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RISK FACTORS FOR OVERWEIGHT AND OBESITY AND ITS ASSOCIATED COMPLICATIONS AMONG SCHOOL AGE CHILDREN IN MOSUL CITY-IRAQ

[1]*Zakarea Ibrahim Ismael Sheet, [2]Entesar M. Ali Hameed and [3]Ekhlas Ahmed Faraj

[1]M.B.Ch.B./F.A.B.H.S (Ped.).
[2]M.B.Ch.B./F.A.B.H.S (FM).
[3]M.B.Ch.B./F.A.B.H.S (FM).

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***Corresponding Author: Zakarea Ibrahim Ismael Sheet**

M.B.Ch.B./F.A.B.H.S (Ped.).

ABSTRACT

Background: Childhood obesity has a significant impact on healthcare systems and remains a barrier to medical innovation. Despite a reported increase in the prevalence of childhood obesity globally and the potential contributions of numerous risk factors to these trends, there is little information available regarding the relationship between the major risk factors and the development of overweight and obesity in Mosul. **Objectives:** Is to evaluate various risk factors and complications related of childhood overweight and obesity in Mosul City. **Methods:** The study is a descriptive, case control study. It was conducted between the 11th of March 2023 to the end of February 2025 at Wafa'a Endocrine specialized center and Al Sukar primary health care center in Mosul. The questionnaire was divided into three parts. The first section provides demographic information about the study participants, including their age, gender, residency, family history of overweight or obesity and school class in addition to their parents' educational levels, occupation and social class. The second part covers personal and environmental factors, such as physical inactivity, meals per day and television watching or internet use hours. The third part covers anthropometric measures, such as patient weight, height, calculated BMI and BMI percentile. **Results**: The study included 200 child, of them 100 child with overweight and obesity (cases) and 100 child with normal weight (controls). Moreover; 106 (53%) child are males and 94 (47%) child are females, with male to female ratio of 1.12:1. Furthermore; 110 (55%) child aged less than 9 years and 90 (45%) child aged between 9-14 years. The mean age of the study participants was 9.24 ± 1.79 years. 141 (70.5%) child are reside in urban districts while 69 (29.5%) child are reside in rural districts. 183 (91.5%) child attended school and 17 (8.5%) child didn't attend school. Additionally; 74 (37%) child reported positive family history of obesity. It's evident that been physically inactive is in significantly associated risk (odds ratio= 5.588) and statistically different (P value <0.001) with overweight or obesity. Moreover; children with overweight and obesity are in in significantly associated risk (odds ratio= 12.25) and statistically different (P value <0.001) with five and more meals intake per day. Additionally; children with overweight and obesity are statistically significant difference from those with normal weight with more TV or internet spending time. Dyslipidemia is prevalent among 21 (21%) child, hypertension among 16 (16%) child, sleep apnea among 14 (14%) child, the same for depression and anxiety 14 (14%) child and lastly; two 2 diabetes among 11 (11%) child among the overweight or obese children. **Conclusion:** Physical inactivity, eating five or more meals per day, and watching television were found to be risk factors for weight gain. Promoting outdoor exercise and implementing functional health and nutrition education programs in schools are important preventive measures for children. Overweight and obesity might be regarded diseases rather than just physical characteristics, as they are associated with a variety of clinical complications that influence patient survival and health.

KEYWORDS: Physical inactivity, Over eating, Excessive TV watching.

1. INTRODUCTION

Childhood obesity has a significant impact on healthcare systems and remains a barrier to medical innovation.[1-2] It persists into adolescence leading to adult obesity, usually associated with both metabolic and non-metabolic risk factors that are linked to a number of medical problems.[3-4] Childhood obesity and overweight have been much more common during the past three

decades.[5] The prevalence of childhood obesity is variable in different regions of the world and about 340 million children and adolescents suffer from overweight or obesity.[6-7]

According to global data given by the World Health Organization, about 20% of school-aged children were overweight or obese in 2020, and over 40 million children between the ages of 0 and 5 considered to be fat.[8] Like other developing countries, Iraq is facing a significant increase in health risk factors among its younger population. In Iraq, the way people eat has shifted to mimic the lifestyles of Western society, which has been linked to overweight and obesity.[9] Some studies demonstrated that the disease's incidence was impacted by both genetic and environmental factors, while other studies showed that the factors of race and family socioeconomic status had an inconsistent link with the overweight and obesity occurrence.[10-11] Childhood physical inactivity might result in adult inactivity.[12] Many young people do not exercise because they spend too much time watching television or playing computer games, which are immobile activities.[13]

School-aged children who spend a lot of time in front of electronic devices, such as computers, games, televisions, and cellphones, are more likely to gain weight and engage in less physical exercise.[14]

Despite a reported increase in the prevalence of childhood obesity globally and the potential contributions of numerous risk factors to these trends, there is little information available regarding the relationship between the major risk factors and the development of overweight and obesity in Mosul. Thus, evaluating various risk factors related of overweight and obesity in Mosul City's school-age population, in addition to the assessment of overweight and obesity related complications are the aim of this study.

2. PATIENT AND METHODS

The study is a descriptive, case control study. It was conducted between the 11th of March 2023 to the end of February 2025 at Wafa'a Endocrine specialized center and Al Sukar primary health care center in Mosul. The study included 200 children which were divided in to 100 overweight and obese patients (the cases) and 100 normal weight patients (controls). The samples of both groups were selected randomly from the study settings. Patients included in the study were aged between 5-14 years. Ethical approval was taken from the Directorate of Health in Nineveh governorate, another consent was also taken from the parents to participate in the study.

The investigators conducted direct interviews with parents to complete self-administered questionnaires. The questionnaire was divided into three parts. The first section provides demographic information about the study participants, including their age, gender, residency, family history of overweight or obesity and school class in addition to their parents' educational levels, occupation and social class. The second part covers personal and environmental factors, such as physical inactivity, meals per day and television watching or internet use hours. The third part covers anthropometric measures, such as patient weight, height, calculated BMI and BMI percentile.

Statistically analysis done by using the SPSS (scientific package for social sciences) version 30.0 software. Descriptive statistics, such as frequencies and percentages, were used to present categorical variables in tables and figures. The chi-squared ($\chi 2$) test was used to determine the significance of differences between cases and controls groups. The statistical findings were expressed as odds ratios (OR) and 95% confidence intervals (CI) for each risk factor, P-values less than 0.05 were regarded as statistically significant.

3-RESULTS

The study included 200 child, of them 100 child with overweight and obesity (cases) and 100 child with normal weight (controls). Moreover; 106 (53%) child are males and 94 (47%) child are females, with male to female ratio of 1.12:1. Furthermore; 110 (55%) child aged less than 9 years and 90 (45%) child aged between 9-14 years. The mean age of the study participants was 9.24 ± 1.79 years. 141 (70.5%) child are reside in urban districts while 69 (29.5%) child are reside in rural districts. 183 (91.5%) child attended school and 17 (8.5%) child didn't attend school. Additionally; 74 (37%) child reported positive family history of obesity. From the other hand; regarding the educational levels of the study participants' parents, the majority of fathers and mother are just finish their primary school class, while; the majority of the study participants' fathers are claimed as they are unskilled manual workers in contrast to the study participants' mothers, the majority claimed as they are unemployed. Most of the study participants are belong to social class of enough income for required daily needs. Physically inactive is the predominant state, most of the patients eat three meal per day and the mean of TV and internet spend is about three and half hours. As shown in table 1.1:

Table 1.1: Socio-demographics information of the study participants.

Variable	Number	Percent
Gender:		
- Male	106	53
- Female	94	47
Age:		
- 5-9 years	110	55
- 9-14 years	90	45
Residency:		
- Urban	141	70.5
- Rural	59	29.5
Attending school:		
-Yes	183	91.5
-No	17	8.5
Family history of obesity:		
- Present	74	37
- Absent	126	63
Educational level of father:		
-Illiterate	37	18.5
-Primary	79	39.5
-Secondary	38	19
-University	31	15.5
-Higher	15	7.5
Educational level of mother:		
-Illiterate	46	23
-Primary	87	43.5
-Secondary	33	16.5
-University	31	15.5
-Higher	3	1.5
Father Occupation:		
- Employed	30	15
- Skilled manual worker	42	21
- Unskilled manual worker	103	51.5
- Unemployed	23	11.5
- Not alive	2	1
Mother Occupation:		
- Employed	44	22
- Skilled manual worker	15	7.5
- Unskilled manual worker	18	9
- Unemployed	121	60.5
- Not alive	2	1
Social class:		
- Not enough for daily needs	27	13.5
Enough for daily needs	161	80.5
Exceeds needs	12	6
Physical activity:		
-Active	53	26.5
-Inactive	147	73.5
Meal per day:		
- Three	112	56
- Four	66	33
- Five and more	22	11
Television watching or internet use hours, means ± Standard deviation	3.51 ± 0.72	

Figure 1.1 illustrates distribution of the study participants according to their BMI percentile.

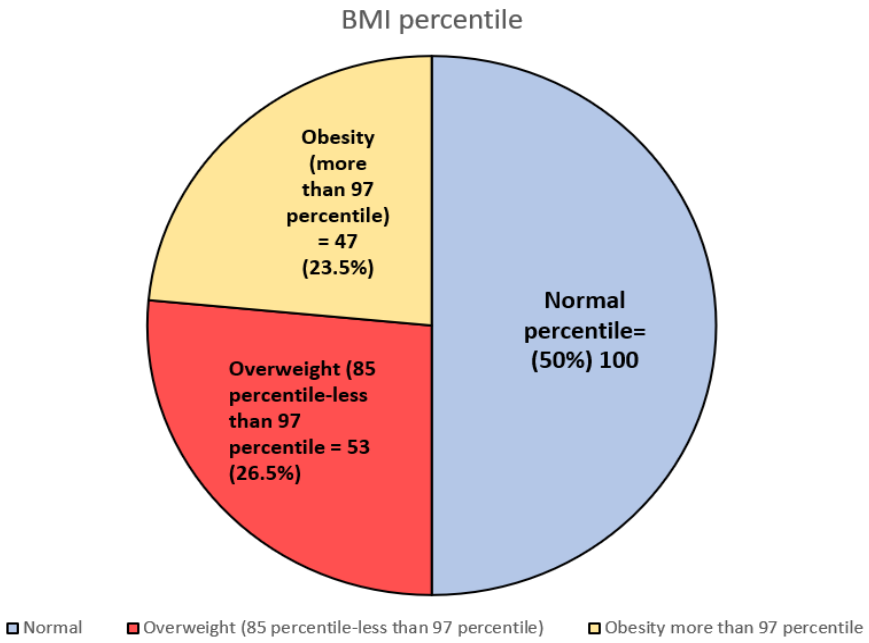

Figure 3.1: Distribution of the study participants according to their BMI percentile.

Table 3.2 shows socio-demographic comparison between cases and controls. No statistically significant association or significant different between children with overweight or obesity and those with normal weight.

Table 3.2: Socio-demographic comparison between cases and controls.

Variable	Cases = 100	Controls = 100	Odds ratio	CI	P-value
Gender					
- Male	54	52	1.083	0.476-1.432	0.246
- Female	56	48	1.378		
Age					
- 5-9 years	51	59	0.723	0.235-1.872	0.124
- 9-14 years	49	41	1.382	0.829-2.002	
Residency					
- Urban	77	64	1.883	0.890-3.210	0.092
- Rural	23	36	0.531	0.102-1.292	
Attending school					
-Yes	91	92	0.879	0.502-1.329	0.778
-No	9	8	1.137	0.478-1.343	
Family history of obesity:					
- Present	34	40	0.772	0.332-1.232	0.320
- Absent	66	60	1.294	0.728-1.349	
Educational level of father:					
-Illiterate	21	16	ref	---	
-Primary	42	37	1.232	0.729-1.439	
-Secondary	17	21	0.770	0.329-1.232	0.293
-University	14	17	0.813	0.289-1.292	
-Higher	6	9	0.645	0.029-1.238	
Educational level of mother:					
-Illiterate	26	20	ref	---	
-Primary	48	39	1.443	0.829-1.892	
-Secondary	15	18	0.803	0.279-1.234	0.379
-University	11	20	0.494	0.130-1.230	
-Higher	0	3	---	----	
Father Occupation:					
- Employed	21	9	ref	---	0.539

- Skilled manual worker	22	20	1.128	0.792-1.278	
- Unskilled manual worker	52	51	1.040	0.730-1.201	
- Unemployed	11	12	0.906	0.489-1.438	
- Not alive	1	1	1	---	
Mother Occupation					
- Employed	23	21	ref	---	
- Skilled manual worker	7	8	0.865	0.320-1.202	
- Unskilled manual worker	9	9	1	---	0.632
- Unemployed	60	61	0.959	0.192-1.290	
- Not alive	1	1	1	---	
Social class:					
- Not enough for daily needs	12	15	0.772	0.389-1.392	
- Enough for daily needs	83	78	1.377	0.492-1.893	0.580
- Exceeds needs	5	7	0.699	0.139-1.239	

Table 3.3 explores the relationship between physical inactivity, number of meals token per day and television watching or internet use hours and overweight or obesity. It's evident that been physically inactive is in significantly associated risk (odds ratio= 5.588) and statistically different (P value <0.001) with overweight or obesity. Moreover; children with overweight and obesity are in in significantly associated risk (odds ratio= 12.25) and statistically different (P value <0.001) with five and more meals intake per day. Lastly; children with overweight and obesity are statistically significant difference from those with normal weight with more TV or internet spending time.

Table 3.3: Comparison between cases and controls regarding personal and environmental factors.

Variable	Cases = 100	Controls = 100	Odds ratio	CI	P-value
Physical activity: -Active -Inactive	 11 89	 42 58	 0.170 5.588	 **0.089-0.428** **3.245-8.392**	**<0.001**
Meal per day: -Three -Four -Five and more	 51 29 20	 61 37 2	 Ref 0.695 12.25	 --- 0.210-1.243 **4.124-19.203**	**<0.001**
Television watching or internet use hours, means ± Standard deviation	4.49 ±0.92	2.43 ± 0.55	---	---	**<0.001**

Figure 3.2 shows complications associated with overweight and obesity. It's evident that dyslipidemia is prevalent among 21 (21%) child, hypertension among 16 (16%) child, sleep apnea among 14 (14%) child, the same for depression and anxiety 14 (14%) child and lastly; two 2 diabetes among 11 (11%) child.

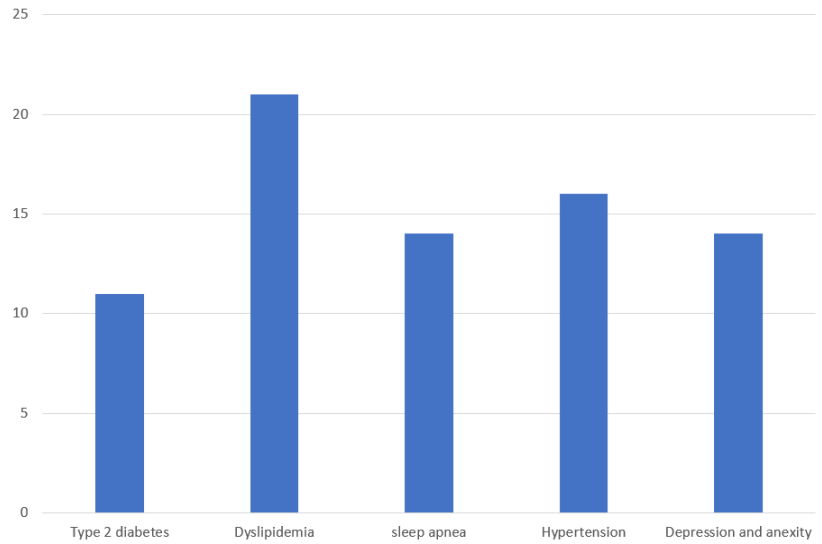

Figure 3.2: Complication associated with overweight and obesity among cases group.

4- DISCUSSION

The risk factors for childhood obesity and excess weight must be identified in developing countries like Iraq.[15] In the present study 23.5 % and 26.5 % of study participants are obese and overweight respectively. Moreover; the study found comparable male to female ratio and overweight and obesity can affect more than and less than 9 years old. In fact, these numbers are depending on the inclusion criteria of the study. Anyhow; Ahmed Al-Delaimy et al[16] and Zuhair Saleh Farhan et al had comparable results.[17] from the other hand; about one third of the study participant reported positive family history of overweight and obesity, which is runs with Muthana Abdulrazzaq Jabbar et al study findings.[18]

This study showed that the rising rate of childhood overweight and obesity are unrelated to level of parent' education or occupation, which is goes with Sabah Shareef Mohammed et al study findings.[19]

From the other hand; physical inactivity and eating five and more meals per day were found to be risky, consistent results was obtained from Faris Abdul Kareem et al in his systemic review.[20] Additionally; overweight and obese children found to spend more hours than those of normal weight, which is going in same way with Muthana Abdulrazzaq Jabbaret al findings.[18]

Children with overweight and obesity were prone to different complication, this study found that dyslipidemia, hypertension, sleep apnea, anxiety or depression and type 2 diabetes are found with variable percentage among these children. Similar percentages found by Zuhair Saleh Farhan et al.[17]

The study's findings are limited by a convenience sample of children from only two centers, which may not be representative of all similar-aged children. However; samples from different districts may provide a more comprehensive view of childhood overweight and obesity clinical manifestations, as the majority of the studied children come from high socioeconomic backgrounds.

CONCLUSION AND RECOMMENDATION

Physical inactivity, eating five or more meals per day, and watching television were found to be risk factors for weight gain. This emphasizes the urgent need for enhanced health knowledge and incentive among stakeholders to promote healthy habits in children. Promoting outdoor exercise and implementing functional health and nutrition education programs in schools are important preventive measures for children. Overweight and obesity might be regarded diseases rather than just physical characteristics, as they are associated with a variety of clinical complications that influence patient survival and health.

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Conflict of intertest

About this study, the authors disclose no conflicts of interest.

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