PROXIMATE ANALYSIS AND SENSORY EVALUATION OF COMPOSITE COMPLEMENTARY FOODS USING DIFFERENT GRAINS

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ABSTRACT

Adequate nutrition is important during infancy and childhood where a short period of malnutrition has long lasting effects on growth, development and health in the adult life. The study was designed to evaluate the nutrient composition of complementary foods prepared from selected grains and their acceptability among nursing mothers in Ilorin South Local Government Area (LGA) of Kwara State, Nigeria. A descriptive design survey was adopted for the study. A total of 80 consenting mothers aged 18 years above were considered respondents. A pretested, semi-structured questionnaire with a reliability coefficient of 0.77 was used to collect respondents' demographics. Results showed that 48(60%) of respondents are between ages twenty-five and thirty. Only 20(25%) of the respondents earn above ₦100, 000 monthly. Four samples; MMO (50% Maize and 50% Millet only), MMSG1 (35% Maize, 35% Millet, 20% Soyabean, 10% Groundnut), MMSG2 (25% Maize, 25% Millet, 30% Soyabean, 20% Groundnut), MMSG3 (22% Maize, 25% Millet, 20% Soyabean, 30% Groundnut) of complementary food were formulated and tested for nutrient composition before preparation and testing for taste, colour, texture, flavour and overall acceptability. Results of Proximate and sensory evaluation show that MMO contains the highest value of Carbohydrate and also the least value of protein and a fat and is the most acceptable of all samples. The study revealed that socioeconomic characteristics of respondents had influence on the overall acceptability of formulated complementary foods. The study recommended that utilization of local foods should be encouraged in preparing protein-energy balanced and nutrient dense complementary foods to battle malnutrition and aid proper growth in infants.

Keywords: Complementary foods, nutrients, malnutrition, infants, socioeconomic, growth, health.

INTRODUCTION

Complementary foods are any nutrient-rich meals or liquids other than breast milk that are provided to young children throughout the complementary feeding phase (6–24 months) (Bolarinwa et al., 2016). Complementary food is primarily made from grains like wheat, maize, and rice, as well as roots and tubers and legumes like soybeans and cowpeas (Olanipekun et al., 2015). Complementary food may be produced by combining one or more plant products, such as cereal and legume (Barber et al., 2017). For many cultures, complementary meals take various forms that are based on the main foods available in that location, ranging from traditional porridge and pap (Olanipekun et al., 2015).

The growth of a newborn during the first two years is quite rapid, and breast feeding alone is insufficient to supply the nutritiAonal needs of the kid beyond the exclusive breastfeeding phase (Bolarinwa et al., 2016). With increasing baby age, breast milk's capacity to provide macronutrient and micronutrient needs becomes reduced. As a result, the introduction of complementary foods during infancy is critical for both nutritional and developmental purposes (Aldossari *et al*., 2019). The ability of a supplementary meal to satisfy the protein-energy requirements of newborns, on the other hand, is dependent on its nutritional quality (Sumarmi and Mahmudiono, 2018).

From six months to two years of age, there is a critical window of opportunity for promoting optimal growth, health, and development; however, insufficient quantity and quality of complementary foods, poor feeding practices, and a high rate of infection have a negative impact on growth during these critical years (Aldossari *et al*., 2019). Poor quality of complementary foods and incorrect feeding methods has been identified as the leading causes of malnutrition in early infants (Sumarmi and Mahmudiono, 2018).

Complementary meals in Africa take the shape of fermented grains or roots that are boiled or mashed into a fine porridge, while in Nigeria, the first complementary food is often a thin cereal porridge prepared from fermented maize, millet, or sorghum (Adepoju and Etukumoh, 2014). This porridge offers 20-26 kcal/kg body weight/day, resulting in an average energy density of 0.26 kcal/g of CFs for a Nigerian newborn and (Adepoju and Etukumoh, 2014).

The porridge is related with issues such as thickening, which causes feeding difficulties, or watery porridge with diluted nutrients if considerable dilution is used, resulting in newborns failing to satisfy their nutritional and energy demands. Furthermore, the weaning period is the most essential stage in a kid's life since the shift of babies from nutritious and uncontaminated breast milk to the regular family meal exposes the child to malnutrition and disease (Onwurafor et al., 2017).

As a result, complementary foods should be high in energy and nutrients, clean and safe, easy to prepare from family recipes, readily accessible locally and reasonably priced (Olanipekun *et al*., 2015). Nigeria complementary meals might be enhanced by combining locally accessible foods that complement one another in such a manner that the new pattern of minerals required by this combination is comparable to that advised for infant growth and development. Maize, soyabean, millet, and peanut are easily available food sources in Nigeria that may have promising nutritional properties (Bolarinwa, *et al*., 2016). This research work therefore is aimed at examining the blends of maize and millet fortified with soybean and groundnut that was nutritionally dense; the sensory properties and also the acceptability of the products.

Statement of the Problem

The world largely depends on and obtains nutritional sustenance from grain crops including the continent of Africa (Jideani et al., 2012). These grains however, hardly meet or sustain the nutritional requirements of infants due to its low nutritional value. In Nigeria, the high cost of commercial breakfast products makes them out of reach for low-income earners.

Consequently, people in this category who constitutes an appreciable percentage of the masses depend on leftover supper for breakfast or at best consume cereal gruels usually of low nutritional value, especially in its protein quality. The Food Consumption and Nutrition Survey conducted in Nigeria revealed that four out of every ten children are stunted as a result of poor diet and disease, one out of every four are underweight, while nine percent are wasted. Therefore, inadequate complementary food is one of the major causes of high incidence of child malnutrition, morbidity, and mortality in many developing countries.

A variety of measures may be utilized to increase the nutritional value of Complementary Foods (CFs). Traditional West African CFs might be enhanced by mixing locally available foods that complement each other so that the new amino acid pattern formed by this combination is comparable to that suggested for newborns. There is little documented information on the sorts of CFs used by women in Kwara State, with little consideration given to their nutrient content, appropriateness, or otherwise. Thus, this study aims at producing a nutritionally improved complementary food using millet, maize, soyabean and groundnut.

Objectives of the Study

The broad objective of the study is to determine the acceptability, proximate composition and sensory properties of complementary food made from selected grains (maize, millet, soya beans and groundnut)

Specifically, the study will;

1. assess the socio- economic characteristics of respondents
2. examine respondents' level of knowledge of complementary foods Ilorin
3. examine the constraints faced by respondents in availability of complementary foods in Ilorin
4. determine the nutrient composition of selected grains for complementary foods
5. determine the sensory properties and acceptability of the complementary foods formulated.

Hypotheses of the Study

The following hypothesis were formulated, for the study

H_{01}-There is no significant relationship between the socio-economic characteristics of respondents and acceptability of complementary foods

H_{02}-There is no significant relationship between level of knowledge of respondents and acceptability of complementary foods.

METHODOLOGY

This study adopted research and development design (R and D). Research and development comprise creative and systematic work undertaking in other to increase the stock of knowledge and to device new application of available knowledge. This includes activities aimed at acquiring new knowledge or understanding without specific immediate commercial application or uses; activities aimed at solving a specific problem or meeting a specific commercial objective; and systematic work, drawing on research and practical experience and resulting in additional knowledge, which is directed to producing new products or process or to improving existing method or processes (Francisco Moris, an annotated compilation of official sources).

Complementary foods were developed from blends of maize, millet, soybean and groundnut flours. The ration of composition of blends are shown in Table I.

Table I: **Compositional Ratio of Sample Blend Ratio (%)**

Sample code	Maize	Millet	Soyabean	Groundnut
MMO(A)	50	50	0	0
$MMSG_1$(B)	35	35	20	10
$MMSG_2$(C)	25	25	30	20
$MMSG_3$(D)	25	25	20	30

Key:
MMO: 100% Maize and Millet only.

$MMSG_1$: 35% Maize, 35% Millet, 20% Soyabean and 10% Groundnut

$MMSG_2$: 25% Maize, 25% Millet, 30% Soyabean and 20% Groundnut

$MMSG_3$: 25% Maize, 25% Millet, 20% Soyabean and 30% Groundnut

Proximate analysis

The moisture, crude protein (N×6.25), ash, crude fat, crude fibre and carbohydrate (by difference) of the samples were determined according to the method of AOAC, 2005. All proximate analyses were carried out in triplicate and reported in percentage.

Sensory evaluation: Porridges were prepared from each of the composite flour blends. One hundred grams of each flour sample was homogenized with 500mls of water. The slurry was heated slowly at 70°Cwith constant stirring for 15mins. One (1) teaspoon (4 grams) of sugar was added to each sample. The porridges were kept separately in thermos flask for sensory evaluation with 20 untrained panellists consisting nursing mothers who have children between ages 6 and

24 months in the Department of Home Economics and Food Science, University of Ilorin. They evaluated the samples using a nine-point hedonic scale ranging from 1(extremely disliked) to 9 (extremely liked) (Watts et al., 1989). The five porridges were coded appropriately in the hedonic scale. The judges were provided with clean water to rinse their mouth in between testing of the porridges to avoid carry over effect. Each panellist evaluated the porridges for colour, flavour, texture, taste and overall acceptability.

Data Collection: A multistage sampling technique was used to select sample size for this study. The sample for the study consisted of 80 nursing mothers aged 18 and above representing of 14% of the population in Ilorin metropolis. A structured close-ended was used to collect data. Specifically, objectives were analysed and described using frequency distribution, percentages. Hypotheses were tested with Pearson Product Moment Correlation.

RESULTS

Table II: Demographic Characteristics of Respondents

Variables	Respondents	Frequency (f)	%age (%)
Age (years**)**	18-25	2	2.50
	25-30	48	60.0
	Above 30	30	37.5
Marital Status	Single	24	30
	Married	54	67.5
	Separated	2	2.5
Education	Primary	5	6.3
	Secondary	9	11.3
	Tertiary	66	82.4
Occupation	Public servant	9	11.3
	Trading	18	22.4
	Self employed	53	66.3
Religion	Islam	33	41.25
	Christianity	43	53.75
	Others	4	5.0
Monthly Income	Below 50,000	30	37.5
	50,000-100,000	30	37.5
	Above 100,000	20	25
Total		**80**	**100**

Source: Field Survey (2022)

Table II shows the demographic characteristics of the respondents. A significant proportion of nursing mothers fall within the age range of 20-25 years (60%), while 38% are older than 25 years, and only 2% are in the 18-20 age group. Notably, Kandel et al. (2016) reported a similar trend with the majority of their respondents being above 27 years old.

In terms of education, 6.3% of the respondents have completed only primary school, 11.3% possess a senior school leaving certificate, and the majority (82.4%) have tertiary education. This contrasts with the findings of Kandel et al. (2016), where a majority of nursing mothers were educated up to the secondary level. However, Akeredolu et al. (2014) discovered that a majority of nursing mothers in their study had tertiary education.

Regarding marital status, 30% of the respondents are single mothers, 67.5% are married, and 2.5% are separated. This aligns with the results of Akeredolu et al. (2014), which indicated that 78.3% of their respondents were married. In terms of occupation, 66.3% of the respondents are self-employed, 22.4% are traders, and 9% are public servants. Akeredolu *et al* (2014) also found that majority of respondents were either traders or self-employed. 41.25% of respondents are Muslims, 53.75% are Christians and 5% practice other religions. 37.5% of respondents earn

below 50,000 another 37.5% earn between 50,000 and 100,000 while 20% earn above 100,000 monthly. This result aligns with the findings of Akeredolu *et al* (2014).

Respondents Level of Knowledge of Complementary Foods

Table III below shows the mean rating, standard deviation and remarks of respondents' level of knowledge of complementary foods. The table shows that majority of the nursing mothers have only basic knowledge of complementary food and feeding. This is backed by the mean score of responses for each statement which higher than the benchmark mean score of 3.50. The mean rating ranged from 3.63 to 4.53.

Table III: Mean Rating of Level of Knowledge about complementary food

S/N	Statements	Mean (x)	Standard Deviation	Remark
1	Complementary foods should be administered to kids from 6 months	4.53	0.656	Agreed
2	Complementary foods have been proven to aid growths of infants.	4.36	0.698	Agreed
3	Complementary foods are very easy to prepare and produce	4.06	0.735	Agreed
4	Knowledge of preparation of complementary foods is very beneficial to families and community as a whole	4.45	0.692	Agreed
5	Only a few nursing mothers know how to prepare highly nutritious complementary foods	3.86	0.964	Agreed
6	Most nursing mothers do not know how to ensure consistency of nutrients in complementary foods	4.04	.702	Agreed
7	Most nursing mothers do not know the type of food produce to be used in making highly nutritious complementary foods.	3.91	0.930	Agreed
8	Most nursing mothers are not aware that locally prepared complementary foods do not contain adequate nutrients	3.63	1.129	Agreed
9	Most nursing mothers are not aware that locally prepared complementary foods can be improved by fortifying with other foods that contain other necessary nutrients	4.09	.889	Agreed
10	People are now willing and eager to learn how to prepare highly complementary foods	3.95	1.135	Agreed

Source: Field Survey (2022)

Table IV: Constraints Faced by Nursing Mothers on Availability and Preparation of Adequate Nutritious Complementary Food

Statements	Yes	No
The cost of imported and branded complementary foods product is the reason why most nursing mothers opt for traditional complementary foods	73 (91.3%)	7 (8.8%)
Only high-income earners purchase imported and branded complementary foods	46 (57.5%)	34 (42.5%)
Unavailability/lack of access to Food stuffs is a major challenge in providing appropriate complementary foods	64 (80.0%)	16 (20.0%)
High cost of foodstuffs is a challenge in preparation of adequate complementary food	68 (85.0%)	12 (15.0%)
Inadequate time to prepare complementary foods is a limitation of preparing and producing complementary foods	62 (77.5%)	18 (22.5%)
Work Schedules of Nursing mothers limits the time to prepare adequate complementary foods	57 (71.3%)	23 (28.7%)
Young nursing mothers lack adequate knowledge of preparation of complementary foods	57 (71.3%)	23 (28.7%)
Illiterate/Semi-literate Nursing mothers lack adequate knowledge of preparation of complementary foods	53 (66.3%)	27 (33.8%)
Majority of Nursing mothers do not know the best choices of foodstuffs needed to prepare complementary food	60 (75.0%)	20 (25.0%)
Locality of nursing mothers is a major challenge in preparation of adequate complementary foods	64 (80.0%)	16 (20.0%)

Source: Field Survey (2022)

Constraints Faced by Nursing Mothers on Availability and Preparation of Complementary Foods

Table IV shows responses on constraints faced by nursing mothers on availability and preparation of adequately nutritious complementary food. Cost of imported and branded complementary foods was identified by respondents to be the major constraints faced by nursing mothers. This can be suggested to be the reason for the perception of responses that only high-income earners are able to purchase imported and branded complementary food products. The high cost and unavailability of food stuffs is agreed to be a challenge with a majority response of 68% and 64% respectively. With 80% of respondents in agreement that locality is a major challenge in preparation of adequate complementary food. The responses in table 4 showed a 77.5% agreement that inadequate time is a major challenge to preparation of complementary food while 71.3% of respondents believed work schedules to be limitations to preparing adequate complementary foods. Furthermore, there is a wide perception that young nursing mothers as well as semi-literate and illiterate nursing mothers lack adequate knowledge of foodstuff combination as well as preparation of complementary foods, this can be seen in the responses (71.3% and 66.3% respectively) presented in Table IV.

Proximate Composition of Formulated Complementary Food Blends

The proximate composition of formulated complementary foods in Table V showed that the moisture content of the blends was within RDA values (5-10%) for moisture content of complementary foods. The low moisture content of the blends (<10) will ensure shelf-life stability. The protein content of the complementary food blends MMSG1, MMSG2 and MMSG3 are within RDA values (13-14 g) for infants as recommended by National Research Council. Ash contents ranged between 1.9% and 3.35% which falls within the RDA values (not less than 2% and not more than 5%) for infants up to 1 year of age recommended by (NRC). Infants need minerals for their growth and development which can be supplied by these products. The energy specification for complementary food intake is 350 kcal/100 g daily for a child up to 1 year of age. Hence the processed complementary food can meet the energy requirement of infant.

Table V: Proximate Composition of Complementary Food Blends

Constituents	MMO	MMSG1	MMSG2	MMSG3
Moisture	10.62 ± 0.01^{a}	9.77 ± 0.13^{b}	10.24 ± 0.01^{c}	8.49 ± 0.01^{d}
Fat	2.61 ± 0.18^{a}	12.56 ± 0.05^{b}	12.85 ± 0.06^{c}	10.62 ± 0.01^{d}
Fibre	2.45 ± 0.05^{a}	2.06 ± 0.01^{b}	2.16 ± 0.01^{c}	2.46 ± 0.04^{a}
Ash	1.90 ± 0.02^{a}	3.35 ± 0.01^{b}	3.02 ± 0.01^{c}	3.18 ± 0.03^{d}
Protein	8.59 ± 0.03^{a}	16.62 ± 0.02^{b}	14.15 ± 0.08^{c}	16.15 ± 0.01^{d}
Carbohydrate	73.83 ± 0.16^{a}	55.55 ± 0.07^{b}	57.58 ± 0.02^{c}	59.10 ± 0.01^{d}

Values are means of duplicate determinations ± standard deviation. Means with different superscript in the same row are significantly ($p<0.05$) different

Sensory Properties of Formulated Complementary Food Blends

The sensory evaluation of the colour, taste/mouth-feel, texture, aroma and overall acceptability of the complementary foods were evaluated using a 7-point hedonic scale as shown in Table VI. The 7-point hedonic scale ranged from dislike very much, through neither like nor dislikes, to like extremely. Complementary food formulation with Maize and millet only (MMO) was the most preferred in terms of taste. This had the highest mean hedonic score (6.00) when compared with MMSG2 with the lowest hedonic mean score (4.60).

Texture is an important part of complementary foods. The food should not be too thick and should not contain excess water. (MMO) is the most preferred in terms of taste. This had the highest mean hedonic score (5.8) when compared with MMSG2 with the lowest hedonic mean score (4.55). Flavour is an integral part of taste and general acceptance of foods before it is put in the mouth. It is therefore an important parameter when testing acceptability of complementary foods blends. Results of sensory evaluation indicated that there is no significant ($p<0.05$) variation from each other. There was no significant difference ($p<0.05$) in respect to the colour of MMO, MMSG1, MMSG2, and MMSG3. MMO had the highest mean score on the hedonic scale for colour and was rated the most acceptable. MMSG2 was the least acceptable with the lowest hedonic scale mean score. In terms of the overall acceptability, sample MMO is the most preferred and MMSG2 is the least preferred.

Table VI: Sensory Evaluation of Formulated Complementary Maize Blends

Samples	Colour	Taste	Texture	Flavour	Acceptability
MMO	6.35 ± 1.12^{a}	6.00 ± 1.12^{b}	5.80 ± 1.24^{a}	5.50 ± 1.85^{a}	6.20 ± 0.83^{C}
MMSG1	5.80 ± 0.83^{a}	5.50 ± 1.40^{a}	5.65 ± 1.35^{d}	5.15 ± 1.50^{d}	5.55 ± 1.36^{a}
MMSG2	5.50 ± 1.19^{ab}	4.60 ± 1.35^{c}	4.55 ± 1.57^{c}	4.25 ± 1.55^{b}	4.90 ± 1.17^{d}
MMSG3	5.70 ± 1.22^{a}	5.15 ± 1.09^{ab}	5.50 ± 1.47^{a}	5.10 ± 1.65^{d}	5.10 ± 1.62^{e}

The values are mean ±standard deviations for duplicate experiments and those in the same column not sharing the same superscript letter are significantly different from each other ($P<0.05$).

Hypotheses Testing

The following hypothesis were formulated, for the study

H_{01}-There is no significant relationship between the socio-economic characteristics of respondents and acceptability of complementary foods

H_{02}-There is no significant relationship between level of knowledge of respondents and acceptability of complementary foods.

Table VII: Correlation on Socioeconomic Characteristics and Overall Acceptability

Variables	***r-value***	***p-value***	***Decision***
Age	0.213	0.162	Not Significant
Marital Status	-0.176	0.826	Not significant
Education	0.139**	0.001	Significant
Occupation	0.294**	0.001	Significant
Religion	0.194	0.261	Not Significant
Monthly Income	0.122	0.624	Not Significant

Source: Field Survey (2022) **Correlation significance ($p<0.05$)

Table VII shows the correlation of relationship between socioeconomic characteristics and overall acceptability. From the results, Education and Occupation were significantly correlated with overall acceptability at $p<0.05$. This implies that there was a significant relationship between socioeconomic characteristics of respondents and overall acceptability of complementary foods.

Table VIII: Correlation Test of Level of Knowledge and Overall Acceptability

Variable	***r-value***	***p-value***	***Decision***
Respondents' knowledge	0.057	0.001	Significant

Table VIII shows the correlation of relationship between respondents' level of knowledge and overall acceptability. From the results, there was significant correlation with overall acceptability at $p<0.05$. This implies that there was significant relationship between level of knowledge and overall acceptability of complementary foods.

DISCUSSION OF RESULTS

The study focused on proximate analysis and sensory evaluation of composite complementary foods using different grains. With the research objectives being assessment of socioeconomic characteristics of nursing mothers in Ilorin, examination of their knowledge of complementary foods. Results showed that majority of respondents are of a youthful age. From the socioeconomic distribution of respondents, the educational status of respondents showed that majority have post-secondary education. This is expected to influence their knowledge of complementary foods and also to be a marker of a good income. Majority of respondents are married. Marriage is a marker of responsibility in the society. Nursing mothers are often assisted by their mothers and mother-in-law in caring for their babies; hence, knowledge is often expected to pass down from the aging mothers. Occupation of respondents is a determinant of income and a marker of time factor. Findings showed that about 66.3% of respondents are were self-employed. However, the findings on income of respondents showed that about 57.5% earn above 50, 000 monthly.

Research question 2 aimed to determine the level of nursing mothers' knowledge of complementary foods. Overall, it was observed that the respondents have a high level of knowledge of complementary foods. This is marked by the mean of responses. A benchmark

mean of 3.5 determined the agreement or disagreement of responses to the statement guiding the level of knowledge. Respondents' responses indicated a high level of knowledge of complementary foods, with mean score ranging from 3.63 to 4.53. The high level of knowledge of complementary feeding among the nursing mothers in this study indicates that the nursing mothers have a positive approach towards appropriate practices of complementary foods. This positive approach aligns with the findings of Aldossari et al. (2019) and Albar (2022), emphasizing the influence of knowledge and attitude on complementary feeding practices. On the contrary, findings of Al-Mutairi and Sulaiman (2021) showed family advice as one of the many reasons of negative complementary feeding practices such as untimely initiation. This comparison showed that the significance of correct and adequate information on complementary feeding practices in nursing mothers.

Research question 3 evaluated the constraints faced by respondents in preparation of complementary food. The percentage of responses to the listed constraints showed that nursing mothers encounter different constraints in preparation of complementary food. These constraints ranged from cost of imported and branded complementary foods to high cost of foodstuff and locality of nursing mothers which is believed to determine access to local foodstuffs required to produce complementary food. According to Kuyper et al. (2013) tradition, availability and ease of access are challenges faced in preparation of complementary foods in developing countries. Inaccessibility maybe a result of proximity to market, locality as well as purchasing power. According to Zahirudin et al. (2016), insufficient endowment poses challenges to some mothers in rural areas where mothers are usually not economically endowed to afford children food.

Furthermore, the findings of Tampah-Naah et al. (2019) explored challenges associated with the lifestyle practices of nursing mothers. The study uncovered that maternal employment schedules pose a significant obstacle to the adherence of exclusive breastfeeding practices. Notably, the prompt return to work within both civil and public services, occurring just three months post-maternity leave, exacerbates the difficulties faced by breastfeeding mothers in maintaining exclusive breastfeeding for their infants. The study found that the absence or limited assistance nursing mothers get in performing household chores tend to have negative influence on time invested in preparation and sourcing for necessary food items.

The results of this study was derived from a limited sample of mothers, it is crucial to acknowledge that the perspectives articulated by these mothers are unique to their individual observations and knowledge. Therefore, it is essential to recognize that these viewpoints may not necessarily reflect the sentiments of other mothers within the same communities. The findings contribute to the broader discourse on maternal and child health, emphasizing the need for targeted interventions that consider educational, economic, and informational dimensions to promote optimal complementary feeding practices among nursing mothers in the studied region.

CONCLUSION AND RECOMMENDATION

Complementary foods should be rich in energy and nutrients, clean and safe, easy to prepare from family foods, locally available and affordable. Most foods developed in the different countries to provide nutrient dense complementary foods to meet the nutritional needs of infants and young children are based on local foodstuffs blended with legumes to give protein portion of the diet. From the findings of the study, it is concluded that utilization of soybean and groundnut

in fortification of complementary foods can provide cheap CFs that are high in protein and energy, and nutrient-dense to meet the nutritional needs of infants and young children. Hence their use should be encouraged as a means of promoting dietary diversity and reducing prevalence of under-five malnutrition in Nigeria.

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