



Determination of Macronutrient Contents in Foods of Children Aged 6 to 24 Months with Moderate Acute Malnutrition (MAM) in Mayahi Department in Niger

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ABSTRACT

Malnutrition is a pathological condition resulting from the relative or absolute deficiency or excess of one or more essential nutrients. According to FAO, it is characterized by insufficient or excessive intake of protein, energy and micronutrients. In order to contribute against malnutrition fight, we decide to determine the macronutrient contents in foods of children aged 6 to 24 months with moderate acute malnutrition (MAM) in Mayahi department in Niger. 20 different types of meals were collected from households and analysed according to AOC method (1990), French standard V03-050, 1970 and international standard "ISO-659, 1998. Our objective was to characterize the foods of children with MAM in the department of Mayahi. The results indicate that the rice couscous with cowpea and rice with bean meals are higher in protein. Millet and flour fritters are the foods highest in fat while porridge has a high carbohydrate content. This work prompts a more in-depth study leading to the development of the food composition table specific to Niger.

Keywords: Malnutrition, Macronutrient, Mayahi, Niger

Introduction

Malnutrition is a pathological condition resulting from the relative or absolute deficiency or excess of one or more essential nutrients. According to FAO (2006), it is characterized by insufficient or excessive intake of protein, energy and micronutrients.

According to the World Health Organization (WHO), undernutrition is characterized by a loss of lean mass and often fat mass, especially in children and adults. Depending on the origin, there are three (03) types of deficiencies: deficiencies of intake, deficiencies of absorption and deficiencies by increased needs (WHO, 2009). Intake deficiencies are observed when the diet is insufficient or unbalanced. It does not provide the necessary amount of nutrients because of poor food availability, anorexia (loss of appetite) or other disorders that prevent food ingestion. In Niger, although malnutrition already reaches significant levels from the age of 6 to 24 months, to our knowledge no study has looked specifically at the analysis of their food in the region of Mardi which presents a rate of Global acute malnutrition above the national rate (SMART, 2014).

Material and methods

1.1. Material

The material used for the study consisted of ready-made meals, intended for consumption by children attending health care centers in the department of Mayahi. A technical sheet is used to identify the samples. It includes information on the date, time, place of collection, and the nature of the sample.

1.2. Methods

1.2.1. Study site

The study was carried out at the level of the two (2) health care center out of the five of the department of Mayahi in the region of Maradi. In fact, the 24-hours recall study carried out in the 5 health care center in 2016 revealed that children have identical eating habits and consume the same types of food.

1.2.2. Sampling

Twenty (20) women were randomly selected from these two health care center and food collected at their homes. With the support of community intermediaries, 20 different types of meals were collected from households, put in sterile food bags, placed in a cooler containing ice and sent to the Laboratory in Niamey for analysis. Table 1 provides information on the number and type of meals, and raw materials.

Table 1 : Different types of meals analyzed

Number	Local Meal Name	Traducted Name	Raw materials and ingredients
1	Awara	Bean cake	Bean
2	Galette de Mil	Millet Cake	Millet
3	Beignet de Farine	Flour Donut	Wheat
4	Beignet du Mil	Millet Donut	Millet
5	Beignet de Niébé	Bean Donut	Bean
6	Riz et Haricot	Rice et Bean	Rice et Bean
7	Couscous du riz et Moringa	Rice couscous and Moringa	Rice et Moringa
8	Spaghetti	Spaghetti	Wheat
9	Boulette de Niébé	Cowpea dumpling	Bean
10	Couscous du riz et Niébé	Rice couscous and Bean	Rice et Bean
11	Pate du riz et sauce Baobab	Rice paste with Baobab sauce	Rice
12	Riz simple et Sauce Baobab	Rice pate with Baobab sauce	Rice
13	Couscous du mil	Millet Couscous	Millet
14	Pate Sorgho et sauce Baobab	Sorghum paste with Baobab sauce	Sorghum
15	Pate de sorgho et sauce Gombo	Sorghum paste with Okra sauce	Sorghum
16	Grand beignet de Farine	Large Flour Donut	Wheat
17	Bouillie de Mil « lisse »	Millet porridge "smooth"	Millet
18	Bouillie de Mil	Millet porridge	Millet
19	Boule du Mil	Millet ball	Millet
20	Boule du Mil avec lait	Millet ball white milk	Millet

1.2.3. Study period

The study ran from September 01st to November 30th, 2018.

1.2.4. Analysis methods

For each sample, humidity and dry matter, contents of protein, lipids and total carbohydrate have been determined. The humidity level is determined according to the official AOC method (1990), the protein content of the samples was determined according to the French standard V03-050, 1970, the

fat content of the samples was determined by Soxhlet extraction according to the international standard “ISO-659, 1998 and the total carbohydrate content in relation to the dry matter is determined by the differential method.

1.2.5. Data processing and analysis

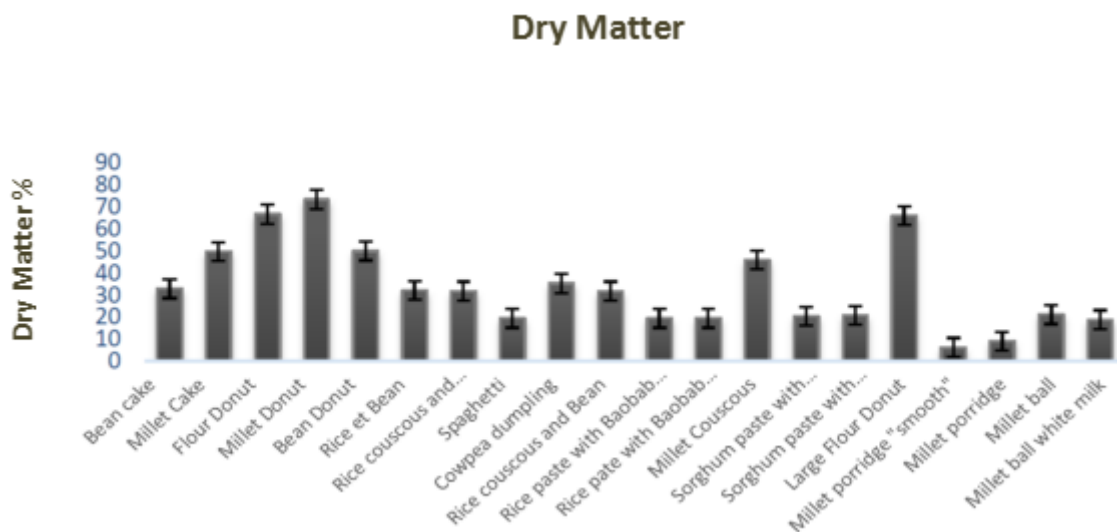
The data collected are processed by SPSS Version 20 software and analyzed using a one-way analysis of variance (ANOVA) at the significance level set at $p = 0.05$. The means of each of the results of the nutritional composition analyzes are obtained from three replicates.

2. Results and discussion

Results

Figures 1 to 5 give us the dry matter (DM), protein, fat, carbohydrate contents expressed in percentage (%).

Dry matter content



The result of the dry matter content of the meals is shown in the following figure 1 :

Figure 1 : Dry Matter content of different foods.

Meals cooked in donut form such as millet donut, flour donut, cowpea donut have the highest dry matter content with 73.26%, 66.64%, 66.01% respectively. The porridge contains 9% of dry matter for the smooth millet porridge and 9% for the millet porridge.

Protein content

The protein contents of foods are shown in the figure below.

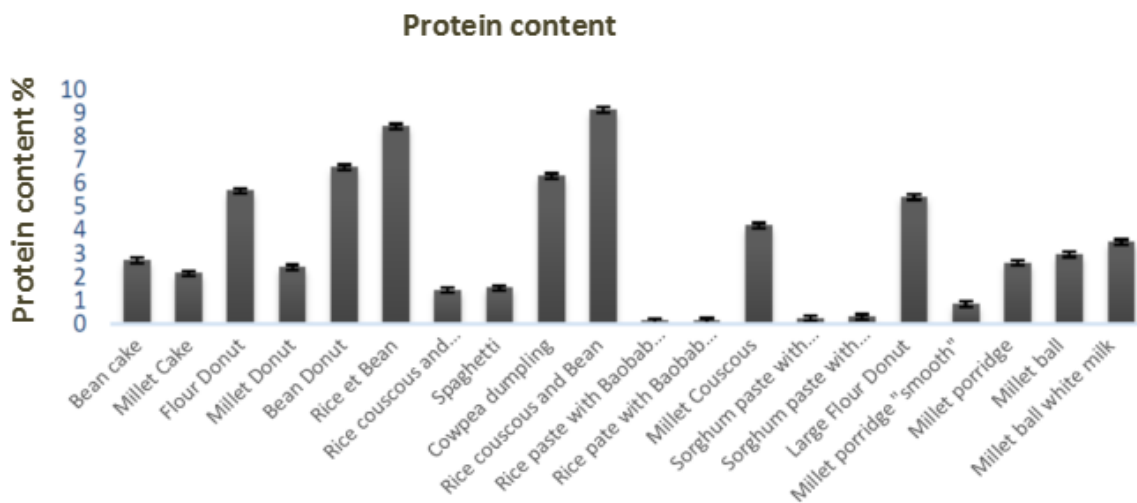


Figure 2 : Protein content of different foods.

It emerges from this figure 2 that the protein contents vary from 9.12% to 0.12%. Cowpea-based meals have the highest percentage of protein, followed by those prepared with wheat flour with respectively 9.12%, 8.41% for rice and cowpea couscous and bean rice. We note that the meals cooked in the form of pate (two in the local language) have a low protein rate with 0.12% for the rice paste and Baobab sauce.

Lipid content

The lipid contents of the meals analyzed are represented in figure 3.

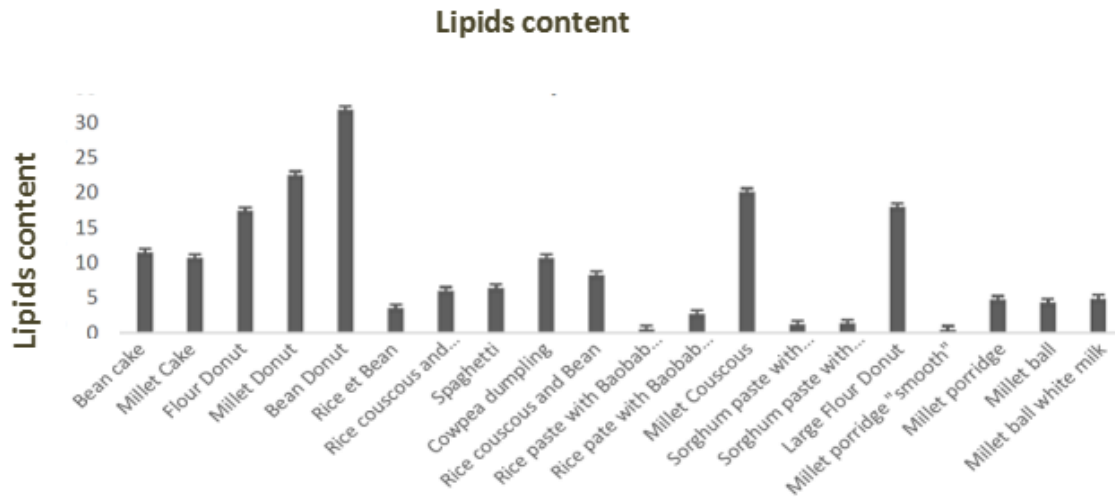


Figure 3 : Lipids content of different foods.

Foods cooked in vegetable oil such as donuts and those made as couscous have the highest fat percentage. The cowpea fritter has a content of 31.8%, followed by millet donut with 22.52% fat. The figure also shows us that the meals in the form of porridge or paste have a low fat content like smooth millet porridge which has a rate of 0.48%.

Carbohydrate content

The results of the Carbohydrate content contents are detailed in Figure 4 below :

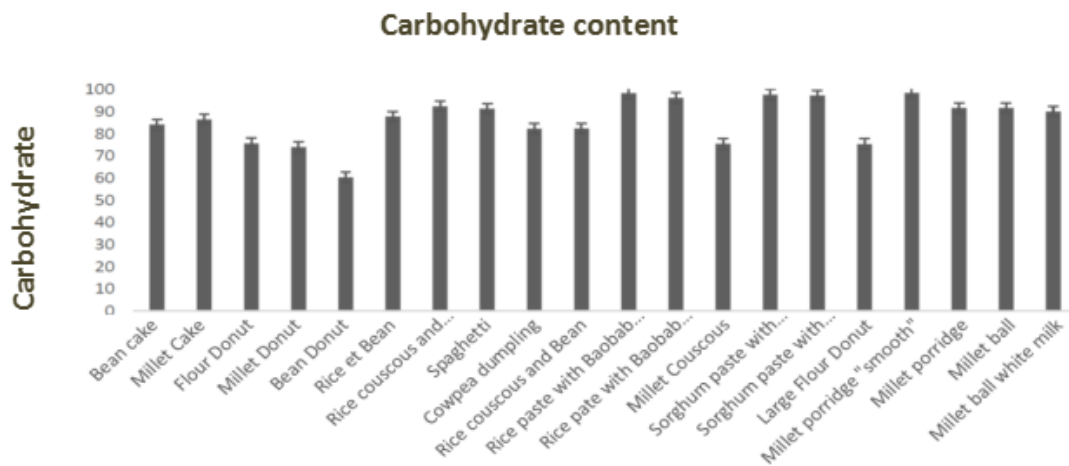


Figure 4 : Carbohydrate content of different foods.

From this figure, we notice that cereal-based meals such as porridge and pasta (Two) are richer in carbohydrates unlike those prepared with legumes. Indeed, millet porridge has a carbohydrate content of 98.53% while cowpea fritters are made up of 60.37% sugar.

Discussion

Our objective was to characterize the foods of children with MAM in the department of Mayahi. The results obtained show overall that cereals are the raw materials most used for the preparation of meals.

A high percentage of dry matter suggests a significant amount of organic matter (Proteins, lipids, Carbohydrates, etc.). In our case, it is the donuts that have a high dry matter content and therefore a higher organic matter composition. Their daily consumption would undoubtedly help infants in their

development. For protein, the analyzes showed that the meals <couscous from rice + Cowpea> and <Rice + Bean> had the highest protein contents. This could be explained by the association of two types of raw material (rice and cowpea) at the time of preparation. In addition cowpea is a food very rich in protein (Feedtables, 2018).

The foods with the lowest protein content are the cooked meals in the form of dough, commonly called Tô, which are among the most consumed foods. The raw materials (Millet, Sorghum and Rice) being rich in proteins with respectively, 11.2; 10.4 and 6.6% (FAO, 1995). The preparation process is believed to be the cause of the low protein content of the two. Indeed, the process of preparing millet or sorghum pasta goes through several stages: shelling, washing, fermentation, molding, sieving and then cooking.

As for lipids, Figure number 3 shows that donuts and couscous are higher in fat. This is because the donuts are fried in vegetable oils and the couscous are seasoned with a large amount of vegetable oil to facilitate their ingestion. Meals cooked in the form of pate (Tô) and smooth porridge are low in fat. All of these meals have gone through a series of processing, including husking and fermentation, which is believed to be responsible for the low fat content of these foods.

Finally for Carbohydrates, according to the results of analyzes of the total sugars content, the average values of the samples are around 86.52% of the dry matter. According to the same results, the cowpea fritter sample shows a lower value compared to that of the others. This difference could be due to the raw material (Cowpea) which has a lower carbohydrate content compared to that of cereals, to a high consumption of microorganisms in sugar or to a loss in the soaking water. Soro in 2013 noted that fermentation lowers the carbohydrate level of the flours. (Soro et al., 2013; Nnam Obiakor, 2003).

Conclusion

The results of this work have provided data on the macronutrient composition (protein, carbohydrates and lipids) of foods. The results indicate that the rice couscous with cowpea and rice with bean meals are higher in protein. Millet and flour fritters are the foods highest in fat while porridge has a high carbohydrate content. This work prompts a more in-depth study leading to the development of the food composition table specific to Niger.

References

- [1] ACF-ESPAGNE ET LE COVERAGE MONITORING NETWORK. (2013). Squeac report Mayahi district, Niger.36p.
- [2] ADAIR L and DAHLY D. (2005). Developmental determinants of blood pressure in adults. *Annual Reviews in Nutrition*, 25p.
- [3] ADAMOU OUMAROU, A. (2018). Study of food consumption habits of children aged 6 to 24 months with moderate acute malnutrition (MAM) in MAYAHI department in Niger. *Environmental and Water Sciences, public Health and Territorial Intelligence Journal*, 2(2), 82-89.
- [4] AICHA. (2009). Évaluation de l'état nutritionnel des enfants de 6 à 24 mois vus en consultation pédiatrique à l'hôpital général de référence nationale de n'djamena (Tchad), Pour obtenir le grade de docteur en médecine, 118.p
- [5] ALDERMAN H, HODDINOTT J and KINSEY B. (2006). Long term consequences of early childhood malnutrition. *Oxford Economy Papers*, 58p.
- [6] BEIIAMY, C. (2000). La situation des enfants dans le monde 1999, New-York, UNICEF, 118p.
- [7] BENGALY D. M. (2010). Cours de physiologie de la nutrition. Licence Technologie Alimentaire et Nutrition Humaine. 43p.
- [8] CILSS/CSAO, 2008. Profil sécurité alimentaire : Burkina Faso. Repéré à : www.food-security.net.
- [9] DOUMBIA K. (2008). Efficacité de la prise en charge nutritionnelle des enfants malnutris sévères au CREN du CMA Paul VI de Tampouy. Mémoire Maîtrise MST/TANH, Université de Ouagadougou. 47p.
- [10] DUNCAN B., EY J., HOLDBERG C.J. (1993). Exclusive breastfeeding for at least 4 months protects against otitis media. *Pediatrics* 1993 ; 91 :867-72.
- [11] FAO. (2010). Améliorer les programmes de nutrition : un outil d'analyse tourné vers l'action. Edition révisée Rome : FAO, 2010 86p.
- [12] FAO (2011). Table de composition des aliments d'Afrique de l'Ouest. Rome 2011.
- [13] FAO. (2007). Évaluation et analyse de l'état nutritionnel, Rome, p 3.
- [14] HATLOY A, HALLUND J, DIARRA MM & OSHAUG A. (2000). Food variety, socioeconomic status and nutritional status in urban and rural areas in Koutiala (Mali). *Public Health Nutr.* 3, P.57-65.
- [15] INS. (2012). Rapport final. Enquête Démographique et de Santé 2012.
- [16] OMS. (2018). Santé de la mère, du nouveau-né, de l'enfant et de l'adolescent. Repéré à https://www.who.int/maternal_child_adolescent/topics/child/nutrition/comp_feeding/fr/
- [17] TRAORE T. (2005). Elaboration et évaluation d'une stratégie d'amélioration de l'alimentation de complément des jeunes enfants au Burkina Faso. Thèse de Doctorat, Université de Ouagadougou. 134p.
- [18] SACHDEV HS, FALL CH and OSMOND C. (2005). Anthropometric indicators of body composition In young adults: relation to size at birth and serial measurements of body mass K index in New childhood in the Delhi birth cohort. *American Journal of Clinical Nutrition*, 2005, 82, p. 456-466.
- [19] STEPHANE ARNAUD. (2004). Etat nutritionnel et qualité de l'alimentation des enfants de moins de 2 ans dans la ville de Dramé (côte d'ivoire) Thèse d'étude supérieure spécialisée de l'université de Montpellier, octobre, 91p.
- [20] VICTORA CG, ADAIR L, FALL C, HALLAL PC, MARTORELL R, RICHTER L, Maternal. (2008). and child undernutrition: consequences for adult health and human capital. *The Lancet*, 371p.
- [21] VICTORA CG, BARROS FC, HORTA BL and LIMA RC. (2005). Breastfeeding and school achievement in Brazilian adolescents. *Acta Paediatrica*, 2005, 94, p. 1656-1660.
- [22] WHO /UNICEF. (2009). WHO child growth standards and the identification of severe acute malnutrition in infants and children. World Health Organization : Geneva.