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Infant Feeding Practices and Growth Pattern in the First Six Months of Life: A Cross-Sectional Study of Babies Attending the Infant Welfare Clinic of the Nnamdi Azikiwe University Teaching Hospital

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Authors' contributions

This work was carried out in collaboration between all authors. Author OSK with guidance from authors EJ and CE designed the study and wrote the protocol. Author ODIC managed the literature searches, analyses of the study data and wrote the first draft of the manuscript. Authors EU and NI managed the data collection processes and contributed in writing of the manuscript. Authors EJ and EC supervised the work and reviewed the final draft of the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Background: Malnutrition which mostly is a consequence of improper feeding practices has been shown to contribute to over 50% of under-5 mortality. This means that appropriate age-specific nutritional prescription is the surest way of significantly shrinking childhood mortality especially in

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sub-Saharan Africa.
Aim: This cross-sectional descriptive and analytical study aims to determine the relationship between different infant feeding practices and the nutritional status of apparently healthy infants below six months of age attending the infant welfare clinic of Nnamdi Azikiwe University Teaching Hospital, Nnewi.
Methods: Mother infant pairs attending the infant welfare clinic that meets the inclusion criteria were consecutively enrolled over a six months period.
Results: Four hundred infants were enrolled for this study. Educational level (*P*=0.003), socioeconomic class (*P*=0.010), occupation (*P*=0.025) and infants age (*P*=0.001) significantly determined exclusive breast feeding (EBF) practice. Exclusively breast feed infants showed higher weight and length indices for age and sex compared to infants in other feeding group (*P*=0.001). Significantly lower proportion of infants in the EBF group (1.9%) compared to infants in the predominant breast feeding (PBF) 5.2% and complementary breast feeding (CBF) 9.7% feeding group showed evidence of under-weight (*P*=0.015). Binary logistic regression analysis showed that EBF infants were 0.12 and 0.51 times less likely to be under-weight (OR 0.12; CI 0.02-0.93) and stunted (OR 0.51; CI 0.27-0.96) respectively.
Conclusion: Since malnutrition is a major contributor to neonatal and infant's mortality in Africa, the campaign for EBF practice should not only be sustained but further strengthened as a way of halting and possibly reversing the gloomy trend.

Keywords: Length-for-age; weight-for-age; head circumference; infant feeding practice; Nnewi.

1. INTRODUCTION

It is clear that feeding practices have a profound impact on the physical growth which is regarded as one of the best indicators of a child's wellbeing [1]. Poor childhood growth is a widespread public health problem in many low income countries especially in Asia and sub-Saharan Africa [2]. Growth faltering is associated with subsequent cognitive and physical disadvantage, morbidity and mortality [3]. Proper feeding practices during infancy are essential for attaining and maintaining proper nutrition, health, and development of infants and children [4-7]. Results of studies on infant and young child feeding have indicated that inappropriate feeding practices can have profound consequences for the growth, development, and survival of infants and children, particularly in developing countries [8-11]. At no time is the influence of proper feeding greater than during infancy because other factors such as genetics, certain hormones, psychosocial factors, environmental factors and disease have been known to contribute significantly to the nutritional profile of older children [12-14]. Because adequate nutrition plays a major role in the growth and development of infants and young children, the significance of appropriate feeding practices during this period cannot be over emphasized. It therefore follows that the growth profile of a child should be a measure of the appropriateness and adequacy of the feeding option being practiced by the mother.

Owing to the far reaching implication of feeding practices on the survival of the child, it follows that studies bordering on the subject continue to be relevant. Breastfeeding intervention has also been noted to be challenging to implement and sustain successfully [15]. In Nigeria with one of the worst under-5 malnutrition rate in the world, the practice of breastfeeding is low and has shown little or no progress in the last 15 years [16]. The need to focus on nutritional programs in infancy to prevent long term effects have been stressed [17]. No other intervention holds this degree of potential for improving childhood survival profile. In fact, it has been documented that other individual preventive interventions, such as clean delivery, Hib vaccine and tetanus toxoid, could each prevent less than 5% of all child deaths [18]. Since childhood mortality has been shown to be related to nutritional status, researches aimed at optimizing infant nutrition are not misplaced. This study tries to investigate the infant feeding practices among mothers and its relationship with nutritional status of apparently healthy infants below six months of age attending the infant welfare clinic of Nnamdi Azikiwe University Teaching Hospital, Nnewi. It is hoped that findings of this study will serve as a monitoring and evaluation instrument to strengthen ongoing nutritional intervention or stimulate a change in strategy if necessary.

2. METHODOLOGY

The methodology used in this study has been previously used in other studies published as parts of the dissertation of which this study is part [19,20].

2.1 Study Area

This study was conducted in the Infant Welfare Clinic (IWC) of Nnamdi Azikiwe Teaching Hospital (NAUTH), Nnewi located in Anambra state southeast Nigeria. Nnewi, the host town of NAUTH is located on latitude 6° 01´N and longitude 6° 55´E. [21] NAUTH is the only tertiary health institution in Anambra State providing health services to a catchment population of about 25,430,493 as at 2005 with an average annual growth rate of 3.4% [22]. It draws clientele from the entire state and neighboring communities. The hospital maintains an Infant Welfare Clinic which runs three times in a week and is manned by trained nursing staff. On the average the centre attends to 30-40 mother-infant pair on each clinic day. The clinic provides mainly free routine immunization services. Other services rendered include growth monitoring, and counseling in diverse aspects of child survival strategies.

2.2 Study Population and Selection Process

This cross-sectional descriptive and analytical study carried out over a 6 months period involved apparently healthy infants under-six month with their mother who attended the Infant Welfare Clinic of NAUTH Nnewi from August to December 2012. The mother-infant pairs who fulfilled the study inclusion criteria were consecutively enrolled.

The *inclusion criteria* includes: (i) Infants below six months of age who after history and physical examination were found not to have any acute or chronic systemic illness. (ii) Infants below six months of age whose mothers have given informed written consent. *Exclusion criteria*: (i) All infants who were HIV exposed, infected or whose HIV status were not known. (ii) All infants delivered prematurely. (iii) Low birth weight infants. (iv) Infant below six months of age who on history and physical examination were found to have organic or congenital abnormalities. (v) Infant below six months of age who had suffered from acute illness within the preceding two weeks. (vi) Infant whose mothers have died and (vii) Mothers with multiple deliveries such as twins, triplets and quadruplets. (viii) Infants below six months of age whose mothers refused giving consent.

2.3 Data Collection

Data collection was done by the principal investigators and two research assistants (interns who are qualified medical doctors). They were trained in the art of interviewing the mothers, desired clinical examination and the protocol of referral if need be. The correct answers to the questions designated “interviewer to determine” were communicated to them just before commencement of data collection daily. The researchers often randomly went back to interview the mothers for quality control checks. These were all geared towards ensuring that study criteria were well applied. The data collection tool was a pre-tested interviewer administered questionnaire which was completed by questioning the mother and taking measurements of the infants’ weight, length and head circumference [23]. Information was collected regarding parental place of origin and domicile, maternal age, marital status, educational attainment and occupation. Socioeconomic status, defined as the wealth index of the household was derived using maternal and paternal highest educational attainment and occupation based on oyedeji classification [24]. This was then categorized as lower, middle and upper class. Data were also collected about mothers’ antenatal clinic attendance, place of delivery and mode of delivery.

Infant’s first feed, everything baby took in the previous 24hours, reason for stopping breastfeeding were documented. There was also a section that sought to find out whether the mothers ever heard of exclusive breastfeeding, mothers’ knowledge of the meaning, willingness to practice it if given the opportunity and reason for rejecting exclusive breastfeeding (where applicable). Prior to enrolment of any mother-infant pair, specific enquiries on the elements of the exclusion criteria were made including the HIV status. The HIV status of mothers who delivered in NAUTH and gave consent to participate in the study was additionally confirmed from the hospital’s record. For mothers who gave birth outside the hospital, their confidentially volunteered status was admissible. Mothers who did not have antenatal HIV or who could not recall their status were excluded from the study. Mothers with ongoing respiratory illness were also excluded alongside their babies. For the infants, information on the sex, birth rank, time of first intake of feed and/or water, reasons for delay beyond 30minutes, first

feed given to baby, colostrums intake, etc were sought from the mothers.

2.4 Predictor Variables

Mothers were asked to recall what they had given to their infants in the past 24 hours. Based on WHO definition [25,26] (Table 1) of infant feeding methods infants were categorized into those exclusively breastfed, predominantly breastfed and complementary breast feeding. The number of mothers and the feeding option adopted for their infants aged 0-6 months was further categorized into (i) Yes, for mothers who practised exclusive breastfeeding and (ii) No, for mother that did not practice exclusive breastfeeding.

Secondary predictor variables like maternal age in years was categorized as 25 or less, 26-30, 31-35, and ≥36; educational level of mothers categorised as no education, primary education, secondary and tertiary education; occupation of mothers during previous 6 months after birth was categorised as none, unskilled, semi-skilled and skilled; socioeconomic class of mother was categorised as; lower, middle, upper (using using oyedeji's classification scale [24] validated for developing countries). Parity of mother was categorised as 1, 2-3, and ≥4. Infant's age was categorised as < 1 months, 1-2 months, 3-4 months and 5-6 months; gender of the infant grouped as male or female; and birth rank grouped into first, second, third, fourth and fifth or higher.

2.5 Outcome Variable

i) Weight: All infants recruited for this study were weighed completely bare using a 10kg Stadler Infant weighing scale (Doebil Industries, India) to the nearest 0.1Kg. After undressing the baby, he/she is gently placed on the scale receptacle. Knowing that most awake babies would be frightened by such procedure, this researcher always had an assistant who kept a close watch over the baby while the weight value is read in a squatting posture about 50cm from the weighing scale calibration focusing directly to avoid error of parallax. Before another baby is weighed even on the same day, the weighing scale was crosschecked for zero adjustment.

ii) Length: The recumbent length was taken with the infant lying supine on a locally constructed infantometer with the feet and heels at right angles to the board and with the head supported at right angles to the head-piece so that the inner and outer canthi of the eyes were in vertical plane [27]. The infantometer has a standard meter rule strapped firmly on one side of the length. An assistant was required to gently and carefully restrain and stretch out the apposed lower limbs while the researcher adjusted the head-piece to read off the value from the meter rule. The length of the infants was measured to the nearest 0.1 cm.

iii) Head circumference: The head circumference equivalent to the occipito-frontal circumference was measured with a flexible inelastic tape firmly applied over the glabella and supra-orbital ridges anteriorly and that part of the occiput posteriorly that gives the maximum value. The measurements were recorded to the nearest 0.1cm. The tape was crosschecked daily against a standard ruler.

Using the WHO Anthro Software (Version 3.1.0) for calculating Paediatric anthropometry, the z-score of the infant's length, weight and head circumference for age and sex was determined. Based on WHO cut-off, infants with z-score below -2SD of the median score were classified as subnormal and those with z-score -2SD and above were regarded as normal. They were subsequently compared with z-scores of the reference population for age and sex from the WHO growth chart.[28]

2.6 Data Entry and Analysis

Data analysis was done using the Statistical Package for Social Sciences (SPSS) software version 15. Student-t test was employed to test difference between two means, Chi-Square to test the difference between proportions from categorical or nominal data, analyses of variance (ANOVA) used to compare statistical difference in more than two means and Pearson correlation to test the strength of associations where applicable. Logistic regression was employed in comparing sub-groups where applicable. A probability (p) value of less than 0.05 was considered statistically significant.

2.7 Ethical Consideration

Ethical clearance was obtained from the Nnamdi Azikiwe University Teaching Hospital Ethics committee (NAUTHEC) with reference number

NAUTH/CS/66/VOL3/50. Informed consent (written) was obtained from every mother in her own right and on behalf of her child before recruitment. Participation in the study was entirely voluntary and no financial inducement whatsoever was involved. Voluntary withdrawal at any stage of interaction was guaranteed for all subjects without any adverse effect for the mother or the baby. All information was handled with strict confidentiality.

3. RESULTS

3.1 Characteristic of Mother-infants Surveyed

From a primary sample of 1865 mother-infant dyads seen during the period of study, 534(28.6%) were found eligible having met the set study criteria. One hundred and thirty- four (134) declined participating in the study giving a final sample size of 400 mother-infant pairs (see Fig. 1).

Exclusive breastfeeding (EBF) was practiced by 134(33.5%), predominant breastfeeding (PBF) by 111(27.8%), and complementary breastfeeding (CBF) by 155(38.8%) of the surveyed mothers. Table 1 shows the characteristics of mothers and infants surveyed. Mothers with higher educational attainment practiced EBF for their infants more than mothers with lower educational levels (*P*=0.003). Mothers with no occupation practiced EBF more compared to mothers with unskilled, semi-skilled or skilled occupation (*P*=0.018). Similarly mothers in the lower and middle socioeconomic class practiced EBF more than mothers in the higher socioeconomic class (*P*=0.025) (Table 2). Two hundred and eleven (53%) of infants surveyed were male. Majority, 255 (57%) of the infants were in the 1-2 months age category while 53 (13%), 76 (19%) and 46 (12%) were less than one month, 3-4 months and 5-6 months old respectively. Apart from the age category (*P*=0.001), infant feeding practice did not significantly differ between sex (*P*=0.838) and birth rank of the infants surveyed. (Table 2).

3.2 Infant's Nutritional Status by Feeding Practices

Table 3 shows the anthropometric measures of surveyed infants stratified by age and sex. In the male infants category, though the mean values for the EBF group were mostly higher, there was no statistically significant differences in the mean values of their weights, lengths and occipitofrontal circumference across the feeding practices except in the weight of the 1-2 months category (*P*=0.011).

For the females, the mean weight for the EBF infants were significantly higher at less than one month (*P*=0.023) and 1-2 months (*P*=0.001). Also, the length of female infants in the EBF category at 1-2 month (P=0.001) and male infants at 2-3 months (P=0.020) was significantly higher compared to infants in other feeding category. Finally, female infants in the EBF category had a significantly larger head circumference in the 1-2 months age group (P=0.001) compared to those in other feeding groups (Table 3).

Table 1. WHO definition of selected feeding practices

Infant-feeding (IF) option	What this type of IF requires infants to receive	What this type of IF allows infants to receive	What this type of IF does not allow infants to receive
Exclusive breastfeeding (EBF)	Breast milk (including milk expressed or from a wet nurse)	ORS, Drops or syrups (vitamins, minerals, medicines)	Anything else
Predominant breastfeeding (PBF)	Breast milk (including milk expressed or from a wet nurse) as the predominant source of nourishment	Liquids (water and water based drinks, fruit juices, ORS), ritual fluids and drops or syrups (vitamins, minerals , medicines)	Anything else (in particular, non-human milk, food-based fluids)
Breastfeeding with complementary foods (CBF)	Breast milk (including milk expressed or from a wet nurse) and solid or semi solid foods	Anything else : any food or liquid including non-human milk and formula	No restrictions applicable
Breastfeeding (BF)	Breast milk (including milk expressed or from a wet nurse)	Anything else: any food or liquid including non-human milk and formula	No restrictions applicable

Table 2. Maternal and infant characteristics and feeding practices

Variables		Infant feeding practice			
	N n (%)	Exclusive EBF	Predominant PBF	Complementary CBF	*P*- value
Age of mother (years)	N=398	N=134	N=110	N=154	
25 or less	106(27)	34(25)	27(25)	45(29)	0.116
26-30	159(40)	59(44)	51(46)	49(32)	
31-35	98(25)	32(24)	26(24)	40(26)	
36 or older	35(8)	9(7)	6(5)	20(13)	
Mother educational level	N=400	N=134	N=110	N=151	
Primary	89(23)	18(13)	26(24)	45(30)	0.003
Secondary	170(43)	55(41)	51(46)	63(42)	
Tertiary	137(34)	61(46)	33(30)	43(28)	
Socioeconomic class	N=400	N=134	N=111	N=155	
Lower	185(46)	48(36)	57(51)	80(52)	0.018
Middle	150(38)	55(41)	42(38)	53(34)	
Upper	65(17)	31(23)	12(11)	22(14)	
Occupation of Mother	N=400	N=134	N=111	N=155	
None	97(24)	37(28)	26(23)	34(22)	0.025
Unskilled	140(35)	31(23)	41(37)	68(44)	
Semi-skilled	86(22)	34(25)	25(23)	27(17)	
Skilled	77(19)	32(24)	19(17)	26(17)	
Mother Parity	N=400	N=134	N=111	N=155	
1	128(32)	34(25)	36(33)	58(37)	0.200
2-3	152(38)	57(43)	38(34)	57(37)	
4 or more	120(30)	43(32)	37(33)	40(26)	
Age of child (months)	N=400	N=134	N=111	N=155	
Less than 1	53(13)	22(16)	27(24)	4(3)	0.001†
1-2	225 (56)	84(63)	70(63)	71(45)	
3-4	76(19)	23(17)	13(12)	40(26)	
5-6	46(12)	5(4)	1(1)	40(26)	
Sex of child	N=400	N=134	N=111	N=155	
Male	211(53)	68(51)	59(53)	84(54)	0.838
Female	189(47)	66(49)	52(47)	71(46)	
Birth rank	N=400	N=134	N=111	N=155	
First	126(32)	34(26)	36(32)	56(36)	0.437
Second	80(20)	31(23)	18(16)	31(20)	
Third	73(18)	26(19)	20(18)	27(17)	
Fourth	62(16)	26(19)	19(17)	18(12)	
Fifth and higher	59(15)	17(13)	19(17)	23(15)	

† Yates correction applied

Table 3. Infants feeding practices and mean anthropometric parameters stratified by age and sex

Age (month)	Sex	Variables	Infant feeding Practice			F-test	*P*
		Mean ± SD	EBF	PBF	CBF		
			N=8	N=19	N=2		
Less than 1	Male	Weight	3.9±0.5	4.2±0.8	4.1±2.2	0.106	0.900
		Length	51.0±2.7	52.7±3.3	49.5±4.9	1.369	0.272
		Head circumference	37.2±0.8	36.5±1.9	37.0±2.8	0.470	0.631
			N=14	N=8	N=2		
	Female	Weight	4.4±0.5	3.8 ± 0.5	3.6±0.8	4.515	0.023
		Length	52.7±2.6	51.6 ± 2.8	52.0±1.4	0.460	0.638
		Head circumference	36.8±1.1	35.8 ± 0.8	37.0±1.4	2.686	0.090
			N=44	N=37	N=34		
1-2 months	Male	Weight	5.7±0.8	5.4±0.9	5.1±0.9	4.661	0.011
		Length	57.1±3.5	55.9±3.6	55.3±3.4	2.705	0.071
		Head circumference	40.0±2.0	39.1±2.0	39.0 ±2.0	3.072	0.050
			N=40	N=33	N=37		
	Female	Weight	5.8±0.8	5.1±0.7	5.0±1.2	8.447	0.001
		Length	57.6±3.4	54.2±3.3	54.2±4.8	9.665	0.001
		Head circumference	39.7±1.6	38.6±1.9	38.2±1.8	7.502	0.001
			N=14	N=2	N=22		
3-4 months	Male	Weight	7.3±0.7	6.6±2.3	6.8±0.9	1.486	0.240
		Length	63.6±4.0	66.5±6.4	60.8±3.4	3.821	0.032
		Head circumference	42.3±1.7	42.5±0.7	41.2±1.9	1.813	0.178
			N=9	N=11	N=18		
	Female	Weight	6.8±0.6	6.1±1.0	6.4±0.9	1.594	0.218
		Length	60.1±2.5	58.9±3.0	59.9±3.9	0.294	0.748
		Head circumference	40.6±1.9	41.3±1.6	41.1±1.6	0.454	0.639
			N=2	N=1	N=26		
5-6 moths	Male	Weight	8.7±0.2	8.8±0.0	7.4±0.9	2.022†	0.554
		Length	69.5±2.1	69.0±0.0	66.4±3.2	1.335†	0.194
		Head circumference	45.0 ±1.4	44.0±0.0	43.3±1.8	1.297†	0.206
			N=3	N=0	N=14		
	Female	Weight	8.3±0.5	0.0±0.0	7.4±0.7	1.858†	0.083
		Length	62.9±2.9	0.0±0.0	64.3±3.1	0.716†	0.486
		Head circumference	41.2±0.3	0.0±0.0	42.6±1.6	1.473†	0.161

† T-test

3.3 Comparison of Infant's Anthropometry with the WHO Median Z-score Value

Figs. 2-4 shows the anthropometric measure (mean weight, length and head circumference) in the respective feeding practices compared with the WHO median z-score value. In the weight parameter, infants on exclusive breastfeeding group had values that were consistently above that of the median z-score for both males and females. The mean weight value of males in EBF

compared to the median z-score value rose from 100.4% at <1 month to 108.6% at 3-4 months to 108.9% at 5-6 months. For the PBF male infants, the values were 99.5%, 100.1% and 110.3% at <1month, 3- 4 months and 5- 6 months respectively. The values for the CBF group consistently fell below that of median z-score after the 1-2 months category (Fig. 2a).

Similar result was found amongst the females where the mean weight of those on EBF rose from 103.6% at <1 month to 112% at 5- 6 months of life. There was no weight faltering for the infants on EBF throughout the age groups. The pattern for the PBF and CBF was similar to the EBF feeding category but their values were to a lesser degree above the median z-score (Fig. 2b).

The length-for-age of male infants in the EBF category showed less consistency. Compared to the median z-score value, it was 98.7% and 99.5% at <1month and 1-2 months age category respectively. The value however rose above the median score from the 3-4 months to the 5-6 months age group (Fig. 3a). For female infants on EBF, the reverse was the case. Their length-for-age values remained slightly above the corresponding median score for <1 and 2-3 months age group, equivalent at 3-4 months age category and dropped below the median score for the 5-6 months age group. Infants in other feeding category showed almost similar length pattern with the EBF group (Fig. 3b).

The head circumferences of infants in the three feeding categories were all consistently above the median z-score across all age categories. However, male infants in the EBF consistently had higher values throughout all age categories while female infants at <1 and 1-2 months age had slightly larger head circumference compared to the infants in other feeding categories (Fig. 4).

3.4 Underweight and Stunting Rate among Infants Surveyed

The overall rate of underweight was 1.9 % amongst EBF infants, 5.2% in the PBF and 9.7% in the CBF group (*P*=0.015). Comparism of proportion of underweight across the different feeding practices showed a significant difference in the female gender (*P*=0.036), 1-2 months old (*P*=0.008) and 3-4 (*P*=0.047) months old age category (Table 4). Across all the feeding practices, the prevalence of stunting was higher among infants in the CBF feeding group (26.5%) compared to those in the EBF (13.5%) and PBF group (17.2%). This however did not attain statistical significance (P=0.078).

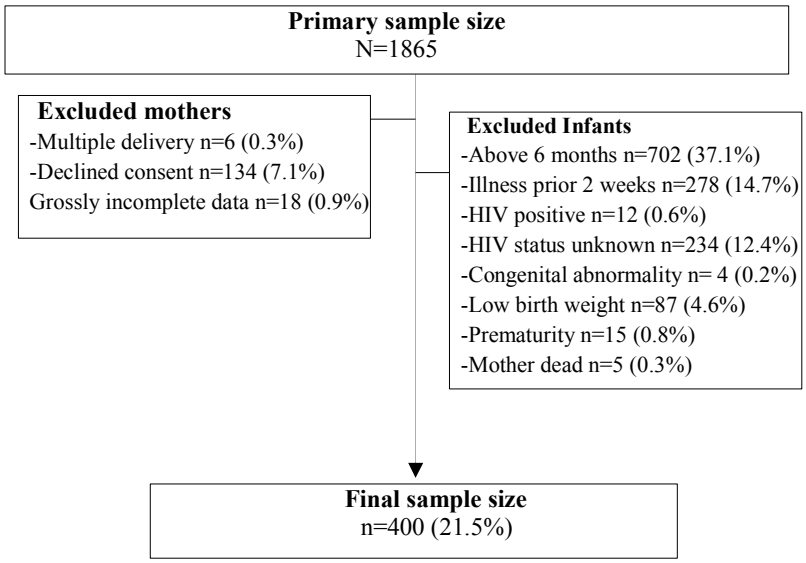

Fig. 1. Selection process for study participants

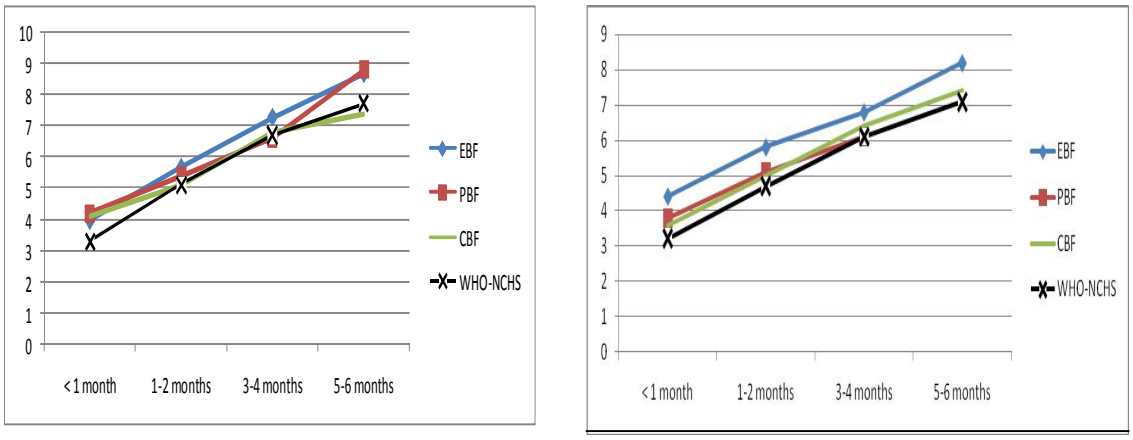

Fig. 2. Mean weight for age for infants surveyed stratified by sex
EBF- exclusive breastfed, PBF- predominantly breastfed; CBF- breastfeeding with complementary feeds

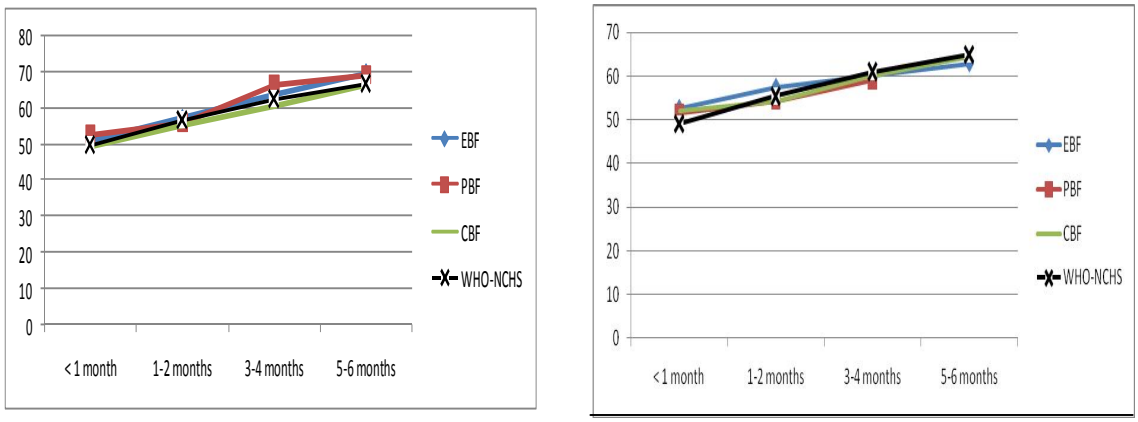

Fig. 3. Mean length for age of infants surveyed stratified by sex
EBF- exclusive breastfed, PBF- predominantly breastfed; CBF- breastfeeding with complementary feeds

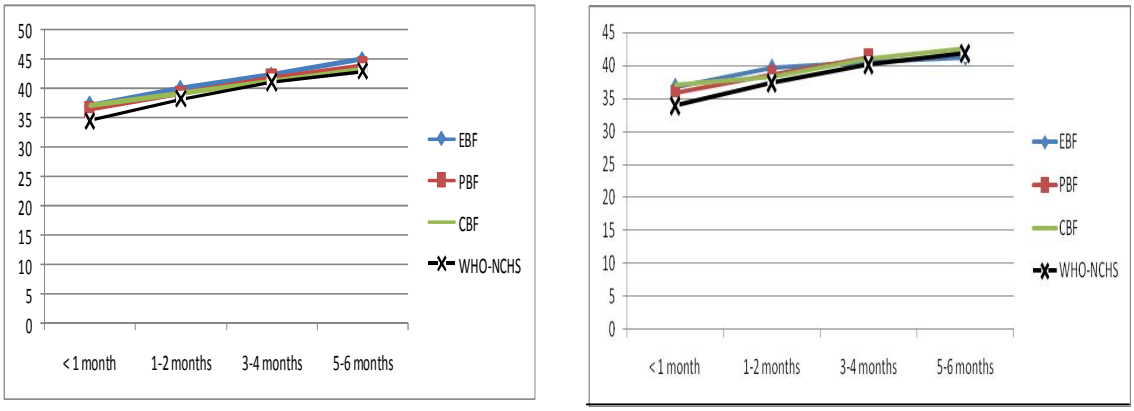

Fig. 4. Mean head circumference for age for infants surveyed stratified by sex
EBF- exclusive breastfed, PBF- predominantly breastfed; CBF- breastfeeding with complementary feeds

Table 4. Infant feeding practices and subnormal z-scores

Variables	Subnormal z-score			
	EBF	PBF	CBF	*P*
	n (%)	n (%)	n (%)	
Weight for age (kg)				
Age of Infants(months)	N=2	N=7	N=15	
Less than 1	0(0)	1(14)	1(7)	0.054
1-2	1(50)	3(43)	9(60)	0.008
3-4	1(50)	3(43)	3(20)	0.047
5-6	0(0)	0(0)	2(13)	0.855
Sex				
Male	1(50)	4(43)	8(53)	0.118
Female	1(50)	3(57)	7(47)	0.036
Prevalence of underweight	1.9	5.2	9.7	0.015
Length for age (cm)				
Age of Infants(months)	N=15	N=23	N=41	
Less than 1	1(7)	2(9)	1(3)	0.362
1-2	10(66)	18(78)	26(63)	0.001
3-4	3(20)	3(13)	9(22)	0.627
5-6	1(7)	0(0)	5(12)	0.723
Sex				
Male	11(73)	11(48)	20(49)	0.483
Female	4(27)	12(52)	21(51)	0.002
Prevalence of stunting	13.5	17.2	26.5	0.078
Head Circumference (cm)				
Age of Infants(months)	N=12	N=6	N=8	
Less than 1	1(8)	1(17)	0(0)	0.908
1-2	10(84)	4(66)	5(63)	0.340
3-4	1(8)	1(17)	2(25)	0.906
5-6	0(0)	0(0)	1(12)	0.926
Sex				
Male	6(50)	2(33)	4(50)	0.375
Female	6(50)	4(67)	4(50)	0.739
Subnormal OFC	12.0	4.5	5.2	0.130

Significantly more female infants (51%) in the CBF feeding group and infants in the 1-2 months age category in the PBF group (78%) were stunted compared to infants in other categories (*P*=0.001 and *P*=0.002 respectively).

The head circumference showed no significant difference in age categories and sex of infants across feeding groups (Table 4). After adjusting for maternal and infants variables considered in this study, logistic regression analysis showed that exclusively breast feed infants were 0.12 times less likely to be underweight compared to infants not exclusive breastfed (OR 0.12; CI 0.02-0.93) and it was 0.5 times less likely that infants in the EBF group will be stunted compared to infants in other feeding group (OR 0.51; CI 0.27-0.96).

4. DISCUSSION

The findings from this study demonstrate the superiority of EBF over other infant feeding practices in most of the anthropometric parameters assessed namely: weight-for-age and length-for-age.

The mean weights of infants on EBF were consistently higher than those in other feeding practices and the median z-score for both males and females. Butte et al. [29] had made this observation in 1984, six years before the Innocenti Declaration [30]. The present study observed a steadily incremental percentage mean weight difference of the EBF infants compared to the WHO median z-score in contrast to a similar study in Sokoto, northern

Nigeria which noted a decline in percentage mean weight from 113% in the first month to 101% in the sixth month [31]. The finding at Port Harcourt[27] which has closer socio-cultural profile with Anambra, the location of this study however did not show that declining trend. That study reported a steady rise from 102% at birth to 107% and 108% at 3 months and 6 months respectively. The difference in trend seen between this study and the Sokoto study might be due to the possible variation in socio-economic status and educational attainment. Preponderance of the mothers that practiced EBF in the present study had tertiary education and were also at least in middle socio-economic class while in the Sokoto study, 80% of the women that exclusively breastfed their babies had no formal education [32]. These factors have been known to affect proper EBF practices [33,34]. The favourable weight-for-age among the PBF group was also noted by Ahmed et al. [32] in Sokoto. These findings probably suggest that offering of small amounts of water to infants below six months of age may not significantly compromise their weight appreciation. The situation was remarkably different for the other feeding practices. Also in the Sokoto study infants on CBF had their weight-for-age below the median z-score across all the age categories unlike this study where this anthropometric parameter was above the median z-score but significantly below the EBF group. One of the possible explanations for this significant weight-for-age compromise may include the established superiority of the nutritional value of breast milk in terms of content and digestibility over other food items. In this instance, it logically follows that the offering of these other food items to infants would likely limit their thirst and space for breast milk. Again, since the infants' gut may not be mature for proper digestion and absorption of these feeds, the babies' true nutritional input may be compromised in many facets.

Length-for-age showed less consistency than weight-for-age but the EBF group still had a more favourable outcome than the other feeding practices. Amongst the EBF infants, the length-for-age means values fell below the median z-score in the first 2 months but overtook it as from the 3rd month. This type of inconsistency was in part noted by Otaigbe [27] in prospective study which noted that the median lengths of females were consistently above the reference length (100.6% to 107% at one and six months respectively) while those of the males were consistently below it (99.6% to 98.4% at the corresponding ages). The lower length of infants on CBF could also be explained by the nutritional insufficiency of the other feeds as well the other factors that were adduced for weight-for-age.

The head circumference of EBF infants just like for infants in other feeding groups remained higher than the standard across all the age categories for both males and females. Comparison of the head circumferences of male and female infants in the different categories of feeding practices did not show any statistically significant variation. This may be due to the simple fact that it takes chronic nutritional deficiency to notice any significant change in head circumference. Contrary to this finding, Haroldo et al. [35] in their study in quilombos communities' northeast Brazil which was undertaken over a 60 month period noted that infants on exclusive breastfeeding for ≥4 months was associated with a larger head circumference in children exposed to great social vulnerability in impoverished communities. This again continues to lend credence to earlier findings that chronic deprivation of requisite and adequate diet could lead to compromise in brain growth [36]. The superiority of EBF in supporting better growth seen in this study should further strengthens the view that greater effort should be made to improve its practice.

5. CONCLUSION

Infant feeding practices have a strong influence on infants' nutritional profile and this reflects in their anthropometric indices. This study demonstrated the superiority of EBF over other feeding practices. Unfortunately, the rate of EBF in this study was low from the first to six months of age. This study therefore adds credence to the position of our National Policy on Infant and Young Child Feeding (NPIYCF), the WHO and UNICEF of untainted EBF for the first six months of life.

6. LIMITATION

Breast Feeding practice information could only be acquired from the questions concerning a 24 hour recall of infant feeding practice. Several misclassifications might have occurred since a mother who has been exclusively breastfeeding her infant but for some reasons gave her infant water or some other liquids the previous day is considered not to have exclusively breastfed their infants and vice-versa. Furthermore, due to the cross-sectional design of this study, only

association not causal relationships can be established with certainty.

7. DECLARATION

This is a dissertation research work which had three parts. Two of which has been published earlier this year in the international journal of breastfeeding and the Journal of Pediatrics and Neonatology both with the same methodology with this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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