Prevalence of obesity and associated factors among secondary school students in Slemani City Kurdistan Region, Iraq

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ABSTRACT

Introduction: Obesity is a well-established risk factor for cardiovascular disease. The objective of the study was to determine the prevalence of obesity and factors associated among secondary school students aged between 13 to 17 years at Slemani City Centre, Iraq. **Methodology:** A cross sectional study design was used. The calculated sample size was 1656. Probability proportional to size sampling technique was used to select the sample. A validated pretested questionnaire was used to collect the data. Weight and height were also taken. Data were analyzed using SPSS version 21. Chi-square test was used to determine an association between two categorical variables. Independent t-test was used to compare two means. Multiple logistic regression was used to determine the predictors for obesity. **Results:** The response rate was 92.54% and the overall mean age of the 1588 respondents was 15.42 (95% CI = 15.35, 15.49) years. The prevalence of overweight and obesity was 20.6% and 11.3% respectively. Variables significantly associated with overweight and obesity (age, monthly family income, education level of parents, body part satisfaction and body size perception) were entered into the logistic regression model. Multiple logistic regression analysis showed that the predictors for overweight and obesity were age, monthly family income, body part dissatisfaction and body size perception. **Conclusion:** The prevalence of overweight and obesity is high (20.6% and 11.3% respectively). The predictors of obesity among secondary school students aged between 13 to 17 years old at Slemani City Centre Kurdistan Region, Iraq were age, family income and body image dissatisfaction.

Keywords: Obesity, Prevalence, Associated factors, Predictors, Iraq

INTRODUCTION

Background

Thirty six million (63%) out of the total of 57 million deaths that occurred in the world in 2008 were due to non-communicable diseases (NCD), principally cardiovascular diseases (CVD), diabetes, cancer and chronic respiratory diseases.[1,2] The leading risk factor for NCDs mortality globally are namely raised blood pressure, tobacco use, overweight and obesity, raised blood glucose and physical inactivity. Obesity adversely affects cardiac function and is an independent risk factor for cardiovascular disease.[3] Obesity is a significant risk factor for and contributor to increased morbidity and mortality especially from CVD, diabetes, cancer and chronic diseases, including osteoarthritis, liver and kidney disease, sleep apnea, and depression.[4,5] Globally, the rates of obesity in children have more than doubles while rates in adolescents have tripled.[6] Overweight and obesity in youth, significantly increase the risk of becoming overweight during adulthood.[7] Changes in food consumption, socioeconomic and demographic factors, physical inactivity, and multiple pregnancies may be important factors that contribute to the increased prevalence of obesity engulfing the middle-east.[8] In Saudi Arabia, the prevalence of overweight and obesity among school-age children have reached 23% and 9.3%, respectively.[9] Unhealthy lifestyle behaviors such as eating high-dense and sugar-contained food and sedentary behaviors result in obesity in adolescents. Intake of soft drinks and sweetened drinks has increased among adolescents. Studies found that sweetened beverage intake was related to being overweight among children.[10] Very little information is available on the prevalence of overweight and obesity amongst the adolescents in

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the Kurdistan Region, Iraq. The objective of this study was to determine the prevalence of obesity and its associated factors among secondary school students aged between 13 to 17 years old at Slemani City Centre Kurdistan Region, Iraq.

MATERAL AND METHODS

Study location, study design sampling method, variables

This study was conducted at secondary schools in Slemani City, Kurdistan Region, Iraq. An analytical cross-sectional study design was used in this study. The study population was secondary school students. The list of all 195 secondary schools formed the sampling frame. The formula for hypothesis testing of two group comparison was used to estimate the sample size.[11] The sample size was 1656 after taking into account the design effect. Probability proportional to size sampling technique was used for the selection of respondents. All students in the selected schools were included in the study. All students with physical and mental disabilities as identified by the school teachers and those who refused to participate or measure their height and weight were excluded from the study. In this study, the dependent variables were overweight and obesity. The independent variables were socio- demographic factors (age, gender, family income and parents' education), behavior factors (smoking and level of physical activity), self-esteem, body parts satisfaction and body size perception.

Instruments

Questionnaire

A validated pretested questionnaire in Kurdish language was used for data collection. The validity and reliability of questionnaire was carried out for face validity, content validity and internal consistency. The questionnaire was divided into six sections: Section A: Socio-demographic data (gender, age, family income,   educational level of father and mother).

Section B: Physical activity - Physical activity questionnaire for adolescent (PAQ-AC) [12] was used in this study for the reason that adolescents spend a substantial amount of time at school. The instrument consisted of 10 items. Item 1 was on leisure time activity of the adolescents during the last seven days. The respondents were required to respond to an activity checklist which was scored on a 5-point scale ranging from ''no'' activity being scored as 1 and '' 7 times or more'' being scored as 5. The mean of all activities on the activity checklist was calculated to form a composite score for item 1. Items 2 to 8 were on activities during physical education (PE) class, recess, lunch, and leisure times, right after school, evenings and weekends. The answer options for each item begins from the lowest activity response (score1) and progresses to the highest activity response (score 5). For item 9, the respondents were asked on the frequency of participating in daily physical activity (e.g. playing sports, dancing) in the previous week. A score of 1 was assigned to ''none'' and a score of 5 was assigned to ''very often''. A mean score for all days of the week was calculated to form a composite score for item 9. Item 10 was used to identify respondents with unusual activities (e.g. sickness or major exam) during the previous week. Once the sum of the scores from items 1 to 9 was calculated, the final PAQ – AC. activity summary score was obtained by taking the mean of these 9 items. A mean score of 1 indicates low physical activity, whereas a mean score of 5 indicates high physical activity. Level of physical activities were classified into two categories (low and high), based on the mean total physical activity score. The score of 1 to 2.99 was categorized as low physical activity and a score of 3 to 5 was categorized as high physical activity.

Section C was the Rosenberg Self-esteem Scale.[13] It is a 10-item scale that measures global self-worth by measuring both positive and negative feelings about the self. All items are answered using a 4-point Likert scale format ranging from strongly agree to strongly disagree. Those respondents who stated "Strongly Disagree" were given 0 point, "Disagree" 1 points, "Agree" 2 points, and "Strongly agree" 3 points. However, items 3, 5, 8, 9, 10 were reverse scored. The scores for all ten items were then added. The highest possible   score was 30 while the lowest was 0. Scores below 15 were classified as low self-esteem while scores of 15 to 30 were classified as normal rage.[13]

Section D: Body Image Scale which had two parts:

Section D1: Body Part Satisfaction Scale had nine questions, which was adapted and modified from Brown et al..[14] The respondent was required to respond to his or her satisfaction level of their the body parts (face, hair, middle parts of the body, lower parts of the body, upper parts of the body, muscle tone, weight and height). Degree   of satisfaction with body parts was scored on a Likert scale. The lowest possible score was 9 and the highest score was 45. The scores

for all nine items were then added. Total scores of less than 27 were classified as "dissatisfied with their body parts", and total scores of 27 to 45 were classified as "satisfied with their body parts".[14]

Section D2: The Body Size Perception

The body size perception assessment scale developed by Stunkard et al.,[15] and adapted by Childress et al.[16] was used to evaluate the body size perception of the respondents. It has eight figures ranging from very thin (shape 1) to obese (shape 8). Shape 1 was given a score of 1 and shape 8 was given a score of 8. The respondents were asked to select one of the shapes that they feel represents their present body size 'current body size' and one shape which they wish to have 'ideal body size'. The level of body size dissatisfaction was calculated from the difference between ideal body size and current body size. This score is the discrepancy score. A score of 0 means satisfied with the body size; a negative or positive score means dissatisfied with the body size. A negative score indicates that the respondent is not satisfied with his or her body size and wishes to have a smaller body size while a positive score indicates that the respondent is not satisfied with his or her body size and wishes to have a larger body size. [17]

Section E: Smoking questionnaire.

This section consisted of nine questions. For this study, a "never smoker" was defined as a person who has never smoked a cigarette in their life time. A "current smoker" was defined as a person who has smoked 100 cigarettes in their lifetime and currently smokes cigarettes every day (daily) or some days (not daily). An "ex-smoker" was **d**efined as a person who had smoked at least 100 cigarettes in their lifetime, but they currently do not smoke.

Validity and Reliability

The questionnaire was translated to Kurdish language and also back translated to ensure that the meaning of both English and Kurdish version was the same. The face validity was evaluated by giving the questionnaire to 30 students who answered the questionnaire to determine whether they understood each section. Comments were noted and necessary corrections were made.

Content Validity

The questionnaire was evaluated by a team of experts in this field. Appropriate corrections were made based on their comments. A few questions from the original questionnaires were modified, and some items on physical activity were removed as they were not relevant to the respondents' culture.

Internal Consistency of Questionnaire

Internal consistency of the questionnaire was assessed by giving the questionnaire to 30 students from schools not included in the study. The reliability of the questionnaire was determined by Cronbach's Alpha and values above 0.7 were considered as acceptable. The scores for each questionnaire are shown in the following table.

Internal consistency of questionnaire

No.	Scale	No. of items	Cronbach's Alpha
1	PAQ-Q1	10	0.62
2	PAQ-Q9	7	0.788
3	PAQC	9	0.822
4	Self-esteem	10	0.718
5	Body part satisfaction	9	0.921
6	Body size perception	3	0.710

Anthropometric measurements

Weight and height were measured using a digital bathroom scale (TANITA model HD-319) and SECA body meter model 206 respectively. Two measurements were taken for each respondent. The average of the two values was used in the analysis.

Body Mass Index (BMI)

Body mass index (BMI) was calculated using the formula weight in kilograms divided by height in meters square (weight in kg/ (height in meters^2). Each of the respondents was classified as normal, severely thin, thin, overweight or obese based on WHO Growth Reference for 5 to 19 years.[18]

Data Analysis

Data were analyzed using IBM Statistical Package of Social Sciences (SPSS) version 21. Descriptive characteristic of the respondents were obtained as frequency, percentage, mean, and median. Chi-square test was used to determine an association between two categorical variables. Independent t-test was used to compare two means, while one way ANOVA was used to compare means of more than two groups. A post hoc test was conducted if the F value from ANOVA was significant. Simple logistic regression was first carried out to determine the crude odds ratio. All the variables with p-value smaller than 0.25 were entered into the multiple logistic regression model.[19] The level of significance used for the above analysis was 0.05.

Ethical Consideration
Ethics approval was obtained from the Universiti Putra Malaysia Ethics Committee for Research involving Human Subjects (ref: UPM/TNCP1/RMC/1.4.18.1 (JKEUPM)/F1 dated 14 August 2013. Permission to conduct the study was also obtained from the Ministry of Education Kurdistan Region Government, State Education Departments and Principles of the participating schools. Written informed consent was obtained from the parents and respondents before data collection.

RESULTS

Response rate

Out of the1656 respondents selected, 1588 participated in this study, giving an overall response rate of 95.9%. The response rate for the schools ranged from 91.9% to 96.6%. Non respondents were those who were absent from school on the day of data collection and those who did not give consent for measurement of height or weight.

Socio-demographic characteristics of the respondents

Table 1 shows the socio-demographic characteristics distribution of the respondents. Out of the 1588 respondents, 838 (52.8%) were boys.   The overall mean age of the respondents was 15.42 years (95% CI = 15.35 - 15.49). The mean age for the males was 15.61 years (95% CI = 15.52 - 15.71) as compared to 15.20 years (95% CI = 15.11 -15.30) for the females. There was a small significant difference in the mean age between males and females (t= 5.96, df = 1586, p < 0.001).   Only 2.8% of the respondents had monthly family income less than US$ 300.00. The results show that 84.4% of the respondents' fathers had low education level. In addition, 90.1% of the respondents' mothers had low education level.

Table 1. Distribution of respondents by gender, age, monthly family income, and education level of father and mother

Socio-demographic	Frequency	Percent
Gender		
Male	838	52.8
Female	750	47.2
Total	1588	100.0
Age years		
13 to less than 14	328	20.7
14 to less than 15	296	18.6
15 to less than 16	402	25.3
16 to less than 17	349	22.0
17 to less than 18	213	13.4
Monthly family income (US$)		
Less than 300.00 (Low)	45	2.8
300.00- 1200.00 (Moderate)	1012	63.7
More than 1200.00 (High)	531	33.5
Educational level of father		
Secondary or less	1340	84.4
Tertiary	248	15.6
Educational level of mother		
Secondary or less	1430	90.1
Tertiary	158	9.9

Body mass index of the respondents by age and gender

Table 2 shows that the overall mean BMI was 22.18 kg/m^2 (95% CI = 21.96, 22.4 kg/m^2) and ranged between 12.17 kg/m2 to 42.86 kg/m^2 . The mean BMI for the male respondents (22.10 kg/m2 ; 95% CI = 21.8, 22.4 kg/m2) was not significantly different as compared to the female (22.27 kg/m^2 ; 95% CI = 21.9, 22.4 kg/m^2) respondents (t= -0.749, df= 1586,   p-value = 0.454). Overall the mean BMI for all respondents increased with age. A one way (ANOVA) result showed that there was statistically significant difference in the BMI across ages (F= 7.337, df = 4, p = 0.001). The results also showed that the mean BMI for the male respondents increased with age across all age groups (F= 7.555, df = 4, p < 0.001). However, among females the mean BMI increased with age except for the age group of 15 to less than 16 years. (F= 3.103, df = 4, p = 0.015).

Table 2. Body mass index of the respondents by age and gender

| Factors | Body mass index(BMI) | | | t/F | df | P-value |
	Mean	S.D	95%CI			
Overall	22.18	4.42	21.96, 22.40			
Gender						
Male	22.10	4.50	21.8, 22.4	-0.749	1586	0.454
Female	22.27	4.33	21.9, 22.4			
Age						
13 to less than 14 years	21.44	4.33	20.9, 21.9	7.337	4	0.001*
14 to less than 15 years	21.69	4.43	21.1, 22.2			
15 to less than 16 years	22.17	4.28	21.7, 22.5			
16 to less than 17 years	22.66	4.36	22.2, 23.1			
17 to less than 18 years	23.23	4.65	22.6, 23.8			
Age and gender						
Male						
13 to less than 14 years	20.47	4.00	19.8, 21.1	7.555	4	0.001*
14 to less than 15 years	21.87	4.92	21.1, 22.6			
15 to less than 16 years	22.27	4.38	21.6, 22.9			
16 to less than 17 years	22.47	4.12	21.9, 23.0			
17 to less than 18 years	23.23	4.82	22.4, 24.0			
Female						
13 to less than 14 years	22.18	4.43	21.5, 22.8	3.103	4	0.015*
14 to less than 15 years	21.48	3.81	20.8, 22.5			
15 to less than 16 years	22.10	4.21	21.5, 22.6			
16 to less than 17 years	23.00	4.75	22.1, 23.8			
17 to less than 18 years	23.23	4.34	22.2, 24.2			

Note: (*): Significant at $p < 0.05$

Prevalence of obesity by gender, age and monthly family income

The overall prevalence of obesity among the respondents was 11.3% and overweight was 20.6% (Table 3). The prevalence of obesity and overweight was higher among the males (11.9%, 20.7%) as compared to the females (10.5%, 20.5%). The highest prevalence of obesity and overweight (13.1% and 25.6% respectively) was observed among the age group 13 to less than 14 years. However, the age group 15 to less than 16 years had the lowest prevalence of obesity (9.2%). Besides, the 16 to less than 17 years age group had the lowest prevalence of overweight (15.2%). The prevalence of overweight was observed to be higher in the high income group (23.0%) as compared to those in the low income group (11.1%).The highest prevalence of overweight and obesity (26.2% and 12.9% respectively) was observed among the respondents' fathers who had obtained high level of education (tertiary)

Table 3. Nutritional status by age, gender, income groups, education level of father and mother

Factors	n	Sever thinness	Thinness	Normal	Overweight	Obese
		n (%)	n (%)	n (%)	n (%)	n (%)
Over all	1588	5(0.3)	32(2.0)	1045(65.8)	327(20.6)	179(11.3)
Gender						
Male	838	1(0.1)	26(3.1)	538(64.2)	173(20.7)	100(11.9)
Female	750	4(0.6)	6 (0.8)	507(67.6)	154(20.5)	79(10.5)
Age years						
13 to less than 14	328	2(0.6)	6(1.8)	193(58.9)	84(25.6)	43(13.1)
14 to less than 15	296	1(0.4)	9(3.0)	186(62.8)	65(22.0)	35(11.8)
15 to less than 16	402	1(0.2)	6(1.5)	277(68.9)	81(20.2)	37(9.2)
16 to less than 17	349	0(0)	7(2.0)	252(72.2)	53(15.2)	37(10.6)
17 to less than 18	213	1(0.5)	4(1.9)	137(64.3)	44(20.6)	27(12.7)
Monthly family income (US\$)						
< 300.00	45	0(0)	1(2.2)	33(73.3)	5(11.1)	6(13.4)
300.00- 1200.00	1012	3(0.3)	21(2.1)	684(67.5)	200(19.8)	104(10.3)
> 1200.00	531	2(0.4)	10(1.9)	328(61.7)	122(23.0)	69(13.0)
Educational level of father						
Secondary or less	1340	4(0.3)	26(1.9)	901(67.2)	262(19.6)	147(11.0)
Tertiary	248	1(0.4)	6(2.4)	144(58.1)	65(26.2)	32(12.9)
Educational level of mother						
Secondary or less	1430	4(0.3)	28(2.0)	955(66.8)	292(20.4)	151(10.6)
Tertiary	158	1(0.6)	4(2.5)	90(57.0)	35(22.2)	28(17.7)

Association between socio-demographic characteristic (gender, age, monthly income and education level of parents) of the respondents and obesity (n=1588)

Table 4 shows that there was significant association between obesity and age (x^2 = 14.916, df= 4, p=0.005), monthly family income (x^2 = 6.816, df = 2, p< 0.033), education level of father (x^2 = 7.113, df = 1, p= 0.008) and education level of mother (x^2 = 5.184, df= 1, p=0.023). However, there was no significant association between gender and obesity.

Table 4. Association between socio-demographic characteristic of the respondents and overweight/obesity (n=1588)

Characteristics	Overweight/ Obese n (%)	Not Overweight/ Obese n (%)	χ^2	df	P
Gender					
Male	273(32.6)	565(67.4)	0.416	1	0.519
Female	233(31.1)	517(68.9)			
Age years					
13 to less than 14	127(38.7)	201(61.3)	14.916	4	0.005*
14 to less than 15	100(33.8)	196(66.2)			
15 to less than 16	118(29.4)	284(70.6)			
16 to less than 17	90(25.8)	259(74.2)			
17 to less than 18	71(33.3)	142(66.7)			
Monthly family income (US\$)					
< 300.00	11(24.4)	34(75.6)	6.816	2	0.033*
300.00- 1200.00	304(30.0)	708(70.0)			
> 1200.00	191(36.0)	340(64.0)			
Educational level of father					
Secondary or less	409(30.5)	931(69.5)	7.113[a]	1	0.008*
Tertiary	97(39.1)	151(60.9)			
Educational level of mother					
Secondary or less	443(31)	987(69)	5.184[a]	1	0.023*
Tertiary	63(39.9)	95(60.1)			

Note: (*): Significant at   p < 0.05

Association between physical activity, self-esteem, body part satisfaction, body size perception and smoking status of the respondents and obesity

Table 5 shows that there was a significant association between obesity and body part satisfaction level (x^2 = 51.932, df= 1 and p = 0.001) and body size perception (x^2 = 488.08, df= 2, p = 0.001). However, there was no significant association between obesity and physical activity, self-esteem and smoking status.

Table 5. Association between physical activity, self-esteem, body part satisfaction, body size perception and smoking status of the respondents and overweight/obesity (n=1588)

Factor	Overweight /Obese	Not Overweight/ obese			
Physical activity	n (%)	n (%)	χ^2	df	P-value
Low	468(32)	983 (68)	0.180^a	1	.6720
High	43(30.3)	99 (69.7)			
Self-Esteem					
Low	45 (37.5)	75(62.5)	1.899	1	
Normal	461 (31.4)	1007 (68.6)			
Body part satisfaction					
Over all					
Dissatisfied	72(52.6)	65(47.4)	29.565	1	0.001*
Satisfied	434(29.9)	1017(70.1)			
Body size perception					
Over all					
Satisfied	109(15.8)	579(84.2)	488.08	2	0.001*
Desire for a bigger body size	9(3.0)	288(97.0)			
Desire for a smaller body size	388(64.3)	215(35.7)			
Male					
Satisfied	76(19.3)	318(80.7)	284.09	2	0.001
Desire for a bigger body size	5(2.9)	169(97.1)			
Desire for a smaller body size	192(71.1)	78(28.9)			
Female					
Satisfied	33(11.2)	261(88.8)	218.592^a	2	0.001
Desire for a bigger body size	4(3.3)	119(96.7)			
Desire for a smaller body size	196(58.9)	137(41.1)			
Smoking status					
Never	454(31.5)	988 (68.5)	1.043	1	0.307
Ever	52 (35.6)	114 (64.4)			

Significant at   p < 0.05

Predictors of obesity

Logistic regression analysis was used to determine the predictors of obesity as shown in Table 6. Both forward and backward stepwise likelihood ratio test were carried out and similar results were obtained. Enter method was finally achieved with the significant variables.   The variables that were included in the final model were age, monthly

family income, body part satisfaction and body size perception. The odds of being obese were 0.65 times lower in respondents who were aged 15 to less than 16 years as compared to those aged 13 to less than 14 years (OR= 0.653, 95% CI = 0.44, 0.95). The odds of being obese were 0.63 times lower in respondents who were aged 16 to less than 17 years as compared to those aged 13 to less than 14 years (OR= 0.639, 95% CI = 0.43). The odds of being obese were 2.43 times higher in respondents with high monthly family income as compared to those with low of monthly family income (OR= 2.43, 95% CI = 0.79, 4.07). The odds of being obese were 1.73 times higher in respondents who were dissatisfied with their body parts as compared to those who were satisfied (OR= 1.73, 95% CI = 1.214, 2.465). The odds of being obese were 6.7 times higher in respondents who were satisfied with their body size as compared to those who desired a bigger body size (OR= 6.685, 95% CI =3.318, 13.468). Also the odds of being obese were 58.3 times higher in respondents with desire for a smaller body size as compared to those who desire a bigger body size (OR= 58.338, 95%CI = 29.28, 116.22). The model was a good one and 41% of the variance in obesity was explained by the model (Nagelkerke R square = 0.409). The hosmer -lemeshow test also showed that the model fits well (p= 0.796).

Table 6. Multiple Logistic Regression model showing predictors of overweight/obesity

Factors	B coefficient	S.E	adjusted OR	95% CI	P value
Age years					
13 to less than 14	-	-	1.00	-	-
14 to less than 15	-0.027	0.205	0.973	0.651, 1.455	0.896
15 to less than 16	-0.426	0.191	0.653	0.449 0.951	0.026*
16 to less than 17	-0.447	0.202	0.639	0.430, 0 .951	0.027*
17 to less than 18	0.065	0.231	1.067	0.678, 1.679	0.779
Monthly Family income (US$)					
< 300.00	-	-	1.00	-	-
300.00- 1200.00	0.58	0.41	1.79	0.79, 4.07	0.163
> 1200.00	0.89	0.42	2.43	1.05, 5.62	0.037*
Educational level of father					
Secondary or less	-	-	1.00	-	-
Tertiary	0.091	0.191	1.095	0.753, 1.592	0.634
Educational level of mother					
Secondary or less	-	-	1.00	-	-
Tertiary	0.130	0.229	1.139	0.727, 1.784	0.570
Body part satisfaction					
Satisfied			1.00	-	-
Dissatisfied	0.548	0.181	1.730	1.214, 2.465	0.002*
Body size perception					
Desire for a bigger body size			1.00	-	-
Satisfaction	1.900	0.357	6.685	3.318, 13.468	0.001*
Desire for a smaller body size	4.066	0.352	58.338	29.28, 116.22	0.001*

S.E= standard error, Significant level p < 0.05, OR= Odd ratio, CI=Confidence Interval

DISCUSSION

The overall prevalence of overweight and obesity amongst adolescents obtained in this study was 20.6% and 11.3% respectively which is higher as compared to that reported by Shabu SA and Al-Tawil NG (2012) in their study in Erbil city Iraq (9.3% and 1.6%).[20] Lower prevalence has been reported in Syria (18.6% and 8.6%).[21] In Malaysia, the prevalence of overweight and obesity was 11.4% and 8.2% respectively in 2005 among secondary school students in Klang District [22] and another study among adolescents in Putrajaya in 2010 showed that the prevalence of overweight and obesity was 12.5% and 11.7% respectively.[23] The prevalence of obesity among adults have also increased from 4.4% in 1996[24] to 12.3% in 2004[25] to 15.1% in 2011.[26] This study found that the prevalence of overweight and obesity was significantly higher in the high income group. Physical activity is vital during youth can prevent and reduce obesity.[27] It is a predictor of subsequent adiposity.[28] The present study showed that the prevalence of obesity among those with low physical activity was higher than those with high physical activity. The strength of the study is that a large sample size of 1588 participants from 12 schools was used in this study. The limitation of the study is that this study used a cross-sectional study design; it may not be concluded that the factors that were found to be related with obesity actually caused the onset of obesity.

Conclusion

The prevalence of overweight and obesity amongst the adolescents in the Kurdistan Region, Iraq was high. The predictors of obesity among secondary school students aged between 13 to 17 years old at Slemani City Centre Kurdistan Region, Iraq in this study were age, family income and body image dissatisfaction.

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