DEMOGRAPHIC, CLINICAL AND BIOCHEMICAL CHARACTERISTICS OF PEDIATRIC OBESITY: INTERIM ANALYSIS OF A LARGER PROSPECTIVE STUDY

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Introduction: Pediatric obesity is the most common nutritional disorder that affects more than a third of the young population and predisposes individuals to greater future morbidity and mortality. Therefore, rising obesity epidemics is becoming one the most important healthcare problems.

Our study aimed at determining the demographic, clinical, and biochemical characteristics of patients referred from primary physicians due to concerns of obesity or prediabetes. Determining early signs of premorbid abnormalities would substantially help with creating preventive strategies regarding reduction in pediatric obesity and future obesity-related complications.

Materials and Methods: In the period of 2017-2018, 62 consecutive pediatric patients referred to the University Pediatric clinic were recruited. Demographic and clinical information for both the patients and their parents were collected using in-person interview and standardized questionnaires. Specific data regarding weight, height, systolic (SP) and diastolic (DP) blood pressure, lipid metabolic profile, thyroid hormone levels, and glucose and insulin levels before and after oral glucose tolerance test (OGTT with 75g glucose dose) were collected. Body mass index was determined and patients were classified based on the International Obesity Task Force (IOTF) criteria. Appropriate descriptive, comparative parametric and non-parametric tests and Spearmans's ranked correlations were used for statistical analyses.

Table 1. Demographic characteristics of the total study population and for male and female pediatric patients separately

Demographic and clinical characteristics	Total cohort (n=62)	Female (n=28)	Male (n=34)	Female vs. Male p-value
Female, n (%)	28 (45.2)	-	-	-
Age, mean (SD)	11.6 (2.5)	11.8 (2.7)	11.4 (2.3)	0.538
Weight, mean (SD)	73.4 (20.7)	72.2 (13.1)	74.4 (23.9)	0.678
Height, mean (SD)	153.7 (13.5)	153.4 (13.1)	153.9 (14.0)	0.897
BMI, mean (SD)	30.5 (5.5)	30.4 (4.6)	30.7 (6.2)	0.834
Obese/overweight/normal, n	32/22/8	16/10/2	16/12/6	0.446
Waist circumference, mean (SD)	98.3 (14.7)	97.4 (10.3)	99.0 (17.7)	0.684
Systolic BP, mean (SD)	117.4 (12.9)	117.3 (14.1)	117.5 (12.1)	0.961
Diastolic BP, mean (SD)	76.3 (10.2)	76.1 (10.4)	76.4 (10.4)	0.913
Ejection fraction, mean (SD)	68.4 (7.2)	68.1 (6.9)	68.5 (7.4)	0.835
Maternal BMI, mean (SD)	28.7 (6.2)	28.1 (4.7)	29.5 (7.4)	0.662
Paternal BMI, mean (SD)	30.9 (5.6)	31.3 (6.3)	30.7 (4.9)	0.385

Legend: BMI – body mass index, BP – blood pressure, SD – standard deviation.

Differences were derived by χ^2 and Student's t-test as appropriate.

Table 2. Biochemical and OGTT analysis of the study population

Biochemical analyses and OGTT	Total cohort (n=46)	Normal or overweight (n=22)	Obese (n=24)	Obese vs. other p-value
Cholesterol, mean (SD)	4.1 (0.7)	4.1 (0.6)	4.2 (0.9)	0.54
Total triglycerides, mean (SD)	1.4 (0.7)	1.3 (0.6)	1.4 (0.8)	0.467
T4, mean (SD)	8.5 (3.2)	9.9 (3.1)	7.5 (2.9)	**0.021**
TSH, mean (SD)	2.9 (1.3)	3.3 (1.1)	2.6 (1.3)	0.155
Oral glucose tolerance test				
Glucose at baseline, mean (SD)	4.4 (0.7)	4.8 (0.6)	4.1 (0.5)	**<0.001**
Glucose during OGTT, mean (SD)	7.5 (1.8)	7.3 (1.9)	7.6 (1.6)	0.586
Insulin at baseline, mean (SD)	17.7 (9.2)	12.9 (5.5)	21.8 (9.8)	**0.003***
Insulin during OGTT, mean (SD)	120.0 (119.7)	134.2 (153.5)	107.9 (82.9)	0.885*

Legend: OGTT – oral glucose tolerance test, TSH – thyroid stimulating hormone, SD – standard deviation, IQR – interquartile range

Differences between the obese and the remaining BMI groups (overweight and normal BMI) were derived with Student's t-test. * - due to non-parametric nature of the variable Mann-Whitney U test was used. P-value lower than 0.05 was considered statistically significant and shown in bold.

Blood pressure measures are shown as mmHg, T4 levels as µg/dL, TSH levels as mU/L, glucose levels as mmol/L, and insulin levels as µIU/mL.

Results: The population was consisted of 34 males and 28 females with respective age of 11.6 and 11.8 years old (p=0.781) were recruited. The mean BMI was 30.5 (SD 5.5), of which 8 were with normal weight (≤25 BMI), 22 were overweight (25-30 BMI) and 32 were obese (≥30 BMI). Patients BMI was significantly associated with the BMI of their parents (Spearman's ranked r=0.395, p=0.004). Both SP and DP were significantly different between the BMI subgroups (one-way ANOVA p=0.005 and p=0.001, respectably) with the obese group having the highest BP values (post-hoc Benjamini p=0.004).

Obese children had lower average T4 levels when compared to the comparators (7.5µg/dL vs. 9.9µg/dL, t-test p=0.021). The obese group of children has significantly lower baseline glucose levels and higher insulin levels when compared to the overweight/normal BMI groups (4.1mmol/L vs. 4.8mmol/L, t-test p<0.001 and 21.8µgU/mL vs. 12.9µgU/mL, Mann-Whitney U test p=0.003). Although not significantly different at follow-up, the obese children had greatest numerical increase in glucose levels during the OGTT (⌂3.5mmol/L vs. ⌂2.4mmol/L, p=0.063) and smaller absolute insulin response (⌂86.1µIU/mL vs. ⌂125.7µIU/mL).

Conclusion: Pediatric patients in our clinic demonstrate familial type of obesity which is characterized with premorbid asymptomatic endocrine impairments. In order to maintain normal glucose levels, obese pediatric patients demonstrate high levels of resting insulin levels and diminished response after OGTT load. Failure of these compensatory mechanisms may lead to early development of diabetes type 2.

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Fat, metabolism and obesity

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