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Prevalence of Obesity among Students in Private and Public high Schools in Sulaimani City

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Abstract

Background: There is an increasing concern about obesity among children and adolescents worldwide as they constitute 20% of the world population. Several predisposing factors are contributing to the obesity that can be monitored, particularly healthy diet and physical activities. Addressing those factors among children and adolescents lead to decreasing health related conditions.

Objective: To investigate the prevalence rate of obesity, sociodemographic, dietary habits, lifestyle and knowledge factors among adolescents attending private and public schools in Sulaimani city, Iraq.

Patients and Methods: Through a school-based cross-sectional study from October 2021 to April 2022, a total of 576 students in high schools located in Sulaimani city, Kurdistan Region, Iraq were studied. A structured questionnaire was used to collect information on students' sociodemographic characteristics, physical activities, dietary habits and knowledge. Body mass index was measured based on WHO Growth Reference for 5 to 19 years of age.

Results: The obesity prevalence rate in private schools (36.11%) was higher than public schools (31.6%) (P=0.5890) however, the difference was not statistically significant. The majority of students in private schools exercised more frequently and for a longer duration; however, they ate more red meat, less dairy produce and had a higher fast food intake.

Conclusion: The prevalence of obesity is slightly higher among students in private schools than the students in public schools.

Keywords: Obesity, private, public, high schools, Sulaimani city

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Introduction

Obesity is a major public health problem worldwide [1]. Obesity has many consequences, including health problems, depression, eating disorders, and death. Obesity increases the likelihood of various diseases, especially type 2 diabetes, heart disease, cancer, osteoarthritis , and obstructive sleep apnea [2,3] and has become a global epidemic, with prevalence increasing throughout developing and developed countries. Obesity rates in Iraq are also increasing, with the population undergoing a transition from underweight to overweight, accompanied with rapid socioeconomic and nutritional changes [4]. Over the past few decades, this worrying increase in obesity has

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heightened concerns about the associated health risks for adults, as well as children and adolescents [1-4]. About 1.2 billion individuals, or 20% of the world population, are classified as adolescents [5, 6]. In 2016, an estimated 124 million children and adolescents between the ages of 5 and 19 were obese worldwide, and 213 million were overweight [7]. Adolescents are considered obese when their body mass index (BMI) is more than the 95th percentile for their age and gender, and overweight when it is between the 85th and 95th percentiles [8]. Aside from age, other factors such as socioeconomic position, gender, reduced physical activity, over-eating, and various genetic, hormonal, metabolic and psychological problems can also lead to obesity [2,3]. Continuous lifestyle monitoring in adolescents is crucial, as nutritional habits and physical activity have an important roles to play in health promotion and preventing disease [9].

School type (public and private) might be used as a socioeconimic indicator for obesity, and this has recently been studied in many countries [10, 11]. This study aimed to investigate the prevalence of obesity, sociodemographic, dietary habits, lifestyle and knowledge factors among adolescents attending private and public schools in Sulaimani city, Iraq.

Patients and Methods

Through a school-based cross-sectional study from October 2021 to April 2022, a total of 576 students (aged 15 to 18 years) in senior high schools located in Sulaimani city were studied. There are 122 public and private high schools in Sulaimani city (110 public and 12 private). Random sampling was employed to choose the public high schools and all private schools was included.The present study was carried out at 24 high schools: 12 private schools and 12 public schools. 24 students were selected from grades (10, 11, and 12) in each school; that is 8 students in each grade. Those 8 students were selected in only one class, and were selected by random sampling method.

A digital bathroom scale (TANITA model HA-801) and SECA body meter (model 206) were utilized to measure the body weight and height, respectively. The formula “weight in kilograms divided by height in meters square” was used to calculate the students’ body mass index (BMI). Based on these measurements and according to WHO Growth Reference for children and adolescents aged 5 to 19 years, the students were classified as underweight, normal, overweight or obese [12].

Table (1): Weight status category of percentile range

Weight status category	**Percentile Range**
Underweight	Less than 5^{th} percentile
Normal range	5^{th} – 85^{th} percentile
Over weight	85^{th} – 95^{th} percentile
Obese	95^{th} percentile

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Required data were collected through a researcher-designed questionnaire which was aimed at gathering data on the students' sociodemographic characteristics, their knowledge, attitude, and behavior, screen time spent, sleep habit, dietary patterns, and their physical activities. The questionnaires were completed by the students while they were accompanied and interviewed by the researcher to make sure they would give adequate and accurate information.

Statistical Analysis

The statistical analysis was conducted using Statistical Package for the Social Sciences (SPSS 21.0). For this purpose, the data were coded, tabulated, and presented in a descriptive form. Chi-square test was used to compare the studied variables, to compare two means, the independent t-test was utilized and p-value of <0.05 was regarded significant.

Results

This study found that one third of the students in both schools were obese Table (2). The rate of obesity in private schools (36.11%) was higher than public schools (31.6%); however, the difference was not statistically significant. Most participants had a normal BMI (38.54% and 38.19%, respectively), whilst the lowest percentage of participants were underweight in both public and private schools (10.42% and 9.72%, respectively). However, there is no statistically significant difference mean of BMI (p=0.909) in public and private school because the result of the p-value more than 0.05

Table (2): Student body mass index in public and private schools

Variables		Public school		Private school		Total		P-value
		Frequency	%	Frequency	%	Frequency	%	
Body mass index {Kg/m^2}	Underweight	30	10.42	28	9.72	58	10.03	P=0.589
	Normal	111	38.54	110	38.19	221	38.24	
	Overweight	56	19.44	46	15.97	102	17.65	
	Obese	91	31.60	104	36.11	195	33.74	
	Mean ±SD	24.29 ± 4.97		24.24 ± 4.68		24.27±4.82		t=0.114
	Max ± Min	43.5±14.3		43.21±14.64		43.5±14.3		(p=0.909)

*P value of < 0.05 was considered as statistically significant, t-test for independent samples was used to compare means

Considering participants' socio-demographic characteristics in public and private schools, the results showed that the majority of students were between the ages of 17-18 in both schools. However, this age group was significantly higher (P=0.001) in public schools compared to private schools. In terms of gender and grade of the students, the results were similar in both groups. Most students in public schools had significantly a family size (17.01%) compared to the students in private schools (5.90%) Table (3).

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Table (3): Characteristics of participating adolescents in public and private schools

Variables		Public school		Private school		Total		P-value
		Frequency	%	Frequency	%	Frequency	%	
Age of students	15-16	120	41.67	161	55.90	281	48.78	P=0.001*
	17-18	168	58.33	127	44.10	295	51.22	
	Mean ±SD	16.72±0.93		16.32±1.02		16.52±0.99		T=4.989(p=0.000)*
Gender	Male	144	50.00	144	50.00	288	50.00	----------
	Female	144	50.00	144	50.00	288	50.00	
Grade	10	96	33.33	96	33.33	192	33.33	----------
	11	96	33.33	96	33.33	192	33.33	
	12	96	33.33	96	33.33	192	33.33	
Family size	< 4	19	6.60	26	9.03	45	7.81	P=0.000*
	4-6	220	76.39	245	85.07	465	80.73	
	>6	49	17.01	17	5.90	66	11.46	
	Mean ±SD	5.35±1.27		4.89±1.1		5.12±1.21		t=4.677 (p=0.000)*
	Max ± Min	9 ± 2		9 ± 2		9 ± 2		

When comparing sedentary behaviors, sleeping and physical activity in public and private schools, watching TV, time spent with electronic devices and the time students went to varied significantly with school type, with private school students watching less TV, spending fewer hours watching electronic devices and going to bed earlier.

Compared with students in private schools, students in public schools also reported significantly lower exercise frequency and duration. However, most students in private schools travelled to school in their private cars (94.44%), compared to students in public schools where private transport to school was much lower (50.35%) (P=0.000) Table (4).

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Table (4): Distribution of selected variables among students of public and private schools

Variables		Public school		Private school		P-value
		Frequency	%	Frequency	%	
Watching TV	Yes	132	45.8	103	35.8	P=0.014*
	No	156	54.2	185	64.2	
Time spent with screens (computer/ smartphone/tablet)	<=1 hr.	58	21.48	56	20.22	P=0.013*
	2-4 hrs.	202	74.81	221	79.78	
	4-6 hrs.	7	2.59	0	0.00	
	more than 6 hrs.	3	1.11	0	0.00	
	Total	270	100	277	100	
Sleep duration (hr)	6 >	35	6.1	53	9.2	P=0.027*
	6 – 8	194	33.7	197	34.2	
	8 – 10	57	9.9	35	6.1	
	< 10	2	0.3	3	0.5	
Bed time	Before 10:00	16	5.6	25	8.7	P=0.004*
	Between 10:00-12:00	155	53.8	183	63.5	
	After 12:00	117	40.6	80	27.8	
Exercise frequency/week	1-2 days	99	55.62	81	42.19	P=0.021*
	3-5 days	61	34.27	78	40.63	
	≥ 6 days	18	10.11	33	17.19	
	Total	178	100	192	100	
Exercise type	Walking	31	17.42	18	9.38	P=0.011*
	Running	29	16.29	28	14.58	
	Football	49	27.53	40	20.83	
	Basketball	10	5.62	16	8.33	
	Swimming	5	2.81	6	3.13	
	Gym	23	12.92	52	27.08	
	Others	31	17.42	32	16.67	
	Total	178	100	192	100	
Exercise duration/day	≤30 minutes	76	42.70	50	26.04	P=0.000*
	30-60 minutes	62	34.83	64	33.33	
	>60 minutes	40	22.47	78	40.63	
	Total	178	100.00	192	100.00	
School access	Walking	131	45.49	14	4.86	P=0.000*
	private car	145	50.35	272	94.44	
	public car	12	4.17	2	0.69	

More students in public schools had home cooked meals (80.8%), compared to students in private schools (64.6%). Also, fast food intake was higher for students in private schools (21.5%) compared to those students in public schools (14.2%). Participants from public schools had a higher dairy product intake (62.5%) compared to those in private schools (52.4%), whereas students from private schools were eating red meat (36.8%) more frequently than the students in public schools (27.8%). Overall, the public and

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private students were significantly different in terms of food sources (p=0.023), intake of fast food (p=0.029), daily intake of dairy products (p=0.003), and red meat intake (p=0.033) Table (5).

Table (5): Eating habits of the students in public and private schools

Variables		Public school		Private school		P-value
		Frequency	%	Frequency	%	
Other food sources	Home	63	80.8	51	64.6	P=0.023*
	Outside school	15	19.2	28	35.4	
	Total	78	100	79	100	
	None	79	27.43	74	25.69	
Daily fast-food intake	Always	41	14.2	62	21.5	P=0.029*
	sometimes	222	77.1	211	73.3	
	never	25	8.7	15	5.2	
Daily dairy products intake	Always	180	62.5	151	52.4	P=0.003*
	Sometimes	79	27.4	80	27.8	
	Never	29	10.1	57	19.8	
	Never	52	18.1	53	18.4	
Red meat intake	Always	80	27.8	106	36.8	P=0.033*
	sometimes	166	57.6	136	47.2	
	never	42	14.6	46	16.0	

The current study reveals that 10.42% of the participants in private schools had visited a nutritionist, compared 5.21% of participants in public schools. In both public and private schools, the majority of participants had a perception of their weight (60.76% in public schools and 52.08% in private schools). The students in private and public schools were significantly different in terms of their perception of their weight (p=0.036) and being visited by nutritionists (p=0.02); however, they were not significantly different regarding regular weight measurement (p=0.369) Table (6).

Table (6): Weight-control knowledge, attitude, and behavior of the students

Variables		Public school		Private school		All		P-value
		Fr.	%	Fr.	%	Fr.	%	
Regular weight measurement	Yes	193	67.01	203	70.49	396	68.51	P=0.369
	No	95	32.99	85	29.51	180	31.14	
Participants perception of their weight	Yes	175	60.76	150	52.08	325	56.23	P=0.036*
	No	113	39.24	138	47.92	251	43.43	
Visited nutritionist	Yes	15	5.21	30	10.42	45	7.79	P=0.02*
	No	273	94.79	258	89.58	531	91.87	

Discussion

It is usually complicated to compare the prevalence of overweight and obesity rates among children and adolescents because studies vary in terms of definitions used by them and because different studies have focused on different age groups [13]. The present study compared the rate of obesity

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and being overweight and their associated risk factors among public versus private high school students in Sulaimani city.

The rate of overweight and obese students in the present study was 17.65% and 33.74%, respectively. In line with this data, Saeed Qadir et al (2014) reported a high prevalence of overweight and obesity rates among students. In comparison to their study, here we show a lower rate of overweight students (<3%), but higher obesity rate (22%)[14].

Based on the results of the present study, the rate of obesity in private schools is higher compared to that in public schools; however, this difference was not statically significant. In a similar study by Baniissa et al (2020), where comparable differences in the rate of obesity among students from private and public schools was observed, the authors justified these differences by the variance in cultural, sociodemographic and environmental factors of attending students. They also reported the effect of variations in nationality and economic status between public and private school participants, recognizing that the obesity rates can be influenced by these personal factors, and stating that understanding of these is vital in order to intervene appropriately to overcome such obstacles to healthy choices [15].

In a study by Varghese *et al*. (2019), a higher prevalence of overweight or obesity among students attending private schools compared to those attending public schools was observed. They also reported a significant association between shorter sleep and higher BMI values, and obesity was found to be significantly correlated with parental education, family income, higher age, and lack of regular physical activity [16].

The results of this current study also revealed that the students in public schools had larger families compared to the students in private schools. In line with the results of this present study, Hajian-Tilaki et al. (2011) demonstrated that a larger family size was associated with being overweight or obese. Moreover, they showed that overweight and obesity prevalence was higher in children with a family size of five or more [17]. Similarly, Zhang et al. (2018) reported an association between family size and weight status [18], although Babayiğit et al. (2018) observed that students with larger families had lower BMIs compared to others with smaller ones[19].

The result of our study also revealed that despite the increased frequency and duration of exercise among students in private school, the majority of private school students also spent more time with electronic devices and they travelled to school by private cars. In a similar study conducted Greier *et al*. (2019), it was found that there is an association between long period of watching TV and poor physical fitness in young people. In this regard, they remarked that sufficient physical fitness in youth should be ensured through intervention strategies to reduce electronic screen time and promote physical activities [20].

Looking at student bed times, we found that the majority of the students in public schools were going to bed later than their private school counterparts, often after midnight. In this regard, Meltzer *et al*. (2016) pointed out that because public and private school students use technology and have to do their

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homework before bedtime, they often have poor sleep hygiene practices [21].

We also compared dietary patterns of students from private and public schools, and found they were significantly different, such that eating home-made food was more prevalent among public school students, while the students attending private schools were eating more readymade food, dairy products and red meat than the students in public schools. In a similar study conducted by Almuhanna *et al*. (2014), it was reported that body weight is significantly associated with readymade food intake, and that non-overweight or non-obese students consumed readymade foods three times or less per week compared to the overweight or obese students whose intake of readymade food was more than 3 times per week [22]. Based on evidence from pooled analysis of cross-sectional studies, Babio et al. (2021) concluded an inverse association between obesity and total dairy consumption [23] and Shin *et al*. (2017) focused on the relationship between being overweight and obese and meat intake in school-aged children. They concluded that it is crucial to establish school lunch policies and school health promotion as part of the school learning environment. Furthermore, they partially supported changing social beliefs regarding the relationship between meat consumption and obesity [24].

One of the most prevalent differences between the students in the private and public schools was that the students in the private schools were regularly visited by nutritionists, while the students in the public schools were not. In this regard, Kim et al. (2019) pointed out that schools should implement an evidence-based practice in nutrition care for obese students; something which is typically possible in private schools but not government-run ones (25). Other similar studies have demonstrated that dietary factors are significantly associated with childhood obesity; therefore, healthy diets should be provided for children in order to prevent nutrition-related non-communicable diseases such as obesity and diabetes in children and adolescents, which necessitates schools providing the students with nutritionists [26, 27].

Conclusions

The prevalence of obesity is slightly higher among students in private schools than the students in public schools. However, comparing the lifestyle between the public and private schools, several factors such as physical activities, eating ready-made food, visiting nutritionists were higher among private schools and were positively associated with overweight/obesity, while watching television and time spent on electronic devices higher among public schools were the associated factors for the occurrence of overweight and obesity. Our results indicated that in addition to a sedentary lifestyle; obesity is also linked to daily diet of children.

Recommendations

The findings suggest that promoting physical activity and healthy eating among adolescents, alongside reducing sedentary behavior, would help reduce the rate of overweight and obesity in both public and private schools. Future research should be conducted at a national level, and which requires the attention of various stakeholders

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(schools, parents and decision maker) to tackle the issue of obesity in adolescents.

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Ethical clearance: The protocol of the study was accepted by the Council of the College and the Ethical Committee of the College of Health and Medical Technology-Sulaimani Polytechnic University. In addition, official permission for data collection was retrieved from Sulaimani General Directorate of Education. Moreover, all students were assured that their participation in the study was voluntary; they were informed about the purpose of the study.

Conflict of interest: Nil

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معدل السمنة بين طلاب المدارس الثانوية الخاصة و العامة في مدينة السليمانية

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الملخص

خلفية الدراسة: هناك زيادة في المخاوف المتعلقة بالسمنة بين الاطفال والمراهقين بالعالم حيث يشكلون نسبة ٢٠% من سكان العالم. ان العديد من العوامل المؤدية للسمنة يمكن ان ترصد وبالاخص التغذية الصحية و الانشطة البدنية . معالجة هذه العوامل بين الاطفال و المراهقين تؤدي الي تقليل الاضطرابات الصحية المرتبطة بالسمنة.

اهداف الدراسة: للتحقق من معدل السمنة و العوامل الاجتماعية الديمغرافية و العادات الغذائية و اساليب الحياة و مستوى المعرفة بين المراهقين الملتحقين بالمدارس العامة و الخاصة في مدينة السليمانية في العراق.

المرضى والطرائق: من خلال هذه الدراسة المقطعية المعتمدة على المدارس التي اجريت من شهر تشرين الاول ٢٠٢١ الى شهر نيسان ٢٠٢٢ ، تم دراسة ٢٧٠ طالب في المدارس الاعدادية في مدينة السليمانية \ اقليم كردستان العراق. استخدمت ورقة الاستطلاع منظمة من اجبل جمع البيانات المتعلقة بالسمات الاجتماعية الديمغرافية و العادات الغذائية و اساليب الحياة و مستوى المعرفة للطلاب. تم قيلس مؤشر كتلة الجسم اعتمادا على مرجع النمو المتبعة من قبل منظمة الصحة العالمية للاعمار ما بين ٥-٩ سنوات.

النتائج: ان معدل السمنة في المدارس الخاصة (٣٦,١١%) كانت اعلى من المدارس العامة (٣١,٦%) (P=0.5890) الا ان هذا الفرق غير دال احصائيا. الاغلبية من طلاب المدارس الخاصة كانوا يمارسون الرياضة اكثر و بمدة اطول. الا انهم كانوا يقضون وقتا اكثر مع الاجهزة الالكترونية مقارنة بطلاب المدارس العامة. اكثرية الطلاب في المدارس الخاصة كانوا يأكلون لحوم حمراء والوجبات السريعة و يأكلون مناجات الالبان بمعدل اقل.

الاستنتاجات: انتشار السمنة أعلى قليلاً بين الطلاب في المدارس الخاصة أكثر من الطلاب في المدارس العامة.

الكلمات المفتاحية: سمنة، خاص، عام، مدارس ثانوية، مدينة السليمانية

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تاريخ قبول البحث: ٢٠ تشرين الثاني ٢٠٢٢

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