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Nutritional Status and Feeding Practices of Infants Among Low-Income Nursing Mothers in Ondo State, Nigeria

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Abstract: To determine the nutritional status of infants and infant feeding practices among low-income nursing mothers in Ondo State, S/W Nigeria. A cross-sectional survey was conducted among 800 infants (0-2 years) and their mothers (15-45 years). The subjects were randomly selected from rural and urban communities from the three senatorial district of the state. Trained interviewers used a questionnaire to collect information on the feeding patterns and types of weaning food. Anthropometrics measurement (weight and height) of the infants was measured. The results showed that the mean age (X±SEM) of the children was 13±0.41 months and that of height and weight were 70.6±0.57 cm and 8.79±0.08 Kg, respectively. The age range of the nursing mothers was between the ages of 15 and 45 years and the mean value of children per mother was 2.48±0.08. The percentage of infant's families falling within a high SES was 23.5%, medium SES was 28.4 and 48.1% was falling within low SES. The result of infant feeding pattern showed that 20.4% of nursing mothers breastfed their infants exclusively, 39.9% breastfed their child on demand and in addition to breast milk the children were also given herbal concoction in the morning and at night. Others, 37.7%, were timing when to breastfeed their babies and 2.0% of the mothers did not breastfed their infants. Introduction of weaning food result showed that 3.0% of the mothers introduced weaning foods to their children between the ages of 0-3 months, 33.5% introduced between 4-6 months and 43.1% introduced between 7-9 months. The common weaning food used was Ogi, traditionally made from cereal (corn or sorghum grains) by fermentation. The result of dietary intake of the children showed 20.4% were fed with breast milk only, 24.2% were fed with breast milk and ogi and 12.9% were fed with ogi only. Others, 10.9, 13.1, 14.1 and 4.4% were fed with breast milk plus infant formula, infant formula only, breast milk plus family diet and family diet (i.e., bread, yam, beans porridge, eba, amala etc.) only, respectively. The result of chemical analyses of ogi showed that MCP contained moisture content of 4.5 g, fat 4.3 g, carbohydrate 81.3 g, protein 6.4 g fiber 1.7 g and ash 1.8 g. The minerals and vitamins composition of MCP were calcium 74.6 mg, phosphorous 185.1 mg, iron 1.8 mg, thiamine 0.11 mg, riboflavin 0.09 mg and niacin 1.83 mg and that of SP were moisture content 7.1 mg, fat 6.7 mg, carbohydrate 72.6 mg, protein 8.7 mg, fiber 1.0 mg and ash 4.9 mg, others calcium 46.2 mg, phosphorus 244.1 mg, iron 3.3 mg, thiamine 0.5 mg, riboflavin 0.2 mg and niacin 3.4 mg. The classification of nutritional status showed that 63.0% of infants were falling with the normal categories and others, 22.5, 9.5 and 5.0% were classified as first, second and third degree of malnutrition, respectively. The results of this present study provide information on the nutritional status, breastfeeding patterns and main weaning food used among low-income nursing mothers in S/W Nigeria. It is not clear whether the findings are specific to the studied population alone or applicable to other parts of Nigeria. Further studies are needed to confirm these findings.

Key words: Nutritional status, breastfeeding practices, local weaning foods

INTRODUCTION

A large number of Nigerian households have become food insecure as a result of the downturn of the economy, as rising inflation and escalating of food prices have eroded their purchasing power. The major consequences of food insecurity are protein energy malnutrition and micronutrient deficiencies, particularly among the children (0-5 years)[1]. Infant and young child feeding are a cornerstone of care for childhood development. Poor feeding practices and frequent infectious diseases or/a combination of the two are both major factors affecting physical growth and mental development of young children in developing countries[2,3]. Studies have shown that poor feeding practices, such as inadequate breastfeeding, offering the wrong foods, giving insufficient quantities and not ensuring that the child gets enough food; contribute to malnutrition[3].

Breast milk is the natural first food for babies, it provides all the energy and nutrients that the infant needs for the first months of life and it continues to provide up to half or more of a child's nutritional needs during the second half of the first year and up to one-third during the second year of life. Breast milk promotes sensory and cognitive development and protects the infant against infectious diseases. Exclusive breastfeeding, that is, the acts of giving infant breast milk without any additional food or drink even water for the first four to six month of life, reduces infant morbidity, mortality and helps for a quicker recovery during illness[4].

When breast milk is no longer enough to meet the nutritional needs of the infant at the age of four or six months and above, weaning foods (i.e., traditional or commercial weaning foods) should be added to the diet of the child. Weaning, that is, the transition from breastfeeding to family foods, should be timely, adequate, safe and appropriate. The adequacy of weaning not only depends on the availability of a variety of foods in the household, but also on the feeding practices of caregivers[3]. In developing countries, the age at introduction of weaning foods is of public health importance, because of the risk of diseases, especially, diarrheal diseases from contaminated weaning foods and the risk of growth faltering and malnutrition from delayed introduction of weaning foods[5]. In developing countries, the age at introduction of complementary foods varies and is influenced by the tradition of the different ethnic groups, urbanization and socio-economic status of households. In urban areas, the tendency is early introduction of complementary foods, but in some rural areas introduction of weaning foods is delayed up to one year or more[6-9].

In South West Nigeria, which is predominantly Yoruba ethnic group, the pattern of infant feeding is a combination of breastfeeding and introduction of weaning diets. Various studies have established that most Yoruba nursing mothers breastfeed their babies immediately after birth for a period of 6-12 months before introduction of complementary foods, such as ogi (corn pap) or infant food formulas[10,11]. A number of recent publications have raised concern about the nutritional well being and feeding pattern of children with respect to prevention of childhood diseases and other chronic diseases[12,13]. However, there is scanty information on the nutritional status and feeding pattern of infants in southwest Nigeria.

This research was designed to address this issue using Ondo state, as a reference point for other Yoruba ethnics group in South West Nigeria. The study aimed to determine the nutritional status of infants via anthropometrics measurement and feeding practices. The specifics objectives were to:

- Evaluate the nutritional status of the infant by using weight-for-height.
- Evaluate the infant feeding patterns among the low-income nursing mothers
- Determine the nutritional composition of the local common weaning food, i.e., ogi

MATERIALS AND METHODS

South West Nigeria comprises eight states and it is predominantly of the Yoruba ethnic group. This group shares the same socio-cultural factors. Ondo state (a case study) is one of the states in S/W Nigeria. The state is divided into three senatorial regions. One-third of the land surface is dedicated to agricultural products like cocoa and food crops (in which nearly 80% of the working population is involved).

A total number of eight hundred mother-child pairs were selected for the study. The age range of the mother was between 15 and 45 years and that of the children was between 0 and 2 years. The study was carried out during the postnatal clinic days at the health centers in both the urban and rural areas. Two hundred and sixty-seven subjects were selected each from the three senatorial regions and the selection was done randomly by using random numbers.

Data collection: This cross-sectional study was conducted by means of structured and semi-structured questionnaires, which were administered by trained investigators to all the nursing mothers to obtain information on their demographic data (such as, age, occupation, monthly income, family size, education.), demographic data of the infants (sex, age), frequency of breastfeeding, types of weaning food and mode of their preparation, sources of water and methods of water treatment. A 24 h dietary recalls method, which is the most widely used method in estimating dietary intakes of illiterate individuals and population groups[14], was adopted to assess the food intakes of all the subjects (infants). Information on the recipes and method of preparation of the ogi were collected from the mothers and the prepared weaning ogi was subjected to chemical analysis.

Preparation of maize corn or sorghum bicolor flours and paps (ogi)

Maize corn or sorghum pap (ogi): The materials were sorted to remove impurities. Afterwards, it was washed with clean water and soaked in water for 5 days. After

soaking, it was properly washed with clean water and drained. The clean samples were then oven dried at a temperature of 60°C 24 h in an air drought oven. The dried seed were then milled and sieved through a 0.4 mm mesh screen to give corn or sorghum flour and then kept in airtight container. The ogi was prepared by mixing the corn or sorghum flour with 40 mL of water into smoother paste. The boiling water (100°C) was slowly added to the paste and stirred continuously until homogenous gel was formed.

Proximate analysis: Triplicate samples of the ogi were analysed for moisture, fat, protein (N x 6.25), crude fiber and ash in accordance with the procedures of AOAC[15]. Total lipids were estimated by petroleum ether extraction. Carbohydrate content was estimated by difference. The gross energy was determined using a Gallenkamp Ballistic bomb calorimeter (Cam Metric Ltd. Cambridge, K). The total ash was estimated after ashing for 12 h at 550°C.

Minerals/vitamins determination: The phosphorous was determined by Vanado-molybdate method[15]. Calcium and iron contents were determined after wet digestion with a mixture of nitric acid, sulphuric and hydrochloric acids, using atomic absorption on ash sample using a Buck Model 200 A flame atomic absorption spectrophotometer. Vitamin B1, vitamin B2 and vitamin B3 were determined using standard methods[15].

Anthropometric measurements: Anthropometric measurements were assessed through standardized procedures[16,17]. Weights of the subject were measured, with light clothing and shoes off, using a portable beam balance and bathroom scale (Hana, Br- 90011) to the nearest 0.1 kg.

Height was determined with a flat board of dimensions 120×40×2 cm with a headboard 30 cm high fixed at a right angle to one end and to the nearest 0.5 cm. When measuring height the subject lies flat and straightened out to full length. The subject weight and height were used to determine the nutritional status of the subjects with reference to standard[18].

Socio-Economic Status (SES): The socio-economic status of the families were determined by considering items such as educational attainment, occupation and monthly income of both mother and father, characteristics of the house (i.e., ownership status) and ownership of goods like car. These items were used to classify the subject into high, medium and low socio-economic status[19]. For the High Socio-Economic Status (HSES) items like higher educational attainment, well paid job like health professionals, top civil servant officials, etc., possession of material like a car and house were considered, for Medium Socio-Economic Status (MSES) items like secondary educational attainment, fairly lucrative job, possession of a car or a house and for Low Socio-economic Status (LSES) items like Primary school educational background or lack of formal education, poor earning job, non possession of a car or a house were considered.

Statistical analysis: Results are expressed as mean values (X) and Standard Deviations (SD). Data was processed and expressed as the percentage of the population sample using SPSS 10.0 computer software[20] and EPI-Info-version 6 computer packages[21].

RESULTS AND DISCUSSION

Characteristics of the nursing mothers: The age range of the mothers was between 15 and 45 years and the mean value of number of children per mother was 2.48±0.08. The distribution of the nursing mothers into different socio-economic statuses showed that 23.5% were falling within high SES, 28.4% were falling within average SES and 48.1% were within low SES Table 1. It was observed in the study that high proportions of the subjects were falling within low socio-economic level. This finding agrees with the results of other researchers who reported that the average income of Nigerian rural women was within the range of N2400 and N4800 ($16-$32)[23].

Characteristics of infants: The mean and standard error of the mean (SEM) values of the children age was 13±0.41 months and that of height was 70.6±0.57 cm. and weight was 8.79±0.08 Kg. The youngest infant of the studied population was 1 month and the oldest was 24 months.

Infant feeding patterns: The feeding patterns of the infants are shown in Table 2.

Breastfeeding patterns: In this study it was observed that high proportion of the respondent nursing mothers breastfed their babies immediately after birth. About 20.4% of the mothers agreed that they breastfed their babies exclusively, 39.9% breastfed their child on demand, but in addition to breast milk the children were also given herbal concoction in the morning and at night, as preventive measure against diseases. Others, 37.7%, mostly the working class nursing mothers, were timing when to breastfeed their babies. It was speculated that they had to be in their places of work between the hour of 8:00 AM and 4:00 PM. every working days and 2.0% of

Table 1: Demographic information of the nursing' mothers and children

Characteristics	Sample size	%
Mothers ages (years)		
15-24	236	29.5
25-34	424	53.0
35-44	132	16.5
45 and above	08	01.0
Socio-economic status of the infants' families		
High	188	23.5
Medium	227	28.4
Low	385	48.1
Children ages (Months)		
O-5	032	04.0
6-10	236	29.5
11-15	224	28.0
16-20	104	13.0
21-24	204	25.0

Table 2: Infants feeding patterns

Characteristics	Sample size	%
Breastfeeding patterns/day		
Exclusive breastfeeding	163	20.4
Breastfeeding on demand + herbal concoctions	319	39.9
Timing of breastfeeding	302	37.7
Not Breastfed +(Infant formula/ herbal concoctions)	016	02.0
Stoppage of breast feeding age (Months)		
0-3	016	02.0
4-6	024	03.0
7-12	360	45.0
13-18	299	37.4
19-24	101	12.6
Age at which mother introduced weaning food to the child age (months)		
0-3	24	3.0
4-6	268	33.5
7-9	345	43.1
10-12	- -	
> 12	- -	
Still breastfeeding	163	20.4
Infants feeding patterns (using 24 h dietary recall)		
Breast milk only	163	20.4
Breast milk + Ogi	194	24.2
Ogi (corn pap) only	103	12.9
Breast milk +Infant Formula (eg Cerelac, SMA, etc.)	87	10.9
Infant Formula only (eg Cerelac, SMA, Nan, etc.)	105	13.1
Breast milk + Family Diet (Rice, Beans, Rice, etc)	113	14.1
Family Diet only (Rice, Beans, Rice, etc)	35	4.4
Sources of water/ treatment		
Pipe water	208	26.0
Well water	386	48.3
Stream water	206	25.7
Boiling of water before used	228	28.5
Not boiling water before used	572	71.5

Table 3: Proximate composition of cooked ogi from Maize Corn Pap (MCP) and Sorghum Pap (SP) (100 g dried weight) used as weaning diet among low-income nursing mothers

Nutrient	MCP	SP
Energy (Kcal.)	389.6	385.3
Moisture content	04.5	7.1
Fat (g)	04.3	6.7
Carbohydrate (g)	81.3	72.6
Protein (g)	06.4	8.7
Fiber (g)	01.7	1.0
(Ash) (g)	01.8	4.9
Calcium (mg)	74.6	46.2
Phosphorus (mg)	185.1	244.1
Iron (mg)	1.8	3.3
Thiamine (mg)	0.11	0.5
Riboflavin (mg)	0.09	0.2
Niacin (mg)	1.83	3.4

the mothers did not breastfed their infants, due to the death of the mothers or illness. High percentage of the nursing mothers agreed that breastfeeding their babies for the first six months of life is essential as this enhances rapid growth and development of the child. This awareness might be as a result of the counseling that the mothers experienced during their antenatal and post-natal clinic. Other reasons given by the mothers were that breast milk is the first food of babies and also breast milk is nutritious and it can provides all the necessary nutrients as required for the growth and development of infants. These findings were similar to others, who reported that human breast milk is essential for physical growth and cognitive development and protects the infant against infectious and chronic diseases[2,23-29]. Despite the exclusively breastfeeding campaign, 05% of the mothers, especially the young ones among them, stopped breastfeeding before 6 months of age. The reason given was that they wanted to avoid flabby breasts and also to maintain their bodies' physique. Others, predominantly rural mothers, breastfed their infants above six months, that is, 45.0, 37.4 and 12.6% stopped breastfeeding between 7-12, 13-18 and 19-24 months, respectively Table 2. This result also agreed with the finding of other researcher that reported high prevalence of breastfeeding practices among nursing mothers in the rural communities than mothers in urban areas where demands of the job or profession tend to reduce available time for breastfeeding[30].

Complementary feeding practices: Evidences have shown that introduction of timely and adequate complementary foods are the cornerstone of care for childhood development and that when breast milk is no longer enough to meet the nutritional needs of the infant, complementary foods is usually added to the diet of the child[3]. This idea was exhibited by large proportion of the mothers, 42.1% of the mothers introduced complementary foods to their children between the ages of 4-6 months, 54.2% introduced complementary foods at the age range between 7 and 9 months and 3.7% introduced the complementary food (infant formula) immediately after birth as a result of peer influenced, illness or death of the mothers Table 2. The reason deduced for early introduction of complementary foods by the majority of the mothers was that breast milk alone was no longer sufficient to provide all the necessary nutrients required by the child. The result of dietary intake of the children showed 20.4% were fed with breast milk only, 24.2% were fed with breast milk and ogi and 12.9% were fed with ogi only. Others, 10.9, 13.1, 14.1 and 4.4% were fed with breast milk and infant formula, infant formula only, breast milk

Table 4: Classification of nutritional status of the infant (using weight-for-length)

Age (month)	Norma		Mildly malnourished (SD≤1)		Moderately malnourished (SD≤2)		Severely malnourished (SD≤3)	
	Size	%	Size	%	Size	%	Size	%
0-5	028	87.5	04	12.5	-	-	-	-
6-10	156	66.1	44	18.6	32	13.6	04	01.7
11-15	200	89.3	12	05.3	08	03.6	04	01.8
16-20	036	34.6	36	34.6	20	19.3	12	11.5
21-24	080	39.2	88	43.1	16	07.9	20	09.8
Total	504	63.0	180	22.5	076	09.5	040	05.0

Table 5: Distribution of the subject's nutritional status according to the socio-economic status of their parents

Number of children falling within different SES	Normal nutritional status		Poor nutritional status	
	size	%	size	%
High SES (n =188)	158	84.0	30	16.0
Medium SES (n = 227)	181	79.7	46	20.3
Low SES (n = 385)	165	42.8	220	57.2

and family diet and family diet only, respectively Table 2. The Ogi pap, made from maize corn or sorghum, is the common weaning foods used by the majority of low-income nursing mothers in Nigeria due to it low cost when compared to sorghum. Ogi is a traditional African fermented starch processed from corn or sorghum grains.

Water source and treatment: The majority of the studied population in rural areas had no access to pipe borne water. 48.3 and 25.7% were living on well water and streams, respectively, while 26.0%, of those in urban areas had access to pipe borne water Table 2. Out of the total population studied only 28.5% boiled water, while a large proportion of the respondents, 71.5%, did not subject the water to any form of treatment. This observation was similar to other researcher finding[30], which reported that large proportion of the rural nursing mothers were lack of health education.

Chemical composition of ogi: The result of chemical analysis of Ogi as used by the low-income nursing mothers to feed their children is shown in Table 3. The result showed that maize corn pap (MCP) contained the following nutrients; moisture content 4.5 g, fat 4.3 g, carbohydrate 81.3 g, protein 6.4 g fiber 1.7 g and ash 1.8 g. The micronutrient composition MCP were calcium 74.6 mg, phosphorous 185.1 mg, iron 1.8 mg, thiamine 0.11 mg, riboflavin 0.09 mg and niacin 1.83 mg. The sorghum pap nutrient composition were moisture content 7.1 mg, fat 6.7 mg, carbohydrate 72.6 mg, protein 8.7 mg, fiber 1.0 mg and ash 4.9 mg, others calcium 46.2 mg, phosphorus 244.1 mg, iron 3.3 mg, thiamine 0.5 mg, riboflavin 0.2 mg and niacin 3.4 mg. It was observed in this study that the nutritional composition of these main weaning foods were low, particularly protein content of Ogi; and these foods need to be complemented with other sources of protein foods before it could meet the protein or other nutrients requirement of the infant. Most of the nursing mothers interviewed did not fortify the ogi with protein food source before being used as weaning food for their children. They attributed the reason to their low purchasing power, which is virtually being experienced by the majority of rural and some of the sub-urban households.

Nutritional status: Table 4 shows the classification of the infant nutritional status. The result showed that 63.0% of infants were adequately nourished, while others 37.0% were malnourished and classified according to the following degrees of malnutrition; first degree, 22.5%; second degree, 9.5% and third degree, 5.0%. The majority of the malnourished infants were from the rural communities; this showed the true reflection of situation at the rural and some parts of urban communities, where poverty is more pronounced and facilities like pipe borne water and health care services are not available.

Table 5 shows the nutritional classification of the subject according to their parents' socio-economic statuses. The result showed that 84.0% of the infants falling within high SES were normal (i.e., not wasted) and 16.0% of the infants were classified as poor nutritional status (i.e., wasted), 79.7% of the subjects falling within medium SES level were normal and 20.3% were classified as poor nutritional status and while those falling within low SES level 42.8% of the subjects were normal and 57.2% were classified as poor nutritional status. The high proportion of malnourished children that was observed in this study could be attributed to the economic restructuring that the country is embarking upon, which has reduced the purchasing powers of many families, particularly among those of low-income group.

CONCLUSION

The results of this present study provide information on the prevalence of exclusively breastfeeding and main weaning foods used amongst low-income nursing mothers. It is not clear whether the findings are specific to the studied population alone or applicable to other parts of Nigeria. Further studies are needed to confirm these findings.

ETHICAL ISSUES

The study protocol was approved by the Ethics Committee of the Human Nutrition Division, Department of Food science and Technology and School of Agriculture and Agricultural Technology, Federal University of Technology, Akure, Nigeria.

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