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Obesogenic Factors in School-Aged Children in Tobruk City, Libya

Nasren G. S. Al Fraik[1*], Amera M. Hamad[2], Aya S. Balhouq[2], Doaa F. Salih[2], Rajaa J. Saleh[2], Sana B. Aqoub[2]

***Corresponding author:** Nasren.Alfraik@tu.edu.ly
Department of Pediatric, Faculty of Medicine, Tobruk University, Libya

[1] Department of Pediatric, Faculty of Medicine, Tobruk University, Libya

[2] Medical Student, Faculty of Medicine, Tobruk University, Libya

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Abstract

Childhood obesity rates are globally on the rise. This study aims to assess the factors contributing to obesity in school-age children in Tobruk City, Libya, across various public and private schools. This epidemiological cross-sectional survey was conducted in May 2024. Students were divided into four groups according to their Body Mass Index: normal, underweight, overweight, and obese. Children were additionally categorized into two groups according to the type of school attended: public or private. Among 201 studied participants, only 18 students were obese all of whom were from the public school. Meanwhile, 89 students were found to be underweight, 12 were overweight, and the remainder 82, were within normal Body Mass Index. No obese children were reported in the private school, only 6 were overweight, but > 40% of children were underweight. Therefore, no correlation was found between school type and childhood obesity with a p value of 0.089. We found screen time to be more prevalent in obese and overweight children. There is no correlation between the student's gender and obesity with a p value of 0.573. The study found that the duration of activity was more extensive in the private school students. The current study concluded that there are many factors, rather than nutritional habits and activities that can affect a child's growth and body build. Further studies with large samples in our city are recommended.

Keywords: Obesity, Children, Pediatrics, Body weight, Nutrition

INTRODUCTION

Obesity in children is a serious public health concern that raises morbidity and mortality rates as well as in adult age groups (WHO, 2020). Childhood and adolescent obesity are a global health concern that is growing more prevalent in low- and middle-income countries (Lobstein, 2019). Childhood obesity can persist into adulthood (Llewellyn et al., 2016) and therefore, leads to an increased risk of many morbidities and chronic diseases. The primary external causes of childhood obesity are urbanization, a decrease in physical activity, and an increase in caloric consumption (CDC, 2010; Freitas et al., 2019). The World Obesity Federation projected in 2019 that 206 million children and adolescents would be obese by 2025, and 254 million in 2030 (Lobstein, 2019). Certain dietary practices and the consumption of highly processed foods account for a small portion of this age-related increase (Costa et al., 2019; Gingras et al., 2018). The primary causes of children and adolescents not getting enough exercise in most countries are the loss of public recreation areas and an increase in motorized transportation (Mahumud et al., 2021). A useful indicator of pediatric

obesity is the body mass index (BMI) (Smetanina et al., 2015), along with the criteria established by the International Obesity Task Force (IOTF) (Rolland-Cachera, 2012). The tables provide international child cut-offs corresponding to the following body mass index (BMI) values at 18 years:

- 16 – thinness grade 3
- 17 – thinness grade 2
- 18.5 – thinness grade 1
- 23 – overweight (unofficial Asian cut-off)
- 25 – overweight
- 27 – obesity (unofficial Asian cut-off)
- 30 – obesity
- 35 – morbid obesity

The current study aimed to determine the differences in environmental factors between two different schools, evaluate certain factors linked to obesity such as dietary and lifestyle factors, and examine changes in children's BMI.

MATERIALS AND METHODS

Study type: cross-sectional epidemiological study.

Study population: The study covered two distinct age groups: six and eleven years old in the same geographic area within Tobruk city, Libya in one public and private school.

Study duration: May 2024

Inclusion criteria: every six and eleven-year-old child within both private and public schools was included in this study.

Exclusion criteria:
The family not filling in the questionnaire, and children aged other than 6 and 11 years old were excluded from the study. Data were collected by authors from parents after their consent through a questionnaire. We asked about the number of meals per day, their breakfast routine, how often and how much they eat snacks and carbonated beverages daily, how active they are, and how much time they spend on screens each day. The height and weight of each student were measured individually in the school by the authors. Following institutional guidelines, the parents of the youngsters gave their informed consent. The researchers performed all anthropometric measurements. A manual tape measure was used to measure height. Weight was measured using a well-calibrated digital electronic scale. We divided the students into four groups based on BMI: normal, underweight, overweight, and obese. The children were also divided into public and private groups.

Statistical methods:
RStudio software version 4.3.2 was used to analyze the data. Means, standard deviations, medians, and/or interquartile ranges were used to summarize numerical data. Numbers and percentages were used to summarize categorical data. The student's t-test was used to compare two groups for regularly distributed numerical data, while the Mann-Whitney test was used to compare two groups for non-normally distributed numerical variables. Notably, Kruskal-Wallis was used to investigate differences between more than two groups, and post hoc analysis was utilized if required (using the Bonferroni test).

RESULTS

This is a cross-sectional study showing the demographic data of 201 studied children aged 6 and 11 years in both public 154 (76.6%) and private schools 47 (23.4%) schools. Females 98 (48.8%) were nearly equal to males 103 (51.2%). Regarding BMI, most children were underweight >44%, normal BMI 40%, obese children were 9%, and overweight children were 6% as also, clearly explained in Figure (1)**.** The current study noted in Table (1) no significant correlation between breakfast types, number of daily meals and snacks, and obesity in studied children, but the less water consumption the more unhealthier growth was noted.

Table (1): Nutritional habits in studied children

		Underweight (n=89) Median (IQR)	Normal (n =82) Median (IQR)	obese (n = 18) Median (IQR)	Overweight (n=12) Median (IQR)	*P*
(%) Breakfast	Home breakfast	(79.8) 71	60 (73.2)	14 (77.8)	10 (83.3	0.82
	School breakfast	(9.0) 8	14 (17.1)	2 (11.1)	1 (8.3)	
	Money-paid breakfast	(11.2) 10	8 (9.8)	2 (11.1)	1 (8.3)	
Breakfast type	Sandwiches	(32.6) 29	22 (26.8)	4 (22.2)	4 (33.3)	0.128
8-	Juices	(40.4) 36	36 (43.9)	4 (22.2)	5 (41.7)	
4+	Cola	(6.7) 6	11 (13.4)	2 (11.1)	1 (8.3)	
	Water	(15.7) 14	9 (11.0)	4 (22.2)	2 (16.7)	
	Fruits	(4.5) 4	3 (3.7)	2 (11.1)	0 (0.0)	
	Vegetables	0 (0.0)	1 (1.2)	2 (11.1)	0 (0.0)	
Breakfast Beverage (%) Types	Natural juices	(39.3) 35	26 (31.7)	6 (33.3)	6 (50.0)	0.724
	Industrial juices	(39.3) 35	34 (41.5)	6 (33.3)	3 (25.0)	
	Soft drinks	(12.4) 11	15 (18.3)	3 (16.7)	3 (25.0)	
	Flavored milk	(9.0) 8	7 (8.5)	3 (16.7)	0 (0.0)	
Number of snacks/day		2.00 [2.00, 3.00]	2.00 [2.00, 3.00]	2.00 [2.00, 3.00]	2.00 [2.00, 3.00]	0.441
Number of daily meals		4.00 [3.00, 4.00]	3.00 [3.00, 4.00]	3.00 [3.00, 4.00]	4.00 [3.00, 4.00]	0.624

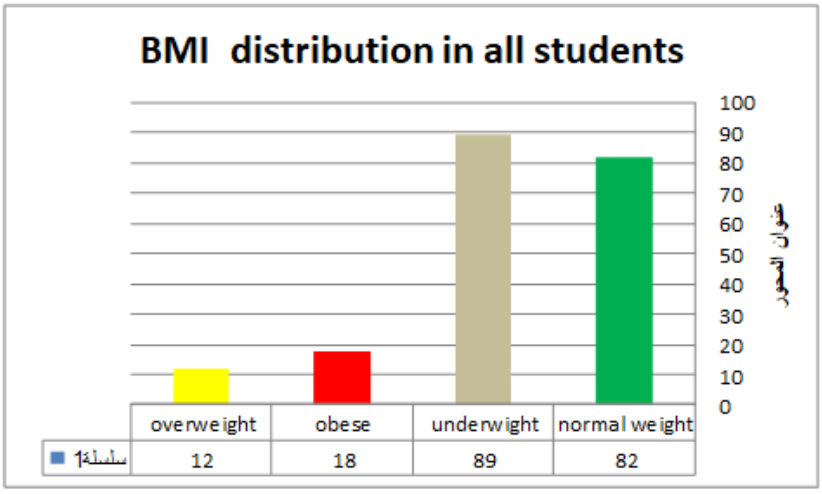

Figure (1): BMI distribution in all students

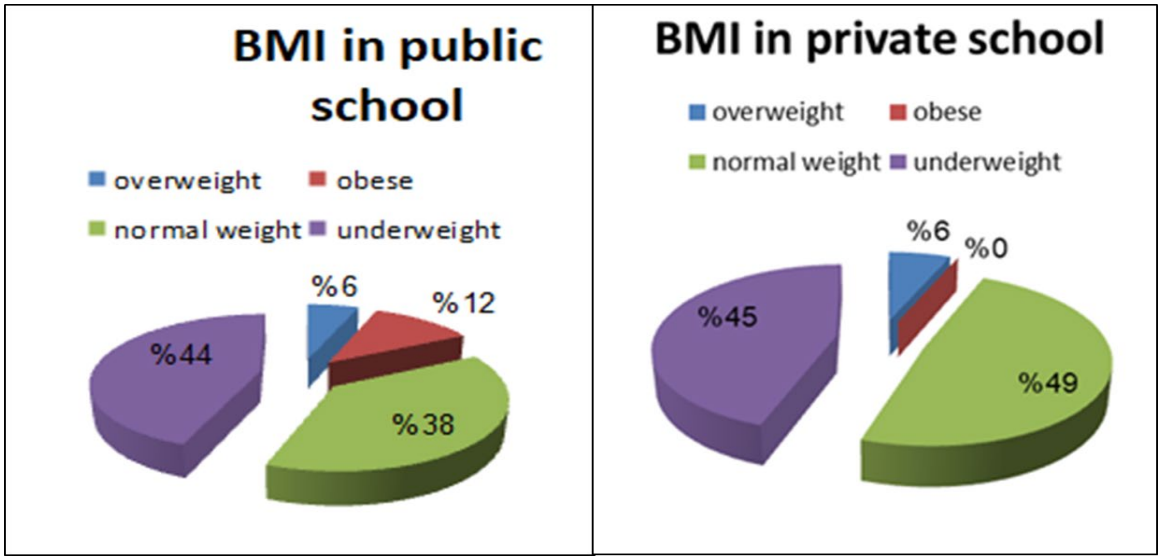

Figure (2): Comparison of BMI for both schools

As we noted in the diagram, there were no obese children reported in the private school, with only 6 overweight, but > 40% of children were underweight. Therefore, no correlation was found between school type and childhood obesity with a P value of 0.089.

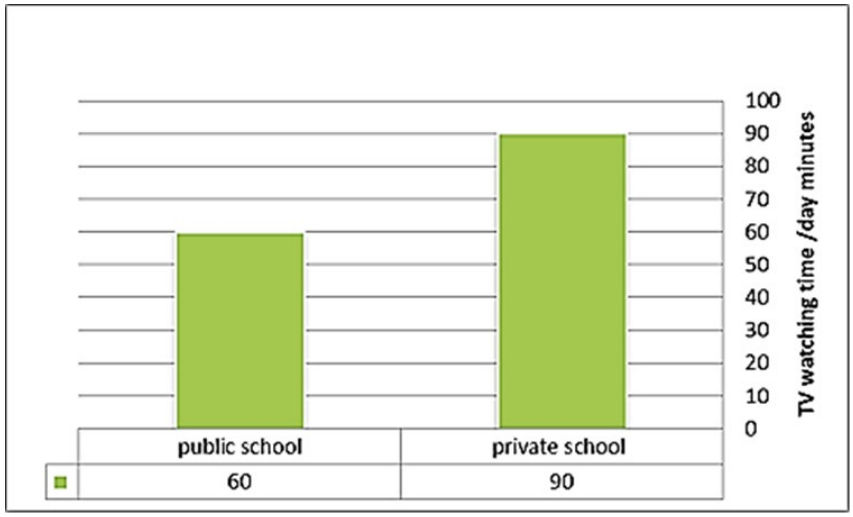

Figure (3): A comparison between public and private schools in TV watching time/day for their studied children

In able (2), the TV watching time was observed to be about 90 minutes per day in both overweight and obese children, while it was about 60 minutes per day in normal and underweight children.

Table (2): TV watching time in correlation to the BMI of studied children

	Underweight (n=89)	Normal (n =82)	Obese (n = 18)	Overweight (n=12)	P value
TV time minutes/day	60.00 [60.00,120.00]	60.00 [48.75,112.50]	90.00 [32.50, 120.00]	90.00 [52.50, 180.00]	0.32

As mentioned in Table (3), overweight and obese children spent more active time per day than the normal and underweight children. Therefore, no correlation was presented between daily activity and obesity in studied children with a P value of 0.585.

Table (3): Daily activity in studied students

	Underweight (n=89)	Normal (n =82)	Obese (n = 18)	Overweight (n=12)	P value
Daily activity minute/day	120.00 [60.00,180.00]	130.00 [60.00,180.00]	140.00 [60.00, 180.00]	180.00 [60.00, 180.00]	0.585

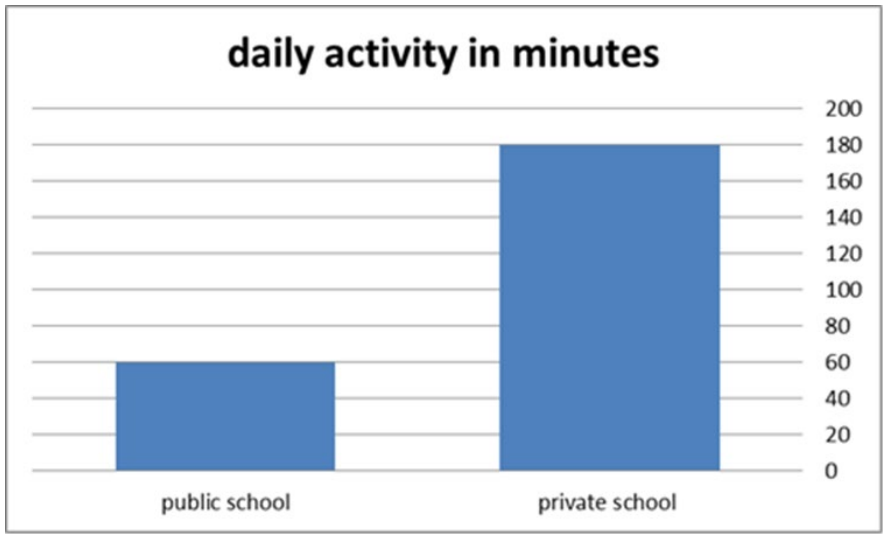

Figure (4): Daily activity per day in minutes for studied children in both public and private schools

We noted in Table (4) that there is no correlation between the student's gender and obesity with a P value of 0.573

Table (4): Correlation between students' gender and BMI

Gender	Underweight (n=89)	Normal (n =82)	Obese (n = 18)	Overweight (n=12)	*P*
Female	45 (50.6)	4636 (43.9)	11 (61.1)	6 (50.0)	0.573
Male	44 (49.4)	46 (56.1)	7 (38.9)	6 (50.0)	

DISCUSSION

The two schools (private and public) where this cross-sectional epidemiological investigation was conducted, were located in Tobruk City, Libya, in May 2024. This is one of the first studies in Tobruk City focused on the risk factors for childhood obesity. Only about 90% of the included families filled in the questionnaire. The other children with incomplete data were excluded. The number of students in the public school was more than double that of the private school 77%:23%. The study found that the atmosphere at the public school was obesogenic and the number of obese students was 6%. The BMI of most of the children in both schools was underweight >44%, normal BMI at 40%, obese children were 9%, and overweight children at 6%, as also clearly explained in Figure (1).

These results agreed with(Yılmazbaş & Gökçay, 2021), showing that the proportion of children with underweight and normal BMI (62.6%) was higher than that of overweight (21.5%) and obese children (15.9%).

In the current study, there were no obese children reported in the private school, and only 6 were overweight, but > 40% of the children were underweight. Therefore, no significant correlation was found between school type and childhood obesity with a P value of 0.089. The study by (Yılmazbaş & Gökçay, 2021) found obesity in both school types, with a lower prevalence in private schools (6%) compared to public schools (15.9%).

In this study, over 77% of obese children consumed breakfast at home. Among them, 22% had a home-prepared sandwich along with juice and water. Additionally, 66% consumed juice, with equal proportions choosing natural (33%) and industrial (33%) options. Notably, a large percentage (40%) of underweight children relied primarily on juice in their breakfast.

Therefore, no significant correlation between breakfast types, number of daily meals and snacks, and obesity in studied children was noted. This finding disagrees with the report by (Mahumud et al., 2021), which identifies dietary factors as contributors to the increased risk of childhood and adolescent obesity. While (Rathnayake et al., 2014; Smetanina et al., 2015) agree with our results. We also observed low water consumption across all study groups, regardless of whether the children were obese or had a normal body build, unlike (Maffeis et al., 2016; Milla-Tobarra et al., 2016), who found that children who were obese used less water than their peers.

We noted in our study that screen time in the private school was more than that in the public school. Also, the TV watching time was about 90 minutes per day in both overweight and obese children while about 60 minutes per day in normal and underweight children. These findings are in agreement with (Rathnayake et al., 2014; Reilly et al., 2005; Yılmazbaş & Gökçay, 2021). Also, (Barr-Anderson et al., 2008) demonstrated that having a television in the bedroom increases the chance of developing obesity. The overweight and obese children in this study spend more active time per day than the normal and underweight children. This finding may be due to parental awareness regarding the increasing body mass. There was no correlation presented between daily activity and obesity in studied children with a P value of 0.585. In addition, the students in the private school spend more active time per day than the students in the public school, which may explain the absence of obesity in the private school.

Limitations: The private school sample was low. Only self-reporting allowed us to gauge the children's activity levels, and this may not accurately represent their actual levels of physical activity. Also, there are endogenous factors such as genetic, endocrinal, and many other factors that were not taken into account in the current study.

CONCLUSION

The current study was the first in our city to focus on obesity and poor growth among school children. We concluded from our research that the school and home environment could increase the risk of obesity, but daily eating patterns and physical activity levels are not the primary risk factors for childhood obesity in our city and that there is no single cause for it; rather, a variety of factors may interact to cause obesity. We recommend conducting further studies with larger sample sizes to cover multiple schools and collect more detailed information on potential confounding factors such as socioeconomic status, family-related emotional stress, sleep duration, transportation methods, parental awareness, and other factors affecting child growth.

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ETHICS

The Ethics Committee of Tobruk University, Tobruk School, gave its approval to this project (approved number NBC: 009.H.24.1).

Duality of interest: The authors declare that they have no duality of interest associated with this manuscript.

Author contributions: Contribution was equal between authors**.**

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