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EVALUATION OF NUTRITIONAL AND ANTHROPOMETRIC PROFILES OF SCHOOLCHILDREN IN AZILAL PROVINCE (RURAL AREA), MOROCCO

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ABSTRACT
The aim of this study is to evaluate the nutritional profile of schoolchildren in a rural area in Morocco. The study was performed using a sample of 152 schoolchildren aged between 7 and 9 years old in the Azilal province in Morocco. The data collected were processed by WHO Anthroplus according to WHO standards and Nutrilog software on the basis of the Moroccan food composition table and were subjected to statistical analysis by SPSS software version 2.1. The Results showed that emaciation measured by the BMI / A indicator (standard deviation) according to WHO standards reaches 0.7%, the average daily energy intake per person is 1513 ± 35.31 Kcal with a prevalence of insufficient daily energy intake of schoolchildren of 56% (N = 85) below the recommended nutritional intake which is 1912Kcal. These daily caloric intakes come from 55% carbohydrates, 32% lipids and 13% protein. The studied population is characterized by a food intake below the recommended nutritional intakes internationally from an energy point of view. This requires a sound policy in nutrition education.

KEYWORDS: Schoolchildren-Energy-carbohydrate-lipids-protein.

INTODUCTION
The prevalence of protein-energy malnutrition which is reflected by the rate of stunting, wasting and underweight, continues to decline slowly at the international level.[1] The protein-energy malnutrition (PEM) is a deficiency in macronutrients and not in micronutrients.[2] Despite its name, it is now accepted that it originates primarily from a caloric deficit due to insufficient dietary intake.[2,3] The caloric deficit is more frequent and more important than the protein deficit.[2,4] PEM is very often associated with infections and micronutrient deficiencies.[2,5] Insufficient care, such as infrequent meals, also play a role. However, the causes of PEM and other current account deficits in developing countries should not be limited to insufficient food intake.[2] For nutrition to be satisfactory, several conditions must be met: food must be accessible to the family in the correct quantity; The child must receive balanced meals corresponding quantitatively and qualitatively at his or her age; He must have an appetite; Digestion and absorption of food must be good; The metabolism must be normal; And there should be no problem preventing cells from using these nutrients or causing abnormal losses.[2] However, more than a quarter of the world children are still malnourished, 26.7% (150 million) are underweight and 32.5 (182 million) are stunted, of whom 70% live in Asia, 26% in Africa and 4 per cent in Latin America.[6] The situation in parts of Africa is of particular concern because the number of malnourished children is increasing as a result of ecological disasters, wars, unrest or mass displacement of populations.[6] Child mortality rates have declined by more than half compared to 1990.[7] According to a new WHO report, the number of deaths of children under five has decreased from 12.7 million per year in 1990 to 5.9 million in 2015.[7] Almost half of the deaths of children under five are linked to malnourishment.[7] According to the High Commission for planninig (Morocco) and concerning children under five, the national prevalence of underweight is 2.3%, stunting is 14.9% and emaciation is 3.1%.[8] Undernutrition in children and adolescents is observed in different situations where there is an imbalance between dietary intake and protein energy requirements of the body.[9] The child is particularly vulnerable because his reserves are low and his protein-energy requirements are high because of his staturoparent growth.[9]

MATERIALS AND METHODS

Population

This work is part of the evaluation of a program of daily distribution of 23000 breakfasts composed of 200 ml of milk in a landlocked rural area in Morocco. This program is carried out jointly by the Ministry of Education and the Children-Nutrition Foundation. It concerns three sites in Azilal region located in the High Atlas at 400-700m altitude.[10] The population in this region is characterized by a fairly high prevalence of iodine deficiency and low to moderate income.[11] More than one-third of children in this region suffer from stunting, knowing that the national prevalence is 14.9%.[8] This is a cross-sectional study involving 152 schoolchildren between 7 and 9 years old in 2012.

Ethics of the study

An oral consent from the parents of schoolchildren is obtained as well as an authorization from the Ministry of Education and the Ministry of Health.

Schoolchildren preparation

The criteria for inclusion of children in this study are: schoolchildren aged 7-9 years old, living in the studied area and attending the selected schools (Iminifri school, Iwariden school and Abouantar school).

The exclusion criteria are severe or chronic malnutrition. Schoolchildren excluded from the study are referred to the nearest health center for treatment.

Anthropometry

The anthropometric data of the schoolchildren: the weight is measured at 0.1kg near with the aid of a portable electronic balance with the minimum of the clothes and without shoes.

The size is measured at 0.1cm near a seca stadiometer (2 meters) as recommended by Lohman.[12]

The 24-hour recall questionnaire

Food intake data are collected following a cross-sectional survey conducted by dietitians using a 24-hour recall questionnaire. This questionnaire covers name, surname, age, gender, address and quantity and nature of food intake: bread, tomato, tea. for breakfast, lunch, snack and dinner. This 24-h recall is repeated twice at 48 h intervals. It gave us information on the students food intake.

NUTRILOG software version 2.5

It is an analysis system based on the nutritional references of L'Anses.[13] which provides information on the dietary profile of individuals. To this software we have integrated the Moroccan food composition table in addition to the food tables that are already integrated by the supplier: Ciqual. France 2012; USD SR24. USA 201.[13] This Moroccan table integrated into the software contains the nutritional reference data of 417 generic foods for energy and 33 constituents (macronutrients, minerals, vitamins). It is used to obtain the reality of the macronutrient intake of the students of the study. Data from the 24-hour questionnaire and 152-student anthropometry questionnaires are incorporated into this NUTRILOG software to analyze each student's macronutrient status.

Statistical analysis

The data matrix established by the NUTRILOG software daily food intake: (energy, carbohydrates, lipids, proteins) and anthropometric data treated by WHO Anthroplus according to WHO standards[14] were analyzed by Statistical software with statistical software for the social sciences (SPSS, version 2.1).

RESULTATS

Characteristics of children studied

The population studied has an average age in years of 8.0 ± 0.7. The analysis of nutritional status shows that the underweight measured by the P / A indicator (weight for age) (<-2SD) according to the WHO standards affects 4.6% of children, the measured growth retardation By the indicator T / A (Size for age) (<-2SD) according to WHO standards affects 9.9% of schoolchildren, emaciation measured by the BMI / A indicator (<-2SD) WHO affects 0.7% and no children are overweight or obese (Table 1).

Table 1: Anthropometric characteristics of the population studied

Variable	Average ± SD
Age (years)	8.0±0.7
weight (kg)	23.2±2.7
weight/Age	-0.7±0.8
Weight/Age <-2SD (%)	4.6
size (cm)	122.2±5.8
size/Age	-0.8±0.9
Size/Age<-2SD (%)	9.9
BMI kg/m2	15.5±1.0
BAZ	-0.2±0.6
BAZ<-2SD (%)	0.7
BAZ>2SD (%)	0.0

Daily caloric intake

The average energy intake is 1513 ± 35.3 Kcal / d with a prevalence of insufficient daily energy intake below the ANC (recommended nutritional intake at international scale) = 1912Kcal of 56 % (N = 85) (Table 2).

The average carbohydrate intake was 208.1 ± 5.6 g / d with a prevalence of insufficient daily carbohydrate intake below the ANC = 239 g / d of 51% (N = 77) (Table 2).

The average protein intake of schoolchildren was 47.8 ± 1.2 g / d (Table 2) with a prevalence of insufficient daily protein intakes below the ANC = 53 g / d of 82% (N=124).

The average lipid intake was 52.6 ± 1.7 g / d (Table 2) with a prevalence of insufficient daily lipid intake below the ANC = 64 g / d of 65% (N = 98).

Table 2: Energetic intake of macronutrients in the study population

Variable	*Average ± SD of daily intakes*	*ANC*	*Percentage Daily Input <ANC.*
Energy Kcal/j	1513±35.3	1912	56
Carbohydrates g/j	208.1±5.6	239	51
Protides g/j	47.8±1.2	53	82
Lipids g/j	52.6±1.7	64	65

Contribution of macronutrients in the average daily calorie intake

Table 2 shows the contribution of different macronutrients to the average daily energy intake. Analysis of this contribution shows that:

Average daily carbohydrate intake accounts for 55% of the average daily energy intake. Average daily lipid inputs account for 32% of the average daily energy intake.

Mean daily protein intake represents 13% of the average daily energy intake.

Table 3: Contribution of average macronutrient intake to the total average energy intake of the population (N = 152)

Variable	Average ± SD	% In the average energy intake
Energitic intakes Kcal/j	1513 ±35.3	-----
Carbohydrates g/j	208.1±5.6	55%
Lipids g/j	52.6±1.7	32%
Protides g/j	47.8±1.2	13%

DISCUSSION

From an anthropometric point of view; this profile seems to show that the overall anthropometric status of children is correct since there is no overweight or obesity and the three types of malnutrition: ematiation, stunting and underweight are respectively 0.7%, 9.9% and of 4.6% does not exceed 10% of the total population studied by WHO standards.[15] The underweight is by comparison lower than the prevalence of 5.5% found by Razafimanatzoa et *al*. during a survey among schoolchildren in Madagascar in Tananariva.[16] Stunting has a prevalence of 9.9%; this proportion is less than the 34% prevalence found by Razafimanatzoa et *al*. among the same schoolchildren in Madagascar.[16] Emaciation affects 0.7% of children affected by this study; this value is much lower than the 18.7% prevalence found by All Safar among students enrolled in a study performed in Baghdad Iraq.[17]

In our study, the average daily food energy intake that is insufficient is close to that found by Mbemba et *al*. in a study carried out in Congo in schoolchildren with an insufficient calorie intake of an average of one- 1533 ± 487Kcal.[18]

More than one schoolchild in two has a daily energy intake below the recommended international food intake that is from 1912 kcal.[19,20] This can be explained by the socio-economic level of households.[21] Indeed the average household size is 4 to 7 people (57% of households) and expenditure on food does not exceed 110 US $ per month in a study carried out in the azilal region (Area of our study) by Zahrou et *al*. in 2012.[21] The deficit in food intakes of carbohydrates, lipids and proteins explains by the fact that the schoolchildren come from a medium of nutrient deficiency and vulnerability.[11,22] By comparison the mean of food intake which is insufficient in carbohydrates is superior to that found by Mbemba during a Study carried out in Congo in Brazzaville in school-age children with an insufficient carbohydrate intake and a mean intake of 51.7 ± 10.5 g/d.[18] The carbohydrate contribution in energy intake is consistent with the internationally recommended value of 50% to 55% in children aged 7-9 years.[19,20] The deficit of lipid food intakes is higher than that found by Mahmoudi et *al*. in a study carried out in Oran, Algeria, in schoolchildren with a prevalence of insufficient lipid intake of 24%.[23] The lipid contribution in energetic intake is consistent with the internationally recommended value of 30-35% in children aged from 7-

9 years old.[19,20] The protein deficiency is opposite to that found by Mahmoudi et *al*. in an earlier study carried out in Algeria in schoolchildren with slightly higher protein intakes with a protein prevalence of 16%.[23] The protein contribution is compatible with the recommended value at international scale of 11-15% among children aged 7-9 years old.[19,20]

CONCLUSION

The population of schoolchildren studied in Azilal region in Morocco is characterized on the anthropometric profile by a prevalence of underweight of 4.6%, a prevalence of stunting of 9.9% and an emaciation prevalence of 0.7%. In terms of food intake, it is characterized by high prevalence of intake deficiencies compared to international ANC in terms of energy, carbohydrates, proteins and lipids intakes respectively of 56%, 51%, 82% and 65%. The nutritional behavior of schoolchildren in rural Morocco requires a judicious nutrition education policy for parents, educators and children and suggests appropriate nutrition policies and programs including improving food quality and safety, promoting healthy eating and lifestyle, food availability and how to incorporate nutritional goals into development policies and programs and the improvement of the quality of life of the population through the fight against poverty, the improvement of nutrition and the promotion of health, as well as the need to increase the energy intake of people at risk of protein-energetic malnutrition.

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