FOOD PROFILE AND NUTRITIONAL STATUS OF SCHOOL-CHILDREN IN THE PERI-URBAN AREA OF CASABLANCA, MOROCCO

MAKHLOUKI HOURIA[1]*, ELARBAOUI MARIA[1], BELHOUARI ABDERRAHMANE[1], JAFRI ALI[2] AND DEROUICHE ABDELFETTAH[1]*

[1]Human Nutrition Research Unit, Laboratory of Biology and Health, Ben M'Sik Faculty of Science, Hassan II University, Casablanca, Morocco
[2]Faculty of Medicine, Mohammed VI University of Health Sciences – Casablanca, Morocco

Abstract– Childhood stunting is a major public health concern in both developed and developing countries. It is the consequence of malnutrition during the first years of life and the preconception period. It represents a socio-medical problem, it can present the first sign of a pathology and which can jeopardize a vital and functional prognosis of the child, also it can even become complicated with a small height in adulthood. This study focuses on the impact of eating behaviors, habits, and lifestyle on the stunting of 219 children aged 7 to 12 in the peri-urban area of Casablanca, Morocco. The sampling involved 219 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 behaviour 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. The study involved 219 children (including 125 girls and 94 boys), the mean age was 9.53 ± 1.48, The prevalence of different height per age classes according to sex showed that the prevalence of growth normal and stunting is respectively 96% and 4% according to WHO (2008). The prevalence of stunting is very high in girls than boys, representing 3% and 1% respectively (Table 3). While the distribution according to age shows a high prevalence of stunting with percentages of 0.9% and in children aged 9 and 12 years. Several characteristics differentiate children with a stunting and normal growth children:). children with a stunting are less likely than normal growth children to eat breakfast often (1.83% versus 37.9% without reaching significance). 0.91% never take it, also 1.83% of children with stunting drink 6 to 8 glasses of water per day (p=0.009). In Morocco stunting prevalence is variable, with prevalence of 16.02% according to WHO standards in children aged less than 5 years (Sellam *et al.*, 2015). The stunting estimated at 4% 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.

INTRODUCTION

Childhood stunting is a major public health concern in both developed and developing countries. It is the consequence of malnutrition during the first years of life and the preconception period. It represents a socio-medical problem (de Onis and Branca, 2016; Stunting in a Nutshell, 2022), it can present the first sign of a pathology which can jeopardize a vital and functional prognosis of the child, also it can even become complicated with a small height in adulthood[1]. We talk about stunting if a child's height for age is below the third percentile on a reference growth chart. Studies around the world show an overall decrease in stunting in children under 5 years of age, during the period from 1990 to 2012 (WHO, 2018).

This decrease in prevalence is 50% in Asia and Latin America and in the Caribbean, on the other hand we have a 24% increase in stunting in Africa during the same period (Malnutrition in Children - UNICEF Data, 2022).

Also, Weight problems in children are very common these days. Children under or overweight is a severe health problems (Bhadoria, *et al.,* 2015; Childhood Obesity Facts, 2022). These conditions can lead to many chronic diseases in adulthood (Bhadoria, *et al.,* 2015; Causes of Obesity, 2022). Research has shown that lower BMI in children can lead to risk factors for coronary heart diseases (Baker *et al.,* 2007). Behavioral research has also shown that weight problems in children in peri-urban areas of Morocco are related to their eating behavior and appetite. The weight problem in these children arises early in life, as the first few years of life are of rapid growth (Okihiro *et al.,* 2012).

Moreover, young children go through many changes in their digestive behavior and eating patterns, physiology. These eating behaviors in children can cause stunting (Scaglioni *et al.,* 2018).

Research has also shown that if a child has a healthy eating pattern, it can reduce stunting because good nutrition can provide all nutritional requirements for the children's healthy growth (de Onis and Branca, 2016; WHO) 2018). Morocco is not spared from this problem, a study on children shows that stunting has reached 16.02% which could be due to the age and level of education of mothers play a determining role in child malnutrition (Sellam and Bour, 2015).

The United Nations predicts that a decade of progress in maternal and child health (sustainable development goal 3) could be stalled by COVID-19. The objective of this study is to

SUBJECTS/MATERIEL AND METHODS

We conducted a cross-sectional study at the Youth Center of Tit-Mellil to find the effect of eating behavior on the nutritional status of these children. This study did not include any children above 12 years old or the children living outside the said region. There were four hundred children in total, and the number of children who met the criteria was 219. The study was carried out with the Deparment of Health's approval, and we also kept the parents and caregivers of the children informed of the study's progress.

a) Data collection

We collected the data from each child about their sex, age, physical measurements, and level of study. Each child was given a light cloth to wear for measuring accurate weight. Weight was measured with the help of a karada scan, a bodyweight monitor. The height was measured barefoot with the help of a stadiometer containing a vertical measuring rod. All the measurements were taken according to the WHO guidelines.

b) Measuring Children's Eating Behaviour Questionnaire

All participants were invited to fill in a CAP scores questionnaire. The questionnaire isdevided 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 or stunting behaviours (food practise, eating behaviour, and lifestyle) and 6 scales that assess food avoidant behaviour (normal sleep, slowness in eating, drinking water and soft drinks, eating protein and dairy food).

c) Statistical analysis

Preliminary assumption testing was used to check for normality, homogeneity of variance-covariance matrices, linearity, univariate and multivariate outliers, and multicollinearity in order to explore the correlations between weight status and eating behaviours among the children. Except when evaluating multivariate outliers, no severe breaches were found. 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.

d) Classification

The children were classified into 4 categories of BMI according to the reference standards established by the WHO 2008 including underweight (Z Score < -2SD), normal weight, overweight (+1SD< Z Score < 2SD) and obesity Z Score > +2DS, also, The were classified into 3 categories of height per age according to the reference standards established by the WHO 2008 including important stunting (Z Score < -3SD), stunting (Z Score<-2SD), normal growth (–1SD < Z score < 2SD) (OMS, 2008).

RESULTS

Characteristics of the sample

The distribution of our sample does not follow a

normal distribution (p <0.005): The sampling included 219 children aged 7 to 12 years. Their average age was 9.53 ± 1.48 The sex ratio was 1.32. The distribution of the sample by ages 7, 8, 9, 10, 11 and 12 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 17.34 ± 3.08 (Table 1).

Table 1. characteristics of the participants

	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

Distribution of BMI

In Table 2, it can be seen that the prevalence of underweight, overweight and obesity in the total sample was 4.1%, 14.2% and 11.9%, respectively. Girls had higher prevalence of underweight (without reaching significance) and lower prevalence of normal weight (without reaching significance) compared to boys.

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

Distribution of height at the level of our sample according to sex and age

The prevalence of different height per age classes according to sex showed that the prevalence of growth normal and stunting is respectively 96% and 4% according to the WHO 2008. The prevalence of stunting is very high in girls than boys, representing 3% and 1% respectively (Table 3). While the distribution according to age shows a high prevalence of stunting with percentages of 0.9% and in children aged 9 and 12 years (Table 4).

Table 3. distribution of stunting at sample level

	total (%)	Girls (%)	Boys (%)
Growth normal	96	54	42
Stunting	4	3	1

Table 4. Distribution of stunting according to age

Age (years)	Number (N)	growth normal % (n)	Stunting % (n)
7	15	6,4 (14)	0,5 (1)
8	48	21,5 (47)	0,5 (1)
9	55	24,2 (53)	0,9 (2)
10	34	15,1 (33)	0,5 (1)
11	42	18,7 (41)	0,5 (1)
12	25	10,5 (23)	0,9 (2)

Distribution of stunting classes according to BMI

The distribution of different height per age classes according to BMI showed that the prevalence of stunting per underweight and normal weight is respectively 0.5% and 3.2% according to the WHO 2008. The prevalence of stunting is very high in normal weight, representing 3.2% (without reaching significance) (Table 5). While girls are a high prevalence of stunting with percentages of 2% (without reaching significance) (Table 5).

Table 5. Distribution of stunting classes according to BMI

		under weight %	Normal weight %	over weight and obesity %
Girl	growth normal	2	36	16
	stunting	0	2	0
Boys	growth normal	1	31	10
	stunting	0	1	0
Total	growth normal	3	67	26
	stunting	0	3	0

Result of CAP scores questionary

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), children with a stunting eat very quickly (1.83%, p=0.008) (Table 6).

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). Children with a stunting are less likely than normal growth children to eat breakfast often (1.83% versus 37.9% without reaching significance). Fifteen percent (0.91%) never take it, also 1.83 of children who are stunting drink 6 to 8 glasses of water per day (p=0.009) (Table 6).

Meals generally consist of dairy milk products or its derivatives, (31.05% without reaching significance), children with a stunting are less likely than normal growth children to consume dairy milk products or their derivatives more than one serving per day (0.93 % versus 30.1% without reaching significance) (Table 6).

Children consume more than one serving per day portion of cereal, and cereal products or bread, (75.34% p <0.05). children with a stunting are less likely than normal growth children to consume more than one serving per day of cereals and cereal product (2.74% versus 72.6% without reaching significance).

Concerning vegetables, 39.27% of children consume two servings per day, and (61.64% p = 0.031), children with a stunting are less likely than normal growth children to consume vegetables (1.83% versus 37.9% without reaching significance); and 2.28% 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, 3.2% of children with a stunting consumed protein half comes from vegetables, etc (Table 7).

80% of children eat their meals with the family (45.21% of girls and 35.62% of boys), 2.74% of children with a stunting eat their meals with her family (Table 8). The healthy lifestyle questionnaire highlights the differences between normal growth and stunting of 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). children with a stunting are also less likely than normal growth children to do a light activity most of the time (1.83% vs. 39.7 %, without reaching significance). Also, children with a stunting are also less likely than normal growth children to sleep 8

Table 6. The eating behavior of the children included in our study

Eating behaviors		Sex				Stunting		Effective totals (N=219)	Percentage	
		Girl (N=125)		Boy (N=94)						
		number	Percentage	number	Percentage	number	Percentage		total	P
Fast to eat meals	Very quickly	11	5,02	18	8,22	4	1,83	29	13,24	0.008
	Between 5 and 10 minutes	53	24,20	34	15,53	2	0,91	87	39,73	
	Up to 15 minutes and more	61	27,85	42	19,18	2	0,91	103	47,03	
Balanced breakfast every day	I don't have breakfast	33	15,07	13	5,94	2	0,91	46	21,00	NS
	I eat very little for breakfast	47	21,46	40	18,26	4	1,83	87	39,73	
	yes	45	20,55	41	18,72	2	0,91	86	39,27	
Water drinking per day	A few sips each time	21	9,59	12	5,48	4	1,83	33	15,07	0.009
	Less than five drinks per day	37	16,89	34	15,53	0	0,00	71	32,42	
	6 to 8 glasses per day	67	30,59	48	21,92	4	1,83	115	52,51	
Meals	Occasionally	35	15,98	22	10,05	3	1,37	57	26,03	NS
	I eat three meals every day, but they are not balanced	17	7,76	12	5,48	1	0,46	29	13,24	
	I eat three balanced meals a day	73	33,33	60	27,40	4	1,83	133	60,73	
Balanced breakfast every day	I don't have breakfast	33	15,07	13	5,94	2	0,91	46	21,00	NS
	I eat very little for breakfast	47	21,46	40	18,26	4	1,83	87	39,73	
	yes	45	20,55	41	18,72	2	0,91	86	39,27	
Drinking soft drinks before sleeping	Every night before sleeping	23	10,50	12	5,48	2	0,91	35	15,98	NS
	a few times a week	26	11,87	27	12,33	1	0,46	53	24,20	
	never or rarely	76	34,70	55	25,11	5	2,28	131	59,82	

Table 7. The food practice of the children included in our study

Food practices		Sex				Stunting		Effective totals (N=219)	Percentage	
		Girl (N=125)		Boy (N=94)						
		number	Percentage	number	Percentage	number	Percentage		totals	P
Portions of vegetables consumed per day	Less than two servings per day	39	17,81	23	10,50	2	0,91	62	28,31	NS
	Two servings per day	52	23,74	34	15,53	3	1,37	86	39,27	
	Three or more servings per day	34	15,53	37	16,89	3	1,37	71	32,42	
Portions of fruits consumed per day	Less than one serving per day	10	4,57	13	5,94	0	0,00	23	10,50	NS
	One serving per day	33	15,07	28	12,79	3	1,37	61	27,85	
	Two servings per day	82	37,44	53	24,20	5	2,28	135	61,64	
Portions of dairy milk products or their derivatives consumed per day	Less than five times a week	29	13,24	24	10,96	3	1,37	53	24,20	NS
	One serving per day	57	26,03	41	18,72	3	1,37	98	44,75	
	More than one serving per day	39	17,81	29	13,24	2	0,91	68	31,05	
Nature of protein consumed per day	All or most red meats	16	7,31	10	4,57	1	0,46	26	11,87	0.058
	All or mostly fish, poultry	45	20,55	40	18,26	0	0,00	85	38,81	
	Half comes from vegetables, etc.	64	29,22	44	20,09	7	3,20	108	49,32	
Portions of cereals and cereal products consumed per day	Less than five times a week	14	6,39	14	6,39	2	0,91	28	12,79	NS
	One serving per day	18	8,22	8	3,65	0	0,00	26	11,87	
	More than one serving per day	93	42,47	72	32,88	6	2,74	165	75,34	

hours at night (1.37% vs 43.8%, without reaching significance) (Table 8).

DISCUSSION

The eating behavior of every child develops during the first years of life. It is when children learn what and when to eat from their direct experience with food and by observing others (Birch, *et al.*, 2007). But there are a lot of children who do not have proper eating behaviour, which can lead them to be underweight and cause stunting (Malnutrition, 2022). This is also the case for schoolchildren in the peri-urban area of Casablanca, Morocco. But the eating behaviour is not just due to the lack of food; many other factors are found after conducting the research study, like environmental factors, parents' attitudes, and lifestyle (Scaglioni *et al.*, 2018). The CAP score questionnaire contains all of the data, which tells us about these factors and their effects on stunting. Table 6 tells about the food servings of each

participant. And study found that children who have completed three portions of meal each day with all the healthy foods show proper growth as compared to those who are taking only one or two servings. And not only food but the lifestyle also affect growth and can increase the risk of stunting (Soliman, *et al.*, 2021). If we see table 8, the schoolchildren who are active most of the time have more weight and height than those who are less active. Other factors like sleep, proper eating also influence growth.

Providing important nutrients to growth of children, health, and development can be aided by eating a well-balanced and varied diet (Cena and Calder, 2020). Unbalanced and diversified diets, on the other hand, might result in insufficient intake of vital nutrients, which can lead to developmental health issues like poor academic performance, obesity, and growth retardation, as well as its immediate and delayed health implications (Early childhood nutrition, UNICEF, 2022).

Table 8. The lifestyle of the children included in our study

Life style		Sex				Stunting		Effective totals (N=219)	Percentage	
		Girl (N=125)		Boy (N=94)						
		number	Percentage	number	Percentage	number	Percentage		totals	P
Exercising	No or less than three times per week	47	21,46	26	11,87	3	1,37	73	33,33	NS
	Light activity most of the time	50	22,83	41	18,72	4	1,83	91	41,55	
	at least 30 months, for at least four days a week	28	12,79	27	12,33	1	0,46	55	25,11	
usual sleep pattern	Very little sleep. I don't have time to rest	18	8,22	6	2,74	2	0,91	24	10,96	NS
	All right, most nights	56	25,57	40	18,26	3	1,37	96	43,84	
	As much as I want every night	51	23,29	48	21,92	3	1,37	99	45,21	
The normal way of eating: doing homework or other things	yes	17	7,76	10	4,57	2	0,91	27	12,33	NS
	No, I eat while doing my homework	9	4,11	6	2,74	0	0,00	15	6,85	
	Just I eat with family	99	45,21	78	35,62	6	2,74	177	80,82	

Despite the importance of a well-balanced diet for one's health and well-being, many young people in the United States consume a low quantity of recommended nutrient-rich food groups and a high amount of energy-dense foods like fats and added sugars. Children are likely to lack the nutrition information and skills necessary to make healthy food choices, as well as the capacity to read product labels. Furthermore, research has demonstrated that nutritional habits and behavior developed during childhood and adolescence can be carried over into adulthood. As a result, it is critical to establish healthy eating habits during childhood to prevent obesity and its severe health repercussions later in life (Nguyen and Murimi, 2017).

There has been a significant increase in the prevalence of overweight and obesity in youngsters worldwide during the last two decades. In Canada, for example, the prevalence of overweight or obese children aged 7 to 13 years old was 12 percent in 1981 and grew to 30 percent in 1996. Children are, in fact, the fastest-growing sector of the obese and overweight population (Janssen *et al.*, 2004).

Children's nutritional status is critical since it influences their health, physical growth and development, academic performance, and life Progress. All children have the right to appropriate nutrition, which is critical for achieving the best possible health. Furthermore, healthy nutrition has been identified as a critical component for present and future generations' survival, health, and development (Chesere *et al.*, 2008).

Although school-based interventions are likely to prevent or cure micronutrient deficiencies in school-children, it is still debatable whether they can increase development, particularly linear growth. Because linear growth retardation is thought to mostly affect children in their early years. Schools are usually the most effective means of delivering health interventions to this age group, and school-based surveys are frequently used to assess the need for various interventions. Although a survey of school-children's height and weight is reasonably straightforward to conduct, the results can be readily misunderstood. In impoverished nations, stunting (shortness for age) is frequent among school-children. However, it is thought to reflect a process that occurs nearly exclusively throughout early development (Stoltzfus *et al.*, 1997).

Urban food and nutrition issues are becoming more significant and pressing as more people in developing countries move to cities. It is necessary to develop new ways that focus on urban consumers. The urban-rural divide must give way to methods that incorporate both areas. Because there are significant differences between cities in the developing world, referring to an "average" urban consumer is misleading, and it is preferable to identify consumer groups with diverse cultural backgrounds, socioeconomic status, lifestyles, and,

as a result, diverse consumer behaviors and needs (Delisle, 1990). Even though general trends in food consumption patterns have been observed, such analysis highlights significant gaps in our knowledge and understanding of which foods are consumed by which consumer groups, in what form, where, and why. As a result, the foods and diets of diverse strata of urban populations demand more attention than they have received thus far, not only because of their implications for food and agricultural planning but also because of the need to determine corrective and preventive measures (Delisle, 1990).

Obesity and overweight were found to be most frequent in children aged 5 to 9. (4.1 percent, 10.8 percent respectively). Girls had higher rates (2.4 percent and 11.3 percent, respectively) than boys (3.1 percent, and 10.1 percent respectively). They were lower than previous area studies' reported results. Obesity affects 13.3 percent of the Moroccan population, 19.1 percent of women, and 7.8 percent of men. Overweight affects 26% of the population over the age of 15 years, according to age (Mokhtar, *et al.*, 2001).

Age has no bearing on BMI, which is the same for both men and women. Due to differences in body proportions, BMI may not correspond to the similarity of obesity in different populations. The health concerns associated with growing BMI are ongoing, and various communities may interpret BMI grading to risk differently (El Hioui, *et al.*, 2020).

In the United States, school-based BMI tests could be useful for tracking trends at the state and local levels, where data is scarce. In California, for example, such data has been categorized by assembly district and used to influence legislation aimed at preventing obesity by improving food and physical activity environments. BMI screening can also be used to assess the long-term impact of schools applying essential interventions to avoid the beginning of childhood obesity (Madsen and Linchey, 2012). School nurses are health professionals who have been trained and qualified to arrange and manage BMI screenings sensitively and compassionately. To help with this effort, funds will need to be set aside for the recruitment and training of non-professional workers. If parents are to be alerted, school personnel must learn how to handle the emotionally charged matter of children being labeled overweight (Sellam and Bour, 2015). Schools must ensure that therapeutic programs are available to assist these children. Regardless of whether or not BMI screening is used, schools must foster an inclusive and courteous environment in which size prejudice is not permitted. To prevent harming kids attempts to improve their health should focus on improving their physical, psychological, and social well-being (Ikeda *et al.*, 2006).

Many different studies have also found a direct link between environmental factors on the eating behavior of school-children (Nielsen and Popkin, 2003). So, in this area of study, stunting is a major problem in school-going children of Morocco, which can also affect their future. And the main cause of this stunting seems to be the bad weaning practices and negative attitude toward food among schoolchildren of pri-urban areas of Casablanca (Hioui, *et al.*, 2011).

CONCLUSION

In Morocco stunting prevalence is variable, with prevalence of 16.02% according to WHO standards in children aged under 5 years (Sellam and Bour, 2015). The stunting estimated at 4% 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.

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