in sources of information reported in the study. With the vast array of information available in the social media / internet channel, compared with radio and television, which are the most common in the Port Harcourt study, such difference / gap in knowledge is not surprising

Among healthcare workers in the South-south geopolitical zone of Nigeria, about half (48.67%) of the respondents knew that the spread of COVID-19 can be prevented through social distancing, staying at home (32%) and environmental sanitation (1.7%).[32] Just like this study, 97.1% of the respondents in a study in Egypt[6] knew that not touching the eyes, nose and mouth with the hands is a preventive measure. Among correctional officers in Nigeria, most of the respondents knew that regular washing of hands (99.3%), use of alcohol-based hand sanitizer (95.0%), avoiding crowded places (96.5%) and wearing of face masks (96.5%) are preventive measures of COVID-19.[23] However, among the general population in Pakistan, just about a tenth (16.8%) of the respondents knew that proper hand hygiene and cough etiquette is a preventive measure of COVID-19 and less than a tenth (7.3%) knew that not touching the mouth with hands is a preventive measure.

Age was found to be associated with knowledge of preventive measures as respondent who are younger in age demonstrated better knowledge than the older respondents. Younger respondents have access to information through sharing with peers, particularly in schools. The younger ones are also likely to be more educated, are active users of the social media channels and surf the internet regularly. However, in a study in Cameroon, older respondents demonstrated better knowledge than the younger ones.[33] The population sampled in the Cameroon study was skewed towards more of those who are older in age and this might provide explanation for the result seen. In this study, those with higher educational status were found to be more knowledgeable than those with lower educational exposure. Education equips one with the ability to access information, thereby positively impacting knowledge, and in this instance, COVID-19-related knowledge. In a community-based study in Pakistan to assess the knowledge, attitudes, practices and risk factors regarding COVID-19, age, marital status, location/provinces, occupation and economic status were found to be significantly associated with knowledge of COVID-19 among the respondents just like this study.[34]

This study found that respondents who had ever been married, [(aOR=7.427 (0.847-65.098); p=0.038)], are much more likely to have knowledge of preventive measures of COVID-19 than those who are single or never married. This can be attributed to companionship and information sharing that occur among couples in a marriage. Older respondents are more likely to have knowledge of preventive measures of COVID-19 in this study as seen in the study in Cameroon.[33] Similarly, in a study in Enugu State Nigeria, age, parity, level of

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education, area of residence and occupation were associated with inadequate knowledge of COVID-19.[29] In the study, respondents above 40 years of age were less likely to have inadequate knowledge compared with younger age groups.[29] Also, those with no formal education are less likely to have knowledge of preventive measures. This was similar to the findings in Enugu, Nigeria, where respondents with no formal education are six times more likely to have inadequate knowledge.[29] The poor mean adherence score and finding that less than half of respondents have good adherence to the preventive measures of COVID-19 showed that despite the knowledge of preventive measures has not translated to adherence among the respondents. The public health implication of this gap will be the sustained transmission, particularly community transmission of COVID-19, resulting in morbidity and mortality and inability to flatten the epidemic curve. This is similar to a survey in Ekiti state, Nigeria, where only 20% of the survey respondents adhered to the wearing of face masks and half of them had attended one mass gathering within 14 days of the survey.[35] This suggests non adherence to the COVID-19 preventive measures and might be due to the drop in the awareness campaign and non-enforcement of these measures in the State. Also, study in Ethiopia, however, found only about a tenth of the respondents adhered to the recommended preventive measures of COVID-1.[36]

This study finding is however in contrast to the good adherence and practice of preventive measures with demonstrable high level of awareness and knowledge reported among respondents in a Saudi Arabia study[37] and this might be attributed to possible enforcement and a more enlightened society with a very high literacy rate. Also, a study among the Chinese population found that 98% of the subjects adhered to the use of face mask. The difference in the study setting might account for this disparity. The Asian country of China was where the pandemic started with high case fatality rate associated with fear in the country at the start of the outbreak and this might be responsible for this high usage rate. In Cameroon[33], a high level of adherence was observed among the respondents as 94.5% wash hands and use sanitizers regularly and another 83.8% avoided crowded places unlike this study where only 47.0% and 38.3% wash hands and use hand sanitizer regularly respectively and 28.0% always avoid crowded places.[33] The study in Cameroon was done at the initial phase of the pandemic with global exponential rise in COVID-19 cases and fatalities and might possibly account for this adherence rate.

Age (≥60 years) was found to be associated with poor adherence and this was statistically significant ($p<0.001$). This is however not in line with a community-based study in Pakistan which found that those aged >30 years had significantly higher means score of practice of preventive measures than younger respondents.[34] Also, level of education was found to be associated with adherence as those with higher level of education demonstrated good adherence than those with lower levels of education. This is because education drives exposure to information which triggers awareness and cascade into better knowledge. Just like this study, study in Pakistan also found that the level of education was also found to be significantly associated with levels of adherence as almost half of those with higher education were in the high adherence category ($p < 0.001$).[34]

The study also found that sex (being a woman), level of education and employment status are associated with adherence practices among respondents. This findings are similar to as reported in Iran, where women were found to have better COVID-19 preventive behaviours and practices than men, so also are people with university-level education compared with the respondents with lower or elementary level of education.[39] The health consciousness of the females was also seen in this study as the females demonstrated good adherence to preventive measures than the males. It is also similar to findings in Enugu, Nigeria, where higher education attainment and being employed were associated with adherence to preventive measures of COVID-19.[27] Just like this study, the unemployed have the highest proportion of those with poor adherence.[27] The unemployed with probable poor socio-economic status might lack access to information and knowledge about COVID-19 that are necessary to drive adherence. This study found that a female was 1.8 times more likely to adhere to preventive measures than the male respondents [(aOR=1.776 (1.173-2.690); p=0.007)]. Respondents with tertiary / postgraduate education were also more likely to adhere to preventive measures than those with no formal education [(aOR=2.863 (1.317-6.221); p=0.008)]. Similar findings were obtained in Bangladesh where females were found to be more likely to adhere to preventive measures than the male

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counterparts.[40] Also, in Enugu, a study obtained similar findings as the odds of poor practice of preventive measures decreases as educational attainment increases.[29] This buttresses the importance of educational exposure as a very important precursor for adherence to preventive measures of COVID-19.

In terms of residence, urban respondents were 10 times more likely to have adherence with COVID-19 preventive measures [(aOR = 9.74, 95% CI: 4.72-20.1)] than the rural dwellers and this is supported by the Saudi Arabia study.[37] This is not unexpected as urban respondents are likely to be educated and also have an advantage in terms of access to health and health information. However, this study found no significant association between residence and adherence to preventive measures of COVID-19.

This study found that healthcare workers [(aOR=1.288 (0.115-2.720)]; p=0.008) are likely to adhere to the preventive measures than artisans, farmers and traders. This finding was also obtained in a study in Enugu where participants who are farmers and artisans are less likely to adopt preventive measures.[29] Health workers are better positioned to know the preventive measures and the implication of non-adherence and are therefore more likely to use the measures. This study found that the higher the socioeconomic status, the higher the odds of adherence as rich respondents [(aOR=3.146 (1.512-6.545); p=0.002)] are three times likely to adhere to the preventive measures than the poor respondents in this study.

CONCLUSION

The knowledge of COVID-19 preventive measures was high, but adherence to it was poor. The study found that age and higher educational status were found to be associated with knowledge while female sex is a good predictor of knowledge of COVID-19 preventive measures Furthermore; socio-economic status was associated with adherence to preventive measures of COVID-19 while being rich is a predictor for this adherence.

The government and other relevant stakeholders in the State need to institute various interventions like health awareness campaign to increase adherence to the preventive measures.

Strength and Limitation of the study

This study did not only determine the knowledge and adherence to COVID-19 preventive measures at community level, it was also able to identify and mapped the level of adherence to preventive measures to reflect rural and urban areas. The study was also able to determine the predictors of the findings to enable identification of activities that will enhance better knowledge and adherence. However, being a cross-sectional study, the study only gave a snap shot of what the community was as at the time of the study and could not determine whether or not there is improvement in the community knowledge and adherence levels. Additionally, the associations established were not causal and there could be social desirability bias due to the study design

Implication of the findings of the study

Findings in this study will help policy makers to put in place measures to combat future pandemic and also to prepare for better handling of epidemics occurrences. The predictors of knowledge and adherence highlighted by this study will help streamline and focus on parametres will help improve preventive practices. The adherence mapping by this study will also help policymakers to understand rural-urban distribution mix in adherence and where resources or interventions could be deployed.

This study finding will also serve as baseline information for future research works and can give good comparison data needed to determine the effectiveness of interventional programme.

List of abbreviations and meanings

aOR: Adjusted Odd Ratio
COVID-19: Corona Virus disease-2019
FETHI: Federal Teaching Hospital, Ido-Ekiti
LGAs: Local Government Areas
PCA: Principal Component Analysis
WHO: World Health Organization

Declaration:

Ethical Approval/Consent to Participant: Ethical approval (reference number ERC/2021/03/02/489A; dated 10/03/2021) for this study was obtained from the Ethical committee of the Federal Teaching Hospital, Ido-Ekiti, Nigeria. Written informed consent, signed or with a thumb print was obtained from all subjects and

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confidentiality of findings was maintained. Participation was voluntary and the financial cost of the research was borne by the researcher. Patients or the public WERE NOT involved in the design, or conduct, or reporting, or dissemination plans of our research

***Consent for the Publication*:** This decision to publish was taken by all the authors and the corresponding author was empowered to submit the article of the authors' behalf.

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