Clinical and Metabolic Profile of Obese Children at a Tertiary Care Hospital

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Abstract

Objectives: Our study aimed to find out the physical features and biochemical complications of obese children presenting to our hospital.

Materials and Methods: This cross-sectional study was conducted in the outpatient department (OPD) of POF hospital Wah Cantt from January 2019 to June 2020. Non-probability convenient sampling was used to include obese children less than 14 years of age. The child was labeled obese as per W.H.O. criteria. History and complete physical examination were done according to the pre-designed proforma of all the participants. Blood samples were sent for analysis after taking consent.

Results: A total of 100 obese children were included in the study out of which 62 % were females and 38% were males. The majority were under 10 years of age (70%). Arthralgia (55%) was the most common complaint and Acanthosis Nigricans (31%) was the most common physical finding. Vitamin D deficiency was present in 60% of the cases. Iron deficiency was found more in females (64.5 %) (p-value 0.01) and in children of both sex under 10 years of age (62.8 %) (p-value 0.02).

Conclusion: Obesity can lead to various health complications. Early detection and prevention of these complications can decrease the associated morbidities and mortalities in adulthood.

Keywords: Obesity, vitamin D deficiency, Iron deficiency, Anemia, Acanthosis Nigricans.

Introduction

Obesity in children has become a major health problem due to the increase in its prevalence globally. According to recent World Health Organization (WHO) figures, 40 million children under 5 years of age and over 340 million children in the age range of 5 -19 years are either overweight or obese.[1] For classification of obesity and overweight WHO recommends using Body mass Index (BMI) charts.[2] Previously cases were reported only from high-income countries but recently they have been reported from low and middle-income countries also.[3] In various countries because of socio-economic inequalities, there is the simultaneous presence of undernutrition and obesity resulting in a financial burden on society.[4] The prevalence of childhood obesity varies in Pakistan from 4.78% to 12%.[5,6] Although it involves both sexes and children from every background but boys[7] and children from high socioeconomic statuses are affected more due to their dietary behavior and lifestyle.[8]

Obesity is a preventable disease with serious short-term and long-term health effects. The most important consequence of childhood obesity is its persistence into adulthood along with its side effects. [9] It almost affects every structure of a child in a very adverse way. It is also considered as an independent risk factor for various diseases like cardiovascular disease, type 2 diabetes, obstructive sleep apnea, orthopedic complications, and psychiatric disease. Early onset of these diseases results in early morbidity and mortality.[10]

Although various local studies have been conducted to find out the prevalence of obesity in our country there is a dearth of local literature on complications of childhood obesity. Thus our study aimed to find out the physical features and biochemical complications of obese children presenting to our hospital.

Materials and Methods

This descriptive cross-sectional study was carried out in the OPD of POF hospital from 1st January 2019 to 3oth June 2020 after approval of the ethical committee of the institute. Children with endocrine disorders, dysmorphic features, chronic illnesses, and those on drugs resulting in obesity were excluded from the study. By using the WHO sample size calculator, a sample size of N = 100 was calculated by taking population prevalence of 6 % [11] and error of precision 1%. Data was collected through non-probability consecutive sampling. The weight and height of all the children between 2-14 years of age coming to the OPD were taken and plotted on respective WHO charts for age and sex. Weight of each child was taken in minimal clothing to the nearest kg using a standardized weight scale and height was calculated in standing position without shoes to the nearest cm using a wall-mounted stadiometer. BMI was calculated as weight in kilogram (Kg) divided by square of the height in meter. History and physical examination were done according to the pre-design proforma of those patients who fulfilled the criteria and noted. Blood samples were taken for Blood CP, renal function tests, and vitamin D level. Serum iron levels were done in those cases that had low MCV (70-86 fl), MCH (23-31 pg), and MCHC (30-36 g %). Fasting samples were done for fasting blood sugar, serum cholesterol, and serum Triglycerides. Urine R/E was done to check proteinuria.

Operational Definition:

Obese:
- Children between 5-14 years: BMI for age > +2 SD above the WHO Growth Reference median [2]
- Children below 5 years of age: Weight-for-height greater than 3 SD above the WHO Child Growth Standards median [12]

Overweight:
- Children between 5-14 years: BMI for age > +1 SD above the WHO Growth Reference median [2]
- Children below 5 years of age: Weight-for-height greater than 2 SD above the WHO Child Growth Standards median [12]

Vitamin D Insufficiency: 25-hydroxy vitamin D level between 20 -30 nanograms/milliliter

Vitamin D deficiency: 25-hydroxy vitamin D level < 20 nanograms/milliliter

Iron deficiency: Serum iron levels < 60-170 mcg/dl

Dyslipidemia:
- Serum cholesterol > 200 mg/dl
- Serum Triglycerides > 200 mg/dl

Data Analysis: Data analysis was done by using SPSS version 19. Descriptive statistics were obtained for all variables. Chi-square association was used to find out the association of age and sex category with all other variables at a 5% level of significance.

Results

Out of 100 children included in the study, the majority were females (62%) and under 10 years of age (70%).

The mean age of the study group was 9.4 years with a minimum age of 3 years and maximum age of 13 years with STD ± 1.6. Hemoglobin values ranged between 10 to 14.7 ± 0.97 mg/dl (mean 12.4).

The majority had a history of arthralgia and Acanthosis Nigricans was the most common physical finding. The most common abnormal laboratory result was Vitamin D deficiency (Table 1). Only 39% of the children had a family history of obesity.

Multivariate analysis showed a high prevalence of high FBS, anemia, and iron deficiency in females as shown in Table 2. Anemia was labeled as per WHO criteria[13] and the underlying cause was an iron deficiency in all the cases. Anemia was present in a significant number of children above 10 years of age (20%) (p-value 0.02) whereas iron deficiency without anemia was seen more in children below 10 years of age (62.8%) (p-value 0.02).

Table 1: Characteristics of Study Participants

S.No	Variable	Frequencies (n-100)
1	Sex	
	• Male	38 (38%)
	• Female	62 (62%)
2	Age	
	• 10 years & below	70 (70%)
	• > 10 years	30 (30%)
3	HISTORY/ CLINICAL FINDINGS:	
	• Arthralgia	55 (55%)
	• Family history	39 (39%)
	• Snoring	16 (16%)
	• Asthma	04 (4%)
	• Somnolence	1 (1%)
	• Acanthosis Nigricans	31 (31%)
	• Hypertension	13 (13%)
4	METABOLIC FINDINGS:	
	• Vitamin D levels	
	○ Deficient	60(60%)
	○ Sufficient	22(22%)
	○ Insufficient	18(18%)
	• Iron deficiency	55 (55%)
	• High Serum Triglyceride	31(31%)
	• High Serum cholesterol	17 (17%)
	• Proteinuria	
	○ + 1	11 (11%)
	○ +2	02 (2%)
	• Anemia	10 (10%)
	• Raised FBS	03 (3%)
	• Deranged RFT	02 (2%)

Table 2: Cross-tabulation of Gender with other variables, N=100

S. No.	Variables	Male (n-38)	Female (n-62)	P value
1	Arthralgia	20 (52.6%)	35 (56.4%)	0.7
2	snoring	6 (15.7%)	10 (16.1%)	0.9
3	somnolence	0	1 (1.6%)	0.4
4	Family history	16 (42.1%)	23 (37%)	0.6
5	Acanthosis Nigricans	08 (21%)	23 (37%)	0.09
6	Hypertension	05 (13.1 %)	08 (12.9%)	0.9
7	Anemia	03 (7.8%)	07 (11.2%)	0.5
8	Vitamin D status			
	• Sufficient	8 (21%)	14 (22.5%)	0.2
	• Insufficient	10 (26.3%)	08 (12.9%)	
	• Deficient	20 (52.6%)	40 (64.5%)	
9	Serum Cholesterol			
	• Normal	33 (86.8%)	50(80.6 %)	0.4
	• High	05 (13.1%)	12(19.3 %)	
10	SerumTriglycerides			
	• Normal	28 (73.6%)	41 (22.5%)	0.4
	• High	10 (26.3 %)	21 (33.8%)	
10	Fasting Blood Sugar			
	• Normal	38 (100%)	59 (95.1%)	0.1
	• High	0	03(4.8%)	
11	Proteinuria			
	• Nil	33(86.8%)	54 (87%)	
	• +1	5 (13.1%)	6 (9.6%)	0.4
	• +2	0	2 (3.2 %)	
12	Misc			
	• Asthma	2 (5.2%)	2 (3.2%)	0.1
	• Raised Urea/ Creatinine	2 (5.2%)	0	
13	Iron deficiency	15 (39.4%)	40 (64.5%)	0.01

Discussion

The current lifestyle of the children has led to an upsurge of obesity cases in children which may lead to complications in adulthood. Our study found increased cases of obesity in females which is in disparity to a study done in Islamabad[7] while the increased incidence was also seen in children less than 10 years of age which was also documented by Ahmed et al [6]. Both of these findings could be attributable to decrease access to physical activities as a consequence of little access to outdoor activities because of social factors which is a risk factor in various studies.[11, 14]

The most common physical finding of our study was Acanthosis Nigricans followed by hypertension which was also observed by Khuhro et al in their study.[15] Acanthosis Nigricans has been the most common skin manifestation in obese children and has been linked to insulin resistance and high risk to type 2 diabetes mellitus (T2DM).[16,17] Therefore early recognition of this symptom can result in screening for complications of obesity in children.

The majority of the cases in our study had subnormal Vitamin D levels which are consistent with the results of Adikaram et al[18] although in our study females were more involved whereas in Adikaram et al study both sexes were equally involved. This Vitamin D deficiency could be due to improper diet, sedentary lifestyle, and impaired vitamin D metabolism as proposed by Zakharova et al.[19] Low Vitamin D levels in obese children are an important finding as failure to recognize this deficiency may lead to undertreatment and complications in children.

Iron deficiency was the most significant finding in our study {p-value 0.01} which was also observed by Ghaemi et al in their study.[20] Various diagnostic tests have been proposed for the identification of iron deficiency but all have limitations when done alone. Although WHO recommends serum ferritin for the diagnosis of iron deficiency but Huang et al have found its level to be elevated in obese children as obesity causes chronic inflammation.[21] Sharif et al[22] in their comparative study had observed that low MCV, low MCH are correlated with Iron deficiency, a finding present in our study also. This finding can help to diagnose iron deficiency in health care facilities with limited resources. Results of our study have shown that obesity may be an independent risk factor of iron deficiency which can later lead to iron deficiency anemia.

Childhood obesity has been linked to various cardiometabolic risk factors like dyslipidemia and diabetes mellitus by Das et al in their study.[23] Our study also showed cases of dyslipidemia in a number of children as observed by a Vietnam study[24] but we did not look for the presence of metabolic syndrome which was shown in an Indian study [25]. Zabeen et al in their study witnessed a high prevalence of diabetes in obese children with a predominance of females[26] which was also seen in our study.

Our study has few limitations as this was a cross-sectional study where only obese children were considered and overweight children were excluded. We did not evaluate for any risk factors like dietary habits and lifestyle leading to obesity nor did screening for metabolic syndrome.

Conclusion

Our study has revealed various clinical and metabolic abnormalities in obese children. Due to the increase in the prevalence of obesity, it is recommended for health professionals to screen these children for various abnormalities to prevent long-term complications.

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