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FOOD CONSUMPTION AND ENERGY EXPENDITURE OF STUDENTS AT IMARA PRIMARY SCHOOL IN LUBUMBASHI

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Summary:

In fewer developing countries pupils' food has been a topic less studied. Thus, a cross descriptive study has been conducted in Schools to work out food habits and set out the nutritional status of School age Students. And a sample of 384 school boys, aged six to 12 years old, was used for this purpose. Our research results have showed that the height/age percentage is 2, 6%.

As to BMI/age pourcentage $<- 2$ is 16, 75% of the pupils. In addition, the study indicates that Sport exercises are carried out once a week in school. Thus, 73.4% or 282 students practice sport. 63.3% practice football and spend 130 Kcal of energy and 36.5% practice jogging and spend 167.1 Kcal of energy, eating 3meal and snack between meals. As a result we have noticed that their food is not diversified and that other food groups such as fruit rich in vitamins and minerals are not consumed by pupils.

Key words: *Consumption, food, energy output, School, primary, Imara*

1. INTRODUCTION

The school calendar in the Democratic Republic of Congo provides 9 months of classes. The students are thus at school about 6 hours a day. At school, students can, depending on the means of parents, feed on various foods. As a result, school can be at best a source of solutions for the prevention of health problems related to food.

Recent studies have investigated the effects of prevention on the evolution of eating behavior and BMI. These studies are, however, difficult to analyze because children are growing rapidly in the pre-adolescent period and in adolescence. Nutrition programs should involve students, but also their parents, to help integrate what have been learned in school. ([1], [2])

School age is a phase of active childhood growth and represents a dynamic period of physical growth as well as mental development. [3]

In times of intense intellectual activity, students should regularly have an energy ration to cover their needs. [4] Although intellectual work does not involve excessively high energy expenditure, however, the use of energy substrates during an intellectual task is similar to that observed during low intensity physical activity. The basic metabolism is thus increased. [5]

The growth of primary-age children in developing countries is an important aspect to study, especially as malnutrition can disrupt the cognitive development of children due to micronutrient deficiencies. [6]

It is important to note that the world population in 2000 was 25 per cent malnourished children out of 800 million primary school children, with growth of 10 million per year. [7]

In the Democratic Republic of Congo, food consumption remains precarious in several households. There is a relationship between the quality of foods to be consumed and the level of malnutrition. [8]

In Lubumbashi, in the absence of school canteens, many parents make food supplies or make money available for their purchases around the school. These various foods consist mainly of starch products, peanuts; sweet drinks are consumed during break times or at the end of classes.

This nibble could constitute an important energy and protein contribution. And we were interested to know their impact on the nutritional status of the students of the IMARA Primary School by carrying out the anthropometric nutritional evaluation, fast technique, simple, reliable inexpensive . [9]

2. ENVIRONMENT, MATERIALS AND METHOD

2.1. Environment

This study was conducted from 2 to 31 March 2017 at the IMARA primary school in Lubumbashi, located in the city center of Lubumbashi, Haut-Katanga province. The 2017 primary school secretariat statistics indicate 4016 students.

2.2. Materials

The materials that allowed us to carry out this study consist of:

- ❖ Students ;
- ❖ survey questionnaires;
- ❖ SECA brand electronic scale;
- ❖ A measuring tape acting as a measuring board;
- ❖ Epi-Info software version 2017 and Excel 2013.

2.3. Methods

We conducted a cross-sectional descriptive study of the students present during the survey period and whose age ranged between 5 and 12 years. Sampling was simple random. The sample was obtained using the formula: $n = Z^2 \times p \times q / d^2$.

With $Z(1.96)$ = confidence threshold of the study; p (50%) = proportion of the population consuming the foods studied according to WHO recommendations; d (5%) = degree of accuracy of the study; q = 1-p, the proportion of the population that does not consume these foods; n = sample of the population. In order to cover the no respondents, the result was multiplied by 1.11 value equivalent to the corrective factor c (c = 1/1 - f, with f equivalent to 10% or 0.1, so the corrective factor c = 1/1 - 0.1 = 1.11). Thus n = 346 x 1.11 = 384 students.

- *Sociodemographic and food surveys*

Using the questionnaire, the respondents were asked about their eating habits; the number of meals taken per day as well as the snacking and their composition, the physical activities practiced and the level of application to the lessons of each student.

- *Determination of anthropometric data [10]*

Weight

To measure the weight, we used a SECA brand electronic scale of 150 kg, d =100g. The students wore their clothes but took off their shoes.

Cut

The size was measured using a tape measure attached to a wall; the barefoot student was standing on the wall, his head and heels touching the wall.

Body Mass Index (BMI)

It was obtained by dividing the weight in kilograms by the square of the height in meters (BMI = P / t2) with P = weight (in kg), t = height (in m).

- *Daily energy expenditure*

Calculated using Harris and Benedict's enhanced physical activity level formula, it is obtained by multiplying the basal metabolism (taking into account height, weight, age) by the factor specific to occupation considered and the number of daily hours spent at this occupation, using the appropriate multiplication factors ([11], [12]).

3. RESULTS AND DISCUSSION

3.1. Results

Table I. Frequency of students by types of malnutrition

Height /age Parameter	n	(%)	BMI/age Parameter	n	(%)
Severe Malnutrition (<-3 z- score)	2	0,5	Overweight (BMI> 1ET)	45	11,78
Moderate malnutrition (<-2z-score)	8	2,1	Obesity (BMI> 2ET)	19	4,97
Total	**10**	**2,6**	**Total**	**64**	**16,75**

This table shows that out of 384 students surveyed, 64 students, or 16.8%, suffered from BMI/age malnutrition and 2.6% of students were malnourished based on height/age.

Table II. Frequency of students following sport at school, type of sport and Time spent practicing it

Sport	n	%	Type of sport	n	%	Time	Activity index	Energy expenditure in Kcal
Yes	282	73,4	football	179	63,5	45minutes		130
No	102	26,6	Footing	103	36,5	45minutes	Strong = 5	167,1
Total	**384**	**100**		**282**	**100**			

Table II shows that out of a total of 282 students who practiced sport, 63.3% of students practiced football and spent 130Kcal and 36.5% of students practiced jogging as a type of sport and spent 167.1Kcal.

Table III. Breakdown of students following home sport practice

Sport	n=384	%=100	Type of sport	Time / minus	Activity index	Energy expenditure in Kcal	n = 152	% = 100
Yes	152	39,6	Acrobatics	10-15	Light =1,75	13	2	1
			Basket Ball	15-20	Light =1,75	26	12	8
			Boxing	20-25	Moderate=3,5	65	3	2
			Karaté	25-30	Moderate= 3,5	167,1	4	3
			Judoka	30-35	Strong = 5	148,5	3	2
No	232	60,4	Footing	40-45	Strong =5	78	17	11
			Football	< 45	Strong =5	130	82	54
			Domestic work	30	Slight = 3,5	143	29	19

It can be seen from Table III that out of 152 highs who practiced sport, 82 students or 54% practiced football and spent 130kcal of energy.

Regarding the number of meals taken per day in Figure 1. shows that 356 students or 93% had 3 meals a day and 2 students had a meal.

Figure 1. Frequency of students according to the number of meals per day snuff

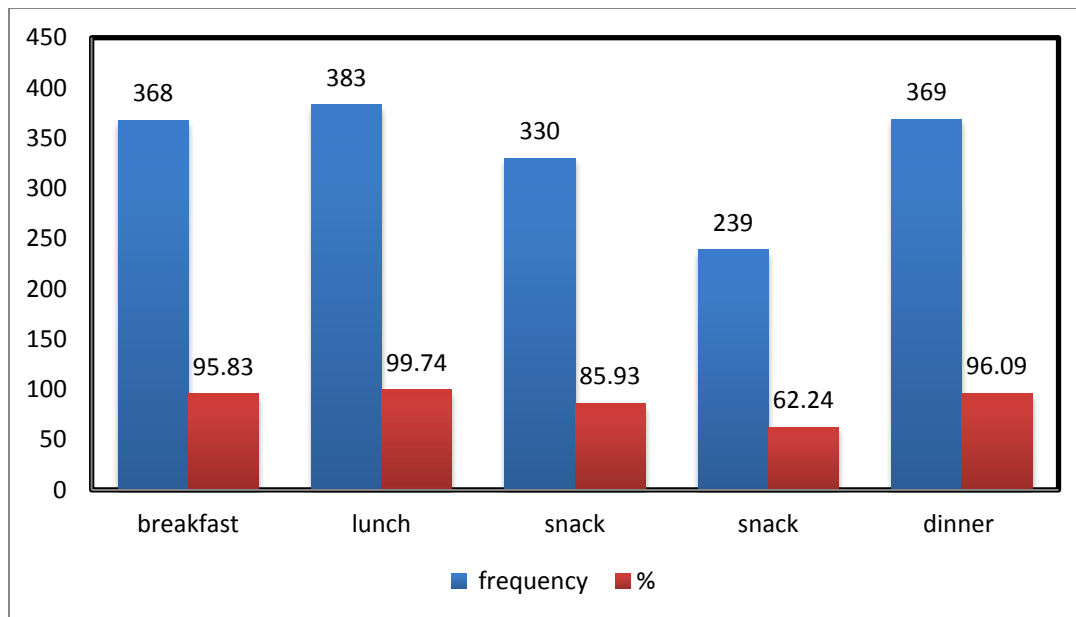**Figure 2** shows that the majority of students had lunch, which is 99.04% of students.

Figure 2

Table IV. Frequency of students by type of food eaten at breakfast

Basic foods	Quantity in g	Food of accompaniments	n= 368	%=100
Bukari	100 - 200	A vegetable dish, ½ Fish of 50g	328	89
Rice	100	Spaghetti, a dish of beans, an egg	12	3
Milk	30	A bread, tea, sugar	17	5
Sugar	40	Corn porridge, boiled rice, red tea, a loaf	11	3

This table IV Informs that the large proportion of students is 89% consumed as a staple at breakfast Bukari accompanied by a vegetable dish, ½ fish 50g.

Table V. Frequency of students by type of food eaten at breakfast

Basic food	Quantity in g	Food of accompaniments	n= 381	%=100
Bukari	100-200	A dish of vegetable, ½ fish, a dish of caterpillars, a piece of meat, cassava leaf (sombe)	286	75
Rice	100	Bean, a piece of 50g meat, spaghetti, a vegetable dish	57	15
Sugare	40	Rice, red tea, bread	14	4
Milk	30	Tea, a 50g bread, sugar of 30g	24	6

Table V. Indicates that out of 381 students who ate lunch, 286 or 75% consumed Bukari (maize paste) as a staple of other foods.

Table VI. Breakdown of students by type of food eaten at dinner

Basic foods	Quantity in g	Foods of accompaniments	n= 369	%=100
Bukari (boiled corn pasta)	100-200	A dish of beans, a dish of vegetable, ½ fish of 50g, a piece of meat of 50g	195	53
Rice	100	A bean dish, a dish of cassava leaf (sombe), a 50g piece of meat and sauce (1càs huil = 20g)	99	27
Sugar	30	cornmeal, rice porridge, soy tea, red tea	31	8
Milk	40	Tea, a 50g bread, cereals (100g)	44	12

53% of students consumed Bukari (maize meal) as a staple of other foods as shown in Table VI.

Table VII. Frequency of students by level of application

Application level	n =384	%=100
Poor	33	8,6
Pretty good	149	38,8
Good	82	21,4
Very good	74	19,2
Excellent	46	12,0

Table VII shows that students with a fairly good level of application are the most represented at 38.80%.

Table VIII. Association between the number of meals taken per day and the level of application

Number of meals per day	Cotation					
	Poor	Pretty good	Good	Very good	Excellent	Total
A meal	0	2	0	0	0	2
Two meals	0	9	11	4	2	26
Three meals	33	138	71	70	44	356
Total	33	149	82	74	46	384

Table VIII shows that students taking three meals a day are the highest rated

Table IX: Nutritional status in (%) of students by age

Age group	Nutritional status BMI/age and height/age	n=384	%=100
	Severe malnutrition	2	0,52
5-6	Normal	38	9,89
	overweight and obesity	23	5,99
	Moderate acute malnutrition	8	2,08
7-9	normal	161	41,92
	overweight and obesity	29	7,55
10-12	normal	111	28,90
	Overweight and obesity	12	3,12

With respect to nutritional status, this table indicates that 80.7% of students aged 6 to 12 are in good nutritional status as a result of their normal BMI.

3.2. Discussion

Our study was conducted in the city of Lubumbashi capital of the province of Haut-Katanga in the Democratic Republic of Congo. The study population consisted of 384 primary school students aged between 6 and 12 years at IMARA primary school.

Table I of our research indicates that the percentage of Height / Age is 2.6%. This may be due to an unbalanced diet. Our results do not corroborate with that of Achouri et al., (2016) which shows a percentage of Height / Age <-2 of boys and girls is 8.5% and 4.2% respectively. [13]

However, other studies have shown a higher prevalence in boys and others in girls. [14], [15],[16]

Indeed Tables IV, V and VI indicate consumption in main foods is lower than the required minimums. Regarding the percentage of BMI / age <-2 is 16.75% of students as shown in Table I. Our results is superior to that of Achouri et al. (2016) which shows the percentage of BMI / age <- 2 is 5.6% in male students. [13]

This may be due to a balance of the energy balance. Table II indicates that sports sessions are performed once a week within this institution. Thus, 73.4% or 282 students practice sport at school, of which 179 or 63.5% of students practice football and spend 130 Kcal and 103 or 36.5% of students practice jogging and expenditure 167.1 Kcal. Since football and jogging are considered gymnastics course taught in the school curriculum and this is done once a week.

With regard to the sport practiced at home, 82 pupils (54%) practice football and spend at least 130 Kcal (see Table III).

Food intake of 3 meals a day except for snacking and snacks is 93% respected. So we found that their diet is not diversified and that some food groups how fruits that are rich in vitamins and minerals are not consumed by students.

Breakfast is the most important meal of the day and contributes to the daily nutritional and energy needs of children. ([17], [18])

Thus Figure 2 of our research shows that 85.94% of students take breakfast but not regularly and 14.06% do not take it. This may be due to the economic conditions of the parents. Our results are superior to that of Mahoney (2005) in his study in the United States which shows that 26% of children consume their irregular breakfasts while 22% never consume them. [19]

Compared with the results of Table VIII on school performance, we noted that the 2 or 100% of students who took at least one meal a day had an average level of application, 26 students or 6.77% who take two meals per day, 9 or 34.6% had an average level of application and 11 or 42.3% of students had an excellence level; however, among 356 students (93%) who took three meals a day, 138 (38.76%) of students, their school

performance was better and 33 students, 9.26%, had poor performance. Our results are far from that of El Hioui et al. (2008) showing that 37.3% of male students who ate three times a day are rated low for the overall average. [20].

Table IV, V, and V of our study show that over 75% of students consume vegetable and Bukari (flour paste corn bein prepare) daily. While Achouri et al. (2016) in his study found only 10% of children ate vegetables daily. [13] These rates are below the recommendations of WHO and FAO (2004) who insist on the daily intake of 5 servings of fruits and vegetables per day to prevent chronic diseases. [21]

According to Tables IV, V and VI of our study indicates that the consumption of milk (30 to 40g) during the three daily meals only 23% pupils, our results are similar to that of Aboussaleh et al. (2009) who found a low consumption of 25% of children who drank milk daily. [22]

Regarding the consumption of sugar we have noticed the tables IV, V and VI shows 23% of students consume sugar the majorities of them consume 30g of sugar daily or the rapid consumption of sugar higher than the recommended proportion which generally should not exceed 10% of carbohydrate intake. [23] Excessive intake can cause behavioral problems in children [24]

Table IX according to the nutrition status of our respondents showed that 80.7% enters a normal nutritional state followed by 16.7% which has an abnormal nutritional status according to BMI /age and 2.6% of the respondents to a state. poor nutrition characterized by size /age.

CONCLUSION

The study was conducted at the Imara Primary School Research Center in Lubumbashi where we conducted a cross-sectional descriptive study and measurements of 384 students at Imara Primary School during the period 01 - 30 November 2017.

Our objective was to assess the nutritional status of the concerned by studying energy expenditure patterns according to dietary habits. The results obtained lead us to the following conclusions:

There are no collective restaurants or canteens in this primary school. The majority of students, 93% consume three meals a day. The best time is in the morning, at noon after school and in the evening. This meal is made of corn paste (Bukari), bean fish and / or vegetables.

39.6% of the students practice the various sports disciplines in this case football, karate, weightlifting, judo, basketball, volleyball, boxing at home against 60.4% who engage in non-sports activities such as reading, housework (cooking, laundry).

80.7% of students aged 6 to 12% are in good nutritional status due to their normal BMI / age. 16.7% of 6- to 12-year-olds have a poor nutritional status characterized by BMIs

and 2.6 students aged 6 to 9 years old have poor nutritional status characterized by height/age. It is important that students have a rich and balanced diet and systematically integrate sports activities into their time schedules.

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