Original article:

Nutritional status assessment among infants under six months exclusively breastfed and non-exclusively breastfed in Jos North LGA, Plateau State, Nigeria

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Abstract

Objective: To determine breastfeeding practices and the nutritional status of infants under six months in Jos north LGA, Plateau state, Nigeria

Design: A cross-sectional study design was employed. 310 mother-infant pairs were selected as study sample from three primary health care centers in the study location. Data collection consisted of the administration of a validated questionnaire and anthropometric measurements were taken.

Results: 39.7 % were seen to practice exclusive breastfeeding while 60.3 practiced non-exclusive breastfeeding. 33 % of infants had already been introduced to complementary foods even before the age of 6 months. In terms of prevalence of malnutrition among males, 13.2 % were severely stunted, 1.6 % were severely underweight and 6.5 % were wasted. Among females, 8.4 % were severely stunted, 0.6 % were severely underweight and 6.6% were severely wasted. There was a significant difference in nutritional indices and breastfeeding patterns ($p<0.05$).

Conclusion: For a decline in malnutrition prevalence, the early introduction of complementary foods by mothers and care givers must be strongly discouraged. Counselling should be targeted at mothers to encourage exclusively breastfeed for 6 months after which appropriate and adequate complementary foods should be introduced.

Background

The physical growth and nutritional status of infants is a function of principle nourishment consumed by the infant daily [1]. Breast feeding of infants as recommended by World Health Organization (WHO) has been shown to be adequatein the provision of nutritional needs protective against foreign substances overwhelming the digestive tract and renal system functional capacity of the infants [2].

Breastfeeding is beneficial even to mothers, breastfeeding creates a special bond between mothers and infants, and helps weight loss due to pregnancy, amongst others. The breast milk is adequate and has the capacity to provide the nutritional needs of infants. It constitutes high amounts of carbohydrates, proteins, fats, minerals and vitamins. Whereas, infant formula as an alternative to breast milk cannot contain the same benefits [3].

WHO defined malnutrition as the cellular imbalance between nutrients supply, energy and the demand required of the body to ensure adequate, specific functions, growth and maintenance [4]. Malnutrition implies deviations from the optimal and adequate nutritional status in infants, in children and also in adults[5].

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The Nigerian Demographic Health Survey (NDHS) carried out anthropometric measurements on children 0-23 months of age. The survey revealed that 41 % of the Nigerian children studied were too short for their age (stunted), 23 % were underweight and 14 % were too thin for their height [6]. A study by [7] assessed nutritional status of children aged 5-15 reported lower rates; stunting was 18.4 %, underweight 26.6 %, and wasting 17.7 %. Another study in the south-west region of Nigeria among infants, classified them into first, second and third degrees of malnutrition with 22.5 %, 9.5 % and 5.0 % respectively [8].

Anthropometry is a very strategic tool in the assessment of nutritional status and also in clinical settings. It is employed during nutritional screenings, monitoring and surveillance. Several indices of anthropometry are used in assessing adequacy of growth and consequently the nutritional status in infants and children. Nutritional status assessment of children by anthropometry growth indicators are used for provision of information on nutritional and health status of children as well as a measure of quality of life indirectly of a particular community.

Materials and Methods

Setting

This research was carried out in Jos North Local Government, Plateau State in three health care facilities, the Plateau state specialist Hospital's primary health care, Township Primary health center and Tudun Wada Primary health center. These centers operate antenatal and child welfare clinics (CWCs) that cater for pregnant women and babies born within and outside the centers, and also provide other healthcare services.

Study design and data source

This was a cross-sectional study design aimed at determining the nutritional status of infant in relation to their breastfeeding pattern among infants 0-6 months.

The data collection procedures consisted of two parts. The administration of a structured questionnaire and the taking of infant's anthropometric measurements. Each baby's body weight was measured using a SECA 385iii electronic scale with a capacity of 50kg and graduation of 20g <20 kg> 50g. The baby's weight was recorded to the nearest 0.1 kg. The infants were placed completely naked in order to obtain accurate measurements. The infant was placed in a supine position; lying flat, straight and facing up and the length of the infant measured using a calibrated wooden measuring board from the forehead down to the toe of the infant.

Statistical Analysis

Statistical Package for Social Sciences (SPSS version 22) and EPI Info 2007 software were used to analyze all data. Descriptive statistics included frequencies of all variables were obtained using SPSS Vs 22. The Epi Info programme transformed all data into Z-scores in order to calculate prevalence of the nutritional conditions; underweight, stunting and wasting. Infants were then classified as malnourished were their Z-scores fell below -2 or -3 standard deviation (SD) of based on the WHO and CDC's reference population on child growth standards.

An infant with Z-score below <-2 SD to >-3 was considered moderately malnourished and below <-3 Z-score as severely malnourished. An infant below -2 SD away from the median reference population for weight-for-height was considered too thin for height which is otherwise known as wasting and below -3 SD as severely wasting.

Ethical considerations

Ethical approval was sought and obtained from the Department of Human Research Ethics committee of

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the faculty of Medicine and Health Sciences, Universiti Putra Malaysia prior to conducting the research. Also, ethical approval was obtained from the ethics committee for research from the Jos North Primary Health Care.

Results

In terms of stunting prevalence (height-for-age) as shown in table 1, 30 (9.7) of the infants were moderately stunted, 40 (12.9) were severely stunted, and 240 (77.4) were found to have normal heights for their age. The mean Z-score was -0.9466±1.9827, with the minimum Z-score -9.38 and maximum Z-score 3.63. With regards to underweight prevalence (weight-for-age), 6 (1.9) infants were moderately underweight, 3 (1.0) were severely underweight and a greater proportion 301 (97.1) were seen to have normal weights for their age. The mean Z-score was -0.0640±1.1461, with the minimum z-score -3.362 and maximum Z-score 3.97. For wasting prevalence (weight-for-height), 6 (1.9) were found to be moderately wasted, 19 (6.1) were severely wasted and about 285 (91.9) were of normal weights for height. The mean Z-score was 0.7409±2.2390, with the minimum Z-score of -7.36 and maximum Z-score of 9.86.

Table 1.Nutritional status classification of all subjects (n= 310)

Interpretation	**Frequency n (%)**		**Z-score classification**
Height-for-age Z-score			
Moderately Stunted	30(9.7)	Mean Z-score ± SD -0.9466+1.9827	Z-score between -3 and 2SDs
Severely Stunted	40(12.9)	Minimum: -9.38	Z-score -3 SDs or less
Normal	240(77.4)	Maximum: 3.63	Normal weight for age
Weight-for-age Z-score		Mean Z-score+ SD	
Moderately underweight	6(1.9)	-0.0640+1.1461	
Severely underweight	3(1.0)	Minimum: -3.62	
Normal	301(97.1)	Maximum: 3.97	
Weight-for-height Z-score		Mean Z-score+ SD	
Moderately wasted	6(1.9)	0.7409+2.2390	
Severely wasted Normal	19(6.1) 285(91.9)	Minimum: -7.36 Maximum: 9.86	

Table 2 shows the nutritional status of infants classified for the male gender. For stunting prevalence (height-for-age), 16 (11.1) males were moderately stunted, 19 (13.2) males were severely stunted, and 109 (75.5) had normal heights for their ages. The mean Z-score was -1.1662±2.1177, minimum Z-score was -9.38 and maximum was 2.85. For underweight prevalence (weight-for-age), 4 (3.3)

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males were moderately underweight, 2 (1.6) were severely underweight and 117 (95.1) were normal. The mean Z-score was -0.1850±1.2239, minimum Z-score was -3.55 and maximum was 3.30. With regards to wasting prevalence (weight for height), 4 (3.3) were moderately wasted, 8 (6.5) were severely wasted, and 111 (90.2) were of normal weights for heights. The mean Z-score was 0.7572±2.2777, the minimum Z-score was -7.36 and the maximum was 9.86

Table 2.Nutritional status classification of infants among male infants (n= 144)

Interpretation	**Frequency n (%)**		**Z-score classification**
Height-for-age Z-score			
Moderately Stunted	16(11.1)		Z-score between -3 and -2SDs
Severely Stunted	19(13.2)		Z-score -3 SDs or less
Normal	109(75.7)		Normal weight for age
Weight-for-age Z-score			
Moderately underweight	4(3.3)		
Severely underweight	2(1.6)		
Normal	117(95.1)		
Weight-for-height Z-score			
Moderately wasted	4(3.3)		
Severely wasted	8(6.5)		
Normal	111(90.2)		

Table 3 shows the nutritional status classification for the female gender. In terms of stunting prevalence (height-for-age), 14 (8.4) females were moderately stunted, 21 (12.7) were severely stunted, and 131 (78.9) were normal. The mean Z-score was -0.7561±1.8429, the minimum Z-score was -5.45 and maximum was 3.63. With regards to underweight (weight-for-age), only 1 (0.6) female was moderately underweight, 1 (0.6) was severely underweight and 164 (98.8) were normal as they had normal weights for their ages. The mean Z-score was 0.0410 ±1.0666, the minimum Z-score was -3.62 and the maximum Z-score was 3.97. For wasting (weight-for-height), 2 (1.2) females were moderately wasted, 1 (6.6) were severely wasted and 153 (92.2) were normal. The mean Z-score was 0.7269± 2.2120, the minimum Z-score was -5.39, and maximum 9.09.

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Table 3.Nutritional status classification of infants among female infants (n= 166)

Interpretation	Frequency n (%)		Z-score classification
Height-for-age Z-score			
Moderately Stunted	14(8.4)		Z-score between -3 and -2 SDs
Severely Stunted	21(12.7)		Z-score -3 SDs or less
Normal	131(78.9)		Normal weight for age
Weight-for-age Z-score			
Moderately underweight	1(0.6)		
Severely underweight	1(0.6)		
Normal	164(98.8)		
Weight-for-height Z-score			
Moderately wasted	2(1.2)		
Severely wasted Normal	11(6.6) 153(92.2)		

Table 4 shows the comparison between nutritional indices Z-scores for infants exclusively breastfed and non-exclusively breastfed. There was a statistically significant difference in the mean Z-score for height-for-age between infants exclusively breastfed and those non-exclusively breastfed (p-value=0.005, t (308) =2.829, 95 % CI=0.1521, 0.6125). There was also a statistically significant difference in the mean Z-score for weight-for-height between infants exclusively breastfed and those non-exclusively breastfed (p-value= <0.001, t (215) =4.732, 95 % CI=0.37294, 0.90550). There was also a statistically significant difference in the mean Z-score for weight-for-age between infants exclusively breastfed and those non-exclusively breastfed (p-value=0.032, t (308) =2.850, 95 % CI=0.54513, 0.48200).

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Table 4. Comparison between Z-scores deviations among infants and breastfeeding pattern

Nutritional indices	Exclusive breastfeeding		t-test	df	95 % CI	p-value
	Yes	No				
Height-for-age Mean Z-score± SD	-0.558±1.9178	-1.202±1.9882	2.829	308	0.1521,0.6125	0.005*
Weight-for-age Mean Z-score± SD	-0.3216±1.2698	-0.3076±0.9806	4.732	215	0.37294,0.90550	<0.001*
Weight-for-height Mean Z-score± SD	0.7218±2.4094	0.7534±2.3598	2.850	308	0.54513,0.48200	0.032*

p-value was calculated using independent t-test

*significance level (p) ≤ 0.05

Table 5 shows chi-square analysis to determine association between breastfeeding pattern and nutritional status. There was a significant relationship between height-for-age and breastfeeding pattern (X^2= 10.693, df= 2, p-value= 0.005). There was no significant relationship between weight-for-age and breastfeeding pattern (X^2= 0.156, df= 2, p-value 0.925). There was a significant association between weight-for-height and breastfeeding pattern (X^2= 6.131, df= 2, p-value= 0.047).

Table 5. Association between nutritional status and breastfeeding pattern

Variable	Exclusive breastfeeding		X^2	df	p-value
	Yes n (%)	No n (%)			
HAZ			10.693	2	0.005*
Severely stunted	9(22.5)	31(77.5)			
Moderately stunted	7(23.3)	23(76.7)			
normal	107(44.6)	133(55.4)			
WAZ			0.156	2	0.925
Severely underweight	1(33.3)	2(66.7)			
Moderately underweight	2(33.3)	4(66.7)			
normal	120(39.9)	181(60.1)			
WHZ			6.131	2	0.047*
Severely wasted	8(42.1)	11(57.9)			
Moderately wasted	2(33.3)	4(66.7)			
Normal	113(39.6)	172(60.4)			

p-value was calculated using chi square test

*significance level (p) ≤ 0.05

Discussion

At the end of this study, only 39.7 % of mothers were seen to practice EBF and while a higher percentage, 60.3 % practiced non-EBF. This infant feeding practice observed in this study certainly doesn't conform to the guidelines and recommendations by WHO/UNICEF; that babies be breastfed solely through their first six months of life, after which appropriate and adequate complementary feeding should be introduced, while breastfeeding is still ongoing for two years and beyond[9].

Complementary foods were rather observed to have been introduced too early, even before the babies got to their first six months of life as recommended. About 102 (33 %) of infants were already introduced to complementary foods before the attainment of six months of age. Results from this study indicate that infant formula was the most common complementary food introduced to infant before six months of age. This study's findings is comparable to the prevalence reported as 23.4%, 21% and 28% in Kebbi, Nasarawa [10] and Niger States respectively, all in the Northern

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part of Nigeria and also 26.6 % in Port Harcourt, south-south Nigeria [11].

Others foods included porridge, fresh cow milk, glucose, fruit juice and solid foods (14. 4%, 10.2 %, 2.7 %, 1.1 % and 1.1 % respectively). These findings are consistent with other studies[12, 13]. Another study by [14] reported several complementary foods and their percentages introduced before the age of six months. They included akamu and soya beans 36.2 %, infant formula 8.7 % and Staple foods 10.6 %. Akamu otherwise known as pap is in form of porridge and made up of maize or sorghum served traditionally as a complementary food in Nigeria.

Several reasons were accrued for early introduction of complementary foods, consequently limiting EBF for the infants first six months of life. They included the perception of breast milk being no longer sufficient, baby getting too hungry often, insufficient production of breast milk and pressure from family, friends and relative. This was particularly true as many mothers identified cultural factors and influence on their decisions to introduce these complementary foods even though they knew the importance of EBF practice. Pressures from village heads, families and mother in-laws became overwhelming. It was believed that all family members before now (in the past) had benefited from eating every food and still turned out to be fine and perfectly healthy. This findings was also consistent with several studies [12, 15].

Anthropometric indices are very sensitive indicators of infant's growth, health and development. [16]. It is the only universally inexpensive, non-invasive and applicable method used for the assessment of human body size and composition [17].

Infant feeding has been shown to be a significant determinant of infant's nutritional status even as shown in this study. Although breastfeeding practice was observed among every mother in the study (100 %), there was an evidence of malnutrition in some of their children. There was a statistically significant difference in mean weight-for-age, length-for-age and weight-for-length among infants who were exclusively breastfed and those who were non-exclusively breastfed. Weight-for-age, length-for-age and weight-for-length deficits were observed to be significantly higher among non-EBF infants when compared to those EBF. There was also a significant relationship between breastfeeding patterns and the nutritional status of the infants ($p<0.05$).

In this study, a significantly higher prevalence of severe stunting (16.6 %) was observed in infant's non-EBF versus 7.3 % in infants EBF. 0.8 % of infants EBF were severely underweight while 1.1 % non-EBF were severely underweight. Interestingly, 6.5 % of infants EBF were severely wasted while a lower prevalence of 5.9 % were observed for infant non-EBF.

Among all infants, it was observed that 12.9 % were severely stunted, 9.7 % were moderately stunted and 77.4 % were normal. The prevalence of stunting in this study was close to a Kenyan study with 11.7 % prevalence of stunting. Findings by [12] reported one out five which accounted for 18.9 % of infants stunted in Limpopo province.

This study's finding was also consistent with those of [7] with stunting prevalence reported as 18.4 %. In contradistinctions, a Bolivian study reported higher rates of stunting of 38 % [18]. Studies by [7] reported 40.9 %, similar to findings reported by the Nigerian Health Demographic survey [6]. Stunting is a proxy for identification of chronic malnutrition [19, 20]. This study's finding may imply nutritional deprivation in the first year of life [7].Stunting is

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inversely related to both wealth and education [6] infant feeding practices, agricultural productivity and food prices.

It was interesting and encouraging to observe a low prevalence of underweight among infants. 1.0 % were severely underweight, 1.9 % were moderately underweight and 97.1 % were normal. This study findings were close to a study in Kenya reporting 6.5 % underweight prevalence. A study in Limpopo province observed 0.5 % of infants severely underweight, 6.5 % moderately underweight and 90.3 % normal. This study's prevalence was however considerable lower than other findings. A study in Nigeria reported 10.3 % severe underweight and 15.5 % moderate underweight [7]. This study's findings was also lower than figures projected by [6] of 23 % Nigerian children underweight.

Infants who were severely wasted were 6.1 %, moderately wasted 1.9 % and 91.9 % had normal weight-for-length. This finding was consistent with other studies [12, 7]. The prevalence of wasting observed in this study is however lower than those reported in Brazil and Kano, Nigeria with 42 % [21] and 17.3 % [14].

Annually, it has been estimated that under nutrition is a contributing factor to mortality rates of children under five, with dwindling figures of about 5-6 million children which automatically includes infants [21]. In developing countries, Nigeria inclusive, 146 million children are underweight and have increased risk of early mortality. [22] Stated that if only more mothers exclusively breastfeed their babies for 6 months, infant deaths would be significantly decreased by 50 %.

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