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Research Article

# Complementary feeding practices and nutritional values of complementary foods used by IGBO Mothers of Imo and Abia states of Nigeria

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**Abstract**

The study has provided information on the complementary feeding practices of Igbo mothers of Imo and Abia states of Nigeria. There were differencies between practices/foods given by urban and rural mothers. The number of times the foods were fed differed between the mothers. Pap with cray fish was adequate in quantity, quality and nutritional value. This also highlighted the factors that affect complementary feeding such as socio-economic and urbanisation, social cultural taboos, physiological etc. Breastfeeding was still prevalent among nursing mothers interviewed during the survey, even though the ceasation from breast milk and introduction of complementary foods were still a bit early for some mothers in urban areas. Some mothers used home prepared foods instead of commercial baby foods as first semi-solid foods. The nutritive values of these home prepared foods were mostly carbohydrates, for example, pap, mashed yam, jollof rice, except if they were supplement or complemented with other food nutrients. For instance, fortifying pap with cray fish or soybeans.

**Keywords:** complementary feeding practices, socio-economic and urbanization, Breastfeeding.

## Introduction

Weaning foods also known as complementary foods can be produced from available local ingredients. They are made out of legumes, grains example com, millets, soyabeans, groundnuts, fruits, vegetables etc.

The term "Complementary" is derived from complement. According to Kornby (1981) (Oxford Advanced Learners Dictionary), it means; "Something added later to improve or complete".It means, an infant becoming gradually accustomed to solids. This is gradually introduced to the infants from six months ideally after exclusive breastfeeding. At this age, babies can push food given by spoon to the back of their mouth, ready for swallowing (Eboh, 1992).

Complementary feeding from a physiological point of view, is a complex process involving nutritional, microbial, immunological, biochemical and physiological adjustments.

Uwaegbute (1990) stated that for the first few months of life, breastmilk and infant food .formulae are the first infant's primary source of nutrients because of the subsequent increase in nutrient needs for a very rapid growth. However, early weaning has been associated with obesity; coeliac diseases, infections and poor motor coordination while late weaning is associated with failure to thrive and anaemia.

During complementary feeding .The period in which diet changes from clean beast milk which contains anti-infective factors to foods which are often prepared, stored and fed in unhygenic ways, malnutrition is more common during this transitional period, because "mothers" may not be aware of the special needs of the infants and may not to how to prepare the complementary foods that are available.

Nutritionally, it is appropriate to begin with iron containing foods at six months, since that is the time the iron stores from birth are being diminished (Okaka, 1992). The requirement at the age exceeds that supplied by human milk. An additional source of protein because the grams of protein per kilogram of body weight supplied by milk drop as the infant grows heavier (Akobundu 1992).
A human infant also needs bulk or roughages in the diet. The exact time, this need becomes apparent is not known but it is certainly by the end of first year (Insley 1991). There is need for information on the complementary feeding practices of Nigerian mothers from different parts of Nigeria. This information is needed because of the problem of Protein Energy Malnutrition has been associated with the complementary feeding period Akobundu 1992).

Such information is necessary in order to advice mothers on infant complementary Feeding, since nutrition education must be based on the knowledge of the existing patterns.

This study is therefore design to document feeding practices and nutritional value of complementary foods fed to Nigerian infants by mothers in Imo and Abia States of Nigeria.

**Statement of problems**

Protein energy malnutrition results from deficiency of protein, energy and calories in the diet is not one disease but a range of pathological conditions arising from inadequate or unbalanced diet (Eboh, 1992).

Akobundu (1992) stated that vegetable proteins are consumed directly as food constitutes the major diet any protein source in cases where animal protein is in short Supply for complementary feeding. The shortage of animal protein and the lack of knowledge of how to blend and process protein food sources farther aggraviate protein energy malnutrition in Nigeria.

For example, malnutrition which is prevalent in infancy, is due to lack of good quality complementary foods. Another problem in Imo and Abia states is inability to utilize effectively inexpensive nutritionally adequate local crops available in the communities for complementary feeding. Even though commercially processed foods are available, their cost limits their use to a small percentage that can afford them.

It then becomes necessary to evaluate the nutritional value of complementary foods fed in Imo and Abia States of Nigeria in order to identify where they are deficient and correct them. This is the problem this research seeks to address.

**Objective**

The study aims at investigating the complementary feeding practices and nutritional value of complementary foods used by Igbo Mothers of Imo and Abia States.

**Specific objectives**

(1) To examine the pattern of complementary feeding by mothers of Imo and Abia States.
*(2)* To identify the age at which complementary foods are started and what is fed. (3)To identify the reason for feeding complementary foods by mothers in the two states.
(4) To chemically determine the nutritional value of the major complementary foods and calculate their nutrient densities.

## Materials and Methods

This chapter discusses the methodology and procedure used in carrying out this study. It will attempt to look at the areas covered by the study the population, methods used in selecting the sample for the, procedure for data collection and method of analysing the data collection.The study will involve survey, collection and analysis of sample of infant foods as fed.

**Survey area**

The areas covered are Umuahia central and Ariam both in Abia State and then Orji and Achi-Mbieri both in Imo State (Urban and Rural respectively). Umuahia central is located at the heart of the town (the state capital) while Ariam is at Ikwuano Local Government Area of Abia State.

Orji in Owerri, is a town near the Owerri Municipal Council of the State while Achi Mbieri is a cornrnunity in Mbaitolu Local Government Area of Imo State. The sample consisted of 100 nursing mothers from both States. The nursing mothers were selected randomly from the population, in which

cluster survey design was used. Clusters drawn from the population were group of educated and illiterate nursing mothers .These mothers were contacted by personal visit and the purpose of the survey was explained to them.

**Materials/instruments**

Structured questionnaires were constructed and were validated by lecturers of Home Economics Department, Michael Okpara University of Agriculture Umudike. The questionnaire was designed to collect information in the following areas:-

Personal Characteristics
Breasfeeding practices
Types of complementary foods given to infants.

Reasons why they give these complementary food
First semi-solid foods given to the infants and reason why they were given first.

* Foods prepared only for the infants.
* Number of times the infants were fed daily.

Validated structured questionnaires were administered to respondents and for those who were not literate,a trained research assistant interviewed them in the local languages. After pretesting, irrelevant responses were removed. Data were grouped into 2:

Personal data.
Breastfeeding / Complementary feeding practices.

**Data analysis**

The data were analysed manually by tallying method and were coded accordingly. Frequencies and percentages were calculated for all the questions. Chi-square analysis was used to evaluate the data on significant differences on nutritional values of the major complementary foods used by Igbo mothers of Imo and Abia *state*

**Collection of foods samples**

Complementary food samples were collected as mothers, were feeding their infants were analysed for their nutritional values.

**Laboratory analysis**

The Laboratory analysis for nutritional values of the major complementary foods used by mothers of Imo and Abia States were done in Central Research Laboratory and Farm Centre Laboratory University of Uyo, Akwa Ibom State.

**Methods/procedures of analysis used**

Analysis was done in triplicate.

**Moisture content determination**

**Procedure**

A clean weighing bottle was dried (a metallic dish or pertridish) in an oven at 80°C for about 30minutes, cool in a dessicator and weighed (w). The sample (about l-2g) was added and weighed (b)

The petridish or can plus sample was put into the oven adjusted to 70°C. After about 5 hours was removed and quickly transfered to dessicator for cooling. Weigh and put back into the oven and adjust to 105°C for another 5 hours, remove, put in the dessicator for cooling. Weigh and repeat the process until a constant weight is achieved.

Calculation

W — weight of moisture can.
B = - - weight of moisture can +sample.
C = weight of can +dried sample.
B-C = weight of dried sample
3-W = weight of wet sample.
moisture content (me) in % = $\frac{b-c}{}$ x 100 = x%
b-w x % =moisture content.

**Procedure for ash determination**

The ash content represent the mineral or in organic residue of a biological material.

**Procedure:**

The porcelain (with lid) used was first ignited or heated in the muffle furnace or with Bunsen burner for one minute. It was rapidly transferred to a dessicator for cooling and then 5g of the sample was accurately weighed into the preheated dish. Weight of the porcelain dish and the samples were noted. The dish was heated with Bunsen burner in a fume cupboard until smoking ceased. Then was transferred to the muffle furnance at 550-570°c to bum off all organic matter for 18-24hours.
At the end of ashing, the crucible was taken out, and was covered immediately and Placed in a dessicutor to cool and was weighed.

**Calculations**

Ash (%) = weight of ash x 100 |
weight of sample

$W_1$ = weight of empty dry crucible with lid.
$W_2$ = weight of sample plus crucible with lid.
$W_3$ = weight of ash plus crucible with lids.

Ash (%) $\frac{W_3-W_1}{W_2-W_1}$ x 300

In this process, all organic matter was burnt off. Therefore percentage organic -100-% ash.

**Procedure for fat determination**

A soxhlet extractor with a reflux condenser and round bottom flask were set
Between 3 and 5g of sample was weighed into a fat free extraction thimble, which 1
been previously dried in an oven and weighed. Let the weight of the extraction thiml be Wl. Plug lightly with cotton wool and weight again -$W_2$.
The thimble was placed in the extractor and the solvent was added until the extract was half full.
Condenser was replaced. The source of heat was adjusted so that the solv boiled gently and left to siphon over for about 6 hours.
When the barrel of the extractor was empty, then the condenser was detached and 1 thimble was removed.
The sample was dried in a fat-free, clean beaker, well away from the flame. 1 thimble was placed (in the beaker) in the oven at 50°C and was dried to const: weight and was also cooled in a dessicator and was weighed-w3.

**Calculation:**

Fat contents (%) (w/w)
= Weight of sample (extracted fat) x 100
Weight of sample
- W,-W, x 100

The solvent with the extracted fat in the flask was distilled off to about 10-20«l was gently evaporated in a water bath.

The lipid (fat)% was calculated thus:
% fat=Weight gain in flask x 100
Weight of sample to Tips to Note

1It is recommended that the single cellulose thickness extraction thimble be used to ensure that the extract freely passes out of the thimble thereby giving way to further extraction.
2Solvents in common use are petroleum ether (B.pt 40-60°c or 80°c) and diethyl ether.
However a mixture of solvents such as acetone: ethanol (1:1) could be employed depending on the nature and on type of lipid to be extracted.
3. A minimum extraction time is 6 hours. However to ensure total or complete extraction; it could be extended to 12-24 hours.

**Determination of crude protein**

Protein was determined by the microkjeldal method (A.O.A.C 1990)

**Apparatus**

Digestion rack with electric heaters ; Kjedahl digestion apparatus,
Kjedahl digestion flask (500mls capacity) Burette (25mls capacity)
Erlenmeyer Flask (50 mls capacity) Pipettes (5 mls; 25mls capacity)
Funnels and measuring cylinder. Metter digital balance.
*Cone* $H_2SO_4$; Analytical grade.
*2}* 40% NaOH: prepared by dissolving 40g NaOH pellets in 100ml of distilled $H_20$
3) 0.05N HCL -prepared by diluting 4.29ml of cone HCL in 1 litre of distilled $H_20$
4) 5% Boric acid solution: 5g of boric acid crystals were dissoved in hot distilled $H_20$ and on cooling the solution was made up to l00 mls in standard flask with distilled $H_20$. (5) Double indicator system: (Methylene red and methylene blue).200ml of 0.1% w/v, ethanotic solution of methyl red and 50ml of 0.1% w/v ethanolic solution of methylene blue were mixed and stored in a dark brown bottle. 6) Kyeldahl digestion catalyst: This was produced by mixing carefully together $CuSo4.5H_20$ and $Na_2So4$ in the ratio 1:5

**Procedure**

1) 2g of each sample were accurately weighed and put into a standard 500ml kjeldahl flask containing a spatula full of the kjeldahl catalyst, some anti-bumping chips and 50ml of cone $H_2So_4$"
2) The digestion flask was placed into the digestion rack and heated gentle for one hour to prevent vigorous charing and frothing.

3) The flask and its contents were then subjected to vigorous heating for 8-12 hours until a clear bluish digest was obtained.
4) After digestion, the digest was cooled and the quantitatively transfered to a 100ml standard flask and made up to mark with distilled $H_20$.
5) 25ml portion of this digest was pipetted into a micro kjeldahl markham distillation apparatus and treated with 40% NaCH solution, then heated.

(6) The ammonia evolved was steam distilled as described by Markham (1942) into a 100ml conical flask containing lOmls 5% Boric acid solution into which 2-3 drops of double indicator has been added.
(7) The tip of the condebnser was immersed into the boric acid double indicator solution and the distillation continued until about 3 times the original volume was obtained
(8) The tip of the condenser was rinsed with a few mls of distilled $H_20$
(9) The boric acid double indicator solution, turned green as the ammonia distilled into it
*(10) The distillate* was titrated *with O.ln HCL* solution until a purple pink colour was obtained at the end point.
(11) A blank determination was carried out in a similar manner as discribed above except for the omission of sample in the digestion flask.

NOTE:

Most protein contains about 16% $N_2$, so that 16mg N2 - 100mg protein: 1mg
The nitrogen value is therefore multiplied by 6.25 to get the weight of protein.

**CALCULATION**

$$\%\ N_2 = 14 \times \frac{100 \times 0.1\text{MHcl} \times 100\% \times \text{titrate}}{1000 \quad 25} \quad 2\text{gm}$$

% protein = 6.25 x N value obtained above.

**DETERMINATION OF CARBOHYDRATE CONTENT**

Under proximate analysis, the carbohydrate content of food sample or material was estimated by difference. This means when other proximate components such as Ash, fat, moisture, protein have been determined as precentage, the sum of these determinations was subtracted from 100 to give carbohydrate contents.

**CALCULATION**

Carbohydrate = 100 - (% Ash+ % Protein + %Fat + % mc&ure).

**DETERMINATION OF FIBRE PROCEDURE**

1. 2g of samples was boiled for 30 minutes in 200ml of 1.25 $H_2SO_4$.
2. The sample was taken to a muffle furnace and ashed at 350c for 2 hours and it was cooked and weighed (1+3).
3. The weight difference, that is, weight of fibre was expressed as a percentage sample weight. was given by; Y, crude fibre =

$$\frac{W2\text{-}W3 \times 100}{5 \quad 1}$$

Where 5 = sample weight
$W_2$ = Weight of porcelain dish and dried sample
$W_3$= Weight of dish tash ashing in muffle furnace.

**DETERMINATION OF ENERGY (Kcal)**

Under proximate analysis, the energy content of the food was multiplication. This means, when other proximate components such as fat, protein.

carbohydrate, were determined, the sum of these determination were multiplied by 4 : and was summed up to give the energy contents.

**CALCULATION**

Energy - (Fat x4)+ (Protein x 4) + (cho x 4).

**DETERMINATION OF VITAMUN A**

METHOD; A.O.A.C; Untraviolet spectrometer was used.

**PROCEBURES**

1 2g of each sample was weighed in a cleared and dry beaker.
2 2ml of absolute ethanol was measured into the beakers, followed by addition of 5ml of Heptane and the beakers were shaken for 2 minutes after mashing of the sample in the beakers.
3. The mixture was transferred into cleaned test tube and centrifuged for 5 minutes at 2000 pm.
4. 3ml of the heptane layer was transferred carefully into another test tube and 1ml of antimony trichloride solutions(cam-price reagent) was added and transferred. 10mm current and the absorbance read 620nm. Using the heptane as blame to zero the unicam uv/vis spectrophotometer 8625. Absorbance of known vitamin A standard concentration was also measured and recorded.

**STANDARDISATION OF VITAMIN A**

Vitamin A stock standard 10mg/ml.
1. 50mg of Vitamin A standard was dissolved in absolute ethanol and diluted to 100ml with the solvent. Irnl of the solution was diluted to 150ml with heptanes and was stored in the fridge.

2. 3ml of the working standard solution was introduced into a cleaned test tube and

1ml of carr-priee reagent was added. This was introduced into the curvet and absorbance read at 620nm.

The absolute concentration of the standard in 50mg/dl. However, since 2g of sample was extracted with 5ml of Heptane, the value of the standard concentration using this method.

Absorbance Test x Concentration of Standard

Absorbance Standard

= Ug/dl.

**VITAMIN C DETERMINATION**

Method: Annin and Giese, 1976

**PROCEDURES**

1. 2g of samples was weighed into beakers, 10ml of 1% oxalic acid reagent was added to each beaker.

2. A glass-rod was used to crushed the samples and agigate for 3 minutes using a laboratory shaker.

3. These were filtered using whatman No 42 filter paper.

4. To 8ml of lOOmg of Norit 9activated charcoal) was added and shaken vigorously for 1 minute. The extract was filtered again using filter paper.

5. 4ml of the filtrates were measured into 2 test tubes each (blank and Test). i A drop of 1 0% thianea solution was added to the test tubes.

To the test tube, 1 ml of *2*, 4-dinitropheny hydrazine solution was added and shaken for 5 seconds.

3. The tubes were incubated at 37°C at for *3* hours in water bath.

9. At the end of incubation, the test tubes (blank and test) were placed in an ice-bath.

10. 5ml of 85% $H_2S0_4$ was slowly added to the blank in the ice bath with mixing followed with addition of 1ml *of 2,4* DPN reagent.

1 1 , 5ml of the acid (85% H2S04) was also added to the test and was allowed to stand for 30 minutes.

12. The absorbance was read at 540nm against each using Unilam and Ur/vis speeirophotometer 8625.

**STANDARDISATION**

4ml of working standard was treated for blank and was also tested as sample from 6-12.

**STOCK STANDARD 100MG/DL**

25mg/25ml of the ascorbic acid (BDH) was dissolved in 25ml of 1% oxalic acid

**WORKING STANDARD (0.4MG/DL)**

O.lml of stock standard was diluted to 25ml using 1% oxalic acid.MINERAL ANALYSIS

CALCIUM DETERMINATION Method: Atomic Absorption Spectrometer Procedure:

Calcuim content was determined by atomic absorption spectrometer. Each solution was introduced into the spectrometer and the absorbance of each sample was determined.

**IRON DETERMINATION**

Method: atomic Absorption Spectrometer Procedure:

The iron content was also determined by using atomic absorption spectrometer. Each solution of sample was introduced into the spectrometer and the absorbance of each sample was taken.

**PHOSPHORUS DETERMINATION**

Method: Ultraviolet (Uv) spectrometer Procedure:

10ml of each sample solution was weighed with 20 ml of Ammonium molybdafc and was made up to volume with deionized water to 100ml. Each solution was tha introduced into a Uv spectrometer (ultraviolet spectrometer) and absorbance of ead sample was determined.

The concentration of each sample is calculated thus:

$$\text{Cone of sample} = \frac{\text{cone of standard x Absorbance of sample}}{\text{Absorbance of std}}$$

**Method: Atomic Absorption Spectrometer Procedure:**

The iodine content of the samples was determined by the use of Atomic Absorption Spectrometer. Each solution was introduced into the spectrometer, then the absorbance of each sample was determined.

**RESULTS PERSONAL DATA**

A total of 100 respondents were involved in the study, that is urban-rural of Imo and Abia States.

The socio-economic status of the respondents. This table shows that, there was no significant differences at 0.05%, in other words, there is relationship between urban and rural and their ages. For their educational qualifications, there were significant differences, that is, there was no relationship between urban and rural and their educational qualifications. Also there were significant differences on their occupation, monthly income and monthly income of their husbands.

Results on the age range of mothers showed that 60% of urban mothers interviewed fall within 25-30years and the least 6% were 40years. While the highest percentage 48% in rural fall within 25-30years and the least 10% were 18-24years.

Data revealed mat the educational qualifications of urban mothers were as follows: 20% had university degrees, 32% Ordinary National Diploma Certificates and 12% Teachers Training Certificates while for rural, 8%, 12%, 16% and 40% had university degrees. Ordinary National

Diploma and Teachers Training Certificates and First School Leaving Certificates.

This therefore indicates that majority of mothers interviewed were educated and were in the working class group, earning higher income than those with lower educational 'qualifications which influences the feeding practices of complementary foods.

Results on the number of children per mother, indicated that some of the mothers interviewed in urban areas, that is 40% of them had two children, 20% had three Idren, 14% had one or four children and 12% had five children. In the rural, 40% each case had five children, 12% four children, 16% three children, 18% two children, 4% one and 2% had six children, during the survey.

Data also highlighted that majority of urban babies that is 60% were 7-9 months, 20%, 4-6 months, 16%, 10-12 months, 2% 0-3 months and the rural babies, 50% of them were 7-9 months, 28% 4-6 months, 2% were either 0-3 months or 10-12 months during the study.

Table 4, illustrates that there was no significant difference; that is, there was relationship between the rural and urban mothers and the ages of introducing complimentary foods.

Results also showed that 80% of mothers introduced complementary foods at the 7th month, some 8% introduced at 6th month, 4% at either 4th or 5th month while 76% of the rural mothers introduced at 7th month, 12% at 6th month, 6% at 5th month, 4% at $4^{th}$ month.

This therefore indicates that complementary foods were best introduced as from 7th month of age.

Table 5, shows that there was no significant difference which means that there was relationship between urban and rural mothers and the foods introduced as the first.

The study also revealed that 30% of respondents in urban first introduced Nutrend or pap 12% gave mashed yam with palm oil or Jollofrice, 16% cerelac as first semi solid food given to the babies, while 40% of rural mothers gave pap, 30% mashed yam with palm oil, 20% Nutrend, 4% Jollof rice or cerelac.

This therefore implies that pap alone or with either soybeans or crayfish was the first semi-solid food given to weanling.

This agrees with Intengen (1992), who stated that the upper socio-economic classes (ie urban mothers) appeared to introduce complementary foods such as pap, soft boiled rice and mashed yam at a later age.

Table 6, shows that there was no significant difference showing relationship between the urban and rural mothers and the complementary foods introduced.

Data indicated that most mothers in urban, 40%, fed complementary foods to their babies with reasons that their ages were culturally accepted, 30% gave reason as what was available to them or foods usually available in the family. In the rural. 50% gave their reasons as ages of the babies were culturally accepted, 30% what was available to them and 20%, foods usually available in the family.

Table 8, shows the foods eaten by the babies which had no significant differences.

This table 9, showed that there was no significant differences, in other words, there were relationship between the urban and rural mothers and the foods listed. All these foods listed can only be prepared for the babies and can also be eaten other members of the family.

The highest percentage in urban 16% listed Nutrend. pap with cray fish, pap with soy beans, mashed yam with oil while the least percentage 6% listed cerelac. In the rural, the higest percentage 20% listed mashed yarn with oil and the least 2% cerelac.

Table 10, shows that, there was no significant difference which means that, there was relationship between the urban and rural respondents.

Results on the frequencies of breastfeeding the babies showed that 32% of r«ban mothers breasfed their babies five times daily, 24% four times, 20% thrice or on demand, while 36% of the rural mothers breastfed their babies four times. 20% five times or on demand, 16% thrice and 8% twice daily.

The frequencies of feeding complementary foods was also noted where 20% of urban mothers fed their babies twice or thrice, 16% fed on demand, 14% five times, 10% once, then 36% fed four times, 20% twice, 10% on demand, 4% once or five times.

Table 1 Socio-economic status of the respondents

| (1) Age Range | Urban Freq. | % | rural Freq. | % |
|---|---|---|---|---|
| 18-24 years | 8 | 16 | 5 | 10 |
| | 30 | 60 | 24 | 48 |
| | 9 | 18 | 13 | 26 |
| | 3 | 6 | 8 | 0 |
| | 0 | 0 | 0 | 0 |
| | 50 | 100 | 50 | 100 |

| (2) Educational qualifications | Freq. | % | Freq. | % |
|---|---|---|---|---|
| First school Leaving cert. | 3 | 6 | 20 | 40 |
| West African School Cert. | 4 | 8 | 12 | 24 |
| Teacher Training Cert. | 6 | 12 | 8 | 16 |
| Ordinary National Diploma | 16 | 32 | 6 | 12 |
| University Degrees | 20 | 40 | 4 | 8 |
| Others specified (Nursery) | 1 | 2 | 0 | 0 |
| | 50 | 100 | 50 | 100 |

| (3) Respondents Occupation | Freq. | % | Freq. | % |
|---|---|---|---|---|
| Teaching | 15 | 30 | 10 | 20 |
| Trading | 3 | 6 | 18 | 36 |
| Civil service | 25 | 50 | 4 | 8 |
| | 2 | 4 | 10 | 20 |
| | 1 | 2 | 0 | 0 |
| | 4 | 8 | 8 | 16 |
| | 50 | 100 | 50 | 100 |

| (4) Monthly income o respondents | Freq. | % | freq | % |
|---|---|---|---|---|
| ₦N100 | 2 | 4 | 25 | 50 |
| N1,000 N10,000 | 12 | 24 | 10 | 20 |
| N11,000-N20,000 | 18 | 36 | 3 | 20 |
| N21,000 N30,000 | 10 | 20 | 3 | 6 |
| N31,000-N40,000 | 5 | 10 | 2 | 4 |
| ₦N40,000 | 3 | 6 | 0 | 0 |
| | 50 | 100 | 50 | 100 |

Table 2 revealed that there was significant differences between the number of children urban and rural women have. Table 2: Number of Children per mother

| | Urban Freq. | % | Rural Freq. | % |
|---|---|---|---|---|
| One | 7 | 14 | 2 | 4 |
| Two | 20 | 40 | 9 | 18 |
| Three | 10 | 20 | 8 | 16 |
| Four | 7 | 14 | 10 | 20 |
| Five | 6 | 12 | 20 | 40 |
| Six | 0 | 0 | 1 | 2 |
| | 50 | 100 | 50 | 100 |

**Table 3: Ages of babies of the respondents**

| | Urban Freq | % | Rural Freq. | % |
|---|---|---|---|---|
| 0-3 months | 2 | 4 | 1 | 2 |
| 4-6 months | 10 | 20 | 14 | 28 |
| 7-9 months 10-10-12 months | 30 | 60 | 25 | 50 |
| | 8 | 16 | 10 | 20 |
| | 50 | 100 | 50 | 100 |

**Table 4:Age at which breastmilk alone was considered inadequate and age of complementary food introduction.**

| | Rural | | | |
|---|---|---|---|---|
| | Freq. | % | Freq. | % |
| 2nd month | 1 | 2 | 0 | 0 |
| 3rd month | 1 | 2 | 1 | 2 |
| 4th month | 2 | 4 | 2 | 4 |
| 5th month | 2 | 4 | 3 | 6 |
| 6th month | 4 | 8 | 6 | 12 |
| 7th month | 40 | 80 | 38 | 76 |
| | 50 | 100 | 50 | 100 |

**Table 5: First semi-solid foods introduced**

| | Urban | | Rural | |
|---|---|---|---|---|
| | Freq. | % | Freq. | % |
| Commercial baby cereal (Nutrend) | 12 | 24 | 1 | 2 |
| Pap | 19 | 38 | 20 | 40 |
| Garri with soup | 3 | 6 | 10 | 20 |
| Mashcu yam witii paim oil | 6 | 12 | 15 | 30 |
| Jollofrice | 6 | 12 | 2 | 4 |
| Another specified (cereal) | 4 | 8 | 2 | 4 |
| | 50 | 100 | 50 | 100 |

**Table 6: Introduction of complementary foods at different ages.**

Urban

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Breast milk | - | - | - | - | - | - | - | - | - | - | - | - | |
| Watery pap alone | - | 1 | 2 | 2 | - | - | - | - | - | - | - | | |
| Watery pap with Soyabeap | - | - | - | - | - | - | 5 | 1 | 2 | 2- | | | |
| Watery pap with Crayfish | | | - | - | - | - | - | 4 | - | - | - | | |
| Cerelac | | | - | - | - | - | 4 | -- | - | - | - | | |
| Nutrend | | - | - | - | - | - | 3 | 8 | - | - | - | | |
| Gari with Okapp Soup | - | - | - | - | - | - | - | 2 | - | -Mashed | | | |
| yam with oil | - | - | - | - | - | - | - | 9 | 2 | | | | |
| Fruit (banana) | | - | - | -- | - | - | - | - | 2 | - | - | | |
| | | - | 1 | 2 | 2 | 7 | 20 | 12 | 4 | 4 | - | - | |

Rural

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Soyabeanmilk Alone | - | - | - | - | - | - | - | - | - | - | |
| Watery pap alone | - | 2 | 1 | 5 | - | - | - | - | - | | |
| Watery pap With soyabeap | - | - | - | 2 | 4 | 2 | - | - | - | - | |
| Water soup With crayfish | | - | - | - | - | 4 | - | - | - | - | - |
| Cerelac | | - | - | - | - | 4 | - | - | - | - | - |
| Nutrend | | - | - | - | - | 1 | - | - | - | - | - |
| Gari/cassava With Okapp soup | | - | - | - | - | -10 | - | - | - | - | |
| Mashed yam With oil | | - | - | - | - | - | 10 | 3 | - | - | - |
| Mashed jollof rice | | - | - | - | 2 | - | - | - | - | - | |
| | | | 2 | 1 | 7 | 13 | 4 | 20 | 3 | - | - |

Table 7: Reasons respondents gave for feeding these complementary foods.

| | Urban | | Rural | |
|---|---|---|---|---|
| | Freq. | % | Freq. | % |
| Age culturally accepted | 20 | 40 | 25 | 50 |
| What was available | 15 | 30 | 15 | 30 |
| What others gives | - | - | - | - |
| Foods usually available In the family | 15 | 30 | 10 | 20 |

Table 8 shows the foods eaten by the babies which had no significant differences.

Table 8: Foods eaten by the urban and rural babies

1. Breastmilk and water
2. Cassava
3. Pap alone
4. Pap with soybean
5. Pap with crayfish
6. Nutrend
7. Jollof rice mashed
8. Mashed yam with palm oil
9. Gaari or cassava with okro soup
10. Beans

Table 9: Foods listed by Respondents, used as complimentary foods in their communities.

| | Urban | | Rural | |
|---|---|---|---|---|
| | Freq. | % | Freq. | % |
| Nutrend | 8 | 16 | 3 | 6 |
| Watery pap with crayfish | 8 | 16 | 7 | 14 |
| Watery pap with soybeans | 8 | 16 | 9 | 18 |
| Mashed yam with oil | 8 | 16 | 10 | 20 |
| Mashed jollof rice | 6 | 12 | 6 | 12 |
| Gaari/Cassava with okro soup | 5 | 10 | 9 | 18 |
| Watery pap alone | 4 | 8 | 5 | 10 |
| Cerelac | 3 | 6 | 1 | 2 |
| | 50 | 100 | 50 | 100 |

Table 10: Frequency of Breastfeeding the babies

Urban

| Ages (Months) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 8 | 9 | | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ondemand | 2 | - | 2 | - | - | | - | | | | - | | - | - |
| Five times | 8 | | - | 1 | | - | 1 | | - | - | - | | | |
| Four times | - | | 4 | - | 1 | | 3 | | 2 | 2 | - | | | |
| Thrice | | - | | - | | - | | 5 | 2 | 3 | - | | | |
| Twice | | - | - | | 3 | 4 | - | - | - | - | - | - | | |
| Once | | - | - | | | | - | - | - | - | - | - | | |

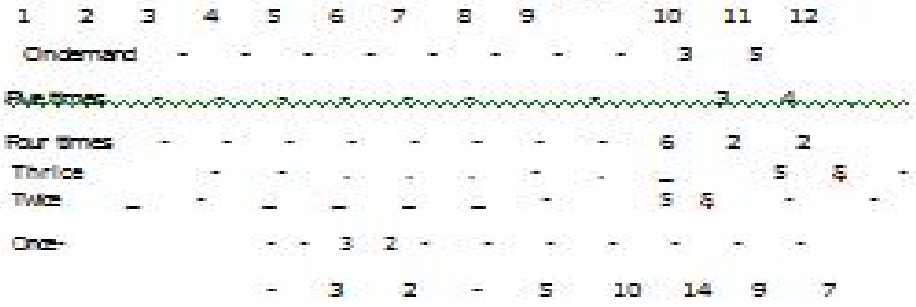
Rural

| | 10 | 4 | 3 | 4 | 5 | 9 | 2 | 5 | 2 | - | - |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| On demand | 6 | | - | - | 2 | | - | - | - | - | |
| On demand | | 6 | - | - | 2 | - | - | - | - | - | - |
| Five time | - | - | - | - | - | - | - | - | - | | |
| Four times | - | | - | 10 | - | 1 | 2 | - | 3 | 2 | |
| Thrice | | | - | - | - | | 4 | 4 | - | 2 | |
| Twice | | | - | | - | - | - | - | 2 | 2 | |
| Once | | | | - | - | - | - | - | - | - | |

| 6 | - | 10 | 2 | 1 | 6 | 4 | 3 | 3 | 5 | 4 | 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|

**Table 11: Frequency of feeding complementary foods to the babies**

**Urban**




**Rural**

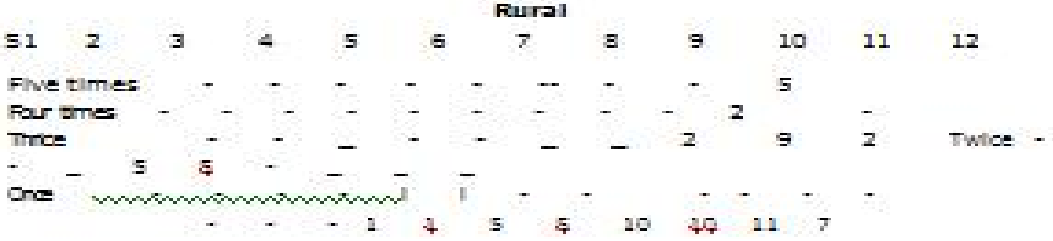



Table 12 Chemical Composition of the complementary foods

| Complimentary foods | Moisture % | Ash % | Fibre % | Fat % | Protein % | CHO Kcal | Energy ug/d | Vit C u/d | Ca u/ug | Fe u/ug | Pb u/ug | I u/ug |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Watery pap | 90.65 | 0,51 | 0.30 | 1.73 | 1.90 | | 92.56 | -0.01 | 3.640 | 2.247 | | 1,136 |
| Watery Pap with [illegible] | 90,25 | 0.53 | 0.30 | 3.87 | 10..85 | | 84.45 | -0.12 | 5,968 | 6.590 | | 2.620 |
| Watery Pap with Crayfish | 88.45 | 2,60 | 1.70 | 2.10 | 16.98 | | 76,62 | -0.15 | 4.588 | 5.880 | | 2.980 |
| Mashed yam with palm oil | 67.05 | 5.31 | 3.50 | 9.77 | 8.40 | | 73.02 | -0.105 | 6.424 | 8.920 | | 1.890 |
| Mashed Jollof rice & fish | 63.80 | 3.73 | 2,50 | 12.13 | 15.75 | | ' 65.89 | -0.34 | 6.392 | 7.640 | | 3..660 |
| Okoo soup with mashed fish | 75.00 | 8.40 | 5.60 | 60.50 | 18.38 | 7.12 | | -0.02 | 7.450 | 6.860 | | 3.88 |
| Gaco | 62.38 | 2.07 | 2,45 | 0.07 | 7.08 | 90.12 | | -0.01 | 3.610 | 5.212 | | 1,112 |
| Cassava (fufu) | 60,46 | 1.80 | 1,25 | 0.32 | 2.86 | 92.80 | | -0.03 | 3.728 | 5,614 | | 1,120 |
| Fruit (Banana) | 77,80 | 3.48 | 3,85 | 0.43 | 6.42 | 88.57 | '..v | 0.09 | 8.660 | 6,120 | | 1,24 |

Table 13:Desired Nutrient Densities/gm by WHO(1985)

| | 6-8 months | 9-12 months |
|---|---|---|
| Protein | 0.7 | 0.7 |
| VitA(µg/RE) | 5 | 9.0 |
| Ca (mg) | 125 | 78 |
| Fe (mg) | 0.8 | 0.5 |
| Riboflavin (mg) | 0.07 | 0.04 |
| Thiamin(mg) | 0.04 | 0.04 |
| Niacin(mg) | 1.1 | 0.9 |
| Energy (kcal) | 0.6 | 0.6 |
| VitC, (mg) | 2.5 | 3 |

Table 14: Calculated Nutrient Densities From Results of Analysis (per gram of food Consumed) Complimentary

| Food | Energy | Protein | Ca | Fe | Ph | VitA | Vit C |
|---|---|---|---|---|---|---|---|
| Watery" pap alone | 2.01 | 0.05 | 0.03 | 0.01 | 0.02 | 0.02 | 0.001 |
| Watery pap with soybean | 4.20 | 0.11 | 0.05 | 0.07 | 0.05 | 0.03 | -0.001 |
| Watery pap with crayfish | 3.93 | 0.16 | 0.05 | 0.06 | 0.04 | 0.06 | -0.002 |
| Mashed yam with palm oil | 4.14 | 0.08 | 0.06 | 0.09 | 0.06 | 0.19 | -0.002 |
| Mashed potato rice & fish | 4.36 | 0.16 | 0.06 | 0.08 | 0.04 | 0.18 | -0.003 |
| Okro soup with fish | 6.47 | 0.18 | 0.08 | 0.07 | 0.06 | 0.29 | -0.002 |
| Gbegiri | 5.83 | 0.07 | 0.04 | 0.05 | 0.03 | 0.16 | -0.001 |
| Cassava (fufu) | 5.91 | 0.03 | 0.04 | 0.06 | 0.03 | 0.14 | -0.003 |
| Fruit (Banana) | 3.67 | 0.06 | 0.09 | 0.06 | 0.04 | 0.09 | 0.009 |

Generally, there were differences in socio-economic status of urban and rural I mothers which affected their feeding practices.

## Discussion

Breastmilk is the best food for babies and it provides sufficient nutrients for growth, energy and prevention of diseases. However, as baby starts to crawl, walk and run, his food needs increases depending on the stomach capacity. Foods like cereals, vegetables, yams, meat and fruits would have to be included in their diets.

In addition, many infants have been breastfed for prolonged periods of time without introducing complementary foods and when they are introduced, it is probably of a low-energy density without considering the stomach capacities of the babies.

According to FAOMHO/UNU, (1985) the stomach capacities of the babies are as follows:-
3-6 months - 228g
6-12 months - 250g The FAO/WHO energy recommended allowances for breastmilk are as follows:
0-3 months - 695kcal
4-9 months - 730kcal
10-12 months - 836kcal $_t$ While the protein content of breastmilk is 1.15g/100ml.

During complementary feeding, breastmilk should be complemented with appropriate foods to provide additional energy, protein and specific nutrients (WHO/ FAO,1996).

The recommended dietary allowance of calorie and protein during imrodoctiaBaf complementary foods include;

***Source:*** **FAO/WHO/UNU 1985.**

From these calculations, it was discovered that most of these complementary foods analysed were not according to FAO/(WHO) recommendation. The energy density for the foods ranged from 6.5-2.0 kcal/gram. This is much higher than 0.8 -).6 kcal/gram recommended forcomplementary foods.
For watery pap alone, whose energy density is 2.0, protein 0.05, calcium 0.03, ion 0.01, phosphorus 0.02, vitamin A 0.02, vitamin C 0.001 per gram of food. For a child of 3-6months whose stomach capacity is 228g to meet his energy, protein and nutrients requirements per day will consume this food 3 times per day with breastmilk also.

For watery pap with soybeans, which is deficient in calcium, iron, vitamin A and vitamin C. To meet with the calcium requirement of 0.025gm, the child will consume this food 3 times per day, calcium rich foods should be consumed. For vitamin A and C, the food has to be consumed along with breastmilk 2 times daily.

For watery pap with cray fish, which is deficient in calcium, iron, vitamin A and vitamin C: with these deficiencies in nutrients, it will not be able to satisfy the nutrient requirements of a child per meal. Therefore, for a child of 3-6months to meet up with the recommended 0.35mg RE, of vitamin A, the food has to be consumed 2 2 times with breastmilk as well.

For mashed yam with palm oil, which is low in protein, calcium, vitamin A and C. For a child of 3-6months with stomach capacity of 228g would meet his vitamin C requirements of 0.025mg/g and other nutrients by consuming this food 3 times per day.

For the jollof rice, which is low in protein and other nutrients except for energy which is higher than the recommended, the food has to be consumed 3 times daily in little quantities to meet with the requirements.

For Okro soup cooked with fish, the food has to be consumed 2 times to meet with the desired nutrients, such as protein, calcium, iron, iodine etc.

Generally, the protein contents were of low quality because of the sources, for example soybean which is of plant source. But protein of pap with cray fish stock of fish used in cooking the rice and soup.

Based on these calculations, some legumes like African yam bean (Akidi), Bambara groundnut (Okpa) can be used to complement complementary foods to provide additional energy, protein and specific nutrients

## Conclusion

The study has provided information on the complementary feeding practices of Igbo mothers of Imo and Abia states of Nigeria. There were differencies between practices/foods given by urban and rural mothers. The number of times the foods were fed differed between the mothers. Pap with cray fish was adequate in quantity, quality and nutritional value. This also highlighted the factors that affect complementary feeding such as socio-economic and urbanisation, social cultural taboos, physiological etc. Breastfeeding was still prevalent among nursing mothers interviewed during the survey, even though the ceasation from breast milk and introduction of complementary foods were still a bit early for some mothers in urban areas. Some mothers used home prepared foods instead of commercial baby foods as first semi-solid foods. The nutritive values of these home prepared foods were mostly carbohydrates, for example, pap, mashed yam, jollof rice, except if they were supplement or complemented with other food nutrients. For instance, fortifying pap with cray fish or soybeans.

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