Full Length Research

Assessment of the nutritional status and quality of food for Brazzaville pupils: The case of high school pupils at Lionil Modern School (Brazzaville, Congo)

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ABSTRACT: The problem of child malnutrition is a phenomenon associated with an accelerated nutritional transition in developing countries. The objective of this work is to assess the nutritional status of high school pupils in the city of Brazzaville, as well as the relationship between the Body Mass Index (BMI) obtained and the eating behavior of these pupils. This study is based on a descriptive cross-sectional survey that was conducted using a questionnaire that provided information on the nutritional status and dietary intake of high school pupils. A total of 160 high school pupils were observed. Nutritional status is appreciated by age BMI for adolescents. The feeding behavior was assessed through food recordings for a period of one month. The results showed that the BMI/age is 18.65 ± 0.9. No significant associations were observed between sex and nutritional status of children. The double nutritional burden, underweight and obesity, coexists. Almost half of the pupils (51.87%) have three daily meals that are taken at varying times with breakfast jump. The consumption of tubers, meat and sweets is very important. The consumption of fruits and vegetables is below recommendations. Consumption of milk and dairy products is low and that of legumes is very low. The majority of pupils have a normal nutritional status but average BMI near the lower limit of normalcy. The coexistence of obesity and underweight in the sample under study as a consequence of unbalanced diets.

Keywords: Adolescents, Congo, dietary intake, nutritional status.

INTRODUCTION

Physical development is the result of body growth, on one hand, and maturation, on the other. Somatic growth is a quantitative phenomenon that is mainly due to the increase in the number of cells and secondarily to their size. It results in an increase in the weight, size and volume of children (Mekhancha-Dahel, 2005). Parallel to this quantitative phenomenon, a process of maturation is taking place: the cells are modified, structured, perfected and acquire a specific function that leads them to maturity (adult state). These two quantitative and qualitative phenomena are concomitant. Physical growth is the most easily observable and quantifiable aspect of child development (Mekhancha-Dahel, 2005). Anthropometric indicators such as height, weight or various perimeters make it possible to situate each child in relation to average values that must not be confused with normality (Mekhancha-Dahel, 2005). The importance of nutrition in social and economic development, especially because of its long-term consequences and intergenerational effects is recognized, and there is a relationship between dietary behavior and overall child development. To this end, malnutrition is the most important public health problem affecting many children in the world and in developing countries especially (Ergin et al., 2007). In these countries,

the nutritional transition (Delpeuch and Maire, 1997) is characterized by the coexistence of overweight and obesity problems and problems of nutritional deficiencies (Mekhancha-Dahel, 2005). Malnutrition affects physical growth, morbidity, mortality, cognitive development, reproduction, and physical ability to work (Pelletier and Frongillo, 2002).

School age is a phase of active childhood growth (Achouri et al., 2016a). It represents a dynamic period of physical growth as well as mental development. The period of puberty is marked by significant changes in size, morphology, psyche, sexual life. Growth and maturation can be influenced by environmental and health factors, and it is therefore difficult to distinguish between normal variability due to genetic and hormonal changes during adolescence and changes induced by environmental factors. However, because growth is sensitive to nutritional deficit or surplus, adolescent anthropometry provides indicators of nutritional status and health risks. Among the factors that condition the school performance, the nutritional status of the pupil has a preponderant role (El Hioui et al., 2008). However, no national survey exists on the nutritional status of adolescents and especially secondary school pupils. The objective of this work is to assess the nutritional status of high school pupils in the city of Brazzaville, as well as the relationship between the Body Mass Index (BMI) obtained and the eating behavior of these pupils.

MATERIAL AND METHODS

The study was carried out at Lionil Modern School (Brazzaville, Congo), educational school with four complete cycles, namely preschool, primary, middle and high school. A cross-sectional study was carried out to assess the nutritional status and dietary intake of high school pupils. The study was conducted from April 30 to June 9, 2018. Fact sheets, an Ami brand electronic weighing scale, and a vertical stadiometer measuring 2 meters in length and graduated in millimeters were used for record taking. The scale and stadiometer were used to determine the weight (double weighing method) and the height of each pupil, respectively.

Sampling

Sampling was done using the simple random selection method. The survey was conducted among 160 pupils between the ages of 14 and 22, randomly selected from the second year of high school in the seven classes of high school. The criteria for non-inclusion were: refusal to participate in the study and absence on the day of the survey. This study was conducted in three phases: the preparatory phase, the field data collection phase and finally the data entry, processing, analysis and publication phase.

Assessment of nutritional status and food consumption

To evaluate the nutritional status of high school pupils, anthropometry was used (height, weight and age). Indeed, the anthropometric nutritional assessment is a universally applicable technique; fast; simple; reliable; inexpensive and able to detect malnutrition (De Onis and Habicht, 1996) because the size is a very faithful measure of the phenomenon of growth and the weight increases with age. However, as the adolescent period is marked by profound morphological and physiological transformations depending on both age and sex, the best parameter for assessing a teenager's nutritional status is BMI (Dekkaki, 2014). For this purpose, the ratio of BMI/age was recommended as the best indicator of deficit or excess weight during the adolescence period (Bray, 1998). Thus, to determine the weight status of high school pupils as a function of age, BMI (Body Mass Index) by age, expressed in z-score, was used (WHO, 2007). Depending on the value of z-score obtained, the teenager is:

- obese> + 2σ (equivalent to a BMI of 30 kg/m^2 at 19 years);

- pre-obese or overweight> + 1σ (equivalent to a BMI of 25 kg/m^2 at 19 years);

- normal: between - 2σ and +1σ;

- moderate weight deficit: <-2σ;

- severe weight loss: <-3σ. (De Onis et al., 2007)

Food consumption was assessed using the food record method, which consists of noting food and beverages consumed over a period of time. The questionnaire was pretested on the pupils of fist scientists for a week to ensure clarity of the questions. This questionnaire is based on a collection of answers to set of questions to obtain information on social characteristics data, the eating behavior and dietary intakes of each pupil.

Data analysis

The processing of the collected data, the input and the production of the raw tables were made with the software Epi info.6.04 and Excel 2013. Quantitative variables are expressed as mean (x) ± standard deviation (s) while indicating extreme values (minimum and maximum). Qualitative variables are expressed in numbers and percentages. The Chi--square test was used for the comparison of qualitative variables. The determination of the degree of significance between the means of the different quantitative variables studied is done by the Student's Law at (k-1) degree of freedom, with a threshold of significance of 5%.

RESULTS AND DISCUSSION

Social characteristics of high school pupils

Age and sex

The survey involved 160 high school pupils including 145 adolescents and 25 adult pupils (Table 1). The gender ratio is not balanced in the sample with respectively 58.75% of girls and 41.25% of boys. These results are different from those obtained by Ateillah et al. (2012) in a survey conducted in Sidi Taydi in Kenitra province in Morocco that involved more boys than girls.

The ages of high school pupils surveyed vary between 14 and 22 years, the average age is 17 years ($\sigma = 0.00$). The average ages of girls and boys are 17.13 years ($\sigma = 1.48$) and 17.3 years ($\sigma = 1.35$) respectively. The average difference between the mean values calculated for boys and girls is statistically insignificant (t at 1 dof = 0.75; p <0.05). There is therefore no significant difference between the ages of high school pupils of both sexes. The results obtained are similar to those reported by Baali (2012) in Marrakech, Morocco.

Age group and gender

High school pupils were divided into three age groups (Table 1). In the first age group (14 to 15 years old), there are 42.86% of boys and 57.14% of girls; for the second age group (16 to 18 years old), there are 40.50% of boys and 59.50% of girls; for the adult high school age group (over 18 years old), there are 44% of boys and 56% of girls. These results show that high school pupils attending Lionil Modern School are mostly teenagers whose age varies between 16 and 18 years (75.56%); there are very few older pupils (15.72%). The difference between the strengths of the age groups is very significant ($\chi 2$ to 2 dof = 0.121; p <0.95).

Household

The number of people per family ranges from 2 to 21, with an average of 6 ±3 people per family. There is therefore large variability in the size of households around the average. The study of the household structure shows that high school pupils living in average families have the highest percentage (43.12%) followed by those living in large families (38.13%); high school pupils living in small families are the least numerous (Table 2). The structures of the high school pupils' families are significantly different ($\chi 2$ to 4 dof = 36.345; p <0.001). The results obtained in this study are different from those of Elmotia (2010) and Baali (2012) for which, there were more children living in large families.

In the first age group (14 to 15 years) and the second (16 to 18 years), there are more average families (64.28% and 46.28% respectively) than other types of families. On the other hand, in the last age group (over 18), there are larger families (52%) than other household structures. However, the chi-square test shows that there is a link between the age class of the pupils in the sample and the size of the households from which they came ($\chi 2$ to 4 dof = 11.167; p <0.05).

Level of education

The results of study revealed that half of the people who looked after the household have a secondary level of education (50%), followed by those with a university level and a high level of education (31%), primary level (16%); the minority are illiterate (3%) (Figure 1). The difference in education levels between those who are used to household care is very significant ($\chi 2$ to 3 dof = 22.345; p <0.001). The findings in this study are different from those of Elmotia (2010) and Baali (2012) who respectively noted 81.8% and 30.1% illiterate rates for mothers of schoolchildren in some schools in Morocco.

Eating behavior

Number of meals per day

The results of the study revealed that half of the high school pupils (51.87%) of Lionil Modern School have at least three meals a day followed by those who have two meals (30%) and only one meal (5.63%) (Table 3). There is a very significant difference in the frequency of meals among high school pupils in the sample ($\chi 2$ to 4 dof = 26.345; p <0.001)

The meal times are constant for 46% of high school pupils and variable from one day to another for 54% of the school pupils. In this study, the significance is very high between the high school pupils' meal times ($\chi 2$ to 1 dof = 12.345; p <0.001).

Breakfast

The findings in this study revealed that 61.25% miss breakfast and only 24.37% have taken it regularly. To reconcile this result to the number of meals per day, it appears that 27.5% of high school pupils have eaten a third meal during the day, which is not breakfast. These results are different from those of Elmotia (2010) who noted that 91% of rural schoolchildren in El Haouz (Morocco) had breakfast. The omission of breakfast by the majority of the pupils in this study could be due to the lack of the time for taking this meal. Indeed, classes start at 7 am and problems due to transportation in the city of Brazzaville require the pupil to come early at the risk of

Table 1. Distribution of high school pupils by age, sex per age and age groups.

Variables	Modalities	Boys		Girls		Total	
		n	%	n	%	n	%
Age (years)	14	0	0.00	1	1.06	1	0.60
	15	6	9.10	7	7.45	13	8.12
	16	15	22.72	30	31.91	45	28.13
	17	13	19.70	24	25.53	37	23.13
	18	21	31.81	18	19.15	39	24.30
	19	7	10.61	10	10.64	17	10.62
	20	4	6.06	0	0.00	4	2.50
	21	0	0.00	2	2.13	2	1.30
	22	22	0.00	2	2.13	2	1.30
Age groups	14-15 y	6	9.10	8	8.51	14	8.72
	16-18 y	49	74.23	72	76.59	121	75.56
	over 18	11	16.67	14	14.90	25	15.72
Total		66	100,00	94	100,00	160	100.00

Table 2. Household structure of high school's pupils.

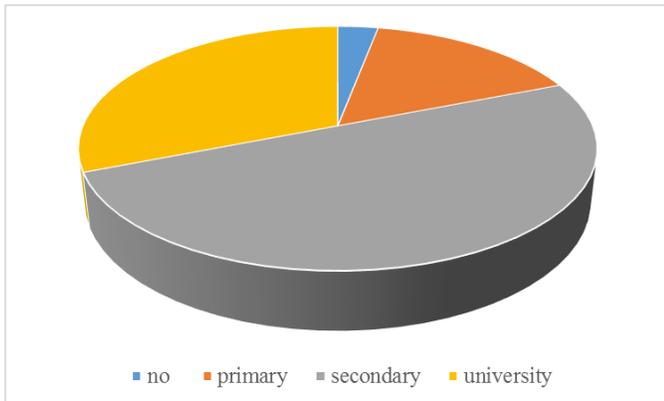| Household strcture	14-15 years		16-18years		Over 18 years		Total	
	n	%	n	%	n	%	n	%
2-4 (reduced families)	1	7.14	21	17.36	8	32.00	30	18.75
5-6 (average families)	9	64.28	56	46.28	4	16.00	69	43.12
7 and more (large families)	4	28.58	44	36.36	13	52.00	61	38.13
Total	14	100.00	121	100.00	25	100.00	160	100.00

Figure 1. Distribution of high school pupils by level of education of the person looking after the household.

being denied access to certain classes. It could also be due to inadequate financial means.

Morning and evening snacks

Table 3 shows that the majority of pupils have had a morning snack (93.75%) against a minority that did not take it (6.25%). Conversely, the majority of high school pupils surveyed did not take an evening snack (92.5%). The very high rate of pupils having the morning snack could be due to the lack of breakfast. After a long period of fasting at night, breakfast helps to energize and strengthen the pupil to meet the energy needs of physical activity and cognitive performance in order to wait for the next meal (Elmotia, 2010; Baali, 2012). The low rate of the evening snack is explained by the fact that the first meal is taken at about 15.00 hours by the majority of pupils in this study.

Nibbling between meals

The results in Table 3 showed that the majority of high school pupils nibbled between meals (88%). The absence of breakfast and the length of time between the morning snack and the first meal of the day are factors that explain the very high frequency of nibbling between meals observed in this study.

Food consumption group

Fruits and vegetables

Table 4 shows the daily consumption of fruits and vegeta-

Table 3. Eating behavior.

Variables	Modalities	n	%
Number of meals per day	1meal	9	5.63
	2meals	48	30.00
	3 meals	76	47.50
	More than 3 meals	7	4.37
	variable	20	12.50
Hours of taking meals	Constant	74	46.00
	variable	86	54.00
Breakfast	Never	98	61.50
	Less 1time/week	8	5.00
	1 time/week	5	3.13
	2-4 times/week	6	3.75
	5-6 times/week	4	2.50
	Every day	39	24.37
Morning snack	No	10	6.25
	yes	150	93.75
Evening snack	No	148	92.50
	yes	1	7.50
Nibbling between meals	Never	14	9.00
	Less 1time/week	5	3.00
	yes	141	88.00

Table 4. Food consumption group.

Variables	Frequencies of consumption (%)						
	Never	Less 1 time/week	1 time /week	2-4 times/week	5-6 times /week	1 time /day	Several times/ day
Fruits	1.86	7.50	5.00	51.25	12.50	13.75	6.14
Vegetables	7.50	14.00	5,64	42.00	8.50	19.36	5.00
Cereals	3.13	11.50	5.62	32.50	15.00	22.25	10.00
Tubers	3.75	2.50	2.50	10.00	16.25	46.25	18.75
Legumes	5.00	72.25	11.25	5.63	3.12	2.50	00.00
Meat	3.13	3.75	15.00	40.62	8.75	20.00	8.75
Fish	9.38	18.75	15.50	45.62	7.50	2.00	1.25
Eggs	10.62	33.13	8.76	38.75	5.00	3.12	0.63
Milk and dairy products	3.12	22.50	8.75	28.75	8.75	20.63	7.50
Sweet products	1.88	3.12	11.88	28.13	10.62	33.75	10.62
Alcoholic beverages	73.12	17.50	3.13	5.62	0.00	0.63	0.00

bles remain low. Only 24.36% of high school pupils have consumed vegetables daily and only 19.89% consumed fruit. In addition, the frequency of fruit consumption was lower than that of vegetables. This corroborates the observations made by Achouri et al. (2016a, 2016b). However, the rate of high school pupils who did not consume vegetables (7.5%) is higher than that of high school pupils who did not consume fruit (1.86%).

Throughout, fruit and vegetable consumption was well below the recommendations of the WHO and FAO (2003) which insist on the consumption of five servings of fruits and vegetables per day. Similarly, there was an almost

total absence of diversity of fruits and vegetables consumed. In fact, 45.30% of respondents have consumed only *Gnetum africanum* as a vegetable followed by leaves of *Manihot glaziovii* and *Manihot utilissima* (16.49%), and *Hibiscus sabdariffa* (14.95%); other leafy vegetables such as *Amaranthus* spp., and *Basella alba* were not appreciated. With regard to fruit, the majority of the pupils in the study have consumed only the fruits of *Mangifera indica*, *Spondias dulcis*, *Persea americana*, *Passiflora edulis* or *Citrus* spp.; other fruits such as *Dacryodes edulis*, *Carica papaya*, *Ananas comosus* and *Annona muricata* were rarely eaten.

From these results, it can be deduced that the food intake of the pupils in the sample is deficient in dietary fiber and the pupils are subject to constipation. It is also deficient in antioxidants and certain mineral elements such as potassium and magnesium. Higher consumption of fruit and vegetables would help prevent pupils becoming overweight and obese.

Cereals, tubers and legumes

The results of the study (Table 4) showed that among starchy foods, tubers are consumed daily at the rate of 65% of which 18.75% have consumed several times a day followed by cereals (32.25%); legumes are rarely consumed (daily rate of 2.5%). In addition, 32.5% of pupils consumed cereal products 2 to 4 times a week and 10% consumed several times a day. The highest frequency of consumption of legumes was once a week. The only legume consumed by the pupils is *Phaseolus vulgaris,* and occasionally *Vigna unguiculata*.

These results shown that the food intake of our pupils at Lionil Modern High School is high in calories, but low in vegetable protein (lacking a good combination of cereals and legumes), in dietary fiber (due to non-consumption of whole grains, low consumption of pulses) and B vitamins (uncommon consumption of pulses).

Meat, fish and eggs

The results of the study (Table 4) shown that 56.25% of pupils consumed eggs, 71.87% consumed fish and 93.12% consumed meat at least 2 to 4 times a week. In this group, meat was therefore the most commonly eaten food followed by fish. In addition, the proportion of pupils who rarely consumed eggs (33.13%) and fish (18.75%) was high. These pupils are exposed to a deficiency of w-3 fatty acids (DHA and EPA), which is abundant in fish, or cholesterol, present in eggs and a precursor of vitamin D and steroid hormones. A very small proportion of pupils (0.63%) consuming several eggs a day are exposed to hypercholesterolemia, a risk factor for coronary heart disease.

Milk and dairy products

The consumption of milk and milk products (Table 4) is generally low. Only 28.13% of pupils drink milk daily. However, pupils who drink irregularly every week are predominant (37.5%) and a small proportion did not consume milk at all (3.12%). The results obtained in this research are different from those obtained in a study conducted in the Kenitra city of Morocco by Achouri et al. (2016a). The low consumption of milk and dairy products exposes pupils to calcium deficiency and increases the risk of osteoporosis in adulthood (Bencharif, 2011).

Sweet products

The consumption of sweets (Table 4) was very important in the majority of children (44.37%) of which 10.62% consumed several times a day. Only 13.12% of pupils rarely consumed sweets. Excessive consumption of sweets by pupils in this study expose them to overweight and dental caries.

Alcoholic beverages

The consumption of alcoholic beverages was very low (Table 4). Only 0.63% of pupils consumed alcoholic beverages daily. 73.12% did not consume them.

Nutritional status

Nutritional status by sex

According to this survey, the majority (82.5%) of high school pupils at Lionil Modern School had a normal weight compared to their height (Table 5) with an average BMI of 18.65 ± 0.9, a minimum BMI of 14.68 and a maximum of 38.73. This agrees with the finding of Baali (2012) in the city of Marrakech and Fifalianaharintsoa (2017) in the region of Vakinankaratra in Madagascar. The average BMI, despite being normal, was just at the lower limit of normality.

The prevalence of underweight pupils in our sample was 5% (z-score <-2 σ) of which 1.25% in the severe form (z-score <-3 σ). The value obtained in our survey was almost half that of all the departments of Congo (5% vs. 10.8%) evaluated in 2011 (ESDC-II, 2012). In addition, the difference in prevalence of underweight is very significant between girls and boys ($\chi 2$ to 4 dof = 19.245; p <0.001). This corroborates the results obtained by Gnimi and Kibangou (2015) in the departments of Brazzaville, Lékoumou and Plateaux. However, the prevalence of underweight was higher among boys than girls in this study. They differ from those obtained by Baali (2012) and Dekkaki (2014) in Morocco.

Table 5. Distribution of nutritional status.

Variables	Modalities	Nutritional status							
		Underweight (%)		Normal (%)		Pre-obese (%)		Obese (%)	
		n	%	n	%	n	%	n	%
Sex	Boys	5	7.67	55	83.34	5	7.58	1	1.51
	Girls	3	3.69	77	81.91	12	12.77	2	2.13
	Set	**8**	**5.00**	**132**	**82.50**	**17**	**10.62**	**3**	**1.88**
Age groups	14-15 y	0	0.00	11	85.72	3	7.14	0	0.00
	16-18 y	5	4.13	104	87.60	11	7.44	1	0.83
	Over 18	3	12.00	17	68.00	3	12.00	2	8.00
Level education (Person Caring for the Household)	No	0	0.00	3	75.00	1	25.00	0	0.00
	Primary	1	3.85	20	76.92	5	19.23	0	0.00
	Secondary	5	6.17	66	81.48	8	9.88	2	2.47
	Universitary	2	4.10	43	87.75	3	6.11	1	2.04
Household size	Reduced families	2	6.67	25	83.33	3	10.00	0	0.00
	Average families	4	5.80	56	81.16	7	10.14	2	2.90
	Large families	2	3.28	51	83.61	7	11.47	1	1.64
Beakfast	Yes	2	5.71	29	82.86	3	8.57	1	2.86
	no	6	4.80	103	82.40	14	11.20	2	1.60
Morning snack	Yes	8	5.34	122	81.33	17	11.33	3	2.00
	No	0	0.00	10	100.00	0	0.00	0	0.00
Sweet	Yes	7	4.96	115	81.56	17	12.06	2	1.42
	No	1	5.26	17	89.48	0	0.00	1	5.26

The prevalence of overweight in our sample was 12.5% with 10.62% pre-obese and 1.88% obese respectively. It was higher for girls than for boys (14.9% vs. 9.09%). This difference may be due either to the role played by sex hormones in the development of fat mass in girls during adolescence, or to the frequent practice of extracurricular physical activities by boys. The frequency of overweight obtained is much higher than that obtained in the Congo Demographic and Health Surveys in 2011 (ESDC-II, 2012).

From these results, therefore, the coexistence within sample of the double burden of malnutrition, namely underweight (5%) and overweight (12.5%). The prevalence of overweight was alarming because according to Weiss and Caprio (2005), the existence of obesity in adolescence increases the risk of coronary heart disease in adulthood by a factor of 12 and atherosclerosis a factor 7.

It seems that the nutritional status of the sample is related to sex, but the chi-square test does not show any relationship between sex and type of malnutrition ($\chi 2$ to 4 dof = 4.369, p <0.05). This finding was also agreed with the results obtained by Achouri et al. (2016a) in the city of Kenitra.

Nutritional status by age group

The results of the sample (Table 5) shown that, regardless of the age group, the majority of pupils were of normal body size. However, the prevalence of malnutrition increased significantly with age. In fact, the prevalence of underweight and overweight was significantly higher among high school pupils over 18 than among teenage high school pupils ($\chi 2$ to 6 dof = 24.234; p <0.001). However, the chi-square test does not show any relationship between the age group and the type of malnutrition ($\chi 2$ to 6 dof = 12, p <0.05). The results were different from those of Baali (2012) who noted a decrease with age in the proportion of adolescents showing both underweight and overweight.

The increase in the prevalence of overweight among the adults in our sample could be due to the decrease or the insufficiency of the energy expenses following the stopping of the growth and the reduction in physical activity. With regard to the increase in the prevalence of underweight in the same age group, this could be explained by the intensification of cognitive activities towards the time of the examinations. Indeed, intense study for a long time can be a cause of undernutrition.

Nutritional status and educational level of the care provider

Among the factors favouring the occurrence of malnutrition, there is the low level of education of the parents or the care provider. The results of the study (Table 5) shown that the prevalence of underweight was higher among high school pupils in households managed by people with secondary education, while the prevalence of overweight decreased with the level of education of the person who takes care of the household. However, the chi-square test does not show any relationship between the level of education of the provider and the type of malnutrition ($\chi2$ to 9 dof = 5.16; $p < 0.05$). This observation was due to the fact that most household providers did not have a good knowledge of the nutritional value of local foods due to the lack of a Congolese food composition table.

Nutritional status and household size

The size of the family is a determining factor of malnutrition. However, the results of the study (Table 5) have revealed that the prevalence of underweight decreasesd with household size while the prevalence of overweight increases. The results obtained in this study were different from those of Elmotia (2010) who made contrary observations to El Haouz in Morocco. The results could be explained by the fact that most pupils attending the Lionil Modern School belong to large families with wealthy parents.

The Chi-square test shows that, in the sample, the size of the household has no influence on the nutritional status of the pupils of the Lionil Modern School ($\chi2$ to 6 dof = 1.676, $p < 0.05$).

Nutritional status and eating habits

The results of the study (Table 5) shown that missing breakfast appears to be one of the risk factors for overweight. These results confirm the observations made by Baali (2012) in a study of adolescents in the city of Marrakech.

Statistical analyses have showed that the nutritional status of high school pupils in the study sample has no relation either to missing breakfast ($\chi2$ to 3 ddl = 0.455; $p < 0.05$), or to the taking of the morning snack ($\chi2$ to 3 ddl = 2,262, $p < 0.05$), nor to excessive consumption of sweets ($\chi2$ to 3ddl = 3.741; $p < 0.05$). There must therefore be other underlying factors not taken into account in this study.

Conclusion

In the present study carried out in the city of Brazzaville, the majority of pupils have a normal nutritional status but with average BMI almost at the lower limit of normality. However, there is the coexistence of the double nutritional burden, obesity and underweight, in the sample under study as a consequence of unbalanced diets. This study needs to be supplemented by others that take into account the socioeconomic and environmental factors of each learner's household.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

ACKNOWLEDGEMENT

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