Research

Child Nutritional status and Practice of C-IMCI among Mothers in Urban and Rural Communities in Oyo state

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Abstract

Background: The introduction of the community component of the integrated management of childhood illnesses, (C-IMCI) includes the development of key household practices (KHPs) and has led to better health outcomes among under-five children. However, malnutrition and childhood illnesses continue to linger among under-five children across communities in Nigeria. This study comparatively explores the knowledge and adoption of key household practices as well as childhood nutritional status in selected rural and urban areas in Oyo state, Nigeria.

Method: A comparative cross-sectional study conducted in Ibadan Northeast and Akinyele local government areas of Oyo State. A total of 484 children aged 0-59 months and their mothers/caregivers were assessed using an interviewer-administered questionnaire adapted from the UNICEF Multiple Indicator Cluster Survey and Nigerian National Demographic and Health Survey tools.

Result: Mean age of mothers was 29.8+5.60 and slightly above half of the urban dwellers (56.4%) had good knowledge of child psychosocial development while half of the rural dwellers had poor knowledge (51.7%). More urban (64.4%) than rural (56.4%) dwellers had good composite key household practices (KHPs) (p=0.011). Stunting (64.1%) was the most prevalent type of malnutrition, and there were more wasted and underweight children in urban areas (12.0% and 23.4%) than in rural areas (8.5% and 22.0%).

Conclusion: The observed gaps in practice of KHPs and nutritional status of under-fives in urban and rural communities calls for greater awareness on key household practices through tailored health campaigns. This should be directed at communities to improve the knowledge and practice of KHPs among caregivers.

Keywords: Integrated Management of Childhood Illnesses, key household practices, child nutritional status, under-five children, urban and rural communities.

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Introduction

While the main causes of death among children vary by age, those under -5 years are particularly at risk of infectious diseases like pneumonia, malaria, tuberculosis, HIV, and diarrhoea[1]. As a means of addressing childhood illnesses by providing top-quality care even in resource-constrained areas, the United Nations Children's Fund (UNICEF) and the World Health Organization (WHO) developed the Integrated Management of Childhood Illnesses (IMCI) in the year 1992.[1,2]

The primary goal of IMCI is to enable communities to address issues affecting children's health, nutrition, and growth[2]. This strategy consists of improving the following: case-management skills of health workers, health systems, and key household/community practices (Community Integrated Management of Childhood Illnesses (C-IMCI)). The later has particularly become a paramount focus in rural or low-income settings where sub-optimal care-seeking practice and poor knowledge have been implicated in contributing to at least 70% of deaths among children[2]. Sixteen key household practices (KHPs) such as exclusive breastfeeding, immunization, vitamin supplementation, etc. were introduced by WHO/UNICEF in 1997 as relevant for C-IMCI[3]. Key household practices are delivered and performed at home by mothers and caregivers of under-five children with routine supervision from qualified healthcare workers. The adoption and practice of KHP in the household helps to reduce maternal and child morbidity as well as mortality.

Nutritional status is a person's physiological condition arising from the interaction between nutritional intake and requirements, as well as the body's ability to metabolize, digest, and utilize these nutrients[30]. On the other hand, malnutrition develops when a person does not get an adequate amount of protein, energy (calories), vitamins, and other nutrients to keep healthy tissues and organ functions[45]. Malnutrition is an outcome of poor eating habits or the lack of available food [43]. In 2018, the Global Nutrition Reports documented that one in every three persons is malnourished, one out of twenty children are hungry.[46] Around the world, malnutrition is responsible for one in every five deaths worldwide [46]. Presently, Nigeria is listed as one of the African countries being responsible for 80% of worldwide malnutrition. The number of stunted and underweight under-5 children in Nigeria is 9.5 million and 7 million respectively.

Malnutrition covers both undernutrition and overnutrition. Undernutrition is due to inadequate food intake or poor absorption (because of disease). Undernutrition is classified into stunting (height-for-age), wasting (weight-for height) and underweight (weight-for-age). A child is said to be stunted, wasted and under-weight if the height-for age, weight-for-height and weight-for-age is less than 2 standard deviations (SD) from the median value.[47] On the reverse, overnutrition is the effect of a surplus or imbalanced energy intake it is manifested as overweight and/or obesity. [48] Overweight is defined as a body mass index (BMI) for age, z-score between +1 and +2 standard deviation. Obesity as BMI for age and Z-score greater than +2 standard deviation[44]

Studies have compared the nutritional status of under-five children in rural and urban settings. Ifeanyichukwu et al[4]reported that when urban children in Edo state were compared to their rural counterparts, a higher percentage of children under the age of five in urban areas were stunted, wasted, underweight, overweight, and malnourished. Fatiregun and Adejugbagbe[5]conducted among under-five children in Ondo state documented that rural children were more likely to be stunted and severely stunted than urban children respectively. Also, children in rural areas were more stunted (22%) than children in urban areas (7.3%). In contrast, a higher percentage of children in urban areas (6.0%) were wasted than those in rural areas (4.7%)[6].

In 2019, about 5.2 million under-5 children died mainly from conditions preventable or treatable with access to basic, inexpensive interventions such as proper nutrition, immunization, clean water, and quality healthcare when required[7]. Sub-Saharan Africa, and particularly Nigeria is reported to have one of the highest mortality rates for children under 5 years[8] caused by malnutrition and other childhood illnesses. Although the introduction of several interventions[9-11] against childhood diseases has resulted in better outcomes for children, the morbidity and mortality rates for children in Nigeria continue to be a cause for concern[12].

According to the 2018 National Nutrition and Health Survey (NNHS)[13], with only 64% of well-nourished children in Nigeria, the burden of underweight, stunting, and overweight among children aged 0-59 months in the country is 19.9%, 32%, and 1.2% respectively. The country has the second highest prevalence of stunted children worldwide which is critical since malnutrition has been linked to directly or indirectly causing 45% of

all deaths of children under 5 years of age[14]. Addressing the menace of malnutrition will no doubt contribute to the 2030 target for the realization of the second Sustainable Development Goal (SDG)[15]. Apart from socioeconomic and local/global contextual factors outlined by the United Nations Children's Fund (UNICEF)[16], maternal malnutrition[17] and poor key household practices such as unimproved sanitation[18], are reported to be associated with a child's growth, nutritional status and state of health.

The effectiveness and sustainability of the IMCI strategy, as well as other interventions used to combat child mortality and morbidity, are largely dependent on mothers, who are the focal point for caregiving and the execution of key household practices for child survival[19]. Therefore, this study sought to comparatively explore the knowledge and adoption of specific key household practices among mothers of under 5 children as well as childhood nutritional status in selected rural and urban areas in Oyo state, Nigeria.

Methodology

Study design

This was a cross-sectional comparative study on key household practices and child nutritional status in Ibadan Northeast and Akinyele Local Government areas in Oyo state, Nigeria.

This study was part of a broader mixed-methods research investigating childhood nutritional status and the uptake of C-IMCI in Oyo state, Nigeria.

Study area

The study was conducted in Ibadan Northeast and Akinyele local government areas of Ibadan- the capital city of Oyo State which is situated in South-Western Nigeria.

Study population

Respondents were children aged 0-59 months and their mothers/caregivers. All children aged 0-59 months and their mothers who have been living in the community for at least one year were included in the study.

Sampling technique

A multistage cluster sampling technique was used as follows:

Stage 1: One senatorial district (Oyo central) was obtained from the three districts in Oyo state by balloting.

Stage 2: One rural and one urban L.G.A. were each selected by balloting from the 11 L.G.A.s in Oyo Central senatorial district.

Stage 3: 4 wards per L.G.A. were selected by balloting from the 12 wards present in each pre-selected L.G.A.

Stage 4: One settlement/area per ward was selected by balloting. All compounds/streets in the selected settlement were taken as a cluster. All houses in the clusters were included in the study and all mothers that gave their consent for the study, with a child aged 0-59 months in these houses were enrolled into the study.

Sample size determination

The sample size was determined using the formula for comparing two proportions[20]

$$n/\text{group} = \frac{(Z_{1-\alpha/2} + Z_{1-\beta})^2 [P_1(1-P_1) + P_2(1-P_2)]}{(P_1-P_2)^2}$$

Where n= minimum sample size for each group; $Z_{1-\alpha/2}$= standard normal deviate corresponding to the probability of type I error (α) at 5% = 1.96; $Z_{1-\beta}$= standard normal deviation corresponding to the probability of making type II error (β) of 20%. Power at 80% = 0.84; P_1= proportion of households that had water and soap available was 48%;[21] P_2= proportion in the comparable population assuming a 10% difference was 38%;[21] (P_1-P_2) =difference in prevalence between the urban and rural communities which will be considered significant (10%). Adjusting for a clustering effect of 2.0 and a 10% non-response, the minimum sample size calculated was 484 respondents per LGA.

Survey instrument

Data were collected using an interviewer-administered questionnaire adapted from the UNICEF Multiple Indicator Cluster Survey and Nigerian National Demographic and Health Survey tools. Length (for children ≤ 24 months old) and height (for children >24 months old) were measured with a tape rule and stadiometer respectively. The weight of children under 24 months was measured with a calibrated digital infant weighing scale while a calibrated digital stand-on bathroom scale was used to measure the weight of older children. The questionnaire asked questions on socio-demographic data, knowledge of KHPs, adoption of KHPs, and prevalence of malnutrition. The questionnaire was translated into Yoruba and back translated into the English Language. It was pretested in Egbeda L.G.A. which has both rural and urban wards. To avoid recall bias, we measured the practice component of the questionnaire based on the information caregivers were able to supply from at most two weeks prior to data collection, and this may not have reflected the habitual practice of respondents.

Data analysis
SPSS version 15 and WHO Anthro software version 3.2.2 were used to analyze data. Children were classified as stunted if height/length-for-age Z score ≤-2 SD, wasted if weight-for-height/length Z score ≤-2 SD, and underweight if weight-for-age Z score ≤-2 SD using the WHO reference standard. Data were summarized in proportions, frequency tables, and graphs. The Chi-square test and logistics regression were used to test for associations between the dependent variable (knowledge of KHPs, adoption of KHPs) and independent variables (socio-demographics characteristics). Categorical variable was summarized using frequency proportions. between variables of interest.

Ethical considerations
Ethical approval for this study was obtained from the Oyo State Ethical Review Board with reference number AD 13/479/595. Permission was further given from relevant L.G.A. authorities, community leaders, and heads of households. Respondents were informed of their right to decline or withdraw from the study at any time without any adverse consequences.

Results

Sociodemographic characteristics: The total mean age was 29.8+5.60, Islam (55.4%) was the predominant religion, and the majority (87.4%) of the respondents were of Yoruba ethnicity (Table 1).

Knowledge of Key Household Practices (KHPs): Significant associations were observed between location and knowledge of exclusive breastfeeding (p=0.013), immunization (p=0.009), as well as good hand hygiene (p=0.023). While the majority of urban dwellers (56.4%) had good knowledge of child psychosocial development, most rural dwellers had poor knowledge (51.7%) (Table 2).

Adoption of KHPs: Use of insecticide-treated net (68.4%) and Vitamin A (63.2%) were more commonly reported among urban dwellers than those who lived in rural areas. However, care-seeking (84.4%) and spousal support for breastfeeding (94.0%) were more common among rural dwellers. There was a significant association between location and composite KHPs (p=0.011) with more urban (64.4%) than rural (56.4%) dwellers having good composite KHPs (Table 3).

Factors associated with the adoption of KHPs: Those in the mid socio-economic class had the highest percentage of adoption of good KHPs in both urban (75%) and rural (72%) areas. In urban areas, the adoption of KHPs had a significant association (p<0.001) with knowledge of KHPs, whereas in rural areas there was no significant association (p<0.102) with knowledge of KHPs. However, majority in both urban (69.9%) and rural (59.1%) areas had good adoption and knowledge of KHPs (Table 4). In the adjusted model (Table 5); marriage type, highest educational status, marital status, socioeconomic status, and knowledge of KHPs were the only statistically significant predictor variables in urban areas. Urban mothers who had good knowledge of KHPs were more likely to adopt good KHPs (AOR=2.668 [1.679-4.241]). On the other hand, in rural areas, marital status, socioeconomic status and knowledge of KHPs were the only statistically significant predictor variables. Rural mothers who had good knowledge of KHPs were more likely to adopt good KHPs (AOR=3.663 [2.301-5.831]) (Table 5).

Prevalence of malnutrition among children: Altogether (64.1%), across location (urban:62.6%, rural:65.6%) and gender (male:66.5%, female:62%), stunting was the most prevalent malnutrition type observed. However, there were more wasted and underweight children in urban areas (12.0% and 23.4%) than in rural areas (8.5% and 22.0%). There were more stunted and underweight males (66.5% and 26.6%) than females (62.0% and 19.5%) (Table 6). In rural areas, however, only stunting had a significant association with EBF (p=0.038) and vitamin A (p=0.025). No significant association was observed between nutritional status and selected KHPs in urban areas (Table 7).

Table 1: Sociodemographic characteristics

Variable	Total N=982 n (%)	Urban N=500 n (%)	Rural N=482 n (%)
Age group (years)			
16-25	224(22.8)	107(22.2)	107(22.2)
26-35	621(63.3)	308(61.7)	313(64.9)
36-45	128(13.0)	71(14.2)	57(11.8)
Above 45	9(0.8)	3(0.6)	6(1.0)
Mean age (years)	29.8+5.60	29.8+5.92	29.8+6.08
Family type			
Monogamous	861(87.7)	442(88.4)	419(86.9)
Polygamous	58(11.6)	63(13.1)	121(12.3)
Educational status			
Primary and below	343(34.9)	125(25.0)	218(45.2)
Secondary and above	639(65.1)	375(75.0)	264(54.8)
Marital status			

Variable	Total N=982 n (%)	Urban N=500 n (%)	Rural N=482 n (%)
Married	883(89.9)	432(86.4)	451(93.6)
Unmarried	99(10.1)	68(13.6)	31(6.4)
Socioeconomic status			
Low	330(33.6)	137(41.5)	193(58.5)
Middle	350(35.6)	200(57.1)	150(42.9)
High	302(30.7)	163(54.0)	139(46.0)
Number of children			
1-4	849(86.5)	437(87.4)	412(85.5)
More than 4	133(13.5)	63(12.6)	70(14.5)
Gender of (index) child			
Male	448(45.6)	232(46.4)	216(44.8)
Female	534(54.4)	268(53.6)	266(55.2)
Age of index child (months)			
0-11	273(27.8)	157(31.4)	116(24.1)
12-23	284(28.9)	140(28.0)	144(29.9)
24-35	226(23.0)	118(23.6)	168(22.4)
36-47	128(13.0)	60(12.0)	68(14.1)
48-59	71(7.2)	25(5.0)	46(9.5)
Mean age of index child (months)	22.0±14.36	20.7±13.52	23.3±15.09

N: number of valid participants used in the analysis
n (%): number of participants in percent

Table 2: Association between location and knowledge of KHPs

Variable	Total N=982 n (%)	Urban N=500n (%)	Rural N=482n (%)	χ^2(p-value)
Knowledge of exclusive breastfeeding				
Good	494(50.3)	232(46.4)	262(54.4)	6.215(0.013)
Poor	488(49.7)	268(53.6)	220(45.6)	
Knowledge of Immunization				
Good	735(74.8)	392(78.4)	343(71.2)	6.830(0.009)
Poor	247(25.2)	108(21.6)	139(28.8)	
Knowledge of proper waste disposal				
Good	804(81.9)	406(81.2)	398(82.6)	0.312(0.577)
Poor	178(18.1)	94(18.8)	84(17.4)	
Knowledge of good hand hygiene				
Good	951(96.8)	478(95.6)	473(98.1)	5.150(0.023)
Poor	31(3.2)	22(4.40)	9(1.9)	
Knowledge of ORS preparation				
Good	861(87.7)	435(87.0)	426(88.4)	0.434(0.510)
Poor	121(12.3)	65(13.0)	56(11.6)	
Knowledge of care-seeking and compliance with treatment advice				
Good	236(24.0)	133(26.6)	103(21.4)	3.678(0.055)
Poor	746(76.0)	367(73.4)	379(78.6)	
Knowledge of child psychosocial development				
Good	515(52.4)	282(56.4)	233(48.3)	6.392(0.011)
Poor	467(47.6)	218(43.6)	249(51.7)	
Knowledge of insecticide-treated net				
Good	557(56.7)	319(63.8)	238(49.4)	20.795(<0.001)
Poor	425(43.3)	181(36.2)	244(50.6)	
Composite knowledge of KHPs				
Good	669(68.1)	349(69.8)	320(66.4)	1.314(0.252)
Poor	313(31.9)	151(30.2)	162(33.6)	

N: number of valid participants used in the analysis
n (%): number of participants in percent

Table 3: Association between location and adoption of KHPs

Variable	Total N=982n (%)	Urban N=500n (%)	Rural N=482n (%)	χ^2(p-value)
Exclusive breastfeeding				
Yes	825(84.0)	401(80.2)	424(88.0)	11.022(0.001)
No	157(16.0)	99(19.8)	58(12.0)	
Vitamin A use				
Yes	599(61.0)	316(63.2)	283(58.7)	2.076(0.150)
No	383(39.0)	184(36.8)	199(41.3)	
Use of insecticide-treated net				
Yes	639(65.1)	342(68.4)	297(61.6)	4.966(0.026)
No	343(34.9)	158(31.6)	185(38.4)	
Immunization up to date				
Yes	922(93.9)	476(95.2)	446(92.5)	3.047(0.081)
No	60(6.1)	24(4.8)	36(7.5)	
Sanitary waste disposal				
Yes	672(68.4)	376(75.2)	296(61.4)	21.601(<0.001)
No	310(31.6)	124(24.8)	186(38.6)	
Hand washing				
Yes	232(23.6)	127(25.4)	105(21.8)	1.778(0.182)
No	750(76.4)	373(74.6)	377(78.2)	
Use of oral rehydration salt				
Yes	819(83.4)	439(87.8)	380(78.8)	14.238(<0.001)
No	163(16.6)	61(12.2)	102(21.2)	
Care-seeking practice				
Yes	823(83.8)	416(83.2)	407(84.4)	0.278(0.598)
No	159(16.2)	84(16.8)	75(15.6)	
Creating play activities				
Yes	948(96.5)	491(98.2)	457(94.8)	8.422(0.004)
No	34(3.5)	9(1.8)	25(5.2)	
Stimulating environment				
Yes	941(95.8)	483(96.6)	458(95.0)	1.530(0.216)
No	41(4.2)	17(3.4)	24(5.0)	
Husband is supportive of breastfeeding				
Yes	893(90.9)	440(88.0)	453(94.0)	10.661(0.001)
No	89(9.1)	60(12.0)	29(6.0)	
Give more food/fluids when sick				
Yes	190(19.3)	117(23.4)	73(15.1)	10.717(0.001)
No	792(80.7)	383(76.6)	409(84.9)	
Composite adoption of KHPs				
Good	594(60.5)	322(64.4)	272(56.4)	6.520(0.011)
Poor	388(39.5)	178(35.6)	210(43.6)	

N: number of valid participants used in the analysis
n (%): number of participants in percent

Table 4: Factors associated with adoption of KHPs

Variable	Adoption of KHPs									
	Total N= 982				Urban N= 500			Rural N= 482		
	Total N=982	Good N=594	Poor N=388	χ^2 (p-value)	Good N=321	Poor N=179	χ^2 (p-value)	Good N=272	Poor N=210	χ^2 (p-value)
Location										
Rural	482(49.1)	272(56.4)	210(43.6)	6.520(0.011)	-	-	-	-	-	-
Urban	500(50.9)	322(64.4)	178(35.6)		-	-	-	-	-	-
Family type										
Monogamous	861(87.7)	531(61.7)	330(38.3)	4.096(0.043)	292(66.1)	150(33.9)	4.598(0.032)	239(57.0)	180(43.0)	0.488(0.487)
Polygamous	121(12.3)	63(52.1)	58(47.9)		30(51.7)	28(48.3)		33(52.4)	30(47.6)	
Educational status										
Primary and below	343(34.9)	174(50.7)	169(49.3)	21.009(<0.001)	67(53.6)	58(46.4)	8.479(0.004)	107(49.1)	111(50.9)	8.743(0.003)
Secondary and above	639(65.1)	420(65.7)	219(34.3)		255(68.0)	120(32.0)		165(62.5)	99(37.5)	
Marital status										
Married	883(89.9)	540(61.2)	343(38.8)	1.672(0.202)	281(65.0)	151(35.0)	0.580(0.447)	259(57.4)	192(42.6)	2.832(0.092)
Not married	99(10.1)	54(54.5)	45(45.5)		41(60.3)	27(39.7)		13(41.9)	18(58.1)	
Socioeconomic Status										
Low	330(33.6)	182(55.2)	148(44.8)	25.651(<0.001)	94(68.6)	43(31.4)	5.408(0.067)	88(45.6)	105(54.4)	27.832(0.067)
Middle	350(35.6)	258(73.7)	92(26.3)		150(75.0)	50(25.0)		108(72.0)	42(28.0)	
High	302(30.8)	196(64.9)	106(35.1)		104(63.8)	59(36.2)		92(66.2)	47(33.8)	
Number of children in the household										
≤4	849(86.5)	517(60.9)	332(39.1)	0.433(0.510)	279(63.8)	158(36.2)	0.467(0.494)	238(57.8)	174(42.2)	2.058(0.151)
>4	133(13.5)	77(57.9)	56(42.1)		43(68.3)	20(31.7)		34(48.6)	36(51.4)	
Knowledge of KHPs										
Good	669 (68.1)	433 (64.7)	236 (35.3)	15.748(<0.001)	244(69.9)	78(51.7)	15.326(<0.001)	189(59.1)	131(40.9)	2.681(0.102)
Poor	313 (31.9)	161 (51.4)	152 (48.6)		105(30.1)	73(48.3)		83(51.2)	79(48.8)	

N: number of valid participants used in the analysis
n (%): number of participants in percent

Table 5: Adjusted predictors of adoption of KHPs

Variable	Total		Urban		Rural	
	AOR (95% CI)	p-value	AOR (95% CI)	p-value	AOR (95% CI)	p-value
Location						
Urban	1.439 (4.345-10.291)	0.013	-	-	-	-
Rural	1		-	-	-	-
Family type						
Monogamous	2.029 (1.296-3.178)	0.002*	1.970 (1.074-3.615)	0.029	0.641 (0.331-1.243)	0.188
Polygamous	1		1		1	
Highest educational level						
Primary and below	0.752 (0.555-1.020)	0.067	0.641 (0.407-1.011)	0.056	0.875 (0.574 -1.332)	0.533
Secondary and above	1		1		1	
Marital status						
Married	1.199 (0.792-1.863)	0.419	1.754 (1.0073-3.052)	0.04	2.481 (1.104 -5.580)	0.028*
Unmarried	1		1		1	
Socioeconomic status						
Low	0.856 (0.608-1.204)	0.372	1.419 (0.852-2.363)	0.179	0.594 (0.367-0.954)	0.235
Middle	1.509 (1.065-2.139)	0.021*	1.717 (1.072-2.750)	0.025	1.372 (0.814-2.313)	0.033*
High	1		1		1	
Number of children						
1-4	0.793 (0.515-1.221)	0.292	0.540 (0.280-1.039)	0.065	1.255 (0.671-2.348)	0.476
>4	1		1		1	
Knowledge of KHPs						
Good	3.035 (2.206-4.177)	0.001*	2.668 (1.679-4.241)	<0.001	3.663 (2.301-5.831)	0.001*

AOR: Adjusted odds ratio

Table 6: Prevalence of malnutrition among children

Variable	Location				Gender		
	Total N=982n (%)	Urban N=500 n (%)	Rural N=482n (%)	χ^2 (p-value)	Male N=448n (%)	Female N=534n (%)	χ^2 (p-value)
Stunted	629(64.1)	313(62.6)	316(65.6)		298(66.5)	331(62.0)	
Non-stunted	353(35.9)	187(37.4)	166(34.4)	0.934(0.334)	150(33.5)	203(38.0)	2.774(0.140)
Wasted	101(10.3)	60(12.0)	41(8.5)		46(10.3)	55(10.3)	
Non-wasted	881(89.7)	440(88.0)	441(91.5)	3.247(0.072)	402(89.7)	479(89.7)	0.000(0.987)
Underweight	223(22.7)	117(23.4)	106(22.0)		119(26.6)	104(19.5)	
Non-underweight	759(77.3)	383(76.6)	376(78.0)	0.277(0.598)	329(73.4)	430(80.5)	6.971(0.008)

N: number of valid participants used in the analysis
n (%): number of participants in percent

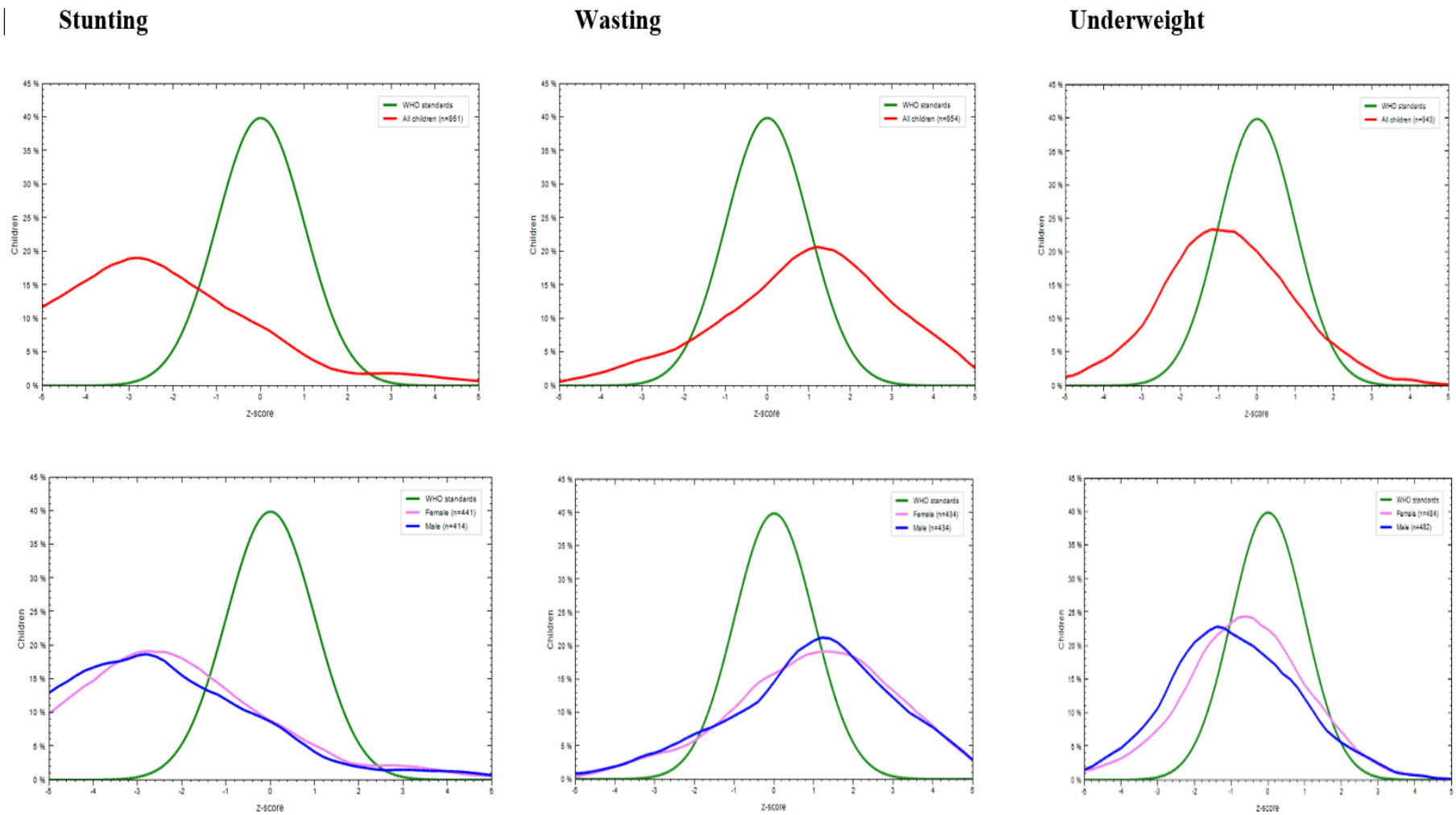

Fig 1: Distribution of children's z-scores using WHO reference

Table 7: Association between selected KHPs and nutritional status

Locality		Exclusive breastfeeding			Vitamin A supplementation			Up-to-date immunization		
		Yes	No	χ^2 (p-value)	Yes	No	χ^2 (p-value)	Yes	No	χ^2 (p-value)
Urban	Non-stunted	148(36.9)	39(39.4)	0.217(0.645)	125(39.6)	62(33.7)	1.705(0.191)	179(37.6)	8(33.3)	0.178(0.673)
	Stunted	253(63.1)	60(60.6)		191(60.4)	122(66.3)		297(62.4)	16(66.7)	
	Non-wasted	356(88.8)	84(84.8)	1.967(0.285)	273(86.4)	167(90.8)	2.101(0.147)	421(88.4)	19(79.2)	1.863(0.172)
	Wasted	45(11.2)	15(15.2)		43(13.6)	17(9.2)		55(11.6)	5(20.8)	
	Non-underweight	310(77.3)	73(73.7)	0.567(0.435)	226(71.5)	127(68.3)	1.598(0.232)	366(79.6)	17(70.8)	0.468(0.494)
	Underweight	91(22.7)	26(26.3)		90(28.5)	57(31.7)		110(23.1)	7(29.2)	
Rural	Non-stunted	139(32.8)	27(46.6)	4.284(0.038)	109(38.5)	57(28.6)	5.488(0.025)	152(34.1)	14(38.9)	0.341(0.559)
	Stunted	285(67.2)	31(53.4)		174(61.5)	142(71.4)		294(65.9)	22(61.1)	
	Non-wasted	386(91.0)	55(94.8)	0.970(0.331)	257(90.8)	184(92.5)	0.409(0.523)	409(91.7)	32(88.9)	0.339(0.560)
	Wasted	38(9.0)	3(5.2)		26(9.2)	15(7.5)		37(8.3)	4(11.1)	
	Non-underweight	329(77.6)	47(81.0)	0.352(0.551)	228(80.6)	148(74.4)	2.613(0.106)	347(77.8)	29(80.6)	0.147(0.701)
	Underweight	95(22.4)	11(19.0)		55(19.4)	51(25.6)		99(22.2)	7(19.4)	

Discussion

In our study, we comparatively assessed the knowledge and adoption of specific key household practices of C-IMCI as well as childhood nutritional status among 982 mother-child pair in selected rural and urban Local Government Areas in Oyo state.

As key household practices are an integral component of C-IMCI, measuring adherence is important for defining the health outcomes of children and caregivers, especially those who reside in low- and middle-income communities where access to health education and care is poor. Although well over half of the caregivers in both rural and urban areas had good knowledge of KHPs, there was a lesser proportion of persons- particularly among rural dwellers, practicing them. One study in Armenia[22] reported substantial changes in the knowledge and practice of IMCI following the introduction of similar KHPs investigated in this research. Contrary to our findings, Mukunyaet al[23] reported low knowledge among caregivers in northern Uganda. Geographical and cultural factors may be responsible for different observations reported by researchers.

Although in the rural areas, there were no jointly significant associations observed in both models, uptake of KHPs was associated with knowledge of KHPs in the adjusted model. A plausible reason for poor uptake of KHPs is the low socio-economic status and poor literacy level of rural dwellers since socio-economically disadvantaged people and those with poor access to education are said to often suffer ill health either from exhibiting behaviours that are harmful to their health or lack of resources to cater for themselves[24]. In both rural and urban areas, married women in the middle socio-economic class who were acquainted with KHPs were more likely to adhere.

Knowledge and adoption of C-IMCI are reported to influence the nutritional status of children[2,25]. We observed a sharp deviation from the WHO standard for all indicators of malnutrition in our study. We recorded a prevalence rate of over 60% in both rural and urban areas, stunting was the most common state of malnutrition, and the highest burden was recorded among rural dwellers. However, underweight and wasting were more common among urban dwellers. This can be ascribed to less consumption of protein-rich meals, an increase in consumption of refined foods, as well as snacks and junk food with little or no nutritious value. In contrast, children in rural areas have greater access to natural foods such as fruits, vegetables, meat, fish, and other unrefined foods thus preserving their high calorific and nutritional qualities[26].Based on a recent study carried out on data from 2018 Nigerian Demographic and Health Survey, the prevalence of wasting, stunting, and being underweight among under-5 children is 6.7%, 36.2%, and 21.4% respectively[27]. A South Asian multi-country study recorded a high prevalence of malnutrition, particularly stunting and wasting in rural areas[28]. Like the finding from this study where more males than females were stunted and underweight, other researchers have also reported that male children are much more susceptible to malnutrition probably because of differential caloric requirements needed for growth and development compared to their female counterparts [29,30].

Resulting from an interplay of contextual factors including disease, hygiene, and dietary practices, childcare activities, and poverty[18,28], other researchers have reported stunting to be the most rampant form of malnutrition, especially in low- and middle-income countries[17,30,31]. The adverse effects of malnutrition are numerous, making children more susceptible to infections and common diseases[32], some of which may potentially result in death[33]. A long-term effect of malnutrition on children with stunting is their propensity to accumulate body fat, particularly central fat (obesity). This can result in non-communicable diseases such as diabetes mellitus (type 2) and hypertension in adulthood[26]. Low literacy[17,34] and poor financial status[17,35] are commonly associated factors with childhood malnutrition. We further investigated the association between malnutrition and select KHPs (EBF, vitamin A supplementation, and up-to-date immunization), and observed that rural areas reported significant associations for stunting in EBF practice and vitamin A supplementation. This is contrary to one study[17] where Vitamin A supplementation was not significantly associated with increased odds of child stunting and being underweight. In the urban regions, none of the malnutrition indicators showed positive associations with the KHP in question.

Rates of immunization, EBF, and vitamin A supplementation was impressive in this study, and this is similar to findings from a study conducted in the south-eastern region of Nigeria which revealed that while the respondents had good practice of micronutrient supplementation, less than 20% of caregivers exclusively breastfed their children even though they were well-informed about the benefits of EBF[36]. Our study reported a low practice of EBF in urban settings than in

rural settings. However, this finding was in contrast with the practice of EBF documented in an urban-rural study in Imo state, which found that women in urban community practiced exclusive breastfeeding more frequently than mothers in a rural community[37]. Because of the decreased practice of exclusive breastfeeding, young children may be exposed to other foods earlier, thus increasing their risk of malnutrition, diarrhea, and infectious diseases like measles and pneumonia[4].
It is said that Nigeria is among the ten countries that are home to many children with incomplete immunization as seen in the less than 30% of children (most of who live in urban areas) who have been fully immunized[38]. This aligns with our findings and those of other studies in foreign countries where higher odds of not being fully immunized were reported among rural dwellers[39,40]. This can be a result of the tertiary level of education of mothers in urban areas in the index study, which helped them to understand the value of immunization. This is consistent with findings from studies where high maternal level of education was a factor that influenced vaccine uptake. Also, the SES of mothers in rural area may play a role in the decreased use of immunization services. A higher percentage of mothers in the urban community have high SES status than their counterparts in the rural community. Studies have shown that high SES is positively associated with the uptake of vaccination[41].Equipping caregivers with the requisite knowledge and skills of C-IMCI will go a long way to reducing child mortality[36] from easily preventable diseases.

In this study, we investigated the knowledge and adoption of specific key household practices and childhood nutritional status in selected rural and urban areas in Oyo state, Nigeria. We observed gaps between knowledge and practice of KHPs, with only half of the study population having good composite knowledge and practice of KHPs. Additionally, most of the children under observation were stunted. We believe that these results necessitate the need for urgent context-specific interventions such as the increased provision of health promotion and education to caregivers in the study region to enable them to provide adequate care for their children.

Declarations

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Competing interests: None
Authors' contribution -Conceptualization and Design: OOC. Material Preparation, Data Collection and Analysis: OOC and OET. First draft of the manuscript was by OOC. Both authors reviewed the previous versions of the manuscript and approved the final manuscript.
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