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Prevalence of Pediatric Obesity in Outpatient Clinics at a Tertiary Maternity and Children's Hospital: A Cross-Sectional Study

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Abstract

Background: This study assessed the prevalence of obese children at a general pediatric outpatient clinic, Latifa Women and Children Hospital, Dubai, United Arab Emirates. Associations between obesity and factors such as the child's sex, age, and nationality are also estimated.

Methods: Data from 266 patients' electronic medical records (aged 2–13 years) were analyzed in this observational cross-sectional study from June 2019 to January 2021. Socio-demographic variables were age, sex, and nationality. The outcome variable was weight status, which was assessed using the Centers for Disease Control and Prevention (CDC) classification of body mass index (BMI).

Results: 26% of the children were either overweight (11.3%) or obese (14.7%). A significant association was found between school-age children and obesity ($P < 0.001$). The mean systolic blood pressure of obese children was 109.56 mmHg (standard deviation (SD) 12.8), which was higher than that of non-obese children (98.05 mmHg (SD 9.8)) ($P < 0.001$). Obesity was found to have a negative correlation with a child's gender and nationality.

Conclusion: The obesity prevalence at Latifa Women and Children's Hospital has not been studied before in the general pediatric clinic. Hence, the high prevalence of obesity identified in this setting may allow for the recognition of overweight and obese children at an early stage when visiting general outpatient pediatric clinics. Furthermore, knowledge of recent obesity prevalence in the general population may help the United Arab Emirates (UAE) in its efforts to reduce obesity (7).

Key Words: Body mass index, Children, Observational cross-sectional study.

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1- INTRODUCTION

Overweight and obesity are defined by the World Health Organization (WHO) as "abnormal or excessive fat accumulation that presents a risk to health" (8). Body mass index, or BMI, is a measure used to classify children's weight status. According to the definitions of the Centers for Disease Control and Prevention (CDC), a BMI equal to or greater than the 95th percentile for age and sex is obese (11).

Worldwide, in 2019, 38 million children under the age of 5 were overweight or obese (1). Additionally, 340 million children and adolescents aged 5 to 19 were overweight or obese in 2016 (1). In the United States, the prevalence of obesity among children and adolescents between the ages of 2 and 19 in 2017-2018 was 19.3% (9). The UAE is not spared from this epidemic, with a prevalence of 17.35% in children between the ages of 5 and 17 in the year 2020 (10). These numbers continue to rise worldwide and in neighboring Gulf Cooperation Council (GCC) countries.

Childhood obesity is associated with multimorbidities, such as type 2 diabetes, hyperlipidaemia, hypertension, and adult obesity (2), as well as psychological comorbidities such as depression (13), emotional disorders, behavioral disorders, and self-esteem issues in childhood (12). Moreover, obese children have more clinical visits, more hospitalizations, longer durations of hospitalization, and more medication usage compared to non-obese children. As a result, pediatric obesity is associated with increased utilization of healthcare services (21), which accounts for a significant portion of the healthcare system and societal costs (22, 30).

Childhood obesity can be sustained into adolescence (6) and adulthood (7). For these reasons, it is vital to identify overweight and obese children visiting general outpatient clinics for early referral to dietitians, who can help them with weight reduction and the implications of a healthy lifestyle. Under-identification of obese and overweight children by physicians (5, 6) reduces early opportunities for pediatricians in the prevention of obesity.

If no action is taken, the associated physical and psychosocial comorbidities pose ongoing threats to health. Intervention may be hindered by under identification and low recognition of obesity prevalence in children visiting outpatient clinics. In Saudi Arabia, it was observed that there is an under-identification of obese and overweight children by physicians (4). In the United Kingdom, it was also found that only 4 out of 10 children visiting an outpatient clinic were recognized as obese or overweight (1). This raises concerns about pediatricians missing out on early intervention opportunities for overweight and obese children. Hence, the main aim of this study is to find the prevalence of overweight and obesity among children visiting a general outpatient clinic.

2- MATERIALS AND METHODS

2-1. Objectives

This study was designed with the following objectives:

a) To determine the prevalence of overweight and obese children visiting the Latifa Women and Children Hospital outpatient clinic between June 2019 and January 2021.

b) To correlate obesity with demographic factors of pediatric patients visiting the outpatient clinic at Latifa Women and Children Hospital from June 2019–January 2021.

2-2. Design and Population

This study is reported according to the

STROBE guidelines. This is an observational cross-sectional study using electronic medical records of pediatric patients at Latifa Women and Children Hospital in Dubai from June 2019 to January 2021.

2-2-1. Inclusion and Exclusion Criteria

All pediatric patients from the ages of 2 to 13 were included. Exclusion criteria were applied to patients who are syndromic, less than 2 years of age, and over the age of 13.

2-2-2. Sample Size

Time-frame sampling was used in order to reduce bias by increasing the representation of the selected sample. It was reported that the prevalence of pediatric obesity in GCC countries ranges from 8% to 20%. Therefore, it was assumed that the prevalence would be about 15% in the UAE (28, 29). Assuming a prevalence of 15%, a sample size estimation with 6% precision and a 95% confidence interval calls for a total of 140 children to be studied. Therefore, a minimum of 150 patients to be investigated was required to achieve an absolute precision of 5 to 6%. However, all patients between June 2019 and January 2021 meeting the criteria for inclusion were selected. This gave a sample number of 286; 20 children were omitted due to missing data or duplication. Therefore, data from 266 patients (aged 2–13 years) from June 2019 to January 2021 were analyzed.

2-3. Data Collection

Anthropometric measurements were obtained from patients' records. Quantitative variables were age (years) and blood pressure (mmHg). Age was divided into two categories: preschool age and school age. Preschool-age children are those aged 2 to less than 5 years, whereas school-age children are those aged 5 to 13 years. Nationality was divided into UAE nationals (Emirati) and non-UAE nationals (non-Emirati).

Categorical nominal variables include sex, nationality, and referrals. Diagnosis and medications were also documented. Medications were classified according to their pharmacological category (31). Body Mass Index, an ordinal categorical variable, was defined using the Centers for Disease Control's weight status classification. A BMI below the 5th percentile is considered underweight. A BMI equal to or greater than the 5th percentile and less than the 85th percentile is considered normal weight. A BMI equal to or greater than the 85th percentile and less than the 95th percentile for age and sex is regarded as overweight. Whereas, a BMI equal to or greater than the 95th percentile for age and sex is considered obese.

2-4. Data Analysis

Logistic regression analysis was conducted to assess the association of obesity with sex, nationality, and blood pressure. In addition to measuring the odds ratio with a 95% CI, the Chi-square test was used to determine the association of obesity with other categorical variables.

A P-value less than 0.05 was considered to be statistically significant. Data from electronic medical records were extracted to a Microsoft Excel sheet before being transferred to the Statistical Package for Social Sciences (SPSS) software version 24 for analysis.

3- RESULTS

Table 1 shows the distributions of socio-demographic variables and referrals based on children's obesity status. The prevalence of obesity among the 266 subjects was 14.7% (95% CI: 10.6%, 19.5%). The majority of pediatric patients in this study were of normal weight (59.8%). Overweight and underweight children were 11.3% and 14.3%,

respectively. Of the females, 17.5%, and of the males, 12.5%, were obese. More Emirati were obese (15.7%) compared to non-Emirati. However, no significant statistical association was found between obesity, sex, or nationality. The degree of obesity increased with age. A significant association was found between the child's age and obesity status (P = 0.001). 23.7% of school-age children were found to be obese, compared to 7.9% of those in the preschool age group. There was a statistically significant relationship between weight category and referral to an endocrinologist or nutritionist; 30.8% of obese patients were referred to a nutritionist, and 12.8% were referred to an endocrinologist (P = .000).

Table-1: Distribution of weight by sex, age, nationality, and referral

Variable		Weight categories								P-value
		Underweight		Normal weight		Overweight		Obese		
		No.	%	No.	%	No.	%	No.	%	
Sex	Female	16	14.0%	65	57.0%	13	11.4 %	20	17.5 %	0.707
	Male	22	14.5%	94	61.8%	17	11.2 %	19	12.5 %	
Age	Preschool	24	15.8%	102	67.1%	14	9.2%	12	7.9%	0.001
	School	14	12.3%	57	50.0%	16	14.0 %	27	23.7 %	
Nationality	UAE	26	68.4%	105	66.0%	19	63.3 %	28	71.8 %	0.876
	Others	12	31.6%	54	34.0%	11	36.7 %	11	28.2 %	
Nutritional referral	Yes	2	5.3%	2	1.3%	0	0.0%	12	30.8 %	0.000
	No	36	94.7%	157	98.7%	30	100%	27	69.2 %	
Endocrine referral	Yes	0	0.0%	2	1.3%	0	0.0%	5	12.8 %	0.000
	No	38	100.0%	157	98.7%	30	100%	34	87.2 %	

UAE, United Arab Emirates

Table 2 presents the difference in mean systolic blood pressure between obese patients and other weight categories. Obese patients were found to have a higher mean systolic (109.56 mmHg) and diastolic (63.59 mmHg) blood pressure compared to their non-obese counterparts. This finding is statistically significant (P values of 0.001 and 0.01). However, blood pressure measurements were undocumented for nearly 41 patients.

Table 3 demonstrates the results of the logistic regression analysis. The odds ratio for obesity in the male gender was less than 1 (0.707). This suggests that male children are about 30% less likely to have obesity. In addition, a similar result was found regarding nationality in relation to obesity, where the odds ratio is 0.574,

indicating that Emirati children are unlikely to be obese. Obese children are 2.4 times more likely than non-obese children to be obese (p =.06), and obese patients have an odds ratio of 1.101, making them more likely to have an increase in systolic blood pressure (95% CI) (p = 0.000). A comparable odds ratio for diastolic blood pressure and obesity was identified; however, it was statistically insignificant (p = 0.801).

Table-2: Distribution of mean Systolic and Diastolic blood pressure

Study Variable	Weight Categories	n	Mean	SD	P value
SBP (mmHg)	Non-obese	191	98.05	9.8	0.001
	Obese	34	109.56	12.8	
DBP (mmHg)	Non-obese	190	60.05	7.9	0.01
	Obese	34	63.59	7.2	

SBP, systolic blood pressure; DBP, diastolic blood pressure; SD, standard deviation; n, number.

Table-3: Odds Ratio and 95% CI from Logistics Regression analysis for Obesity

Variable	OR	95% C.I.		P value
		Lower	Upper	
Sex (Male)	0.725	0.323	1.629	0.437
Age (School)	2.442	0.932	6.404	0.06
Nationality (Local)	0.613	0.247	1.518	0.290
SBP (mmHg)	1.088	1.043	1.135	0.000
DBP (mmHg)	0.999	0.946	1.056	0.984

SBP, systolic blood pressure; DBP, diastolic blood pressure; OR, odds ratio.

The diagnosis of obese children are varied. Only twelve patients received a formal diagnosis of obesity. The rest of the obese children had a variety of diagnoses, ranging from spastic diplegia to speech delay. Vitamin D supplements, antihistamines, and antibiotics were the most commonly prescribed drugs among obese individuals.

A summary of major findings upon analysis of 266 pediatric patients is that 14.7% were found to be obese. Obesity was found to be associated with age, referral, and an increase in mean systolic blood pressure. Children in school age, i.e., over 5 years old, have a higher burden of obesity than preschoolers. A correlation was found between a referral to an endocrinologist or nutritionist and the weight category of a child. Moreover, obese children have a higher likelihood of having an increased mean systolic blood pressure reading than others. The sex and nationality of a child have no statistically significant relationship with obesity.

4- DISCUSSION

In a previous study looking at obesity among school-aged children (6–11 years) in Sharjah, UAE, it was found that the prevalence of obesity and overweight was the highest (14.2%) in children aged 11 years and the lowest (3%) at 7 years old (15). In this study, the degree of obesity also increased with age, with 23.7% of school-age children being obese, compared to 7.9% of those of preschool age. This steady rise in obesity with increasing age was also shown in a large

cross-sectional study among UAE schoolchildren in the Emirate of Ras Al Khaimah (18).

Our results are consistent with earlier research showing an alarmingly high prevalence of overweight and obesity among school-aged children. This trend points out that interventions, recognition, and campaigns focused on this age group may have a greater impact on decreasing obesity rates. The clustered nature of school-age children presents opportunities for targeted and effective approaches.

This strikingly high prevalence of overweight and obesity (37.7%) among school-aged children may be due to an increased susceptibility to obesogenic pressures in this age range, perhaps due to the potentially increasing independence of decision-making on food choices. Furthermore, the food choices of a child may be influenced by their peers' selections, which may create a whirlwind of unhealthy eating habits. The lower rate of obesity among preschool-age children (17.1%) may be explained by parental control over a younger child's eating habits. Furthermore, a significant proportion of patients in this age range were suffering from failure to thrive, which may explain the disparity.

Numerous studies from the UAE provide evidence that vitamin D deficiency could be a major public health burden among UAE residents (33). This study supports this finding, with vitamin D being the most prescribed medication in the study population.

A study done in Brazil has also shown weaker correlations with diastolic blood pressure compared to the correlations seen in SBP like in this study (34). This could be due to a "co-linear problem," which occurs when two variables are highly correlated; in this case systolic, and diastolic blood pressures.

In a previous study in the United Arab Emirates, using the CDC method of weight categorization as used in this study, amongst the school-age children between the ages of 6 and 16 years, the prevalence of overweight and obesity were 17% and 8%, respectively, in the year 2000 (14). The prevalence of obese school-age children in this study was 23.7%. Therefore, it may be suggested that in the 20-year-apart assessments of prevalence in the UAE, there was a threefold increase in obese children in similar populations. The prevalence of overweight school-age children was found to be 14% in this study. Therefore, there was a decrease in overweight children of 3%.

Weight categorization may use the International Obesity Task Force (IOTF), World Health Organization (WHO), and Centers for Disease Control (CDC) reference methods. The BMI interpretations between these methods have different outcomes in the same population (16), (17), and (18). This study used the CDC criteria only, so this may demonstrate an underestimation or overestimation of obesity. However, a previous UAE study looking at all three methods identified that CDC values were in between IOTF and WHO values (18). As a result, using the CDC criteria provided less variation than using the IOTF or WHO methods.

Height and weight data for the calculation of the body mass index have been measured directly by healthcare professionals at Latifa Women and Children Hospital. In studies where self-reported data were used, standard deviations were large, thus indicating substantial variability between individuals in reporting results (19). Furthermore, self-reported BMI majorly underestimates the prevalence of overweight and obesity (23). As a result, using hospital-measured data reduces the challenge of imprecise data due to the effects of self-perception and parental perception on child

measurements and more accurately detects overweight and obesity (23).

Previous research in children has discovered discrepancies between measured BMI and fat proportion (25), implying that using BMI alone, without other adiposity measures that estimate body composition and differentiate between fat and muscle, may not provide an accurate classification of obesity status. In young children, less than 9 years of age, BMI is shown to be a weak indicator for total fat mass and fat percentage. The limitations of using BMI to estimate body fat in young children should be made clear to pediatricians. However, in older children, total fat mass was strongly predicted by BMI (26). Hence, the reliance on BMI alone as a tool for determining obesity status is under question. Therefore, stronger and multiple predictors of adiposity may be required in future studies. It may not always be feasible to use some measures, such as dual x-ray absorptiometry (DXA), in all settings. However, other adiposity measures such as skin folds are strongly correlated with DXA fat mass (27), and hence BMI along with skin-folds could be used when DXA is not practicable. Furthermore, the use of sex and ethnicity-specific body mass index (BMI) may accurately identify individuals at increased risk of obesity (32).

The strong association, seen between elevated systolic blood pressure and obesity, shows that future studies should investigate this relationship. In the UAE, there have been a few studies, if not any, that show a correlation between blood pressure and pediatric obesity.

4-1. Limitations and Recommendations

Nonetheless, the use of a single method remains a limitation in our study, as it may overestimate or underestimate the prevalence of obesity. Additionally, comparisons between our data and previous studies can only be made if the same BMI interpretation as the CDC criteria is used.

Retrospective data was used, and as a result, some details were undocumented in the medical records of patients, such as crucial skin exam findings like acanthosis nigricans or blood pressure readings of children, especially those of younger ages, as it may be difficult in some instances with a crying child, etc. Moreover, the nature of this study is cross-sectional, so it is difficult to infer causal relationships (20). Furthermore, the study sample was taken from general pediatric outpatient clinics, which is not representative of children seen in other specialized clinics such as diabetic and cardiology clinics. Moreover, because it is only conducted in a public hospital in Dubai, it cannot be completely generalized to the entire population of the United Arab Emirates.

Factors such as heterogeneity among the non-Emirati population in our study and the pubertal stage of school-aged children are also recommended to be considered in future studies. The onset of puberty is associated with dramatic changes in body composition (24), and pubertal onset varies between adolescents of the same age and sex. Therefore, taking pubertal stage into account may allow for a more accurate developmental comparison than an age-wise comparison, as done in this study.

5- CONCLUSION

Our study showed a significant burden of pediatric obesity and overweight in patients visiting the general pediatric outpatient clinic, with school-age children being more affected than pre-school-age children. Children visiting the general outpatient clinic routinely have their height and weight measured using precision scales, which accurately define their weight status. Weight status, if recognized, creates health-promoting

prospects for pediatricians, such as referral to nutritionists and endocrinologists, which is essential for weight reduction as well as to identifying children who are prone to insulin resistance and metabolic syndrome for early intervention. Furthermore, focusing solely on symptom management and the reason for the visit takes away these opportunities.

5-1. Ethical Considerations

This study, a student research project, was reviewed and approved by the Institutional Review Board (IRB) of the Mohammed Bin Rashid University of Medicine and Health Sciences (MBRU) Student Research Projects (SRP) Committee (MBRU IRB-SRP2021-37).

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