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Assessment of Maternal Factors associated with Nutritional Status of Children 4-24 Months old Attending Immunization Clinics in Jos North Local Government Area, Plateau State.

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Abstract

***Background**: Malnutrition is responsible for more than 41 percent of the deaths that occur annually in children from 6-24 months of age in developing countries. Mothers play a vital role in the choice and use of complementary feeds of their children and this is in turn determined by their varied socio-demographics. This study therefore set out to ascertain the maternal factors associated with the nutritional status of children aged 4-24 months attending routine immunization clinics in Jos North Local Government Area of Plateau State.*

***Methods**: In this cross-sectional study, multistage sampling technique was used to select 210 mothers of children 4-24 months of age from two immunization clinics in Jos North Local Government Area. Quantitative data was collected from them using an interviewer administered questionnaire and analyzed using Epi Info statistical software version 3.5.4. Statistical associations between maternal factors and nutritional status were determined using Chi-square test and logistic regression analysis based on a p - value of less than or equal to 0.05.*

***Result**: The maternal factors associated with the children's nutritional status included level of education (p = 0.047 for PCV), ethnicity (p = 0.023) and religion (p = 0.007) for food consumption. Also, income (p = 0.004 for food consumption), age group (p = 0.032 for food consumption and p = 0.019 for PCV).*

***Conclusion**: It was concluded that more attention needs to be paid by families and governments to improving socioeconomic status of women as a strategy to curbing childhood malnutrition in in Nigeria.*

***Key words:** Nutritional status, Under-fives, Maternal factors*

Introduction

Complimentary feed is a semi-solid meal introduced to children from six months of age when the breast milk alone is no longer sufficient to meet the nutritional requirements of an infant. Therefore other

foods (liquid and/or solids) are needed along with breast milk, from this time onwards.[1] It signifies a transition from exclusive breastfeeding to the family diet, and usually covers the period from 6-24 months of age; even though breastfeeding may continue after the child is two years of age.[1, 2] Complementary feeding introduces the child to the family diet and is a great opportunity to improve the child's nutritional status, enable catch-up growth and establish an eating pattern for the preschooler. This makes it a vital as well as vulnerable period of time for both the child and the caregiver. Its timing is also very critical to optimal nutritional success; if it is done too early, the child, mother and family may miss out on the valuable nutrients, bonding and other advantages of exclusive breastfeeding.

Malnutrition is responsible for more than 41 percent of the deaths that occur annually in children from 6-24 months of age in developing countries; this approximates to about 2.3 million annual deaths.[1] Furthermore, yearly, about 200 million children under five years of age fail to reach their full cognitive and social potentials; most of these children live in south east Asia and Africa.[1, 2] More than two thirds of these deaths and poor development have been attributed to inappropriate feeding practices among mothers and care-givers, particularly when they occur in the first year of the infant's life.[1,2,3]

These poor infant feeding practices stem almost directly from mothers' poor knowledge of what food to give the growing child, when to give it, in what quantity and in what proportions the constituents need to be given. Other possible elements include the attitude and practices of the mothers and caregivers towards certain food related cultural, religious and social restrictions in their society.[3, 4] Maternal factors refer to a mother's socio-demographic variables which have a direct or indirect bearing on her Infant and Young Child feeding (IYCF) practices. They include her educational status, income and cultural practices among many others. These play a critical role in their complementary feeding decisions and invariably affect the child's nutritional status.

Poor IYCF feeding practices have other consequences on the children which include an increase in susceptibility to infection with resultant otherwise preventable illnesses, impaired intellectual development, delayed sexual development, decrease in muscle mass and strength, poor cognitive function and an increase in life time risk of osteoporosis.[1,4,5] This study therefore set out to ascertain the maternal factors associated with the nutritional status of children aged 4-24 months attending routine immunization clinics in Jos North Local Government Area (LGA) of Plateau State.

Methods

Background of study area

Plateau State is situated in the north central region of Nigeria between latitudes 80^{o} 24' and 100^{o} 20 north and longitudes 80 ^{o} 32 and 100^{o} 38 east. It had a population of 4,376,193 in 2018 projected from the 2006 population census.[6] Jos North is one of the 17 LGAs in Plateau State. It has an area of 291 sq. kilometres, divided into 20 wards, with a population of 429 300 people, projected from the 2006 census.[6] It is a cosmopolitan area, the population being made up of people from all over the country, who are mainly civil servants, skilled and unskilled labourers as well as traders practicing Islam and Christianity as religion.

Study design and study population: This was a descriptive, cross-sectional, facility-based study of the elements of complementary feeding and their effect on

the nutritional statuses of the children, among mothers of children aged 4-12 months attending immunization clinics in Jos University Teaching Hospital (JUTH) and the Plateau State Epidemiological Unit, both in Jos North LGA, Plateau State. Both clinics run daily and used to attend to an average of 85 under-five children daily. However, with the COVID-19 control measure of "lockdown" by the State Government, the clientele dropped to about 15-25 children daily in both clinics.

Only biological mothers of children aged 4-24 months attending any of these two routine immunization clinics were recruited into the study and the index child must have commenced complementary feed at the time of the study, irrespective of the age of onset of the complementary feed. Children with congenital deformities that could affect their nutritional status like a cleft lip or cleft palate, were excluded from the study as these could act as confounders.

Sample size determination, sampling and data collection

The required minimum sample size (n) was calculated using the formula for population estimate.[7]

$n=z^2pq/d^2$

Where z=1.96 at 95% confidence interval

p = Prevalence of wasting in Nigerian children 4-24 months of age[8] = 10.6%

q = 1-p = 1- 10.6 = 89.4%

d = degree of precision which is 0.05 = 5%

n = minimum required sample size

After adjusting for non-response, inappropriate and incomplete responses, a minimum sample size of 161 was arrived at.

A multi stage sampling technique was used to select the study participants. In the first stage, JUTH was selected from the list of the three tertiary health facilities in Jos North LGA, by Simple Random Sampling, by balloting while the Plateau State Epidemiological Unit Clinic was also selected from the three state government owned immunization clinics in Jos North, by Simple Random Sampling, by balloting. In the second stage, out of the three clinics that care for children within this age group in JUTH; the Paediatric Outpatient clinic, the General Outpatient Clinic and the Family Health Clinic, the Family Health clinic was selected using Simple Random Sampling by balloting. In the Epidemiological Unit, only one clinic operates; the Routine Immunization Clinic, so it was selected. In the third stage, mothers of children aged 4 -24 months who had already started complementary feeding and who met the inclusion criteria were recruited into the study consecutively as they registered into the clinic on a daily basis, until the sample size was attained.

Data was collected between March and June 2020, using a semi-structured interviewer administered questionnaire, adapted from the Multiple Indicator Cluster Survey 2017 questionnaire.[8] The questionnaire had three sections covering socio-demographic characteristics of mothers and their children, 7-day dietary assessment of nutritional history of index child and the nutritional assessment of children using anthropometric measurements and Packed Cell Volume (PCV).

Data grading, scoring and analysis

Data collected was analyzed using the Epi Info version 3.5.4 computer software and presented in tables and charts. Significant relationships and associations were determined using the Chi square (χ^2) test and a p value of ≤ 0.05 was considered statistically significant.

I. Food frequency tables were used to assess dietary diversity of the infants in the 7 days preceding the interview:[10]

   Each child's weighted food group scores were summed up to obtain Food Consumption Scores (FCS) for

each child. FCS were graded as "inadequate" if they were 0 – 35 and "adequate" if they were > 35.

II. Nutritional status was also assessed by estimating the Packed Cell Volume (PCV) of the children using a Hematocrit machine and drop of venous blood, taken using aseptic methods, from the finger-tips of the children. This helped to estimate the extent of a micronutrient deficiency (iron deficiency anemia) of the children. All children with a PCV < 30% were termed anaemic while those with a PCV ≥ 30% were termed "normal".

III. Anthropometric measurements were used to determine the nutritional status of the children. Their height/lengths and weights were measured and interpreted as Height for Age (H/A), Weight for Age (W/A) and Body Mass Index (BMI). The World Health Organization (WHO) reference values were used in the interpretation of the values obtained. Nutritional Parameters assessed included: Stunting (H/A< 2SD), Underweight (W/A<2SD), Overweight and Obesity (W/H > 2SD and >3SD respectively). Their Mid-Upper Arm Circumference (MUAC) was also assessed using WHO reference values: <12.5cm as "undernourished" and >_12.5cm as "well-nourished"

Height for age

Infantometers were used for measuring length of the children. The children were laid flat on the already calibrated infantometer with their feet flat on the "zero" line of the instrument while the mobile part was adjusted to lie flat at the top of the head of the child. The reading was then read off at the mobile calibration. Length was measured twice for each subject and the average recorded to the nearest 0.1metre (m).

Weight for age

Weight was taken using the "Bassinet" weighing scale. They are portable spring-type weighing scales which were re-calibrated before each use. Study subjects had clothing removed and were made to sit or lie down in the scale for the readings to be taken. Each subject's weight was taken twice and the average recorded to the nearest 0.1kg.

Body Mass Index

BMI for Age is defined as body weight in kilograms divided by the square of the height in meter squared. Undernourished, overweight and obesity were assessed using the WHO reference standards for children aged 0-59 months with regards to their ages and sexes. Any child < -2SD of reference value was termed "undernourished", -2 to +2SD was termed "normal", > +2 to < +3 SD was "overweight" while ≥ +3SD was termed "Obese".

Mid-Upper Arm Circumferences (MUAC): The circumference of the arm, midway between the elbow and the shoulder tip was measured on bare skin using a tape measure wrapped firmly (but not tightly) around the arm. Those with a MUAC of < 12.5cm were termed "malnourished" while those with measurements ≥ 12.5cm were assessed as being "well-nourished".

Infant and Young Child Feeding (IYCF) Practices were graded as "good" or "poor" based on the score out of twelve (12) that the mother obtained. She got one mark for an appropriate practice and a zero for an inappropriate one. A score of < 6 was "poor" while ≥ 6 was "good".

IYCF Knowledge was graded "good" and "poor". Out of a total of 17 questions, a score < 8 was graded "poor" while ≥ 8 was "good".

Ethical Considerations

Written permission was obtained from the

Jos University Teaching Hospital Human Ethics Research Committee to conduct the research. Written informed consent was obtained from each mother before being recruited into the study. No participant was coerced or financially motivated to participate in the study and they were assured of confidentiality. Participants were also free to drop out of the study at any point without any negative consequences.

Results

Of the 231 respondents approached, 210 consented to participate in the research giving a response rate of 90.9%.

Table 1: Socio-demographic variables of mothers and children studied

Variable	Frequency n = 210	Percentage (%)	Mean ± standard deviation
Age group of mothers (Years)			
15 – 24	28	13.3	**36.38±6.21**
25 – 34	103	49.0	
35 – 44	76	36.2	
45 – 54	3	1.4.	
Highest level of education			
None	2	1.0	
Primary	11	5.2	
Secondary	71	33.8	
Tertiary	126	60.0	
Religion			
Christian	154	26.7	
Muslim	56	73.3	
Tribe			
Plateau Indigenous	110	52.4	
Non-Indigenous	100	47.6	
Monthly income			
< ₦ 30,000	151	71.9	
= ₦ 30,000	59	28.1	
Age group of children (Months)			
4 – 11	156	74.3	
12- 24	54	25.7	
Child's sex			
Male	111	52.9	
Female	97	46.6	

Majority of the Mothers studied were aged 29 – 35 years, had attained tertiary level of education and their income was below the Country's minimum wage of N 30,000 monthly. Majority of the children (74.3%) were aged 4-11months of age and were male (52.9%).

Table 2: Nutritional status of children studied

Variable	Frequency n = 210	Percentage (%)	Mean ± standard deviation
Body Mass Index for Age (Kg/M ^{2})			
Obese	4	1.9	17.05±1.83
Overweight	10	4.8	
Normal	155	73.8	
Undernourished	41	19.5	
Weight for Age (kg)			
Overweight	34	16.2	8.63±1.33
Normal	123	58.6	
Underweight	53	25.2	
Height for Age (cm)			
Normal	148	70.5	71.01±5.18
Stunted	62	29.5	
Mid Upper Arm Circumference Categories (cm)			
Undernourished	37	22.7	144.98±11.88
Well Nourished	173	82.4	
Food Consumption Score Category			
Adequate	71	33.8	
Inadequate	139	66.2	
PCV (%)			
Anemic	48	22.9	
Normal	162	77.1	

Majority of the children were well nourished; 73.8% had a normal BMI for age, 58.6% had normal weight for age, 70.5% had normal height for age and 82.4% had normal MUAC readings. 66.2% of the studied children had inadequate food diversity and 77.1% of the studied children had normal PCVs.

Table 3: Association between maternal socio-demographics and nutritional status of children (Packed cell volume)

Variable	Nutritional Status (Packed Cell Volume)		Total	x^2	P-Value
	INADEQUATE F (%)	ADEQUATE F (%)	F (%)		
Level of Education					
None	0 (0.0)	2 (100.0)	2 (100.00	3.905	0.272
Primary	5 (45.5)	6 (54.5)	11 (100.0)		
Secondary	16 (22.5)	55 (77.5)	71 (100.0)		
Tertiary	27 (21.4)	99 (78.6)	126(100.0)		
Tribe					
Plateau indigenous	21(19.1)	89 (80.9)	110(100.0)	1.858	0.173
Non-Indigenous	27 (27.0)	73 (73.0)	100(100.0)		
Religion					
Islam	20 (35.7)	36 (64.3)	56 (100.0)	**7.159**	**0.007**
Christianity	28 (18.2)	126 (81.8)	154(100.0)		
Family Setting					
Nuclear	34 (20.2)	134 (79.8)	168(100.0)	3.268	0.071
Extended	14 (33.3)	28 (66.7)	42 (100.0)		
Monthly Income					
< ₦ 30,000	38 (25.2)	113 (74.8)	151(100.0)	1.624	0.202
= ₦ 30,000	10 (16.9)	49 (83.1)	59 (100.0)		
IYCF Practice					
Poor Practice	30 (24.2)	94 (75.8)	124(100.0)	0.307	0.580
Good Practice	18 (20.9)	68 (79.1)	86 (100.0)		
IYCF Knowledge					
Poor Knowledge	8 (13.8)	50 (86.2)	58 (100.0)	3.734	0.053
Good Knowledge	40 (26.3)	112 (73.7)	152(100.0)		
Mother's Age Group					
15 – 24	9 (30.3)	19 (69.7)	28 (100.0)	**9.634**	**0.019**
25 – 34	43 (41.8)	60 (58.2)	103(100.0)		
35 – 44	10 (16.0)	66 (84.0)	76 (100.0)		
45 – 54	0 (0)	3 (100.0)	3 (100.0)		

*IYCF = Infant and Young Child Feeding; F = Frequency

Maternal age group (p = 0.019) and religion (p = 0.007) only, had a statistically significant association with nutritional status of children using PCV as a measure of nutritional status assessment.

Table 4: Association between maternal socio-demographic characteristics and nutritional status of children (using food consumption category)

Variable	Nutritional status (Food Consumption Category)		Total	x^2	P-Value
	Inadequate F (%)	Adequate F (%)	F (%)		
Level of Education					
None	2 (100.0)	0 (0.0)	2 (100.0)	**7.961**	**0.047**
Primary	2 (18.2)	9 (81.8)	11 (100.0)		
Secondary	29 (40.8)	42 (59.2)	71 (100.0)		
Tertiary	38 (30.2)	88 (69.8)	126(100.0)		
Tribe					
Plateau indigenous	45 (40.9)	65 (59.1)	110(100.0)	**5.203**	**0.023**
Non-Indigenous	26 (26.0)	74 (74.0)	100(100.0)		
Religion					
Islam	16 (28.6)	40 (71.4)	56 (100.0)	0.936	0.333
Christianity	55 (35.7)	99 (64.3)	154 100.0)		
Family Setting					
Nuclear	55 (322.7)	113 (67.3)	168(100.0)	0.431	0.512
Extended	16 (38.1)	26 (61.9)	42 (100.0)		
Monthly Income					
< ₦ 30,000	60 (39.7)	91 (60.3)	151(100.0)	8.433	**0.004**
= ₦ 30,000	11 (18.6)	48 (81.4)	59 (100.0)		
IYCF Practice					
Poor Practice	51 (41.1)	73 (58.9)	124 100.0)	**7.249**	**0.007**
Good Practice	20 (23.3)	66 (76.7)	86 (100.0)		
IYCF Knowledge					
Poor Knowledge	11 (19.0)	47 (81.0)	58 (100.0)	**7.890**	**0.005**
Good Knowledge	60 (39.5)	92 (60.5)	152(100.0)		
Mother's Age Group					
15 – 24	15 (51.1)	13 (49.9)	28 (100.0)	3.529	0.284
25 – 34	63 (62.3)	40 (37.7)	103(100.0)		
35 – 44	43 (47.9)	33 (42.1)	76 (100.0)		
45 – 54	2 (56.4)	1 (43.6)	3 (100.0)		

*IYCF = Infant and Young Child Feeding; F = Frequency

Maternal factors significantly associated with having good dietary diversity in the complementary feed of the child included: level of education (p= 0.047), tribe (p = 0.023), income (p = 0.004), IYCF practices (p = 0.007) and IYCF Knowledge (p = 0.005).

Table 5: Logistic regression to ascertain predictors of nutritional status of the Children

S/N	Variable	AOR	AOR 95% CI	p value
	Abnormal BMI for Age			
	Religion			
	Islam	4.898	1.693;14.164	**0.003**
	Christianity*	1	-	
	Child's Sex			
	Male	2.333	1.005;5.414	**0.049**
	Female*	1	-	
	Mother's Age Group (Years)			
	15-21	0.028	0.001;0.559	**0.019**
	43-49*	1	-	
	Normal MUAC			
	Religion			
	Islam			
	Christianity	0.072	0.020;0.054	**0.0001**
		1	1	
	Current Feed used			
	Canned	10.497	1.254;87.899	**0.030**
	Packaged	1	1	

*Reference Category

The Logistic regression model suggests that if a child is fed on canned feeds he has a 10 times odds of having a normal MUAC. While a child of a Muslim mother, has a 0.07 odds of having a normal MUAC. Also, a Muslim mother has 4 times the odds of having a child with abnormal BMI for age, while being male has 2 times the odds of having an abnormal BMI. Conversely, a mother aged 15-21years of age**,** has a 0.028 odds of having a child with an abnormal BMI.

Discussion

Majority of the mothers studied were aged 29 years to 35 years, had attained tertiary level of education and their income was below the Country's minimum wage of N 30,000 monthly. This is not surprising because in most developing countries like Nigeria, majority of women in this age group are at the peak of their reproductive years and may not be gainfully employed in private and government owned organizations. They are therefore more likely to be skilled workers or full-time housewives, not earning much money monthly. This has implications on their ability to care for the nutritional needs of their children. They are, however, freer and less preoccupied so they will give more attention to the feeding of their children. Research has documented a statistically significant association between low maternal age and childhood malnutrition and recommended an improvement in maternal social status as a means of improving children's nutritional status.[11]

Majority of the children were well nourished, whichever anthropometric measurement was used to assess them; 73.8% had a normal BMI for age, 58.6% had normal weight for age, 70.5% had normal height for age and 82.4% had normal MUAC readings. These finding are in contrast with the findings of another set of researchers in the south western part of

Nigeria who found that majority of the children were undernourished.[12] This contrast could be because the other research only studied teenage mothers who were inexperienced and had their first child with little knowledge of IYCF practices. Another study in Kenya found the prevalence of under-nutrition to be thus: stunting in 47% of the children, underweight in 11.8% and wasting in 2.6% of the children. However, they found severe stunting in 23.4%, severe underweight in 3.1% and severe wasting in 0.6% of the children.[13] These forms of severe malnutrition were lacking in this study. This could be because the study group in our research are younger children, who are still breastfeeding whereas in the Kenyan study, the children were older and the timing of their research was immediately after some political crises in that country which could have worsened food supply to the children. Another set of researchers in Nepal found that out of the 243 under-five children they studied using WHO weight for height assessment 17 (7.0%) were wasted, in height for age analysis 97 (39.9%) were stunted and in weight for age assessment 46 (18.9%) were underweight.[14] These findings suggest that a fearfully high proportion of children are undernourished at such a young age. This will have a lot of effect on their cognitive development and will increase their risk of diseases and death.

Based on food consumption scores, majority of the studied children had inadequate food diversity. This was similar to findings from Kenya where researchers found low food diversity in 41.9% of the studied children, medium diversity in 35.7% and high food diversity scores in 22.5% of them.[15] Furthermore, UNICEF noted in 2019 that 59% of under-five children globally are not being fed the much needed nutrients from animal source foods while 44% of children are not fed on fruits and vegetables. It also reported that the prevalence of high food diversity scores globally were 29%; the lowest being in south Asia (20%), the highest in Latin America (60%) while west and central Africa had scores of 25%.[16] These low food diversity scores have dire consequences on the physical and mental growth and development of this nutritionally vulnerable population. However, using their PCV to estimate micronutrient deficiency, 77.1% of the studied children were normal. This was contrary to the findings of some researchers in Abeokuta, south western Nigeria where 94.8% of the studied children were anaemic.[17] Another study in Guinea Bissau also had a prevalence of 80.2% for anaemia among the under-five children studied.[18] This difference can be ascribed to the age group studied which was pre-school children while this research was among children less than two years of age who were still getting Iron from their mothers breast milk as well as the nutritious complementary feed they are on. Iron Deficiency anaemia is a very common micronutrient deficiency in children in developing countries with negative effects on their cognitive development as well as risk of infections.

Only maternal age group and religion had a statistically significant association with anaemic status of the children in this study. This was however not the same finding by researchers in Ethiopia where maternal educational and socio-economic status were the only correlates to the PCV of the children studied.[19] The difference in these findings could be in the fact that the data source for their study was more robust and detailed than the one used in this study. Also, even though the settings in both studies are similar (both developing countries), there could be socio-cultural, religious and economic differences between the two populations. Both studies

however, suggest a need to improve maternal socio-cultural and economic statuses as a control measure for childhood anaemia.[19]

The maternal factors significantly associated with having good dietary diversity in the complementary feed of the child included maternal education, tribe, income, complementary feeding, knowledge and practices of the mothers. Other researchers in Ethiopia found that the meal frequency was positively associated with dietary diversity. Although in this study, meal frequency was not assessed, both study findings suggest that women's involvement at household decision making improves dietary diversity of children. Also, ensuring maternal education and improving their income can contribute to better dietary diversity of children.[19]

A limitation of this study is that the COVID-19 pandemic disrupted normal immunization clinic activities, affecting the type of patients who turned up for immunization as only the fairly educated mothers who value routine immunization kept coming for immunization. In addition, the FCS may not be a true reflection of the Dietary diversity of the households since the lockdown period limited both geographical and financial access to many food items, particularly dairy products, meat and vegetables.

Conclusion

Both maternal and child's socio-demographics are associated with the nutritional status of the children. Also, both maternal and child's factors combine as predictors of good nutritional status when using MUAC or BMI as markers of nutritional status. It is therefore recommended that female empowerment and literacy be given priority by families, communities and governments as a measure of controlling childhood malnutrition.

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