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IMPACT OF EATING BEHAVIOR ON NUTRITIONAL STATUS OF SCHOOL CHILDREN IN THE PERI-URBAN AREA OF CASABLANCA, MOROCCO

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Abstract– Between 1975 to 2016 childhood obesity in children aged 5 to 19 increased from 1% to 6 and 8% in girls and boys respectively (WHO). The Global Nutrition Report 2020 revealing that childhood obesity will exceed underweight by 2022 and which would be due in particular to the existence of a strong association between eating disorders and obesity. This study focuses on the impact of eating behaviour, eating habits and lifestyle on the weight status of 219 children aged 7 to 12 in the peri-urban area of Casablanca, Morocco.

MATERIALS AND METHODS

We conducted a cross-sectional survey and recruited children aged 7 to 12 from the region of Tit mellil "peri-urban area of Casablanca, Morocco. All participants completed a CAP Scoring Assessment Questionnaire. The questionnaire was divided into three sections: food groups, eating behavior and lifestyle. The height measurement was carried out by a vertical measuring rod, the weight and the BMI using an impedence meter (krada scan). Body status was assessed by comparing BMI to WHO 2008 reference standards.

RESULTS

The study involved 219 children (including 125 girls and 94 boys), the mean age was 9.53 ± 1.48, the prevalence of overweight and obesity was 14.2% (95% CI (19.30,20.49)) and 11.9% (95% CI (22.13,24.40)) respectively according to the 2008 WHO references. Several characteristics differentiate overweight or obese children from normal-weight children: overweight or obese children are less likely to eat breakfast often (10.95% vs 26.48%). The majority of overweight or obese children do not practice any sporting activity (7.3%), and sleep less than 8 hours at night than normal-weight children (12.87% vs 29.26%)

Conclusion and perspectives

In Morocco overweight and obesity are variable, with prevalence of 8% and 3% respectively according to WHO standards in children aged 8 to 15 years (Sebbani *et al.,* 2013). The overweight and obesity estimated respectively at 14.2% and 11.9% according to the 2008 WHO references, hence the interest of implementing a preventive strategy in order to slow the progression of this problem is necessary. Accordingly, the promotion of a healthy diet and the establishment of regular extracurricular physical activity in youth centers and the encouragement of the creation of health and sports clubs in schools is also of great importance.

INTRODUCTION

Children's and adolescent's obesity is a major health public problem in developed and developing countries. It represents also one of the consequences of the nutritional transitions and sedentary lifestyle that has emerged in many countries particularly in urban areas (Gupta *et al.,* 2010).

According to WHO (Word Health Organisation), the number of obese children and adolescents aged 5 to 19 years has increased ten times from 11 million in 1975 to 124 million in 2016 (WHO 2017). Epidemiological studies and research have indicated an accelerated increase in the prevalence of overweight and obesity (WHO 2017). This alarming figure has reflected the seriousness of the problem presenting a real epidemic (Sebbani *et al.,* 2013) in addition to the problems caused by a physical nature, it causes psychological and social problems (Guo *et al.,* 2003 and French *et al.,* 1995) since this problem persists in adulthood (Guo *et al.,* 1994. The management and prevention of this problem begins first with monitoring the nutritional status of children, adolescents and early detection of overweight cases.

Morocco is not spared from this problem, a study on children and adolescents (Sebbani *et al.,* 2013) has shown that overweight and obesity have reached 8% and 3% respectively which could be due to the change in lifestyle marked by the change in eating behavior and sedentary lifestyle. The aim of this study is to analyze the impact of eating behaviour, eating habits and life style on the weight status in children enrolled in the youth center of Tit mellil and residing in the said region.

PARTICIPANTS, RECRUITMENT AND METHODS

We carried out a cross-sectional study to assess the effect of eating behaviors on the weight status in children registered in the youth center of Tit Mellil and residing in the said region. All children above 12 years old or residing outside Tit Mellil were excluded.

Recruitment was carried out through open invitations to the youth center. Four hundred children participated including 219 who met the inclusion criteria.

The study was carried out after obtaining the approval of the delegation of the Minister of Health and the guardians of the participants were informed of the objectives and progress of our study and their consent was obtained orally.

Data collection

The data collected for each child concerned age, sex, level of study and anthropometric measurements. Weight was measured while wearing light clothing using a body weight monitor (krada scan). Height was measured barefoot using a stadiometer fitted with a vertical measuring rod (Seca 213). All measurements were realized according to the WHO standards (1995).

Children's Eating Behaviour Questionnaire

All participants are invited to fill in a CAP scores questionnaire because it is easy for them in accordance with their parents. The questionnaire is devided in three sections: food group, nutritional behaviour and life style.

The parent-report, nutritional statuts. It consists of three scales that assess food approach questionnaire was prepared that evaluates a variety of eating behaviours in children that are associated to being overweight and obesity (food practise, eating behaviour, and lifestyle) and 6 scales that assess food avoidant behaviour (normal sleep, slowness in eating, drinking water and soft drinks and eating after exercise, eating protein and dairy food).

Statistical analysis and Classification

Statistical analysis was carried out using R software, Excel and WHO Anthro-plus. Quantitative values were expressed as means and standard deviations, qualitative variables were presented as frequencies and percentages. The children were classified into 4 categories according to the reference standards established by the WHO 2008 including underweight (Z Score < -2SD), normal build, overweight (+1SD< Z Score < 2SD) and obesity Z Score > +2DS[7].

RESULTS

Characteristics of the sample

The sampling included 219 children aged 7 to 12 years. Their average age was 9.53 ± 1.48 The sex ratio girls to boys was 1.32. The distribution of the sample by ages 7, 8, 9, 10, 11 and 12 a was 7%, 22%, 25%, 16%, 15%, 11% respectively. The data on weights and heights are shown in Table 1. The average BMI of the children surveyed was 17.0 ± 2.8.

Distribution of BMI at the level of our sample

The prevalence of overweight and obesity are respectively 14.2% (IC 95% (19.30,20.49)) and 11.9% (IC 95% (22.13,24.40)) according to the WHO 2008. The prevalence of underweight is 4.1% (IC 95% (12.67,14.36)) according to the 'WHO2008 (Table 2). The distribution of different BMI classes according to sex showed that the prevalence of overweight and obesity is high in girls compared to boys (Table 2). While the distribution according to age shows a high prevalence of overweight of obesity with percentages of 4.6% and 4.1% in children aged 8 to 9 years respectively (Table 3), the prevalence of underweight was high in children aged 11 years (Table 3).

The daily food intake is divided into three meals (breakfast, lunch and dinner), 60.73% take three balanced meals (wholemeal bread - animal or vegetable protein - milk and derivatives - fruits and vegetables) for at least 15 minutes (47.03% p> 0.05) (Table 4).

Breakfast is the least eaten meal on a regular basis: (39.27% p <0.05) of children who take it regularly, (39.73 p <0.05) sometimes and (21% p <0.05) never take it. Girls are more likely to never eat breakfast (15.07% against 5.94% of boys, p = 0.0179). Overweight children are less likely than normal weight children to eat breakfast often (10.95% versus 26.48% without reaching significance). Fifteen percent (15%) never take it (Table 4).

Meals generally consist of dairy milk products or its derivatives, (44.75% p = 0.009) children consume one serving per day, and cereal products or bread, (75.34% p <0.05) children consume more than one serving per day. Concerning vegetables, 39.27% of children, they consume two servings per day, and (61.64% p = 0.031) of them consume two servings of fruits per day. 11.87% of children consume animal proteins including red meats against 49.32% of whom they consume half of the proteins which come from vegetables, etc. (Table 5).

80% of children eat their meals with the family (45.21% of girls and 35.62% of boys), obese children are less likely than normal-weight children to eat them in company (22.37% vs 54.79% p> 0.05)

Table 1. Characteristics of the sample

	Overall (N=219) Mean ± SD	Girls (N=125) Mean ± SD	Boys (N=94) Mean ± SD
Age (years)	9,53±1,48	9,53±1,48	9,52±1,48
Weight (kg)	32,26±8,89	32,75±9,55	31,61±7,93
height (m)	1,35±0,10	1,36±0,10	1,35±0,09
BMI (kg/m²)	17,34±3,08	17,56±3,34	17,04±2,67

SD : Standard deviation BMI : Body Mass Index

Table 2. Distribution of children's corpulence according to body mass index

	total (%)	Girls (%)	Boys (%)	P
Underweight	4,1	4,8	3,2	NS
Normal build	69,9	66,4	74,5	NS
Overweight	14,2	16,8	10,6	0,04
Obesity	11,9	12	11,7	NS

NS : not significant

Table 3. Distribution of BMI classes according to age (WHO references)

Age (years)	Number (N)	Underweight % (n)	Normal build % (n)	Overweight % (n)	Obesity % (n)
7	13	0,0 (0)	5,9 (13)	0,0 (0)	0,9 (2)
8	33	0,5 (1)	15,1 (33)	4,1 (9)	2,3 (5)
9	36	0,5 (1)	16,4 (36)	3,7 (8)	4,6 (10)
10	23	0,5 (1)	10,5 (23)	2,7 (6)	1,8 (4)
11	30	1,8 (4)	13,7 (30)	1,8 (4)	1,8 (4)
12	18	0,9 (2)	8,2 (18)	1,8 (4)	0,5 (1)

WHO: World Health Organization BMI: Body Mass Index

(Table 6). The healthy lifestyle questionnaire highlights the differences between normal-weight and overweight children. Only 25.11% of children say they practice regular physical or sporting activity. Girls are more likely to play sports than boys (12.79% girls vs. 12.33% of boys, p> 0.05). Overweight children are also less likely than normal weight children to participate in sports (7.3% vs. 16.89%, p> 0.05). Also, overweight children are also less likely than normal weight children to sleep 8 hours at night (12.87% vs 29.68%, p> 0.05). (Table 6)

DISCUSSION

Obesity and overweight are of major concern to public health and to the international community around the world. Its rapid spread has been the subject of several publications around the world by researchers, nutritionists and pediatricians. In our study the prevalence of overweight and obesity was estimated respectively by 14.2% and 11.9% according to the 2008 WHO references. This finding is perhaps explained by the eating behavior of children who consume more food, high calorie foods rich in lipids (WHO, 2020), and by sedentary lifestyle (WHO, 2020). Also our results showed very marked prevalences of the overweight and obesity in girls more than in boys. This difference can be explained by the development of fat mass in girls its decrease in boys in pre-puberty (Regaieg, 2014).

The prevalence of overweight and obesity varies in the literature according to local and regional studies, and according to the reference curves used. 12.2% and 5.4% respectively of overweight and obesity according to a study conducted in Marrakech in 2012 (Sebbani *et al.,* 2012) with 1,418 children aged between 8 and 15 years. Oulamara *et al.,* in 2016 showed that the prevalence of obesity and overweight in Constantine (Algeria) was respectively 11.6% and 28.9% (OMS, 2008).

The Arab countries and specifically the Gulf countries are not spared. In Qatar, the prevalence of

Table 4. eating behaviour

Eating behaviors		Sex				Obesity		Effectifs totals (N=219)	Percentage total	P
		Girl (N=125)		Boy (N=94)						
		effectif	Percentage	effectif	Percentage	effectif	Percentage			
Fast to eat meals	Very quickly	11	5,02	18	8,22	3	1,37	29	13,24	NS
	Between 5 and 10 minutes	53	24,2	34	15,53	7	3,2	87	39,73	
	Up to 15 minutes and more	61	27,85	42	19,18	16	7,31	103	47,03	
Water drinking per day	A few sips each time	21	16,8	12	12,77	7	3,2	33	15,07	NS
	Less than 5 drinks per day	37	29,6	34	36,17	10	4,57	71	32,42	
	6 to 8 glasses per day	67	53,6	48	51,06	9	4,11	115	52,51	
Meals	Occasionally	35	15,98	22	10,05	5	2,28	57	26,03	NS
	I eat 3 meals every day, but they are not balanced	17	7,76	12	5,48	3	1,37	29	13,24	
	I eat 3 balanced meals a day	73	33,33	60	27,4	18	8,22	133	60,73	
Balanced breakfast every day	I don't have breakfast	33	15,07	13	5,94	8	3,65	46	21	NS
	I eat very little for breakfast	47	21,46	40	18,26	5	2,28	87	39,73	
	yes	45	20,55	41	18,72	13	5,94	86	39,27	
Drinking soft drinks before sleeping	Every night before sleeping	23	18,4	12	12,77	4	1,83	35	15,98	NS
	a few times a week	26	20,8	27	28,72	9	4,11	53	24,2	
	never or rarely	76	60,8	55	58,51	13	5,94	131	59,82	

Table 5. food practice

Food practices		Sex				Obesity		Effectifs totals (N=219)	Percentage totals	P
		Girl (N=125)		Boy (N=94)						
		effectif	Percentage	effectif	Percentage	effectif	Percentage			
Protions of vegetables consumed per day	Less than 2 servings per day	39	17,81	23	10,5	8	3,65	62	28,31	0,031
	2 servings per day	52	23,74	34	15,53	26	11,87	86	39,27	
	3 or more servings per day	34	15,53	37	16,89	23	10,5	71	32,42	
Protions of fruits consumed per day	Less than 1 serving per day	10	4,57	13	5,94	5	2,28	23	10,5	NS
	1 serving per day	33	15,07	28	12,79	15	6,85	61	27,85	
	2 servings per day	82	37,44	53	24,2	37	16,89	135	61,64	
Protions of dairy milk products or its derivatives consumed per day	Less than 5 times a week	29	13,24	24	10,96	13	5,94	53	24,2	0,009
	1 serving per day	57	26,03	41	18,72	26	11,87	98	44,75	
	More than 1 serving per day	39	17,81	29	13,24	18	8,22	68	31,05	
Nature of protein consumed per day	All or most red meats	16	7,31	10	4,57	3	1,37	26	11,87	NS
	All or mostly fish, poultry	45	20,55	40	18,26	26	11,87	85	38,81	
	Half comes from vegetables, etc.	64	29,22	44	20,09	28	12,79	108	49,32	
Portions of cereals and cereal products consumed per day	Less than 5 times a week	14	6,39	14	6,39	4	1,83	28	12,79	NS
	1 serving per day	18	8,22	8	3,65	9	4,11	26	11,87	
	More than 1 serving per day	93	42,47	72	32,88	44	20,09	165	75,34	

obesity and overweight is 40.4% and 44.8% respectively. While the results of the prevalence of overweight closest to ours concern a study conducted among children aged 7 to 12 living in Babol in Iran by Hajian-Tilaki *et al.,* 2011 presenting a prevalence of obesity and overweight respectively of 5.8% and 12.3% (Oulamara *et al.,* 2016). he prevalence of childhood obesity has more than tripled in the past four decades in the United States (Al-Thani *et al.,* 2018) with a prevalence of up to 18.5% in children (Hajian *et al.,* 2011).

The questionnaire relating to eating behaviors highlights the differences between normal-weight and overweight children. Indeed, overweight children are less likely to eat a full breakfast. This behavior has been reported in various studies on the relationship between breakfast and the prevalence of childhood obesity (Andreson *et al.,* 2019). Also, overweight children tend to eat their meals alone and away from their families.

In our study, the proteins consumed are 50% of plant origin (vegetables, etc.) and therefore of lower value than proteins of animal origin. Obese and overweight children eat red meat, fish and eggs a little less often. Underreporting by obese children is probable and classically reported (Bandini, 1990).

Sedentary lifestyle presents a risk factor for obesity. Often overweight or obese children do not participate in extracurricular sports activities, reported recently in Europe.

In conclusion, studies from around the world have shown a revised upward trend in the

Table 6. life style

Life style		Sex				Obesity		Effectifs totals (N=219)	Percentage totals	P
		Girl (N=125)		Boy (N=94)						
		effectif	Percentage	effectif	Percentage	effectif	Percentage			
Exercising	No or less than 3 times per week	47	37,6	26	27,66	6	2,74	73	33,33	NS
	Light activity most of the time	50	40	41	43,62	9	4,11	91	41,55	
	at least 30 mnts, for at least 4 days a week	28	22,4	27	28,72	11	5,02	55	25,11	
Usual sleep pattern	Very little sleep I don't have time to rest	18	14,4	6	6,38	3	1,37	24	10,96	0,037
	Alright most nights	56	44,8	40	42,55	10	4,57	96	43,84	
	As much as I want every night	51	40,8	48	51,06	13	5,94	99	45,21	
Normal way of eating : doing home-works or other things	yes	17	7,76	10	4,57	3	1,37	27	12,33	NS
	No, I eat while doing my homework	9	4,11	6	2,74	1	0,46	15	6,85	

prevalence of childhood obesity compared to the previous decade. In our study, the prevalence overweight and obesity is high. As a result, the implementation of a preventive strategy based on nutritional education "the promotion of a healthy diet" and healthy lifestyle "the establishment of regular extracurricular physical activity" to slow down the progression of this problem and early medical treatment are necessary to reduce or stabilize the obesity rate in the region.

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Contributions from the authors

All authors also contributed to the conduct of this work and have read and approved the final version

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Ethics Committee

The study was carried out after obtaining the

approval of the delegation of the Minister of Health (No. MS01 January 14, 2019)

The Patient and Public Involvement statement

guardians of the participants were informed of the objectives and progress of our study and their consent was obtained orally

Conflicts of interest

The authors declare no conflict of interest.

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