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# Formulation of Satisfactory Meal for Sudanese Children (3-5 years) in Wad Medani Greater Locality, Gezira State, Sudan

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**BACKGROUND:** A knowledge of chemical composition of food is the first essential in the quantitative study of human nutrition and in the dietary treatment of disease. One of the reasons for studying nutrition is to learn how to select meal that will enable to achieve and maintain good health.

**OBJECTIVE:** The objective of this study was to conduct approximate analysis for some types of food so as to formulate adequate meals for Sudanese children.

**MATERIALS AND METHOD:** A total of 300 children 3-5 years of age from Wad Medani locality, Gezira State, Sudan, were surveyed. The study was conducted during period from July 2014 to February 2015. Dietary data and eating habits of children were obtained by interviewing mothers about their children's diet using pre-tested questionnaires. Analysis of the main food was carried out according to the protocols of AACC (1980) and AOAC (1975, 1984).

**RESULTS:** The results showed that, all samples of food are relatively high in carbohydrate and low in protein and fat content. Bearing in mind that all these types of stuff do not give a balanced diet therefore, two adequate meals were suggested.

**CONCLUSION:** It is important to add more ingredients to some of our traditional foods, to improve the nutritional values.

**KEYWORDS:** Children, Food Samples, Approximate Analysis, Optimal Meals

## INTRODUCTION

Nutrition is described as the sum of the process by which a living organism receives materials from its environment and uses them to promote its own vital activity such material are known nutrients. Essential nutrients are nutrients which necessary for the life and can't be synthesized by the body, therefore, it must be included in the diet.<sup>1</sup> Good nutrition during childhood continue to be the corner stone for survival, health and appropriate development.<sup>2</sup>

A balanced diet consists of carbohydrates, fats, proteins, vitamins, mineral and water. Adequate nutrition is essential during childhood to ensure healthy growth, proper organ formation and function, a strong immune system, and neurological and cognitive development.<sup>3</sup> Optimal nutritional status is achieved, by consuming adequate nutrients.<sup>4</sup> Lack of food as well as poor health and sanitation, inappropriate care and feeding practices are major causes of poor nutritional status.<sup>5</sup>

The Food composition data (FCD) are sets of information on the nutritionally important components of foods and provided values for energy and nutrients including carbohydrates, protein, fat, vitamin, mineral and other important food component

such as fiber.<sup>6</sup> FCD are important in many fields including practice, research nutrition policy and education and the food manufacturing industry also is used in variety of ways including national programs for assessment of diet and nutritional status.<sup>7</sup>

## MATERIALS AND METHOD

In this study a sample of 300 preschool children was involved from Wad Medani locality, Gezira State, during the period from July 2014 to February 2015. Dietary data and eating habits of children were obtained by interviewing mothers about their children's diet using pre-tested questionnaires. Analysis of the main food was carried out according to the protocols of AACC<sup>8</sup> and AOAC.<sup>9</sup> All samples were prepared for analysis. The Sudanese national sauce known as Mullah Sharmout, prepared from minced beef meat, onions, tomatoes sauce, Waika powder (from dry okra). Traditional stiff porridge, (Aceda) is prepared from fermented sorghum and cooked roub prepared from fermented milk, onion, wheat flour. Aceda, mullah sharmout and cooked roub (the most often food consumed by children) were analyzed for the contents of protein, fat, fiber, ash, moisture, and carbohydrates. The sample size of 300 children was calculated according to the method described by Boehlert M.<sup>10</sup>



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## RESULTS AND DISCUSSION

The result reported in table 1 show the chemical composition of Stuff porridge, aceda, cooked roub, and mullah sharmout.

The moisture content of stiff porridge (aceda) is 76.2% this value is close to value of moisture content of aceda 78.6% reported by Boutros JZ.<sup>11</sup> The softest aceda is that made by city people and has moisture content of about 80% the harder types of aceda are to be found in rural areas in western Sudan. This types of aceda probably have moisture content of about 65% - 70%.<sup>12</sup> The protein content value 1.3% is generally lower than 2.4% which was verified by Boutros JZ.<sup>11</sup> The fat content is 0.7% is close to the value of 0.2% reported by Boutros. J.Z (11). Aceda contain values of 1.1 % and 0.1% of ash and fiber respectively while Boutros JZ<sup>11</sup> stated that aceda contain 0.5% and 0.8% for ash and fiber content respectively. The carbohydrate content is about 20.6% which is generally higher than value of carbohydrate 17.7 % which was reported by Boutros JZ.<sup>11</sup>

The proximate chemical composition of the cooked roub is shown in table 1. The moisture content of cooked roub was found to be 78.8% which was less than that stated by Mohammed F<sup>13</sup> who reported 89.5% and also, less than that reported by Sulieman AE<sup>14</sup> who stated 91.40% for fresh roub. The ash content of cooked roub was found to be 0.8%, and this value was higher compared with ash content of cooked roub 0.1% as was determined by Mohammed F.<sup>13</sup> The fiber content of cooked roub was found to be (4.34%), which was greater than (0.82%) ash value specified by the Sulieman AE<sup>14</sup> for fresh roub and greater than (0.7%) stated by Suliman SM<sup>15</sup> for ash content of tradition zabadi prepared at home. The cooked roub was found to contain 3.7% protein, which was close to 4.2% reported by Mohammed F<sup>13</sup> for cooked roub. Fat content of the cooked roub was found to be 3.7% which is relatively more than 3.1% according to Suliman SM.<sup>15</sup> for tradition zabadi made in home.

Table 1 shows the chemical composition of mullah sharmout. The moisture content of mullah sharmout is 80.5% this value is similar to value of moisture content of mullah sharmout 80% mentioned by Mohammed F.<sup>13</sup> The protein content value is 4.5% these value greater than 1.6% value of protein content of mullah sharmout that was mentioned by Mohammed F.<sup>13</sup> The fat content is 4.3% is close to value of fat content of mullah sharmout 4.50% mentioned by

Mohammed F.<sup>13</sup> Mullah sharmout contain 1.5% fiber and 2.1% ash these values generally close to that stated by Mohammed F<sup>13</sup> for fiber and ash 1.4%, 1.52% respectively. The carbohydrate content is about 7.10% which is generally less than value of carbohydrate 10.8 % that indicated by Mohammed F.<sup>13</sup>

From table 2, a gram of stiff porridge (Aceda) give 0.939 calorie, one serve of aceda (220 grams) give 206.58 calories.

From table 3, a gram of cooked roub, give 0.831 calorie, one serve of cooked roub (160 grams) give 132.96 calories. A meal consist of stiff porridge (aceda) with cooked roub give a total energy of 339.54 calories.

From table 4, a total energy from stiff porridge (aceda) with mullah sharmout is calculated as: a gram of mullah sharmout give 0.86 calorie, one serve of mullah sharmout (160 grams) give 137.6 k. calories. A meal consist of stiff porridge( aceda) with mullah Sharmout give a total energy equal to 344.18 calories.

**Suggested Adequate Meal (SAM):** The meals vary according to the nutrients that constitute them. All various kinds of meals contain a certain sort of nourishing materials. An adequate meal must contain all types of nutrients such as carbohydrates, proteins, fats, vitamins and minerals.

Two satisfactory meals have been prepared for children. The first meal consist of:

1. 220 grams of sorghum stiff porridge (aceda) and 160 grams of sauce (mullah) sharmout.
2. 30 gram- on cup- of vegetables salad, contain tomato, cucumber, carrot and green pepper.
3. Medium sized fruit of orange, apple, guava, (12-15) pieces of grapes, (4-6) pieces of strawberries. Or one small cup of fruit juice
4. 200 ml of milk-small cup- or 150 gram of yoghurt.

**Note:** Dates, Nabag fruit- ziziphus Spinacristi and laloup fruit- Balanites Aegyptioca can substitute the above mention fruits also roub can substitute yoghurt.

This meal can supply the concerned children of (3-5) year of age with total energy required also provide children with 18.6 grams of protein, as a requirement for children at this age. Another option as the substitute of aceda sharmout as an adequate meal is roub aceda. This second option stemmed out from the fact the amino acid that found in beef protein is quite different

SAMPLE	PROTEIN %	FAT%	FIBER %	ASH %	MOISTURE %	CARBOHYDRATE %
Stiff porridge (Aceda)	1.3	0.7	0.1	1.1	76.2	20.6
Cooked roub	3.7	3.7	4.3	0.8	78.8	8.7
Mullah Sharmout	4.5	4.3	1.5	2.1	80.5	7.1

**Table 1.** Chemical Composition of Some Sudanese Food

CONSTITUENTS	QUANTITY (GRAM)	PHYSIOLOGICAL FUEL VALUE (CALORIE/GRAM)	CALORIE/ GRAMS
Carbohydrate	0.206	4	$4 \times 0.206 = 0.824$
Protein	0.013	4	$4 \times 0.013 = 0.052$
F at	0.007	9	$9 \times 0.007 = 0.063$
Total energy			0.939

**Table 2.** Physiological Fuel Values of Aceda  
(220 gram stiff porridge(Aceda) gives  $220 \times 0.939 = 206.58$  calories)

CONSTITUENTS	QUANTITY IN (GRAM)	PHYSIOLOGICAL FUEL VALUE (CALORIE/GRAM)	CALORIE/ GRAMS
Carbohydrates	0.087	4	$0.087 \times 4 = 0.35$
Protein	0.037	4	$0.037 \times 4 = 0.148$
Fat	0.037	9	$0.037 \times 9 = 0.333$
Total			0.831

**Table 3.** Physiological Fuel Values of Cooked Roub  
(160 grams cooked roub gives  $160 \times 0.831 = 132.96$  calories)

CONSTITUENTS	QUANTITY IN (GRAM)	PHYSIOLOGICAL FUEL VALUE (CALORIE/GRAM)	CALORIE/ GRAMS
Carbohydrates	0.071	4	$0.071 \times 4 = 0.284$
Fat	0.043	4	$0.043 \times 4 = 0.172$
Protein	0.045	9	$0.045 \times 9 = 0.404$
Total			0.86

**Table 4.** Physiological Fuel Values of Mullah Sharmout  
(160 grams mullah sharmout gives  $160 \times 0.86 = 137.6$  calories)

than that found in roub bearing in mind that, the protein quality of roub has high score than beef protein (1 to .97). The constituents of the second adequate ideal meal are:

1. 220 grams of sorghum stiff porridge (aceda) and 160 grams of cooked roub.
2. 30 gram- on cup- of vegetables salad, contain tomato, cucumber, carrot and green pepper.
3. Medium sized fruit of orange, apple, guava, (12-15) pieces of grapes, (4-6) pieces of strawberries. Or one small cups of fruit juice
4. Big sized whole egg or 10 grams of meat.

**Note:** Dates, Nabag fruit-ziziphus Spinacristi and laloup fruit- Balanites Aegyptioca can substitute above mention fruits; also roub can substitute yoghurt.

This meal provides children with total energy required for children at this age group and 16.796 gram of protein which is a minimum amount requirement for children at this age group. The two meals can supply the concerned children with total energy required depend to different choices, also provide children with amount of protein required, derived mainly from mullah sharmout and milk or yoghurt or roub, egg and meat. Moreover such meals supplies children with vitamins and minerals required derived mainly from vegetables and fruits such as vitamin A, vitamin B, vitamin B<sub>2</sub>, vitamin B<sub>3</sub>, B<sub>12</sub> vitamin C, folic acid also, potassium, calcium, iron, magnesium and Phosphorous.

## CONCLUSION

All samples of food are relatively high with regard to carbohydrate and low in protein and in fat. Bearing in mind that all this stuff do not give a balanced diet therefor, it is important to add more ingredients to some of our traditional foods, to improve their nutritional values.

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**Source of support:** Nil, **Conflict of interest:** None declared

**Cite this article as:**

Abdelrahman SE, Ali AO, Babikir HE, Abdoun GT, Elkabashi AET. Formulation of Satisfactory Meal for Sudanese Children (3-5 years) in Wad Medani Greater Locality, Gezira State, Sudan. *Int Healthc Res J.* 2019;3(7):235-239. <https://doi.org/10.26440/IHRJ/03067.10288>

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