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PRODUCTION OF BABY FOOD FROM SOME LOCAL PRODUCTS AS AN ALTERNATIVE TO SOME IMPORTED BABY MEALS FOR RURAL AREAS AROUND KOSTI CITY

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Abstract: *The objectives of this study is to prepare baby food or meal from some local products (Wheat, Sesame, Date and milk) and use these locally prepared foods as a an alternative to some imported baby food or meals. These are Cereals, Cerelac and Ridielac, to make use of some available local products and use the cost of the imported baby meals in hard currency for others necessary imported items. Some chemical analysis were done to show the nutritive values of these local products, also sensory evaluation was done to show the acceptability of these meals by adults and children. The result of sensory evaluation done by adults, show that, there is a significant difference ($p \leq 0.05$) in color, smell, taste, texture and general acceptability for this local baby food as compared with these imported baby food or meals, but the majority of these panelist said that, the local meal is better than the three imported meals.16 out of 20 children accepted this meal and did not refuse it. On the other hand, feeding 20 children with this meal show no signs or symptoms of allergy, vomiting or diarrhea as the effect of this meal. The price of 100 gram of locally prepared meal is far less than the price of each 100 gram of the three imported meals individually.*

Keywords: *wheat, dates, sesame, milk, baby, local meal, cereals, cerelac redielac*

INTRODUCTION

Nutrition is a basic requirement. It contains a variety of nutrients including carbohydrates, proteins, fats, vitamins, and minerals. These nutrients are necessary for healthy growth, development, and maintenance throughout one's life. They're also crucial in supporting the demands of pregnant and breastfeeding women, as well as those recovering from disease. (Parvathi.P, 2004). Adequate nutrition during infancy and childhood is fundamental for the development of a child to its full potential. (Talabi, et al, 2021). A daily diet that includes at least four food categories has been linked to enhanced growth in young children, according to research. Introducing healthful and diverse foods to children at a young age aids in the development of taste preferences and good eating habits later in life. According to the WHO, malnutrition affects 2 out of every 5 children, resulting in 2.7 million child fatalities each year, accounting for 45 percent of all child mortality. The feeding of infants and young children is an important aspect of improving child survival and promoting healthy growth and development. (WHO, 2000).

Traditionally, many weaning cereals have included a significant quantity of additional carbohydrate, especially sugar. In order to obtain an appropriate consistency for feeding to a newborn, sucrose, Rusk's, and simple sugar or oligosaccharides must be added to flour and water. (FAO\WHO, 1973). Protein is a source of energy. Malnutrition is an issue in many underdeveloped nations, affecting children primarily. The problem could be caused by a lack of food or an infection that causes a loss of appetite. (David, 2008). Better social and thinking skills, better language ability, better math skills, higher levels of school preparation, and less reports of behavior problems are all linked to good quality early childhood care provided by parents and other caregivers. Children who are malnourished have a harder time battling illnesses. As a result, they may become ill more frequently, skip school more frequently, and fall behind in class. (Mathews, etal, 1999). Baby food is any soft, readily digestible food

that is created specifically for infants between the ages of four to six months and two years, and is not breast milk or infant formula. The meal comes in a variety of flavors and kinds; it could be mashed or otherwise broken down table food that the rest of the family is eating, or it could be purchased ready-made from the market. (Misra, S. and Dwivedi, P., 2015). Baby foods are any soft, easily consumed food, other than breast milk or infant formula, that is made specifically for infants, roughly between the ages of four to six months and five years, and intended for use by infants while they are being weaned, and by young children as a supplement to their diet or for their progressive adaptation to ordinary food, or any soft, easily consumed food, other than breast milk or infant formula, that is made specifically for infants, roughly between the ages of four to six months and five years. The meal comes in a variety of flavors and kinds; it can be mashed or otherwise broken down table food that the rest of the family is eating, or it can be purchased ready-made from producers. They can be either ready-to-eat or dry, requiring only water to rehydrate. Products covered by the Codex Standard for Infant Formula and the Codex Standard for Processed Cereal-Based Foods for Infants and Children are not included. Heat is used to process ready-to-eat baby foods before or after they are sealed in their containers and physical techniques are used to prepare dry baby foods. Baby meals can be made from any nutritional element that is regularly used, recognized, or sold as a food item, including spices. (FAO/WHO, 1981). Children in rural areas rely primarily on Brest milk and local foods. When compared to imported infant food, local food is less expensive. Preparing infant food using locally available ingredients such as wheat, sesame, dates, and other additives can meet and satisfy the following requirements. Reduce the cost of imported infant food by using locally produced food instead of imported food, freeing up hard currency for other purposes. Rural places and towns without storage or transportation can benefit from the local baby meals. (i.e. no electricity and bad transportation roads) and this will reduce the cost of transportation; As it prepared in dry form it can be storage and preserved with no deterioration or spoilage; Provide a good food security; To lengthen product storage period for use in scarcity time. Therefore the objectives of this study whereas fallowed; production of baby food from some local products; compare this local meal or food with some imported meal in term of nutrient value and cost; sensory evaluation also will be done to show the degree of acceptance to these baby produced meal or food.

METHODS

This study was carried out at Kosti City, White Nile State, Sudan; for preparing children's meals from local products to feed children in rural areas around Kosti city. The materials used for preparing baby meal were sesame, wheat, dates and milk. These were used as the main components of the meal. These local materials were bought from Kosti local Market.

The imported baby meals are cereals (vita meal imported from Morocco produced by: AGRO-FOOD INDUSYRIE, the imported meal was used for comparison (plate 3.1)), Cerelac (The Cerelac meal was imported from France produced by: NESTLE COMPANY. This meal was used for another comparison between locally prepared baby meals), and Ridielac (Imported from Minh city. Vietnams. Produced by**:** VIETNAM DAIRY PRODCTS J.S. COMPANY. This meal was also used for comparison between locally prepared baby meals). These three imported meals were bought from Al-Hayat Pharmacy, Kosti, Sudan. These meals were used for comparison between the local baby meal and imported baby meals.

The equipments are Sensitive Balance (A digital sensitive balance of model Citizen with capacity of 620 g and accuracy of $\pm$0.01g, made in Japan was used to determine the weight of local product), pan (The pan was used as a tool for roasting local product (sesame)), Aluminum foil: aluminum foil was used to protect local product and prepared meal from the surrounding environment i.e. not to gain or to loss moisture and also to be protected from contamination with any foreign materials or

microorganisms), Miller (An electrical machine was used to mill the grain and seeds of local products (wheat, sesame and dates) and prepare these in powder form), and Crucibles (used as a container in a Muffle furnace for ash content determination).

The methods used are:

1) Proximate Analysis of Local Products: Wheat, sesame and dates and milk were chemically analysis using proximate analysis method described by AOAC (1984); to determine the chemical composition of each product .The purposes of these chemical analysis is to know their nutritive value with respect to others imported baby meal (cereals, Cerelac and Ridielac) and this will help in choosing the suitable percentage of locally prepared meal. It was done as follows:

2.4.1.1 Nitrogen and Crude Protein Determination

The nitrogen content for each local product (wheat, sesame, dates and milk) was determined according to kjeldahl method, which is described by AOAC (1984). The nitrogen content was multiplied by a factor of 6.25 to obtain the percentage of crude protein using the following equation:

Crude protein (%) = $\frac{T \times N \times 14.0 \times 100}{W \times 1000} \times 6.25 \ldots\ldots\ldots\ldots\ldots\ldots.\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$

Where

T = titration number of HCL

N = normality of HCL (0.02N)

14 = mass of nitrogen molecular, g

1000= number of milligrams in one gram.

2.4.1.2 Crude Oil Determination:

Crude oil (CO) was estimated according to the official method described by AOAC (1984) using a soxhelt device. The crude oil was calculated as percentage by the following equation :

CO% = $\frac{\mathrm{W2}-\mathrm{W1}}{S} \times 100 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots. (2)$

Where :

W1 = Weight of empty crucible, g

W2 = Weight of crucible +oil, g

S = Weight of sample, g

2.4.1.3 Determination of Moisture Content

The moisture content for each local product (wheat, sesame and date) was determined according to the method described by AOAC (1984).

The moisture content of the samples was calculated using the following equations:

$$MC(w.b.) = \frac{W_w}{W_w + W_d} \times 100 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

$$MC(d.b.) = \frac{W_w}{W_d} \times 100 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Where:

MC (w.b.) =product moisture content on wet basis, percent

MC (d.b.) = product moisture content on dry basis, percent

W_w = mass of water, g

W_d = mass of dry matter, g

2.4.1.4 Crude Fiber Determination:

Duplicated for each local product (wheat, sesame and date) were digested in 200 ml boiling $H_2SO_4$for 30 minutes, then filtered using a screen filter to obtain a residue, which was washed with hot distilled water to remove any trace of the acid. A second alkaline digestion for the residue was

done using 200 ml boiling 0.344 NaOH for 30 minutes and then a similar filtering was done as mentioned earlier. The residue was washed with hot distilled water and then dried at 105°c in an oven for overnight and weighed. The dried residue was burnt in Muffle Furnace at 550°c for 2 hours and then re-weighed after cooling in desiccators. The crude fiber was calculated using the following equation: -

$$CF\% = \frac{W1-W2}{S} \quad \text{..... (5)}$$

Where:

CF%: crude fiber, percent (%)

W_1= mass of sample after drying and before being ignited in a muffle furnace, g

W_2= mass of sample after being ignited by Muffle Furnace, g

S= mass of the sample, g.

2.4.1.5 Total Ash

Total Ash for each local product (wheat, sesame and date) was estimated according to the official method described by AOAC (1984). The ash content was calculated using the following formula: -

$$\text{Total ash } \% = \frac{W_2}{W_1} \times 100 \quad \text{..... (6)}$$

Where

W_1= original mass of sample, g

W_2= mass of sample after igniting, g

2.4.1.6 Carbohydrate Contents Determination:

Total carbohydrates for each local product (wheat, sesame and date) were estimated from the following equation:

Carbohydrates (%) =100 – [MC%+ Protein%+Ash%+ Oil%+ CF%]..... (7)

2.5 Sensory Evaluation of Local and Imported Baby Meals

To insure the acceptability of these meals for children. Children can't differentiate between these meals so we use adults' people to govern these meals. When these meals were approved by adults consequently it will be accepted by children.

Simple Paired Comparison Test:

Organoleptic characters of locally prepared baby food and imported baby meals such as, taste, smell, color, texture and general acceptability were tasted. Two types of dishes were prepared for local one and imported one. The preparation of each one was done as described below using Simple Paired Comparison Test as described by Ihekoronye and (Ngoddy, 1985)

a) Preparation of local baby food from some local products (wheat, sesame dates):

i) Sesame preparation:

The sesame was carefully cleaned and roasted by pan after it was put over the fire so as to improve taste and flavor and also to give a good color for meal. Then the sesame was milled by using miller (machine) till it became powder the objective of milling is to facilitate the release of nutrients contained in these seeds.

(**ii**) **Dates Preparation**:

The dates were carefully cleaned, the internal seeds were removed, and then the dates were milled by using miller.

(iii) Wheat Preparation:

Wheat were carefully cleaned and milled by an electrical machine (miller).

Each component from local product (wheat, sesame and date) kept in package (Aluminum foil) so as to isolate it from outside surrounding environment (i.e. not gain or give moisture to the surrounding environment) till the time of use for preparation.

(iv) Preparation of Local Baby Meal from Local Products:

The percentage of each local component was as fallowed:

40%wheat ,30% milk , 20% date ,10 %sesame From these percentages above, we chose these figures because these percentages were found to give high nutritive value in protein ,fat carbohydrates and these elements were very useful for child growth and development also these percentages were found to give good color and taste acceptable for children. These components were prepared in dry form and kept to the time of use except milk which is added as a liquid form after it was carefully boiled at 100 c to the time of use (i.e. when we need to give the meal to the children).

(v) Preparation of the imported baby meal

This will be done by adding water (pure water) to these dried imported meals. These meals are Cereals, Cerelac and Ridielac.

The meals from each sample (local meal coded A) and imported meal of Cereals coded B_1, and imported meal of Cerelac coded B_2, and imported meal of Ridielac coded B_3.

A panel of 20 persons tastes the coded meal A and B_1.

Others 20 persons taste the coded meal A and B_2.

And third 20 persons were taste coded meal A and B_3.

These three sensory evaluations (A and B_1, A and B_2, A and B_3) for conducting the simple paired comparison test (Ihekoronye and Ngoddy, 1985).

3.4 Estimation of the Economic Cost:

To show each economic cost of these locally prepared baby food from wheat, sesame date and milk and the cost for each imported three meals. Cost estimation was done by calculating the cost of 100 gram from locally prepared baby meal and cost of 100 gram of each imported baby meal (Cereals, Cerelac and Ridielac) to compare the two costs in order to see what type of two meal cost less than other. This will be estimated as fallowed

(i) From each imported meal determine the total cost and the weight of each package, and then determine the cost of 100 gram for each one.

ii) Calculate the total cost for each percentage of the components (wheat, dates, sesame and milk) plus any other cost of the local meal, from the total cost calculate the cost of 100 gram.

(iii) Compare the cost of each 100 gram of the individual imported meal with the total cost of 100 gram of locally prepared meal to show what type of these two meals cost more than the other and then calculate these differences.

RESULTS AND DISCUSSION

Table (1). The Chemical Composition of Some Local Products as the Percentage Per 100 Gram of Product

Composition (%)	Wheat	Dates	Sesame	Milk
Protein	13.70	5.25	21	3.55
Fat	2.99	0.55	53.06	4.25
Moisture	11	33.05	6.91	86.24
Ash	1.78	9.47	4.75	1.15
Fiber	10.95	1.99	10.52	-
Carbohydrates	59.58	49.69	4.76	4.81

As shown from Table (1) the amount of carbohydrate was found to be 59.58, 49.69, 4.76 and 4.81 for wheat, dates, sesame and milk respectively .It is clear that there is a large amount of carbohydrate in wheat and dates, so this can be good source of energy for the prepared baby meal,

and as we know that energy is very important for this period (child hood). On the other hand as shown from the table above sesame has a large amount of protein and fat (21 and 53.06 respectively) and also wheat have a large amount of protein (13.70) as we know that protein is very important for growth and development for children .Liquid milk contain a large amount of water (86.24%) which is essential for baby hydration, For all these justifications above we use these local products for preparing baby meal, In addition, these products were available i.e. no problem of production in white Nile State and others states of the Sudan . These results were in a good agreement with (Karthiga, etal, 20 04) in their study of Nutrition and Dietetics, they said that, carbohydrates and fats are called energy yielding foods. They provide energy to sustain the involuntary processes essential for continuance of life. The presence of protein in food is very important for children and called body building foods.

Table (2). Comparison Between some Imported Baby Meals and Locally Prepared Baby Meal for Chemical Composition per 100 grams of each

Baby meals	Protein%	Fats%	Fibers%	Carbohydrate%
Imported Cerelac	15.5	10.0	2.2	67.3
Imported Cereals	11.9	1.9	1.8	75
Imported Ridielac	15	9	1.3	69.6
Locally prepared baby meals	12.02	9.67	2.16	33.41

From the results above in Table (2) the amount of protein is higher in two types of the imported meals and lower in the third one compared to the locally prepared food. Fats are higher in the locally prepared baby meals (9.67%) and as we know fats is high source of energy. Carbohydrate in locally prepared baby meal was found to be less as compared to the imported meals. This is due to the increase of the amount of protein and fat which is very important for child growth. The amount of fat can be added to amount of carbohydrates, fat and carbohydrate are main source of energy and activity to the child.

Table (3). Response of 20 Panelists for Tasting the Quality Parameter of Baby Meal Prepared from Local Product (A) and Imported Meal (B_1)

Quality parameters	"yes" there is a difference		"no" there is no difference
	A is better	B_1 is better	
Color	14	6	-
Smell	13	7	-
Taste	16	4	-
Texture	13	5	2
General acceptability	16	4	-

Table (3) shows the response of 20 panelists (judges) for the difference in quality in term of color, smell, taste, texture and general acceptability for locally prepared baby meal (A) and imported baby meal (Cereals) B_1. From the results it clear that 20 judges commented that there were a significant differences ($p \leq 0.05$) in color, smell, taste, general acceptability between (A) locally prepared meal and (B_1) imported baby meal, because for all characters above 15 panelist said yes there is a significant differences between A (locally baby food) and B_1 (Cereals) imported baby meal as a simple paired comparison test method described by (Ihekoronye and Ngoddy, 1985). Although there is a significant differences but the majority is said A is better this means the A is better than B_1.

Table (4). Response of 20 Panelists for Tasting the Quality Parameter of Baby Meal Prepared from Local Product (A) and Imported Meal (B_2)

Quality parameters	"yes" there is a difference		"no" there is no difference
	A is better	B_2 is better	
Color	13	7	-
Smell	14	6	-
Taste	15	5	-
Texture	10	7	3
General acceptability	14	5	1

Table (4) shows the response of 20 panelists (judges) for the difference in quality in term of color, smell, taste, texture and general acceptability for locally prepared baby meal (A) and imported baby meal (Cerelac) B_2. From the results it clear that 20 judges commented that there was a significant difference ($p \leq 0.05$) in color, smell, taste, texture, general acceptability between (A) locally prepared meal and(B_2) imported baby meal, because for all characters above 15 panelist said yes there is a significant difference between A(locally baby food)and B_2(Cerelac)imported baby meal dealing with simple paired comparison test method described by (Ihekoronye and Ngoddy, 1985). However, the majority is said A is better this means the A is better than B_2.

Table (5). Response of 20 Panelists for Tasting the Quality Parameter of Baby Meal Prepared from Local Product (A) and Imported Meal (B_3)

Quality parameters	"yes" there is a difference		"no" there is no difference
	A is better	B_3 is better	
Color	13	7	-
Smell	14	6	-
Taste	15	5	-
Texture	12	6	2
General acceptability	14	6	-

Table (5) shows the response of 20 panelists (judges) for the difference in quality in term of color, smell, taste, texture and general acceptability for locally prepared baby meal (A) and imported baby meal (Ridielac) B_3 From the results it clear that 20 judges commented that there was a significant difference ($p \leq 0.05$) in color, smell, taste , texture ,general acceptability between (A) locally prepared meal and(B_3) imported meal, because for all characters above 15 panelist said yes there a significant difference between A(locally baby food)and B_3 (Ridielac) imported baby meal according to simple paired comparison test described by (Ihekoronye and Ngoddy ,1985). However, the majority is said A is better this means the A is better than B_3.

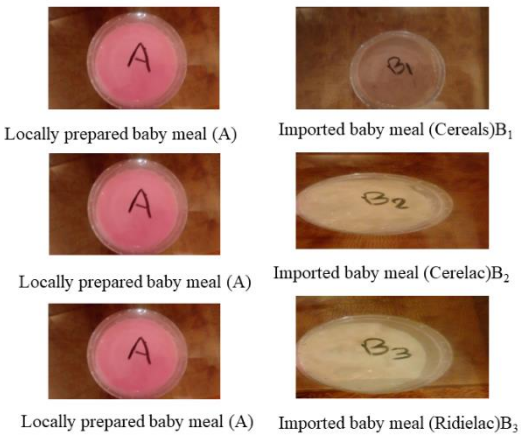

Plate 4. the Variation in Color for Locally Prepared Baby Meal and other Three Imported Baby Meals

From the picture in plate (1) above it is clear that the color of locally prepared baby meal is attractive color and interesting for children to prefer and a accepted this locally prepared baby meals.

Table (6). The Response of 20 Children from Different Ages between (6month – 5 years) of Locally Prepared Baby Meal

Age Group of Children	Child No.	General Acceptability		Symptoms, Side Effect or Impression				
		Acceptable	***Unacceptable***	***Allergy***	***Vomiting***	***Diarrhea***	***Face impression***	***Others***
6 months -1 year	1	Yes		No	No	No	Good	No
	2	Yes		No	No	No	Good	No
	3	Yes		No	No	No	Good	No
	4	Yes		No	No	No	Good	No
	5		Yes	No	No	No	Bad	No
2- 3 years	6	Yes		No	No	No	Good	No
	7		Yes	No	No	No	Bad	No
	8	Yes		No	No	No	Good	No
	9	Yes		No	No	No	Good	No
	10		Yes	No	No	No	Bad	No
3 -4 years	11	Yes		No	No	No	Good	No
	12	Yes		No	No	No	Good	No
	13	Yes		No	No	No	Good	No
	14	Yes		No	No	No	Good	No
	15		Yes	No	No	No	Bad	No
4 -5 years	16	Yes		No	No	No	Good	No
	17	Yes		No	No	No	Good	No
	18	Yes		No	No	No	Good	No
	19	Yes		No	No	No	Good	No
	20	Yes		No	No	No	Good	No

Table (6) shows the response of 20 children for locally prepared meal. These children were chosen randomly and divided into five groups. From the result above it clear that the majority of children accepted these meal because 16 out of 20 children accepted these meals and not refuse it. On the others hand feeding the 20 child with this locally prepared meal show no any symptom of

allergy ,vomiting ,diarrhea as the effect of this meal. The majority of children show their good impression when ate these meals , also no any others side effect will observed among those children, so that this meal will be accepted and suitable for children nutrition and can be used as a supplementary or alternative to the some imported baby meals.

Table (7). The Total Cost and Price of 100 gram for each Locally Prepared Food and other Three Imported Baby Meal in Sudanese Pounds

Meal	Price
Imported Cereals	42.5
Imported Cerelac	56.25
Imported Ridielac	50
Locally prepared baby meal	10.10

As shown in Table (7) above its very clear the price of all the imported three meals is higher than the price of locally prepared baby meal. The amount of hard currency used for importing baby meals can be used for some others imported necessary items.

CONCLUSION

Local baby food or meals were prepared from some local products, wheat, dates, sesame and liquid milk and compared with some imported baby foods or meals .the results show that, the locally prepared foods is better in their nutritive value and cost than the imported baby meals or foods.

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