

Complementary feeding and associated factors: Assessing compliance with recommended guidelines among postpartum mothers in Nigeria

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ABSTRACT

INTRODUCTION Malnutrition in childhood has been linked with inappropriate and ineffective feeding practices especially during the first year of life. This study assessed the knowledge and factors associated with complementary feeding among postpartum mothers in Nigeria.

METHODS A cross-sectional study was performed in Osun State, Nigeria, in September 2019. Sample size was estimated using Fisher's formula for simple proportion and mothers were selected through multi-stage sampling. Data from 193 postpartum mothers were analyzed using SPSS software version 22 at univariate, bivariate and multivariate levels, $p < 0.05$ was considered significant.

RESULTS Findings showed that 28.0% of postpartum mothers practiced exclusive breastfeeding, 39.9% introduced complementary feeding within the first 3 months, 32.1% commenced complementary feeding between the 4th and 5th month, 36.3% of the mothers fed their infants with minimum meal frequency, 52.3% fed their infants with the minimum

dietary diversity, and 25.4% fed their infants with minimum acceptable diets. Regression analysis revealed that minimum meal frequency was significantly associated with having good knowledge about complementary feeding (OR=2.21; 95% CI: 1.31–3.73, $p=0.03$), tertiary education (OR=0.18; 95% CI: 0.05–0.59, $p=0.01$) and household food security (OR=0.49; 95% CI: 0.26–0.94, $p=0.03$). Minimum acceptable diet remained significantly associated with mothers having good knowledge about complementary feeding (OR=2.67; 95% CI: 1.38–5.14, $p=0.003$) and highest educational level (OR=0.11; 95% CI: 0.02–0.71, $p=0.02$).

CONCLUSIONS Postpartum mother's nutritional knowledge, education level and household food security were main predictors of complementary feeding practices among postpartum mothers, effective nutritional intervention on infants' feeding should therefore take cognizance and address these variables.

INTRODUCTION

Malnutrition in childhood remains a significant public health concern, especially in developing countries¹, where poor child feeding practices, high prevalence of common childhood diseases such as diarrhoea, malaria, pneumonia exert a serious negative impact on health outcomes². Consequently, approximately 45% of mortalities among children aged <5 years are related to undernutrition, with approximately 33% of these deaths resulting from inadequate feeding practices³. These nutrition-related

morbidities and mortalities mostly occur in low- and middle-income countries, especially in Sub-Saharan Africa and Asia⁴. At the same time, about one-third of these malnutrition cases are attributable to inappropriate nutrition and ineffective feeding practices, which occur during the first year of life⁵ especially from the sixth month of life when only breastmilk cannot sufficiently meet the dietary needs of the infants and for which an appropriate and effective complementary feeding is expected to be introduced.

Furthermore, a global estimate showed that about 22.9%

of children aged <5 years are stunted while Central Africa accounted for 32.5%, Southern Africa 28.1%, Northern Africa 17.6% and West Africa accounted for 31.4%⁵. In Nigeria, data from the Nigeria Demographic and Health Survey, NDHS⁶ showed that 37% of children are stunted, and 19% are severely stunted. The breakdown of these figure varies across the six geopolitical zones of the country, with the North–West and North–East regions recording the highest prevalence for stunting, wasting and under-weight. In contrast, the South–East and South–South recorded lowest prevalence. A higher proportion of children in rural areas were also recorded to be malnourished than those in urban areas⁶.

Similarly, the Nigeria National Nutrition and Health Survey (NNHS)⁷ revealed that acute malnutrition among children aged <5 years in Nigeria was between 5% and 9.9%. In comparison, the prevalence of underweight was about 19.9% which is close to 22% obtained in the West and Central Africa regions. The NNHS further revealed that the prevalence of stunting was 32% and has been considered as the largest burden of malnutrition in Nigeria since 2014, with some states in the North–West and North–East Nigeria recording a significantly high prevalence of $\geq 40\%$. The above have been observed to be direct and indirect consequences of inappropriate complementary feeding practices.

Complementary feeding involves the introduction of other forms of foods and or liquids from six months of age when breast milk only can no longer meet the dietary requirements of infants⁶. It is the transition from exclusive breastfeeding to family foods beginning from 6 months of age and continuity of breastfeeding up to two years of age. It is the period when malnourishment usually begins in infants thus contributing significantly to the high incidence of malnutrition observed among children aged <5 years⁸. The WHO consequently recommended that complementary feeding should be timely, adequate in quantity, have variety, of appropriate frequency and consistency using a variety of foods combination to accommodate the nutritional needs of the growing child while continuing breastfeeding. In contrast, inadequate quantities, qualities and inappropriate combination of complementary foods in addition to ineffective feeding practices have been found to pose a serious nutritional risk to infants' wellbeing⁹, including growth failure, stunting, delayed sexual maturation, impaired cognitive and intellectual development, and impaired immune system¹⁰.

To ensure effective feeding practices for infants globally, the World Health Organization (WHO) recommended the following core indicators to ensure appropriateness and optimal combination of complementary foods for infants and young children. These indicators include: early initiation of breastfeeding; exclusive breastfeeding up to 6 months of age; continued breastfeeding till the age of two years; introduction of solid, semi-solid or soft foods; ensuring minimum dietary diversity; minimum meal frequency; and minimum acceptable diet. This is in addition to other optional dietary indicators such as intake of iron-fortified or

iron-rich foods; continued breastfeeding up till two years; age-related breastfeeding, and milk feeding frequency, especially for non-breastfed children¹¹. The WHO further indicated that minimum dietary diversity (MDD), minimum meal frequency (MMF) and minimum acceptable diet (MAD) are more related to adequate complementary feeding.

Despite several nutrition related policies and interventions in Nigeria, such as Baby Friendly Initiatives (BFI) and the Nigeria National Policy on Infant and Young Child Feeding (IYCF), studies on complementary feeding have observed several variations in the pattern, timing, quality and quantity of complementary foods among mothers in different regions in the country. For instance, a study conducted in North–West Nigeria reported that 17.8% of the infants studied commenced complimentary food between the 1st and 2nd months while 41.2% of the infants commenced complementary foods from the 3rd month¹². A similar finding was reported in Cross River State, Nigeria, where it was found that 85.4% of children aged <5 years had early introduction of complementary foods¹³.

Early introduction of complementary foods (before the 6th month) has been found to be associated with a varying degree of health risks and childhood illnesses, including food-borne infectious diseases¹⁴.

The above are in addition to the fact that the proportion of children aged ≥ 6 months who were fed following IYCF practices in Nigeria remain low¹⁵. In contrast, the proportion of infants who were fed according to recommended minimum acceptable diet in Nigeria decreased from 30% in 2008 to 10% in 2013¹⁶ with only a marginal increase to 11% in 2018⁶. Studies have investigated predisposing factors to ineffective feeding practices in most West African countries; for instance, WHO identified cultural beliefs as barrier to effective feeding practices³. This assertion was corroborated by a study in West Africa which identified sociocultural myths and misconceptions about childhood feeding as determinants of infant and young child feeding practices in a review of complementary feeding practices across West African countries¹⁴. A similar study in Kenya concluded that cultural beliefs and food taboos strongly influenced optimal infant feeding practices in Kenya¹⁷. The above are in addition to poor knowledge about complementary feeding and basic nutritional needs observed to influence complementary feeding among mothers in Northwestern Nigeria¹⁸. In addition, the Nigeria Federal Ministry of Health reported that the commonest predisposing factors of malnutrition in the first two years of life in Nigeria are related to inappropriate complementary feeding practices, while in most cases, the diets introduced are inadequate concerning the quantity of food given, nutritional value, energy, protein, micronutrients, quantities and frequency of feeding¹⁹.

Furthermore, a study on complementary feeding practices among mothers of children under five years in Lagos, Nigeria, reported a significant relationship between timing for introduction of complementary foods and

nutritional status of infants¹⁰. There is, however, a dearth of information regarding mothers' compliance with feeding recommendations and guidelines using standard indicators and the influence of maternal characteristics such as age, education level, occupation, marital status, socioeconomic status, place of residence and parity in this study area; hence this study aimed at assessing the level of knowledge about complementary feeding among postpartum mothers in Osun State, Nigeria. This study also examined complementary feeding practices among postpartum mothers and identified factors associated with complementary feeding practices among mothers in Osun State. These were to identify enabling factors that can encourage mothers and primary care givers to adopt effective child feeding practices for optimal wellbeing of infants and young children.

METHODS

Study setting

This study was conducted in Osun State, South-West Nigeria, between 2 and 30 September 2019. Osun state covers an area spanning approximately 12820 km². Osun state is divided into three Senatorial districts with 30 Local Government Areas (LGAs) and an area office. The state is located within the interior of the cocoa belt of the South-West Nigeria. According to the 2006 National Population Census, Osun state has an estimated population of about 3.4 million consisting of 1.74 million males and 1.68 million females. Osun state has 30 Local Government Areas (LGAs) and an area office, and is distributed into the three Federal Senatorial districts namely: Osun Central Senatorial district, Osun East Senatorial district and Osun West Senatorial district. Nineteen out of the 30 Local Government Areas (LGAs) are designated as rural Local Government Areas while 11 are considered urban. A rural Local Government Area is a Local Government Area that has one or two small towns as the principal settlements. The major ethnic groups in Osun state are Yorubas while major sub-ethnic groups are Ife, Ijesha, Oyo, Ibolo and Igbomina, although the state also accommodates other ethnic groups from other parts of Nigeria such as the Ibos, Itsekiris, Ijaws, Hausas, Fulanis, Igalas, and several other ethnic groups. Yoruba and English are the official languages. The people of Osun state are mostly farmers, producing cash crops such as cocoa, and palm produce, and food crops such as yam, maize, cassava, beans, plantain, banana, and cocoyam. This is in addition to other skilled professionals having sources of income in the state.

Study design

The study was a descriptive cross-sectional study conducted in September 2019. The study involved postpartum mothers attending clinics in the selected local government areas.

Study population – sample size determination

The study included postpartum mothers in selected Local Government Areas in Osun state, Nigeria. The selected Local

Government Areas were Ife Central, Ife East, Oriade and Atakunmosa West Local Government Areas.

Using Fisher's formula for estimating sample size, $n = Z^2 pq/d^2$, where n = desired sample size, Z = standard normal deviation at 95% confidence level, $z=1.96$, $p=0.11$ (proportion of infants fed with minimum acceptable diet¹³, $q=1-p=0.89$, d = degree of accuracy desired, taken to be 0.05, 95% level of confidence and degree of accuracy at 0.05 and 15% attrition rate, minimum sample estimated was however increased to 200 mothers to give wider coverage to the study and to make the sample size more representative. Data from 193 postpartum mothers were, however, analyzed giving a response rate of 96.5%.

Sampling technique

Postpartum mothers were selected through multistage sampling technique. In stage one, Osun East Senatorial district was selected out of the three Senatorial districts in Osun state by simple random sampling technique (balloting). In the second stage, two rural and two urban Local Government Areas namely Oriade, Ife Central, Ife East and Atakunmosa West Local Government Areas were selected from a list of rural and urban LGAs within the Senatorial district²⁰ by simple random sampling technique (balloting) giving a total of four LGAs. In stage three, one Primary Healthcare Center (PHC) was purposively selected (PHCs with highest number of daily attendees obtained during a preliminary survey) from each rural and urban LGAs to give a total of four PHCs. In contrast, in the fourth stage, 50 postpartum mothers who met the inclusion criteria were purposively selected in the Primary Healthcare Centers. Mothers were selected during their visit to the PHCs in selected Local Government Areas. Selection of mothers continued daily until the required number of mothers from each Primary Healthcare Center was attained.

Inclusion Criteria

Postpartum mothers whose infants were six months old were included in this study. This was to reduce the possibility of recall bias about pregnancy history and feeding type of index child in the first six months of life.

Exclusion Criteria

Mothers whose infants had gross congenital or chronic abnormalities such as cleft lips, cleft palates or any other gross neurological deficits that could impair anthropometric measurements were excluded from this study.

The instrument for data collection

Semi-structured questionnaire was used to collect data from mothers. The questionnaire organized into different sections which obtained information about the background characteristics of mothers, child's pregnancy history, history of delivery and immunization, child's age, sex and child's breastfeeding history. This section was adapted

from Demographic and Health Survey questionnaire⁶. Another section of the questionnaire was adapted from the Food and Agricultural Organization (FAO) guidelines for assessing nutrition-related model questionnaires²¹. This section had 10 items which assessed mother's knowledge about complementary feeding. An additional section of the questionnaire obtained information on the household food security status. This section was adapted from the 6-item food security scale of the United States²². The section contains six items for assessing food security status of each household. An additional section of the questionnaire was also adapted from Food and Agriculture Organization (FAO) dietary assessment²³ which serve as 24-hour infants' food recall section. The section obtained information on mother's feeding practices based on WHO/IYCF recommended indicators: Minimum meal frequency, Minimum dietary diversity, and Minimum acceptable diet. Information regarding these indicators were obtained by recall of food and liquid consumed by infants in the previous day prior to data collection.

Validity of research instruments

Face and content validity of the research instruments was ensured by subjecting the instruments to review by experts in the field of Public Health, Paediatrics and Child Health, Nutrition and Dietetics, Demography and Social Statistics. Each item of the instruments was reviewed to ensure appropriateness and ability to meet the stated objective of the study. Necessary corrections were made on the research instruments after review by experts before data collection.

Reliability of research instruments

Internal consistency of the questionnaire was examined by calculating Cronbach's alpha for the questionnaire and a value of 0.74 was obtained.

Training of research assistants

Three research assistants were trained on the aim and objectives of the study as well as their role during the data collection, explanation of the questionnaire to infants' mothers and ability to use the Yoruba version of the questionnaire for better understanding of infants' mothers.

Data collection and scoring

Mother's knowledge about complementary feeding was assessed using 10 items in the questionnaire. Each correct answer was scored 1 while an incorrect answer scored 0. Scores on the 10-item scale assessing mother's knowledge about complementary feeding were also summed up to give a total of 10; mothers who scored 0–4 were categorized as having poor knowledge about complementary feeding while mothers who scored 5–10 were categorized as having good knowledge. Household food security status was assessed using 6 items adapted from the 6-item food security scale of the USA²⁰. Each of the options 'often true, sometimes true' in

items 1 and 2 of the scale scored 1 while 'never true' scored 0. A 'yes' in items 3, 5 and 6 also scored 1 while 'no' scored 0. 'Almost every day' and 'some days, but not every day' in item 4 scored 1 while the option 'only 1 or 2 days' scored 0. These scores were summed up to a maximum of 6 points and a minimum of 0 points. Total score of 0–1 was categorized as high food security, scores 2–4 were categorized as low food security, while scores 5–6 were categorized as very low food security.

Mother's socioeconomic status was evaluated as a composite variable using mother's education level, employment status and average monthly income. Mothers who had no formal education scored 1 point, primary education 2 points, secondary education 3 points, while mothers who had tertiary education scored 4 points; mothers who were unemployed scored 1 point, while mothers who were employed (self-employed, Government or employed in the private sector) scored 2 points. Mothers who receive less than 30000 NGN, the minimum wage in Nigeria at time of this study, scored 1 point while mothers who earned ≥ 30000 NGN (10000 Nigerian Naira about 24 US\$) scored 2 points. All scores were summed up to a minimum of 3 points and a maximum of 8 points. Mothers who scored a total of 3–4 points were categorized as low socioeconomic status, 5–6 points were categorized as middle socioeconomic status, while 7–8 points were categorized as high socioeconomic status²⁴.

Data analysis

The outcome variable in this study was mother's complementary feeding practices. This was assessed based on indicators recommended by the WHO Guideline on Infants and Young Child Feeding. The indicators are minimum meal frequency, minimum dietary diversity, and minimum acceptable diet.

Minimum Meal Frequency (MMF) is the proportion of infants who received at least the recommended minimum meal frequency appropriate for age in the last 24 hours prior the survey: 2–3 feeding times for infants aged 6–9 months and 3–4 times daily for infants aged 10–12 months in the last 24 hours^{25–27}.

Minimum Dietary Diversity (MDD)¹¹ is the proportion of children aged ≥ 6 months who received food from at least four out of the seven recommended food groups in the last 24 hours prior the survey. The seven foods groups used for calculating minimum dietary diversity indicator are: grains, roots and tubers; legumes and nuts; dairy products like milk; fleshy foods such as meat and fish; eggs; fruits and vegetables rich in vitamin A; other fruits and vegetables. The dietary diversity score ranged from 0–7 with a minimum of 0 if none of the food groups is consumed and 7 if all the food groups are consumed. Thus, from the dietary diversity score, the minimum dietary diversity indicator was estimated using the WHO recommended cut-off point with a value of 1 if the child had eaten at least four out of the seven groups of

foods (designated as ‘adequate’ in this study) and 0 if less (designated as ‘inadequate’).

Minimum acceptable diet in this study was considered as a composite variable involving minimum dietary diversity and minimum meal frequency: infants who received both the minimum diversity and the minimum meal frequency the previous day are considered to have met the WHO recommended minimum acceptable diet¹¹.

The independent variables include mother’s knowledge about complementary feeding and selected sociodemographic characteristics. These variables have been observed to influence feeding practices of children aged <5 years in previous studies²⁵⁻²⁷. These variables include mother’s age, parity, education level, employment status, socioeconomic status, and household food security status.

Data entry and analysis was done using IBM SPSS software version 25. Analysis was done at univariate, bivariate and multivariate levels: univariate analysis was done and findings presented using frequency (n) and percentage (%) distribution tables. Association between complementary feeding practices, mother’s knowledge about complementary feeding and selected sociodemographic characteristics of the mother (age, parity, education level, employment status, socioeconomic status, and household food security status) were examined at the bivariate level using chi-squared test while the simultaneous effects of independent variables on the outcome variable were examined using logistic regression analysis. A p-value<0.05 was considered statistically significant.

RESULTS

Sociodemographic characteristics of postpartum mothers

Findings from this study revealed that 39.9% of the mothers were aged 25–29 years while 5.2% were aged 15–19 years, 6.2% had no formal education, 59.6% had secondary school education, 25.4% had tertiary education, 14.0% were unemployed, 63.7% were self-employed while 65.3% earned below 30000 NGN monthly (Table 1). Seventy-two percent of the mothers received skilled antenatal care during pregnancy of index child, 73.1% delivered their index child in a hospital or healthcare facility, while 28.0% practiced exclusive breastfeeding (Table 2).

Complementary feeding practices among postpartum mothers

Findings also revealed that 71.5% of the mothers had good knowledge about complementary feeding (Table 3). Results also revealed that 39.9% of mothers introduced complementary feeding within the first 3 months, 32.1% commenced complementary feeding between the 4th and 5th month, 36.3% fed their infants with minimum meal frequency, 52.3% fed their infants with the minimum dietary diversity, while 25.4% fed their infants with minimum acceptable diets (Table 3).

Table 1. Sociodemographic characteristics of mothers in Osun State, Nigeria 2019 (N=193)

Variables	n	%
Age (years)		
15–19	10	5.2
20–24	57	29.5
25–29	77	39.9
30–34	38	19.7
35–39	11	5.7
Marital status		
Married	178	92.2
Single	13	6.7
Widowed	2	1.0
Family type		
Monogamous	147	76.2
Polygamous	33	17.1
Single parents	13	6.7
Place of residence		
Rural	97	50.3
Urban	96	49.7
Ethnicity		
Yoruba	137	71.0
Hausa	30	15.6
Igbo	19	9.8
Urhobo/Itsekiri	7	3.6
Religion		
Christianity	117	60.6
Islam	69	35.8
Traditionalist	7	3.6
Education level		
No education	12	6.2
Primary	17	8.8
Secondary	115	59.6
Tertiary	49	25.4
Employment status		
Not employed	27	14.0
Self employed	123	63.7
Government employed	29	15.0
Employed in private sector	14	7.3
Average monthly income (NGN)		
<30000*	126	65.3
≥30000	67	34.7
Socioeconomic status		
High	40	20.7
Middle	119	61.7
Low	34	17.6
Household food security status		
High	77	39.9
Low	46	23.8
Very low	70	36.3

*30000 NGN was the monthly minimum wage payable in Nigeria at the time of this study. NGN: 10000 Nigerian Naira about 24 US\$.

Factors associated with complementary feeding practices among postpartum mothers

Bivariate analysis (Table 4) revealed that mother’s knowledge about complementary feeding was significantly associated with meal frequency (p=0.02), meal diversity (p=0.01) and acceptable diets (p=0.01). Findings at bivariate level of analysis also showed that mother’s employment status was significantly associated with acceptable diet (p=0.001), while mother’s monthly income was significantly associated with meal frequency (p=0.04). Findings at bivariate level of analysis also showed that household food security status was significantly associated with meal

Table 2. Reproductive characteristics of mothers in Osun State, Nigeria 2019 (N=193)

Reproductive variables	n	%
Parity		
Primipara	41	21.2
Multipara	148	76.7
Grand multipara	4	2.1
Antenatal care during index pregnancy		
Received skilled antenatal care	139	72.0
Did not receive skilled antenatal care	54	28.0
Place of delivery of index child		
Hospital/healthcare facility	141	73.1
Mission/traditional birth facility	30	15.5
Home birth	22	11.4
Time of initiation of breastfeeding of index child after birth		
Within 1 hour	35	18.1
Between 1 hour and 24 hours	92	47.7
After 24 hours	66	34.2
Pattern of feeding of index child		
Exclusive breastfeeding	54	28.0
Mixed feeding	139	72.0

Table 4. Bivariate analysis of mother’s factors associated with complementary feeding of the index infant in Osun State, Nigeria 2019 (N=193)

Variables	Complementary feeding indicators					
	Meal frequency		Dietary diversity		Acceptable diet	
	Less than minimum n (%)	Minimum n (%)	Less than minimum n (%)	Minimum n (%)	Less than minimum n (%)	Minimum n (%)
Knowledge						
Poor	42 (76.4)	13 (23.6)	34 (61.8)	21 (38.2)	48 (87.3)	7 (12.7)
Good	81 (58.7)	57 (41.3)	58 (42.0)	80 (58.0)	96 (69.6)	42 (30.4)
χ^2 df p	5.31	1 0.02	6.17	1 0.01	6.51	1 0.01

Continued

frequency (p=0.02) and acceptable diets (p=0.03).

Logistic regression analysis (Table 5) revealed that there was a significant association between mother’s knowledge about complementary feeding and minimum meal frequency (OR=2.21; 95% CI: 1.31–3.73, p=0.003). The odds that mothers who had good knowledge about complementary

Table 3. Complementary feeding practices of index infants in Osun State, Nigeria 2019 (N=193)

Variables	n	%
Mother’s knowledge about complementary feeding		
Poor	55	28.5
Good	138	71.5
Commencement of complementary feeding (months)		
≤3	77	39.9
4–5	62	32.1
6	54	28.0
Compliance with complementary feeding indicators		
Meal frequency		
Less than minimum meal frequency	123	63.7
*Minimum meal frequency	70	36.3
Dietary diversity		
Less than minimum	92	47.7
**Minimum	101	52.3
Acceptable diet		
Less than minimum	144	74.6
***Minimum	49	25.4

* An infant who was fed at least 2–3 times in the last 24 hours prior this survey was categorized to have received minimum meal frequency appropriate for age.

** An infant was categorized to have received minimum dietary diversity if fed with at least four out of the seven groups of foods recommended by WHO in the last 24 hours prior the survey. *** Infants who received both the minimum meal frequency and minimum dietary diversity the previous day prior the survey were considered to have met the WHO recommended minimum acceptable diet (WHO 2008).

Table 4. Continued

Variables	Complementary feeding indicators					
	Meal frequency		Dietary diversity		Acceptable diet	
	Less than minimum n (%)	Minimum n (%)	Less than minimum n (%)	Minimum n (%)	Less than minimum n (%)	Minimum n (%)
Age (years)						
15-19	9 (90.0)	1 (10.0)	6 (60.0)	4 (40.0)	10 (100.0)	0 (0.0)
20-24	44 (77.2)	13 (22.8)	33 (57.9)	24 (42.1)	51 (89.5)	6 (10.5)
25-29	58 (75.3)	19 (24.7)	54 (70.1)	23 (29.9)	68 (88.3)	9 (11.7)
30-34	27 (71.1)	11 (28.9)	21 (55.3)	17 (44.7)	33 (86.8)	5 (13.2)
35-39	8 (72.7)	3 (27.3)	3 (27.3)	8 (72.7)	10 (90.9)	1 (9.1)
χ^2 df p	1.57 4	0.81	8.68 4	0.07	0.28 4	0.99
Family type						
Monogamous	111 (75.5)	36 (24.5)	84 (57.1)	63 (42.9)	129 (87.8)	18 (12.2)
Polygamous	25 (75.8)	8 (24.2)	23 (69.7)	10 (30.3)	31 (93.9)	2 (6.1)
Single parent	10 (76.9)	3 (23.1)	10 (76.9)	3 (23.1)	12 (92.3)	1 (7.7)
χ^2 df p	0.01 2	0.99	3.33 2	0.19	1.21 2	0.55
Parity						
Primipara	35 (85.4)	6 (14.6)	25 (61.0)	16 (39.0)	41 (100.0)	0 (0.0)
Multipara	107 (72.3)	41 (27.7)	91 (61.5)	57 (38.5)	127 (85.8)	21 (14.2)
Grand multipara	4 (100.0)	0 (0.0)	1 (25.0)	3 (75.0)	4 (100.0)	0 (0.0)
χ^2 df p	3.01 2	0.22	2.17 2	0.34	4.72 2	0.09
Place of residence						
Rural	75 (77.3)	22 (22.7)	61 (62.9)	36 (37.1)	87 (89.7)	10 (10.3)
Urban	71 (74.0)	25 (26.0)	56 (58.3)	40 (41.7)	85 (88.5)	11 (11.5)
χ^2 df p	0.30 1	0.59	0.42 1	0.52	0.07 1	0.80
Education level						
No formal education	7 (58.3)	5 (41.7)	6 (50.0)	6 (50.0)	9 (75.0)	3 (25.0)
Primary education	14 (82.4)	3 (17.6)	11 (64.7)	6 (35.3)	17 (100.0)	0 (0.0)
Secondary education	86 (74.8)	29 (25.2)	73 (63.5)	42 (36.5)	102 (88.7)	13 (11.3)
Tertiary education	39 (79.6)	10 (20.4)	27 (55.1)	22 (44.9)	44 (89.8)	5 (10.2)
χ^2 df p	2.83 3	0.42	1.70 3	0.64	2.89 3	0.41
Employment status						
Not employed	16 (59.3)	11 (40.7)	17 (63.0)	10 (37.0)	23 (85.2)	4 (14.8)
Self employed	97 (78.9)	26 (21.1)	76 (61.8)	47 (38.2)	115 (93.5)	8 (6.5)
Government employed	22 (75.9)	7 (24.1)	18 (62.1)	11 (37.9)	26 (89.7)	3 (10.3)
Employed in private	11 (78.6)	3 (21.4)	6 (42.9)	8 (57.1)	8 (57.1)	6 (42.9)
χ^2 df p	4.69 3	0.20	2.00 3	0.57	17.63 3	0.001
Average monthly income (NGN)						
<30000	101 (80.2)	25 (19.8)	81 (64.3)	45 (35.7)	116 (92.1)	10 (7.9)
≥30000	45 (67.2)	22 (32.8)	36 (53.7)	31 (46.3)	56 (83.6)	11 (16.4)
χ^2 df p	4.01 1	0.04	2.04 1	0.15	3.24 1	0.07
Socioeconomic status						
Low	30 (75.0)	10 (25.0)	24 (60.0)	16 (40.0)	35 (87.5)	5 (12.5)
Middle	91 (76.5)	28 (23.5)	76 (63.9)	43 (36.1)	107 (89.9)	12 (10.1)
High	25 (71.4)	9 (26.5)	17 (50.0)	17 (50.0)	30 (88.2)	4 (11.8)
χ^2 df p	0.14 2	0.93	2.14 2	0.34	0.21 2	0.90
Household food security						
High	50 (64.9)	27 (35.1)	39 (50.6)	38 (49.4)	63 (81.8)	14 (18.2)
Low	39 (84.8)	7 (15.2)	32 (69.6)	14 (30.4)	44 (95.7)	2 (4.3)
Very low	57 (81.4)	13 (18.6)	46 (65.7)	24 (34.3)	65 (92.9)	5 (7.1)
χ^2 df p	8.15 2	0.02	5.51 2	0.06	7.27 2	0.03

feeding (OR=2.21) will feed their infants with recommended minimum meal frequency was twice higher than the odds for mothers who had poor knowledge. The regression analysis also showed that there was significant relationship between mother's education level and meal frequency (OR=0.18; 95% CI: 0.05–0.59, p=0.01). Findings (Table 5) also showed significant relationship between household food security and meal frequency (OR=0.49; 95% CI: 0.26–0.94, p=0.03). Logistic regression analysis also revealed

significant relationship between minimum dietary diversity and household food security (OR=0.47; 95% CI: 0.26–0.83, p=0.01). Regression analysis further revealed significant association between minimum acceptable diet, mother's knowledge about complementary feeding (OR=2.67; 95% CI: 1.38–5.14, p=0.003) and mother's education level (OR=0.11; 95% CI: 0.02–0.71, p=0.02) (Table 5). The odds (OR=2.67) that mothers who had good knowledge about complementary feeding will feed their infants with minimum

Table 5. Logistic regression analysis of mother's factors associated with minimum meal frequency, minimum dietary diversity and minimum acceptable diet (N=193)

Variables	Minimum meal frequency			Minimum dietary diversity			Minimum acceptable diet		
	p	OR	95% CI	p	OR	CI	p	OR	CI
Knowledge									
Poor		1			1			1	
Good	0.003	2.21	1.31–3.73	0.05	1.58	0.99–2.50	0.003	2.67	1.38–5.14
Age (years)									
<20		1			1			1	
20–29	0.22	2.24	0.62–8.04	0.46	0.67	0.23–1.95	0.28	2.48	0.47–13.01
30–39	0.14	2.87	0.71–11.63	0.83	1.14	0.35–3.74	0.36	2.33	0.39–13.99
Family type									
Monogamous		1			1			1	
Polygamous	0.70	0.88	0.45–1.71	0.36	0.76	0.42–1.37	0.21	0.57	0.24–1.37
Single parent	0.39	1.58	0.56–4.47	0.19	0.52	0.20–1.38	0.35	1.82	0.52–6.37
Parity									
Primipara		1			1			1	
Multipara	0.32	1.37	0.73–2.58	0.51	0.83	0.48–1.44	0.09	2.03	0.90–4.58
Grand multipara	0.36	0.35	0.04–3.20	0.42	2.06	0.36–11.75	0.91	1.14	0.12–11.29
Place of residence									
Rural		1			1			1	
Urban	0.20	0.64	0.32–1.27	0.88	1.05	0.57–1.92	0.80	0.44	0.17–1.11
Education level									
No formal education									
Primary	0.07	0.30	0.08–1.09	0.34	0.56	0.17–1.82	0.02	0.11	0.02–0.71
Secondary	0.14	0.45	0.16–1.29	0.10	0.43	0.16–1.17	0.23	0.49	0.15–1.59
Tertiary	0.01	0.18	0.05–0.59	0.07	0.36	0.12–1.10	0.05	0.26	0.07–0.98
Employment status									
Employed		1			1			1	
Unemployed	0.28	1.58	0.69–3.63	0.76	0.89	0.42–1.90	0.64	1.27	0.47–3.42
Average monthly income (NGN)									
<30000		1			1			1	
≥30000	0.15	1.54	0.85–2.77	0.84	1.06	0.62–1.82	0.54	1.24	0.62–2.49
Household food security									
High		1			1			1	
Low	0.03	0.49	0.26–0.94	0.01	0.47	0.26–0.83	0.05	0.46	0.21–1.02
Very low	0.06	0.57	0.32–1.03	0.05	0.59	0.35–1.00	0.44	0.76	0.39–1.51
Constant	0.24	0.35		0.10	3.68		0.04	0.10	

OR: odds ratio.

acceptable diets was higher than the odds for mothers who had poor knowledge about complementary feeding.

DISCUSSION

This study observed that majority of mothers had good knowledge about complementary feeding. Nutritional knowledge of mothers and those in primary care is important towards reduction in childhood malnutrition. This assertion corroborates the submission of a study in Northwestern Nigeria, which observed that the quality and quantity of feeding in early childhood depend largely on the basic nutritional knowledge of their mothers¹⁸. The above submissions underscore the importance of mother's knowledge for ensuring optimal infant feeding practices.

This study also observed that 28.0% of mothers exclusively breastfed their infants in the first six months. This observation is comparable with a finding from a study conducted in Lagos, Nigeria, which reported that the proportion of exclusive breastfeeding among women in urban communities of Lagos State was 29%²⁷. This observation also corroborates a study conducted in Addis Ababa, Ethiopia, which found that the proportion of exclusively breastfed infants in Sub-Saharan Africa was 35%²⁸. The Nigeria Demographic and Health Survey reported that 29% of children aged <6 months are exclusively breastfed in Nigeria⁶.

In addition, this study found that 39.9% of mothers introduced complementary feeding within the first 3 months while 32.1% commenced complementary feeding between the 4th and 5th month. Similar studies on complementary feeding conducted in Iraq and the United Arab Emirates observed that 78.6% of infants in Iraq and 70% of infants in the United Arab Emirates commenced complementary foods between the 4th and 6th month²⁹. A multicenter study conducted in Italy, Belgium, Germany, Spain and Poland reported that 25% of the infants studied commenced complementary feeding before the 4th month while approximated 90% of the infants commenced solid foods by the 6th month³⁰. The above observations are comparable with the finding from a study conducted in Northwestern Nigeria which reported that 17.8% of the infants studied commenced complementary food between the 1st and 2nd month while 41.2% of infants commenced complementary foods from the 3rd month¹². A similar finding was reported in Cross River State, Nigeria, where it was found that 85.4% of children aged <5 years had early introduction of complementary foods¹³. Early introduction of complementary foods (before the 6th month) has been found to be associated with varying degree of health risks and childhood illnesses including food-borne infectious diseases¹⁴. Inappropriate timing of initiation of complementary feeding is associated with several nutrition-related morbidities and mortalities among children aged <5 years in developing countries of the world.

Furthermore, findings from this study showed that 36.3% of the mothers fed their infants with minimum meal frequency, 52.3% fed their infants with the minimum dietary diversity

while 25.4% of the mothers fed their infants with minimum acceptable diets. These findings are comparable with the observation from the study conducted in Delta State, Nigeria, which found that 54.0% of mothers studied fed their infants three times daily in addition to breastfeeding¹⁴. The Nigeria Demographic and Health Survey, however, reported that only 11% of children aged 6–23 months are fed in accordance with the criteria for a minimum acceptable diet⁶. In a study to examine the proportion of infants who received minimum dietary diversity and minimum meal frequency among infants and young children aged 6–23 months in Ethiopia, it was observed that the proportion of children who were fed with minimum recommended dietary diversity was 10.8% while about 50% of these children received the recommended meal frequency of complementary foods for age³¹. This finding corroborates the report of a study conducted to evaluate dietary diversity of complementary foods in Mongolia which revealed that majority of children studied consumed less than two food groups out of the recommended seven groups, which was below the recommended minimum dietary diversity of at least four foods groups³². In addition to the above findings, a cross-sectional study conducted in Osun State, Nigeria, revealed that mostly consumed diets among children aged 1–2 years were cereals and tuber food with minimal consumption of animal protein, fruits and vegetables²⁹. The study further recommended adequate dietary diversity for infants and young children. In their study on nutritional status of infants in Akpabuyo, Cross River State, Nigeria, Udoh and Amadu¹³ reported that 36.7% of the infants received minimum meal frequency, 31.5% received minimum dietary diversity while 7.3% received minimum acceptable diet.

Analysis of factors associated with complementary feeding at the bivariate level revealed that meal frequency was significantly associated with mother's knowledge about complementary feeding, mother's monthly income and household food security status. Mother's knowledge about complementary feeding was also significantly associated with meal diversity while minimum acceptable diet was significantly associated with mother's employment status and household food security.

Regression analysis of factors associated with complementary feeding, however, revealed that minimum meal frequency remained significantly associated with mother's knowledge about complementary feeding, educational level and household food security. Regression analysis also revealed that minimum dietary diversity was significantly associated with household food security while minimum acceptable diet was significantly associated with mother's knowledge about complementary feeding and educational level. The above findings are comparable with the report of a study in South-West Nigeria on attitude, knowledge and practice of infant feeding which observed an association between mother's knowledge about infant feeding and infant's feeding practices²⁷. In addition, studies conducted in South-West Nigeria on determinants of

children aged <5 years feeding practices in also identified place of residence as a factor that influenced childhood feeding practices^{26,33}. A cross-sectional study by Ogunba²⁵ among children aged 0–2 years in Osun State, South-West Nigeria, also observed significant relationship between household socioeconomic status and dietary diversity. A similar finding was observed in another Nigerian study on sociocultural factors affecting Nigerian mother's weaning practices conducted in Zaria, Northern Nigeria, which observed significant association between sociocultural factors and mother's weaning practices¹⁷. The above observations are consistent with findings from a study conducted in Nepal which observed an association between infants' feeding practices and maternal characteristics such as education level, occupational status, place of residence, knowledge about infants' diet, and monthly income²⁶. Furthermore, a study conducted in Kenya on sociocultural practices and beliefs influencing infant and young child feeding concluded that cultural beliefs, taboos and certain food restrictions strongly influence breastfeeding and complementary feeding practices¹⁷. An effective nutrition intervention for mothers on infants feeding practices should incorporate strategies aimed at reducing myths and misconceptions related to infants feeding in this study area.

Strengths and limitations

This study involved postpartum mothers in Osun State, South-West Nigeria. Findings from this study may therefore not be considered nationally representative. However, findings from this study are comparable with data obtained from different regions across the country. Findings are also comparable with data obtained from the national survey such as the Nigeria Demographic and Health Survey (2018) as well as data from different African sub-regions.

CONCLUSIONS

Mothers' nutritional knowledge, education and household food security were the main predictors of complementary feeding practices among studied mothers; effective nutritional intervention on infants and childhood feeding should take cognizance of these variables.

Advocacy must focus on interventions that could improve household food security and mothers' socioeconomic empowerment in order to achieve a significant reduction in childhood malnutrition and related burdens.

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CONFLICTS OF INTEREST

The authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none was reported.

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PROVENANCE AND PEER REVIEW

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