

Nutritional status, socioeconomic characteristics and breakfast habits among a group of school children in the Beni Mellal Khenifra region (Morocco).

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Abstract— The data presented in this work are the result of a cross-sectional survey studying the weight status, nutritional and hygienic behavior achieved in 2016 in the Beni Mellal Khenifra region. The sample includes 350 school adolescents, including 201 boys and 149 girls aged 12 to 18 years. The assessment of the nutritional status is made from the Body Mass Index (BMI) according to the French reference curves. Of the total number of students surveyed, nearly 81% have "normal" BMI values, 16.2% are underweight and 2.9% of children are overweight.

By sex, the prevalence of underweight and overweight / obesity is higher among boys than girls; the respective prevalences are 21.5% and 14.9%. This difference in prevalence between the two sexes is statistically significant (Chi-square = 8.581 and $p < 0.014$). Indeed, underweight is almost twice as common among boys (20%) as among girls (9.6%), while the percentage of overweight and obesity is high among girls (2.9%) than among boys (1.5%).

The prevalence of underweight is more prevalent in rural areas (24.4%) than in urban areas (11.1%), while the percentage of overweight and obesity is higher in urban areas (4.2%) than in rural areas (0.8%).

Index Terms— Nutritional status, school children, Beni Mellal Khenifra region, Morocco.

1 INTRODUCTION

The prevalence of adult obesity, especially childhood obesity, has been showed to increase rapidly over the last few decades [1]. This trend is observed in most industrialized countries and now it is also depicted in developing countries. The increase is such that since 1998 the World Health Organization (WHO) has considered obesity as a major public health problem worldwide [2]. The prevalence of obesity in Morocco is poorly known, as available studies are generally conducted at regional levels [3,4] or in some European countries where a large Moroccan community lives. Especially children aged 5 years of Moroccan origin living in the Netherlands, as reported by Fredriks et al [5] who show a high risk of overweight and obesity compared to the population of children of Dutch origin.

Obesity is influenced by many factors including heredity, environmental and behavioral factors [6]. Monitoring the epidemic of obesity is crucial especially in countries where current economic development is pushing the youngest populations (children and adolescents) towards a change in eating habits and lifestyle, which could lead to increase in the prevalence of overweight. This, in final could be responsible of the implementation of chronic non-communicable diseases that are costly for the economy.

The objective of this work is to study the distribution of the corpulence in a population of school children in the Beni Mel-

lal Khenifra region and to characterize certain factors associated with it, notably the socio-economic and cultural level of parents and the habit of having breakfast in the morning.

2 SUBJECTS AND METHODS

2.1 Geographical and economic situation of the studied population

The region of Beni Mellal Khenifra is located in the center of the country. It covers an area of 28,374 Km² or 3.99% of the national territory [7]. According to the General Census of Population and Housing (RGPH) 2014, the region of Beni Mellal-Khenifra has 2,520,776 inhabitants of which 49.14% are urban, lower rate than the national rate (60.36%), the density is 88.8 inhabitants per km², it is high compared to the national average (47.6 inhab / km²), thus occupying the 6th position in terms of density after the regions of Casablanca-Settat, Rabat-Sale Kenitra, Tangier-Tetouan-Al Hoceima, Marrakech-Safi and Fez-Meknes. The region of Beni Mellal-Khenifra gathers administratively five provinces: Azilal, Beni Mellal, Fquih Ben Salah, Khenifra and Khouribga. The province of Beni Mellal is the chief place of the region.

The agricultural sector is one of the promising sectors in the region and constitutes the bulk of economic activity in the region. Indeed, the agricultural area used in the Beni Mellal-

Khenifra region is estimated at 948,426 hectares. Mineral resources are a wealth for the region. The phosphate deposits, which are managed by the Cherifien Phosphate Office (CPO), constitute the main regional underground wealth.

2.2 Inclusion Criteria

As part of a research program on the health of young people in the Beni Mellal Khenifra region, in 2016 we carried out a retrospective cross-sectional survey in some schools in the Beni Mellal Khenifra region. A sample of 350 children and adolescents aged 12 to 18 was established in public schools in the study area. Recruitment of school children was made after explanation of the study's objectives and work methodology and obtaining their consent.

2.3 Questionnaire

The survey is based on a standardized questionnaire on the living conditions, hygiene and diet of students. The filling out of the questionnaire took place in private, with each student alone, in order to guarantee the confidentiality of the information and so that he could express himself freely.

2.4 Educational level and socioprofessional category of parents

The socio-economic and cultural level of families is valued by the parents' occupation, educational level, type of housing, and size and structure household.

The socio-economic categories are defined according to the proposed classification Orban-Segebarth et al [9] which distinguishes four socio-professional categories:

- ✓ The first category (PCS1) includes large traders and the liberal professions;
- ✓ The second category (PCS2) includes civil servants and managers;
- ✓ The third category (PCS3) concerns craftsmen, wage earners, laborers, employees, farmers, laborers, taxi and truck drivers, tradesmen and day laborers;
- ✓ The fourth category (PCS4) includes parents without a profession at the time of the survey.

2.5 Anthropometric measurements

An anthropometric examination (weight, height, skin folds, brachial circumference and abdominal perimeter) was performed for each child or adolescent recruited in the sample. In this work only the weight and the size are analyzed.

The nutritional status of students is assessed using the Body Mass Index (BMI). The value of each child's BMI was plotted on French reference curves [8] in order to determine their corpulence compared to the references, taking into account their age and sex. The child will then be classified in one of the three weight categories defined by French standards: underweight, normal or overweight and obesity. The French reference curves, ranging from the 3rd to the 97th percentile, have the advantage of making it possible to evaluate the deficit and the excess weight.

2.6 Statistical analyzes

Data entry and statistical processing was performed using SPSS software version 10 * (* SPSS Version for Windows Re-

lease 10.0.5, SPSS Inc.).

Statistical analysis consisted on comparisons of frequencies (Chi-square test) and averages (Student's test). The materiality threshold was set at 0.05.

3 RESULTS

3.1 Characteristics of the population

- Age

The calculated average age is at level at 15.89 years (Standard Deviation = 1.60).

The distribution of students examined by gender and year-class is given in Table 1.

TABLE 1
NUMBER AND PERCENTAGE OF STUDENTS BY AGE AND GENDER

Age (years)	Male		Female		Total	
	N	%	N	%	N	%
12.5	3	1.5	8	5.4	11	3.1
13.5	11	5.5	5	3.4	16	4.6
14.5	13	6.5	15	10.1	28	8.0
15.5	43	21.3	44	29.4	87	24.9
16.5	40	19.9	41	27.5	81	23.1
17.5	47	23.4	24	16.1	71	20.3
18.5	44	21.9	12	8.1	56	16.0
Total	201	100	149	100	350	100

- PCS of parents

Table 2 gives the socio-economic and cultural characteristics of parents of students.

For men, the category most represented is the PCS3 which represents 72.3%. Housewives account for 95.7%. The illiteracy rate calculated for the entire sample is 26% for fathers and 50.3% for mothers. The illiteracy rate thus shows a great disparity between men and women. Compared with the national level where illiteracy rates are estimated in 2004 at 35.8% and 19.77% respectively for women and men aged 25 and over, the rates found in our sample are very high. The presence of "kuranic" or primary education levels is widely observed in both fathers and mothers. The respective percentages are 39.7% and 34.9%. Reduced families with 3 or fewer people make up 8.4% (n = 29) and large families of 7 or more represent 34.4% (n = 108).

TABLE 2 SOME SOCIO-ECONOMIC AND CULTURAL CHARACTERISTICS OF PARENTS OF SCHOOL CHILDREN.

Variables	Modalities	N	%
Father occupation	PCS1	08	2.30
	PCS2	05	18.60
	PCS3	253	72.20
	PCS4	14	4.00
	Died	10	2.90
Mother occupation	Active	15	4.30
	Housewife	335	95.70
Father's level of education	Illiterate	91	26.00
	Koranic / primary	139	39.77
	Secondary	80	22.90
	University	40	11.40
Mather's level of education	Illiterate	176	50.30
	Koranic / primary	122	34.90
	Secondary	43	12.30
	University	09	2.60
Habitat type	Villa	10	2.90
	Individual house	290	93.90
	Apartment	07	2.30
	Other	02	0.60
Nature of the accommodation	Property	257	92.10
	Leasing	15	5.40
	Mortgage	05	1.80
	Other	02	0.70

- Distribution of BMI in the studied population

Table 3 gives the distribution of student corpulences according to BMI and according to sex with reference to the French corpulence curves. This table shows that, of all the students surveyed, nearly 81% of them have "normal" BMI

TABLE 3 DISTRIBUTION OF PUPIL CORPULENCES BY SEX WITH REFERENCE TO FRENCH CORPULENCE CURVES

Class of BMI	Male		Female		Together	
	N	%	N	%	N	%
Underweight	39	20.00	11	9.60	50	16.2
Normal state	153	78.50	97	85.0	250	80.9
Overweight and obesity	03	01.50	06	5.30	09	2.9
Total	195	100	114	100	309	100

values, 16.2% are underweight and 2.9% of children are overweight.

By sex, the prevalence of underweight and overweight or obesity is higher among boys than girls; the respective prevalences are 21.5% and 14.9%. This difference in prevalence

between the two sexes is statistically significant (Chi-square = 8.581 and $p < 0.014$). Indeed, underweight is almost twice as common among boys (20%) as among girls (9.6%). While the percentage of overweight and obesity is higher among girls (2.9%) than among boys (1.5%).

The prevalence of underweight is more prevalent in rural areas (24.4%) than in urban areas (11.1%). While the percentage of overweight and obesity is higher in urban areas (4.2%) than in rural areas (0.8%). This difference in prevalence between the two backgrounds is statistically significant (Chi-square = 11.76 and $p < 0.003$).

- Association between BMI and level of education and socioprofessional class of parents

Table 4 shows the corpulence of students according to their parents' level of education and socioprofessional class. It shows that the prevalence of underweight is higher in children whose fathers have low levels of instruction, while overweight and obesity are associated with higher levels of education. However, for the socioprofessional classes no statistical association was noted.

- Association between BMI and the habit of having breakfast

Based on the data in Table 5, which represents the association between breakfast frequency and Body Mass Index (BMI) classes, we find that the frequency of breakfast is statistically associated with the student's corpulence (Chi-

TABLE 5 ASSOCIATION BETWEEN BMI CLASSES AND FREQUENCY OF BREAKFAST

Frequency of breakfast	Body Mass Index (BMI)		
	U	NS	O
Always	3(8.5)	49(42.0)	0(1.5)
Sometimes	33(26.5)	125(131.7)	5(4.8)
Never	14(15.0)	74(74.3)	4(2.7)

Underweight; NS: Normal Status; O: Overweight and obesity; Values in parentheses: Theoretical staff. Chi-Square = 8.83; 4 ddl; $p < 0.06$

Square = 8.83, $p < 0.06$). Teenagers who skip breakfast are overweight (overweight or obese).

Depending on the place of residence, we note a statistically significant dependency relationship between breakfast frequency and area of residence (Chi-square = 29.38 $p < 0.001$). Thus, we note that adolescents who never eat breakfast in the morning are less numerous (12.3%) in rural area than in urban area (18.9%).

TABLE 4 SCHOOL CHILDREN CORPULENCE BY LEVEL OF EDUCATION AND SOCIO-OCCUPATIONAL CLASS OF PARENTS

		U		NS		O		χ^2
		N	%	N	%	N	%	
Father's level of education	Illiterate	17	34.0	63	25.2	01	11.1	10.77*
	Koranic and primary	17	34.0	100	40.0	03	33.3	
	Secondary	6	12.0	63	25.2	3	33.3	
	University	10	20.0	24	9.6	2	22.2	
Mother's level of education	Illiterate	27	54.0	128	51.2	2	22.2	n.s
	Koranic and primary	15	30.0	84	33.6	5	55.6	
	Secondary	6	12.0	32	12.8	2	22.2	
	University	2	4.0	6	2.4	0	0.0	
Father PCS	PCS 1	2	28.6	5	71.4	0	0.0	n.s
	PCS 2	10	17.2	46	79.3	2	3.4	
	PCS 3	33	14.7	186	82.7	6	2.7	
	PCS 4	4	33.3	7	58.3	1	8.3	
	Died	1	14.3	6	85.7	0	0.0	
Mother activity	Housewife	48	16.2	240	80.3	9	3.0	n.s
	Active	2	16.7	10	83.3	0	0.0	

* $p < 0.05$; U: Underweight; NS: Normal Status; O: Overweight and Obesity; n.s: not significant.

4 DISCUSSION

This study provides information on the current weight status of school children aged 12 to 18 in the Beni Mellal Khenifra region and the factors associated with it. Overweight and obesity pose definitional problems. These difficulties stem from the choice of criteria, the thresholds used and the existing reference data.

The prevalence of overweight and obesity in the group of children and adolescents in the Beni Mellal Khenifra region is at the level of 2.9%. This prevalence is consistent with the prevalence found in a population of school children in the city of Rabat aged between 7 and 14 [10] and is lower than those reported by Kaoutar et al [11] in Marrakesh and by Anzid [12] in Ouarzazate. The study conducted in Marrakech [11] showed that 8% of adolescents were overweight or obese, while in Ouarzazate this rate was at 8.3% [12]. The difference noted in the prevalence of overweight and obesity between our study and the other studies [11; 12] can be explained by the fact that our sample includes children and adolescents from rural areas.

The prevalence of underweight in our sample is at level of 16.2%. This prevalence remains higher than that found in the study of Kaoutar et al [11] (8.3%). However, it is similar to that of adolescents in the city of Ouarzazate: the underweight rate is almost the same for boys (17.3%) and girls (19.4%) [12].

Underweight is more common in boys, while overweight is more prevalent in females. The prevalence of underweight among boys doubles that of girls (20% versus 9.6%).

Depending on the place of residence, this study reveals that overweight (overweight and obesity) is higher in urban areas (nearly 4.2%) than in rural areas (0.8%). As for the underweight, its prevalence is very marked in rural areas with a percentage of 24.4% compared to 11.1% in urban areas.

Life in rural areas appears to be a protective factor against obesity in developing countries [13]. In the Aounallah et al [14] study in Tunisia, the prevalence of overweight was higher in urban areas than in rural areas. Thus for him, among boys, 21.7% of overweight cases were found in the city against 10.4% in rural areas and for girls 21.7% in the city and 19.2% in rural areas [14].

Although these results are not representative of the whole country, they could constitute a reference that could be exploited in comparative studies. The present results are somewhat relatively lower than reported in Algerians, (3396 children aged 5 to 8, enrolled in five primary schools), showing a prevalence of overweight and obesity in the order of 6,36% [15]. In Tunisia, overweight and obesity reach 8.7% of Sfax children between 9 and 12 years of age [16]. By sex, the prevalence is higher among girls (10.7%) than among boys (6.7%). The authors have shown that age and sex do not influence the prevalence of overweight and obesity. The prevalence of overweight and obesity found in our sample remains low compared to that of the infant population of Sfax and that of the infant population of Tunisia.

The situation in Morocco is different from that of some European countries. In France, a survey involving a sample of 1507 middle school students (boys: 51.6%, girls: 48.4%), aged 11 to 17, conducted in the Hauts-de-Seine department, showed that 17.6% of students are overweight (obesity included); 7.7% of girls and 10.0% of boys are overweight and 5.5% of girls and 11.7% of boys are obese [17]. The study conducted by Prado et al [18] indicates that in Spain, this

prevalence is in the order of 29% in children aged 13 to 16 years [18].

Because of its global prevalence and the seriousness of risk factors for immediate and long-term morbidity associated with it, obesity has become one of the greatest public health challenges [19, 20]. Our study has analyzed several factors that may be associated with the risk of overweight and obesity among school children in the Beni Mellal Khenifra region. In this study, we did not notice a statistically significant association between excess weight and the socio-economic level of families. This linkage of overweight with the high socioeconomic level of parents has been reported by several authors [21, 22, 23]. But the impact of the socio-economic level on the occurrence of obesity varies with the level of development of the country. A high socioeconomic level is a risk factor for obesity in developing countries. In developed countries, on the other hand, a low socioeconomic level is generally a risk factor for obesity [24]. In both situations, this could be explained by the increase in the availability of foods rich in refined fats and sugars and by the lack of access to healthy food choices and health services.

In our study, overweight and obesity are related to high father's educational level. This result is consistent with that of the Algerian study [15]. However, in industrialized countries, there is an inverse relationship between parental educational level and BMI [25].

In the sample surveyed we found that 16.2% of students never take breakfast in the morning. Also, we found some differences between the breakfast eating habit and teenager's corpulence. Overweight teens are more likely not to have breakfast. We also noted that adolescents who never take breakfast in the morning are less numerous (12.3%) in rural area than in urban area (18.9%). In the study of Taleb and Agli [15] the increase in the risk of overweight and obesity is explained in part by this behavior (zapping breakfast, 12.2%). In Marrakech, a recent study of schoolchildren in 2012 showed that 36.1% of adolescents skip breakfast and that this habit was more marked among girls than boys [29]. The habit of not having breakfast could result from a lack of appetite in the morning or lack of time or even a way for girls especially the older ones, to decrease the daily intake of calories. This behavior has been reported in other studies on the relationship between the eating habits of overweight and normal weight children [30, 31].

5 CONCLUSION

Underweight, overweight and obesity are relatively common among students in the Beni Mellal Khenifra region. It is therefore important to set up a prevention program that takes into account the modifiable factors in order to influence the evolution of the prevalence of overweight and obesity and its health consequences in schools. Pending the development of such a program, efforts should focus on health education, balanced nutrition and the importance of regular physical activity. Indeed the implementation of fast food multinationals recently

in Beni Mellal city could affect significantly the actual recorded tendency.

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