Increased prevalence of severe obesity and related comorbidities among patients referred to a pediatric obesity clinic during the last decade

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Introduction

- Childhood obesity has become a major worldwide health concern, and is strongly linked to co-morbidities with potentially devastating consequences.
- Obesity in childhood is defined as BMI ≥95th percentile for age & gender.
- Data from the US indicate a growing spectrum of severe obesity, defined as BMI ≥99th percentile, in the pediatric population.
- In Israel, the same alarming trend of child & adolescent obesity is emerging.

Objectives

To examine prevalence trends in severe obesity & related comorbidities among patients referred to a tertiary pediatric obesity clinic in Israel from 2008 to 2017.

Methods

A retrospective cohort study design was used.

- The medical files of patients aged 2-18 years with BMI >95th percentile at initial referral to the obesity clinic were reviewed for demographic, anthropometric, & cardiometabolic data.

Inclusion criteria:

- Children & adolescents aged 2-18 years with BMI ≥95th percentile for age & gender.

Exclusion criteria:

- Known syndromic obesity
- Presence of endocrine disorders associated with obesity or non-endocrine chronic illness (e.g. chronic renal failure, chronic asthma, past history of oncologic disease or bone marrow transplantation)
- Intake of medications that might impact body weight (systemic steroids, psychiatric medications, etc.)
- History of bariatric surgery
- Missing data on obesity related comorbidities.

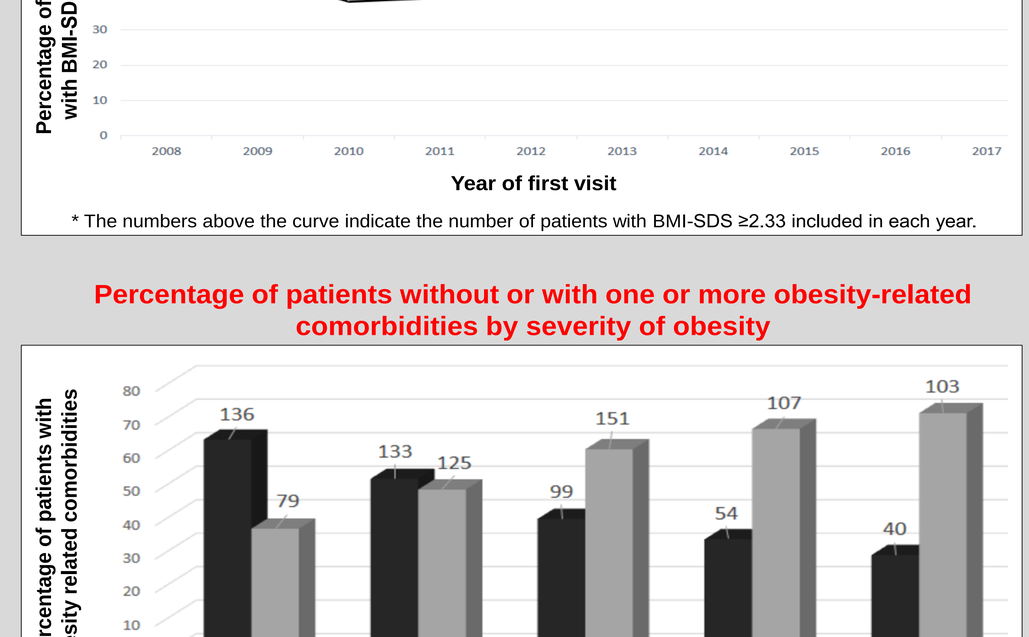
Severe obesity was defined as BMI ≥ 99th percentile, which corresponds to BMI-SDS≥2.33.

Findings were compared between patients with 2.3>BMI SDS≥1.645 and BMI-SDS≥2.33 (severe obesity), and yearly rates of severe obesity were calculated.

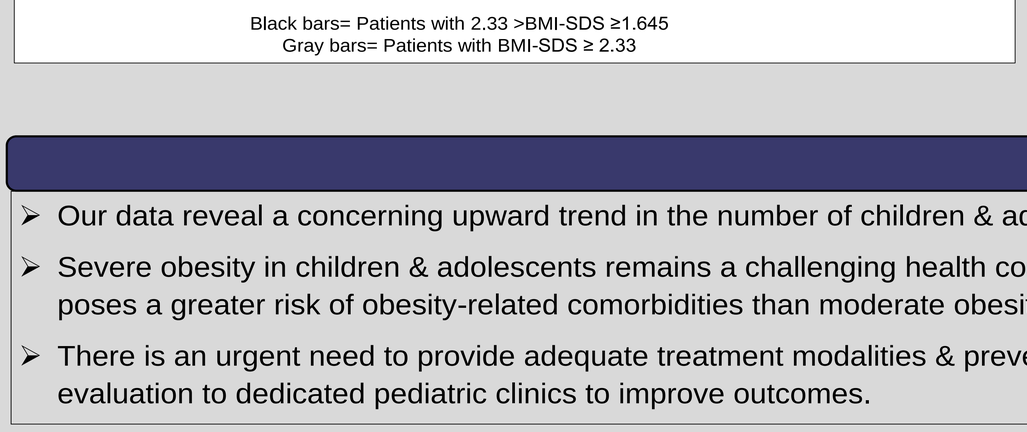
Results

The cohort included 1027 children (median age 10.8 years, 41.8% male) of whom 565 (55%) were severely obese.

Flowchart of the study population selection



Yearly percent of patients with severe obesity (BMI-SDS ≥ 2.33)



* The numbers above the curve indicate the number of patients with BMI-SDS ≥2.33 included in each year.

Percentage of patients without or with one or more obesity-related comorbidities by severity of obesity

Black bars= Patients with 2.33 >BMI-SDS ≥1.645
Gray bars= Patients with BMI-SDS ≥ 2.33

Clinical and laboratory data of the study cohort by severity of obesity, for male and female patients, at the first visit to the obesity clinic

Characteristics	Male (n=429)			Female (n=598)		
	2.33 >BMI-SDS ≥1.645	BMI-SDS ≥2.33	*p* value	2.33 >BMI-SDS ≥1.645	BMI-SDS ≥2.33	*p* value
Clinical data						
Total patients	169 (39.4%)	260 (60.6%)	<0.001*	293 (49.0%)	305 (51.0%)	<0.001*
Ethnicity						
Jewish	143 (84.6%)	212 (81.5%)	0.43	256 (87.4%)	260 (85.5%)	0.55
Arabic	26 (15.4%)	48 (18.5%)		37 (12.6%)	45 (14.5%)	
Age at first visit (yr)	11.9 ± 2.8	11.2 ± 4.5	0.22	10.5 ± 3.6	10.5 ± 4.4	0.88
Height (m)	1.50 ± 0.1	1.50 ± 0.2	0.64	1.40 ± 0.1	1.44 ± 0.2	0.6
Weight (kg)	61.6± 1.9	84.9 ± 4.1	<0.001*	54.5 ± 2.2	75.5± 3.6	<0.001*
BMI (Kg/m²)	26.3 ± 3.5	34.9 ± 9.0	<0.001*	25.7 ± 4.9	34.1 ± 9.2	<0.001*
BMI-SDS	2.0 ± 0.2	2.8 ± 0.5	<0.001*	1.9 ± 0.2	2.6 ± 0.3	<0.001*
Tanner						
1	36 (22.5%)	63 (27.5%)	0.002*	96 (34.2%)	110 (38.3%)	0.002*
2-4	111 (69.4%)	118 (51.5%)		108 (38.4%)	72 (25.1%)	
5	13 (8.1%)	48 (21%)		77 (27.4%)	105 (36.6%)	
Acanthosis nigricans	116 (68.6%)	248 (95.4%)	<0.001*	76 (25.9%)	153 (50.1%)	<0.001*
Age at obesity onset (yr)	6 ± 3.9	4.2 ± 3.7	<0.001*	4.2 ± 3.5	3.6 ± 4.5	0.15
Previous participation in weight-reduction program	47 (27.2%)	126 (72.8%)	0.01*	90 (36.6%)	156 (63.4%)	0.07
Laboratory data						
Systolic blood pressure (mm Hg)	116 ± 12.3	120 ± 14.9	<0.001*	116 ± 12.5	116 ± 14.8	0.01*
Diastolic blood pressure (mm Hg)	66.5 ± 10	70 ± 11	0.003*	67.5 ± 9.8	67.5 ± 11.3	0.31
Triglycerides (mg/dL)	120 ± 67.8	120 ± 52.3	0.93	126 ± 65.7	126 ± 54.6	0.01*
Total cholesterol (mg/dL)	168 ± 46.1	156 ± 36.9	0.16	156 ± 38.5	156 ± 37.4	0.8
LDL- cholesterol (mg/dL)	100 ± 28.8	100 ± 30	0.26	96 ± 26.6	102 ± 23.7	0.18
HDL-cholesterol (mg/dL)	49 ± 17.1	42 ± 10	0.01*	45 ± 9.3	45 ± 11.2	0.01*
Fasting glucose (mg/dL)	90 ± 12.3	90 ± 10	0.93	84 ± 12.9	91 ± 14.7	0.04*
Obesity-related comorbidities						
Systolic Hypertension	55 (32.5%)	108 (41.5%)	0.03*	95 (32.4%)	142 (46.6%)	<0.001*
Diastolic Hypertension	18 (10.7%)	48 (18.5%)	0.01*	48 (16.4%)	48 (15.7%)	1.0
Hypertriglyceridemia	76 (45%)	152 (58.5%)	<0.001*	109 (37.2%)	164 (53.8%)	0.05
Elevated LDL- cholesterol	23 (13.6%)	34 (13.1%)	0.5	20 (6.8%)	24 (7.9%)	0.9
Low HDL- cholesterol	84 (49.7%)	171 (65.8%)	<0.001*	48 (16.4%)	82 (26.9%)	0.02*
Impaired fasting glucose	27 (16%)	43 (16.5%)	1.0	17 (5.8%)	25 (8.2%)	1.0
OSA (n=911)	5 (4.1%)	43 (17.3%)	<0.001*	3 (1.3%)	39 (13.9%)	<0.001*
NAFLD (n=933)	5 (4.1%)	51 (19.7%)	<0.001*	11 (4.9%)	11 (18.6%)	<0.001*
PCO (n=182)				21 (9.5%)	14 (4.5%)	0.03*
Family history						
Obesity in first-degree relative(s)	153 (31.8%)	196 (68.8%)	0.01*	153 (40.3%)	227 (59.7%)	0.07
Obesity-related comorbidities in first-degree relative(s)	195 (60.4%)	292 (64.2%)	0.29	61 (32.3%)	128 (67.7%)	0.05*

NAFLD- non-alcoholic fatty liver disease, OSA-obstructive sleep apnea, PCO-polycystic ovaries.
Data are expressed as number and (percent) or as mean ± standard deviation (SD).
P values are between the subgroups of severity of obesity. Significant differences between groups are indicated by an asterisk (*).

Conclusions

- Our data reveal a concerning upward trend in the number of children & adolescents with severe obesity referred for evaluation to an obesity clinic.
- Severe obesity in children & adolescents remains a challenging health condition. It places an enormous medical, emotional, & financial burden on the children & their families, & it poses a greater risk of obesity-related comorbidities than moderate obesity, with potentially devastating cardiometabolic consequences.
- There is an urgent need to provide adequate treatment modalities & prevention services to severely obese children & adolescents, & pediatricians are encouraged to refer them for evaluation to dedicated pediatric clinics to improve outcomes.

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