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# NUTRITIONAL STATUS AND OBESITY IN 10-13 YEARS MOROCCAN STUDENTS FROM THE PROVINCE OF KHEMISSET

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**Abstract**

Obesity and overweight are forms of malnutrition. It can occur from a very young age and have lifelong consequences. The objective of this study was to evaluate the relationship between nutritional status and obesity in primary school children from the province of Khemisset, Morocco. 210 primary school children including 90 boys and 120 girls aged 10 to 13 years were recruited from public primary schools from the province of khemisset. Anthropometric parameters (weight, height, body mass index) were measured. The data was collected using a questionnaire. The results showed that 17% of primary school children are overweight, compared to 7% with obesity. Weight, height, and weight z-score were significantly higher in boys than in girls. Most children do not consume dried fruits, legumes, olives and olive oil, tea, and juices. Most primary school children eat pasta, cakes, cookies and cakes. The prevalence of obesity and overweight among primary school children is high. Primary school children are at risk of developing obesity-related diseases that can persist into adolescence and adulthood. Several studies on nutritional status will be recommended in preschool children in Morocco.

**Keywords:** Nutritional Status – Obesity – Primary School Student – Health – Khemisset- Morocco.

## 1. INTRODUCTION

At an alarming rate, not only in industrialized but also developing countries, throughout human history, weight gain and fat accumulation are seen as signs of prosperity and health [1-4].

Being overweight is the result of excessive accumulation of body fat. We consider that the child is overweight from the moment when their amount of fat mass represents a danger to their health. The identification of a situation of overweight or obesity in children is done by calculating their Body Mass Index (BMI) regularly. This BMI is compared to the corpulence curve, a reference tool which takes into account the age and sex of the child [5, 6].

Several factors are associated with the problems of excess weight and obesity in children, including changes in the eating habits and lifestyle of populations under the combined effect of urbanization and industrial activities [7, 8]. Weight gain and obesity pose a threat to health in all countries, both among adults and children [9, 10].

In addition, several studies confirm the link between the nutritional transition and the emergence of chronic diseases including obesity [11, 12]. Morocco presents all the characteristics of a country in nutritional transition, like other mediterranean countries [13, 14].

The causes of obesity in children and adolescents are complex and multifactorial, including genetic, environmental, social and behavioral factors [15, 16]. Among these factors, poor eating habits and a sedentary lifestyle play a major role in the development of obesity [17]. The health consequences of obesity for young people

are numerous and can include physical problems such as type 2 diabetes, high blood pressure and heart problems, as well as psychological and emotional problems such as depression and low self-esteem [18, 19].

To prevent and treat obesity in children and adolescents, it is essential to promote a balanced diet and good dietary practices. This involves educating families on the basic principles of healthy eating, reducing the consumption of energy-dense foods, and encouraging the consumption of fruits, vegetables, and low-energy-density foods [4]. In addition, it is important to highlight the role of health professionals, schools and institutions in the dietary management of obesity in young people [20, 21].

A healthy diet promotes the improvement or maintenance of good health. It plays a crucial role in preventing the development of chronic diseases, several determinants that influence healthy eating in children and adolescents [22]. The objective of the current study was to evaluate the relationship between nutritional status and obesity in Moroccan primary school children from the province of Khemisset.

## 2. MATERIALS AND METHODS

### 2.1 Study Design

The survey was carried out in the city of Khemisset located in the northwest of Morocco. This study took place from January to December 2023, and included 4 public primary schools selected randomly.

### 2.2 Participants

The population consists of 210 preschool children including 90 boys (42.9%) and 120 girls (57.1%) aged 10 to 13 years. The children were randomly selected and informed about the objectives of the study. The ethics committee approved the study protocol.

### 2.3 Instruments

Weight and height were measured according to the standard norms. During the measurement, the participants were in their underwear, without shoes. The weight was determined using a new mechanical scale (Terraillon with an accuracy of 0.5 kg). Height was measured using a height chart with an accuracy of 0.1 cm. Body mass index (BMI), kg/m2, was calculated by dividing weight in kg by height squared in m2.

BMI indices (Z score of BMI, weight and height) were calculated in children using the AnthroPlus software for people aged 5-19 years. Overweight is indicated by a Z-score > +1 SD. Obesity is indicated by a Z-score > +2 SD.

### 2.4 Statistical Analysis

All statistical analyzes were carried out using Excel software. Data were represented as mean ± standard deviation (SD) or median, and percentage. Normality of distribution was tested by the Kolmogorov-Smirnov test. The Chi-square test was used to test the association between nominal variables.

In the case of abnormal distribution, the Mann-Whitney test was used to compare the medians between two independent samples. In the case of normal distribution, the one-way ANOVA test between two or more independent samples was used. Spearman's correlation was used. All statistical tests were considered significant when the p value was less than 0.05.

## 3. RESULTS

### 3.1 Distribution of Students by Gender

As shown in figure 1, we see that the study population is made up of 210 students, of whom 42.9% (n=90) are male and are in the majority compared to the female sex, which represents 57.1% (n=120). The sex ratio is therefore unbalanced, it is equal to 0.75.

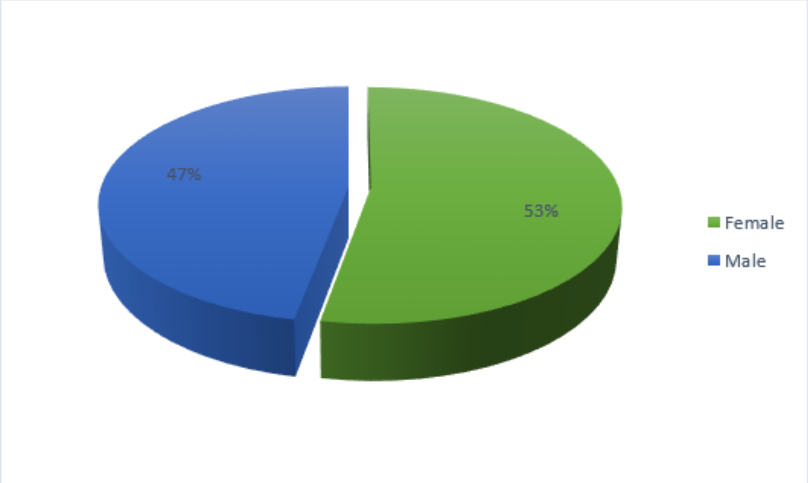


**Figure 1: Breakdown of Students Surveyed by Gender**

### 3.2 Distribution of Students according to Their Ages

According to the descriptive analyses, we note that the average age of the pupils is 10.37 ±1.42 years, with a minimum age of 8 years and a maximum age of 14 years (figure 2). Shape parameters such as the asymmetrical coefficient and the flattening coefficient confirmed the Gaussian aspect of this population.

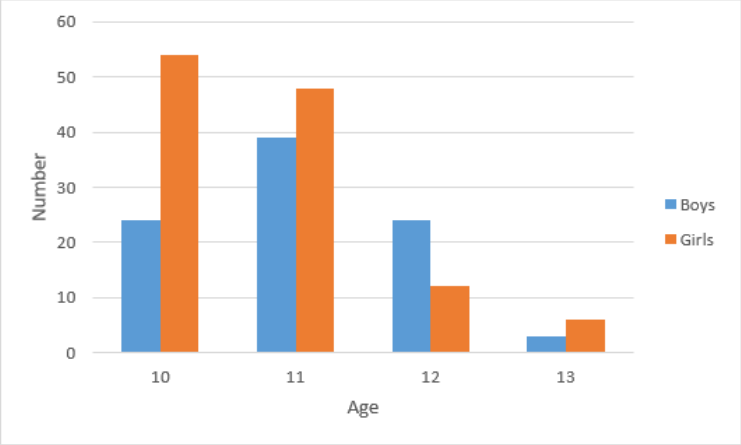


**Figure 2: Distribution of Children Interviewed by Age**

### 3.3 Anthropometric Characteristics According to Gender

The table 1 shows the characteristics of the study population by sex. Weight, height, and weight z-score were significantly higher in boys than in girls. We also note that 14% of preschool children are overweight, compared to approximately 6% who are obese.

**Table 1: Anthropometric Characteristics according to Gender**

| | Boys (n=90) | Girls (n=120) | Significance |
|---|---|---|---|
| Age (years) | 10.75 | 11.07 | NS |
| Weight (Kg) | 40.97 | 39.38 | * |
| BMI (Kg/m2) | 17.31 | 17.05 | * |
| Z score of BMI | 0.22 | 0.20 | NS |
| Weight status | | | |
| Overweight | 5% | 5% | NS |
| Obesity | 2% | 1.4% | |

NS: no significant, * p< 0.05

### 3.4 Diet Habits in Studied Population

Table 2 shows the healthy and poor dietary habits in studied children. The majority of primary school children consume low quantities of fruits, legumes, and olive oil, and high quantities of pasta, cakes, biscuits, and cakes at least once a day and juices. There are no significant differences between girls and boys regarding the consumption (0 times/day, at least 1 time/day) of these eating habits considered healthy.

**Table 2: Diet Habits in Studied Population**

| | Boys (n=90) | Girls (n=120) | Significance |
|---|---|---|---|
| Vegetables | 23 (26%) | 30(25%) | NS |
| Fruits | 20 (22%) | 25(21%) | * |
| Olive oil | 45(50%) | 41(34%) | * |
| Tea | 73(0.22) | 101(0.20) | NS |
| Pasta | 81(90%) | 109 (90%) | NS |
| cakes | 80(89%) | 110(92%) | NS |
| cookies | 87(97%) | 115(96%) | NS |

NS: no significant, * p< 0.05

## 4. DISCUSSION

The objective of our study was to evaluate the relationship between nutritional status and obesity in a sample of primary school children from the province of Khemisset, Morocco.

Worldwide, childhood obesity is a public health problem. In fact, 5% of mortality is attributable to overweight and obesity. In children, the study of the prevalence of these phenomena has been the subject of numerous studies around the world [23,24]. Results vary from country to country. The differences in frequency estimates are mainly explained by the choice of reference values. Indeed, they are established on different percentile levels, and the reference populations differ by the date of data collection, the country of origin, the study designs and the smoothing methods used [25].

In our study, we found the prevalence of overweight and obesity are 5% versus 2% respectively.

In Morocco, several studies have been carried out, which estimate the prevalence of obesity in children, the prevalence of overweight is 5 to 15%, while the prevalence of obesity is 3 to 10%. This difference could be explained by the choice of age range which is short in our study [26-28].

Despite the small number of the population studied, our results are reasonable because they are more or less similar to several studies. On the other hand, in African continent, many studies have been carried out which estimate the percentages of obesity, with figures approximately lower than ours [29, 30].

These prevalences are low compared to our study and this is due to the lower standard of living [31, 32].

Among the sample, 23.45% of schoolchildren do not eat breakfast, 2% of them are overweight, 5% are obese, the prevalence of overweight is greater among children who do not take breakfast. no breakfast only in those who take it ($P < 0.01$), eating disorders could explain this situation, the nocturnal eating syndrome which corresponds to the inversion of the nycthemeral rhythm of the diet is very often observed in children who eat late at night or who cause insomnia when falling asleep which promotes nighttime eating followed by morning loss of appetite, which in turn generates cravings for snacking which are generally satisfied by snacks with very high glycemic indices [33-37].

Regarding the consumption of sugary drinks (sodas and sugary drinks of industrial origin), 59.716% of schoolchildren regularly consume at least one glass per day, 63.95% of schoolchildren consume, among them 40.11% are overweight, girls are heavier than boys ($P< 0.05$) [38, 39]. Among the children who consume sweets and chocolate bars as a snack and who are enrolled in 5th grade class (average age 11.49 years) 49.18% are overweight, girls are heavier than boys. Boys ($P< 0.001$), are these the consequences of poor eating habits that set in between the start and the end of schooling in the primary cycle? This type of eating behavior causes nutritional imbalances which lead to the gradual onset of excess weight. Parents must, without completely forbidding a food to the child, help them rediscover the taste of varied foods prepared at home as well as the notions of hunger and satiety [40-43].

We can conclude that our prevalence is much lower than certain European and American countries, sometimes higher or slightly higher than other African countries, this difference is due to variations in the standard of living between these countries.

From a dietary point of view, in our study, most children seem to be at risk of vitamin and fiber deficiency, and can contract health problems because they do not eat dried fruits on a daily basis [45, 46].

Our study showed that most children consume low quantities of legumes and fruits compared to cakes, so they are at greater risk of poor muscle and brain functions [47, 48].

Fruit juices without added sugar can be consumed for breakfast or as a snack, because they are rich in minerals and vitamins, and provide few calories thanks to their high water content, and are part of the prevention of obesity and diabetes, while our result shows that most children do not take fruit juices on a daily basis.

According to our statistical results, we found that the majority of children do not take tea daily. Tea drinking may have therapeutic effects like antioxidant, vasculoprotective, antihepatotoxic, antiallergic, anti-inflammatory, antiulcer and even antitumor properties. On the other hand, tea can have an exciting effect, and its consumption should be restricted in young children, which coincides with our study [49, 50].

Regular consumption of fruits and legumes has beneficial effects in certain disorders of the digestive and hepatobiliary system, in osteoporosis, in the prevention of aging and in strengthening the immune system. Olive oil also exerts a protective effect against certain malignant tumors and reduces the incidence of certain types of cancer, which shows that our study population has a risk of having these diseases [51].

In summary, most of the children in the present study have poor eating habits including consumption of pasta, biscuits, cakes and pastries at least once/day. These dietary practices are consistent with many regions in the world where diets have become increasingly energy dense and softer with fiber-rich foods being replaced by more highly processed versions [23, 52].

The eating habits of the children studied therefore do not seem to be appropriate for a healthy lifestyle. Moroccan children are at risk of developing non-communicable diseases because poor nutrition is considered among the main causes of major non-communicable diseases and obesity can persist into adulthood and adulthood. Adolescence. However, due to the limitations of our study, the source population was restricted to the public education sector in the province of Kenitra, because there are no public nursery groups. This forces us to gain access to private establishments despite the presence of local constraints in terms of access. Finally, the assessment of nutritional status was based solely on BMI, which despite its wide use and great interest has limits, and which should be associated with other indices such as fold thickness. Cutaneous, the measurement of waist circumference or the waist circumference index relates to the size for an optimal assessment [23, 34].

## 5. CONCLUSION

Primary school children are at risk of developing obesity-related diseases that can persist into adolescence and adulthood. Several studies on nutritional status will be recommended in these children in Morocco.

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