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## Abstract

**Objectives:** To assess how often obesity is acknowledged at pediatric gastroenterology outpatient visits.

**Methods:** A retrospective chart review was performed to identify obese children seen at a gastroenterology subspecialty clinic over a 1-year period of time; 132 children were identified. Demographics, obesity comorbidities, reasons for referral, diagnosis of obesity, and a plan to address obesity were abstracted. Chi-square or Fisher's exact tests were used to examine statistical associations.

**Results:** Only 49% of children were given a diagnosis of obesity. In total, 52% of children were given a body mass index reduction plan. Those diagnosed with obesity were more likely to receive a body mass index reduction plan ( $p < 0.0001$ ). Younger children and males were more likely to receive an obesity diagnosis ( $p = 0.002$  and  $p = 0.02$ , respectively). Diagnosis of obesity was more likely in patients with obesity-related comorbidities ( $p = 0.0004$ ) and those referred for obesity or related comorbidities ( $p = 0.01$ ).

**Conclusion:** Obesity is diagnosed less than 50% of the time in pediatric gastroenterology outpatient clinics. To increase opportunities for addressing childhood obesity in the pediatric gastroenterology outpatient setting, further investigation of barriers and optimal provider education is urgently required.

## Keywords

Pediatric gastroenterology, obesity, children, obesity comorbidity, overweight

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## Background

Pediatric obesity is defined as a body mass index (BMI) at or above the 95th percentile for age and sex, as determined by the Centers for Disease Control and Prevention (CDC) 2000 growth charts. In the past 30 years, pediatric obesity has increased threefold to sixfold.<sup>1</sup> Approximately 12%–18% of children between the ages of 2 and 19 are now obese.<sup>1</sup> Unfortunately, the rates of obesity-related comorbidities, including type 2 diabetes, non-alcoholic fatty liver disease, and obesity-related sleep apnea, have also increased in the pediatric population.<sup>2,3</sup> Importantly, it is now known that childhood obesity increases the risk of adult obesity<sup>1</sup> and being overweight as a child has been shown to be predictive of several adverse health effects as an adult, independent of adult weight.<sup>4</sup> Thus, it is critical that obesity is identified and appropriately treated in the pediatric patient population.

The United States Preventive Services Task Force recommends all children above the age of 6 be screened for obesity and referred for treatment when necessary.<sup>1</sup> Several studies have demonstrated that physician counseling has a positive impact on patient willingness to lose weight in the adult population.<sup>5,6</sup> Unfortunately, the rates of physician counseling in

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the United States have declined.<sup>7</sup> However, no study has previously established the rates of obesity diagnosis and/or treatment in children referred to a pediatric gastroenterologist, who are often expected to address and manage childhood obesity.

The purpose of this study was to assess how often obesity is acknowledged at pediatric gastroenterology outpatient visits and to determine factors associated with obesity being addressed.

## Methods

### Subjects

This study was conducted as a quality improvement initiative at a pediatric subspecialty practice based in the Northern Virginia area. A retrospective chart review was completed to identify new patient visits with a BMI  $\geq$ 95th percentile for age at four outpatient gastroenterology clinics over a 1-year period of time (January 2014 to January 2015). Patients and visits were identified using the reports function of the electronic medical records system “Epic.” Children with a BMI  $\geq$ 95th percentile for age (calculated in Epic using CDC growth charts from measured visit anthropometrics), between 3 and 20 years of age, and having a new patient visit within the inclusion dates were included.

### Measures

To ensure consistency, a single author completed all data extraction from identified patient charts. Specific variables extrapolated included age, sex, ethnicity, race, office location, provider, if initial BMI  $\geq$ 99th percentile, reason for referral, obesity-related comorbidity, alanine aminotransferase (ALT) levels, cholesterol levels, and 25-OH Vitamin D levels. In addition, it was noted whether a diagnosis of obesity, diagnosis of overweight, assessment of obesity, assessment of overweight, and if a plan to address obesity was given.

After completion of the chart review, a survey was created to assess barriers subjectively to identifying and/or treating obesity during a new patient visit. This survey included nine questions and answers were given by a 5-point scale: “strongly disagree,” “somewhat disagree,” “neutral,” “agree,” and “strongly agree.” The specific questions are shown in Table 2.

### Statistical analysis

Chi-square or Fisher’s exact tests were used to examine statistical associations. The statistical software program *SAS* version 9.2, SAS Institute Inc., Cary, NC, was used to complete all statistical analyses. Statistical significance was considered as  $p < 0.05$ .

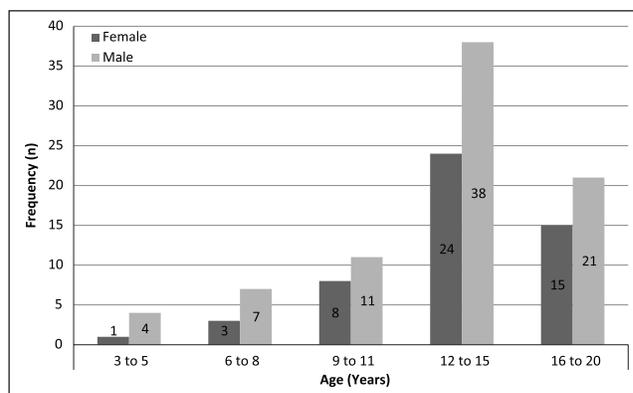


Figure 1. Demographics—age and gender distribution.

## Results

### Chart review results

A total of 132 subjects were identified. Age and gender distribution is summarized in Figure 1. Only 49% of obese children were given a diagnosis of obesity at their visit. In 58% of children being overweight or obese was acknowledged in their assessment. Only 52% of children were given a BMI reduction plan and those with an obesity diagnosis were significantly more likely to receive a BMI reduction plan (74% vs 22%,  $p < 0.0001$ ).

Younger children were more likely to receive an obesity diagnosis: 3–5 years (100%), 6–8 years (50%), 9–11 years (74%), 11–15 years (47%), and 16–20 years (33%;  $p = 0.02$ ). Males were more likely to be diagnosed than females (58% vs 38%,  $p = 0.02$ ), but ethnicity and race were not associated with being given a diagnosis of obesity. The severely obese (BMI  $\geq$ 99th percentile) were not more likely to be given a diagnosis of obesity, but those with obesity-related comorbidities were (75% vs 40%,  $p = 0.0004$ ). Referral for obesity or an obesity-related comorbidity, as compared to other referrals (e.g. abdominal pain), were more likely to receive a diagnosis of obesity (79% vs 38%,  $p = 0.01$ ). Among 11 practice providers, an obesity diagnosis was highly provider specific ( $p = 0.0005$ ). The office location where patients were seen was also significantly associated with whether a diagnosis of obesity was given ( $p = 0.01$ ; see Table 1).

Children with abnormal laboratory results possibly related to obesity were more likely to be given a diagnosis of obesity. In total, 68% of patients with a raised ALT were given a diagnosis of obesity, while only 38% of patients with normal ALT levels were diagnosed ( $p < 0.005$ ). Similarly, subjects with elevated triglycerides were more likely to be diagnosed with obesity than those with normal levels (74% vs 63%,  $p = 0.02$ ).

### Provider survey results

The survey results are shown in Table 2. The survey was completed by 8/11 providers. In all, 100% of providers who

**Table 1.** Factors associated with a diagnosis of obesity.

Category	Subcategory	No (f) (% of cohort)	No	Yes (f)	Yes (% of cohort)	p-value
Age (n = 132)						0.002
	3–5 years	0/5	0.0	5/5	3.8	
	6–8 years	5/10	3.8	5/10	3.8	
	9–11 years	5/19	3.8	14/19	10.6	
	11–15 years	33/62	25.0	29/62	22.0	
	16–20 years	24/36	18.2	12/36	9.1	
Sex (n = 132)						0.02
	Female	35/56	26.5	21/56	15.9	
	Male	32/76	24.2	44/76	33.3	
Ethnicity (n = 132)						0.07
	Declined	3/8	2.3	5/8	3.8	
	Hispanic/Latino	11/39	8.3	28/39	21.2	
	Non-Hispanic/Non-Latino	32/45	24.2	13/45	9.9	
	Unavailable	21/40	15.9	19/40	14.4	
Race (n = 132)						0.07
	>1 Race	4/6	3.0	2/6	1.5	
	Asian	1/3	0.8	2/3	1.5	
	Black/African American	6/8	4.6	2/8	1.5	
	Declined	2/5	1.5	3/5	2.3	
	Hispanic/Latino	15/39	11.4	24/39	18.2	
	Other	8/21	6.1	13/21	9.9	
	Unavailable	4/11	3.0	7/11	5.3	
	White/Caucasian	27/39	20.5	12/39	9.1	
Location (n = 128) (Frequency missing = 4)						0.01
	A	34/76	26.6	42/76	32.8	
	B	12/24	9.4	12/24	9.4	
	C	6/14	4.7	8/14	6.3	
	D	13/14	10.2	1/14	0.8	
Provider (n = 132)	(11 providers analyzed)					0.0005
	Total	67/132	50.8	65/132	49.2	
BMI $\geq$ 99th% (n = 132)						0.3
	No	61/116	46.2	55/116	41.7	
	Yes	6/16	4.6	10/16	7.6	
Referral (n = 123) (Frequency missing = 9)						0.01
	Fatty liver/ALT	4/22	3.3	18/22	14.6	
	Obese/overweight/weight gain	2/4	1.6	2/4	1.6	
	Other	60/97	48.8	37/97	30.4	
Obesity comorbidity (n = 132)						0.0004
	No	58/96	43.9	38/96	28.8	
	Yes	9/36	6.8	27/36	20.5	
Plan given (n = 132)						0.0001
	No	49/63	37.1	14/63	10.6	
	Yes	18/69	13.6	51/69	38.6	
Raised ALT (IU/L) (n = 104) (Frequency missing = 28)						0.005
	No	39/63	37.5	24/63	12.5	
	Yes	13/41	23.1	28/41	26.9	
Total cholesterol (mg/dL) (n = 61) (Frequency missing = 71)						0.98
	Borderline (170–199)	5/17	8.2	12/17	19.7	
	High ( $\geq$ 200)	3/6	4.9	3/6	4.9	
	Normal (<170)	14/38	23.0	24/38	39.3	
Triglycerides (mg/dL) (n = 59) (Frequency missing = 73)						0.02
	Borderline (150–199)	4/13	6.8	9/13	15.3	

(Continued)

**Table 1.** (Continued)

Category	Subcategory	No (f) (% of cohort)	No	Yes (f)	Yes (% of cohort)	p-value
25-OH vitamin D (ng/mL) (n = 44) (Frequency missing = 88)	High ( $\geq 200$ )	1/10	1.7	8/10	30.5	0.02
	Normal (<150)	18/36	30.5	18/36	30.5	
	Deficient ( $\geq 10$ –20)	1/3	2.3	2/3	4.6	
	Insufficient ( $\geq 20$ –30)	14/27	31.8	13/27	29.6	
	Severely deficient (<10)	4/4	9.1	0/4	0.0	
	Sufficient ( $\geq 30$ )	2/10	4.6	8/10	18.2	

BMI: body mass index; ALT: alanine aminotransferase.

**Table 2.** Barriers to addressing obesity: provider survey results.

Question	Disagree/ strongly disagree	Neutral	Agree/ somewhat agree
I do not have time in a clinic visit to address obesity when a patient is being seen for another diagnosis	2/8	3/8	3/8
I feel that obesity should not be managed by gastroenterology	5/8	1/8	2/8
I do not want to make the patient feel self-conscious by talking about obesity when patient is being seen for another diagnosis	4/8	2/8	2/8
I do not feel obesity should be addressed at a first clinic visit if a patient is being seen for another diagnosis	5/8	1/8	2/8
I do not feel comfortable discussing obesity with patients and giving recommendations to treat obesity	8/8	0/8	0/8
It is the job of the primary care doctor to diagnose, discuss, and treat obesity	3/8	2/8	3/8
I do not feel we have the resources to offer to help patients with obesity	1/8	2/8	5/8
I only address obesity when the patient's BMI is severe (BMI > 99th percentile)	7/8	1/8	0/8
I only address obesity when the patient has a comorbidity, such as fatty liver, NASH, and diabetes	6/8	1/8	1/8

BMI: body mass index; NASH: non-alcoholic steatohepatitis.

answered the survey felt comfortable discussing obesity and the majority believed that addressing obesity should not be the sole duty of primary care physicians. Most agreed that obesity should be addressed even without severe obesity (BMI  $\geq 99$ th percentile) and obesity-associated comorbidities (88% and 75% of providers, respectively). Barriers to discussing and treating obesity include lack of time and lack of resources available to help patients with obesity.

## Discussion

To our knowledge, this is the first study to assess how often obesity is diagnosed or addressed in a pediatric gastroenterology outpatient setting. Our study highlighted the underdiagnosis and treatment of obesity in this setting. Only 49% of obese children were diagnosed with obesity and only 58% of obese children had obesity acknowledged in their final assessment. Similar results have been previously reported in the adult population. Mehta et al.<sup>8</sup> reported that less than one-third of preventive ambulatory visits in an obese adult population resulted in obesity management.

Our study identified trends in which patients were likely to be diagnosed as obese. Specifically, younger children and boys were more commonly diagnosed. As expected, patients who had obesity-related comorbidities and were referred to gastroenterology for obesity were more likely to be diagnosed with obesity. Previous research has also shown that physicians provide weight loss counseling to patients with obesity-related risk factors<sup>5</sup> consistent with the findings in our study. Additionally, physicians were more likely to provide counseling to those with a higher BMI.<sup>5</sup> Interestingly, in our study, there was no difference in whether an obesity diagnosis was given if a patient had a higher BMI of  $\geq 99$ th percentile. These overall trends indicate that physicians may subconsciously focus diagnosis and treatment of obesity on certain patient populations.

Additionally, only 52% of children were given a BMI reduction plan and those with an obesity diagnosis were significantly more likely to receive a BMI reduction plan. This demonstrates a key shortcoming in obesity management. Several studies have demonstrated that physician counseling has a positive impact on a patient's willingness to lose weight.<sup>5,6</sup> Furthermore, a meta-analysis completed by Rose et al.<sup>9</sup> demonstrated a statistically significant impact of weight

loss advice on weight loss behavior. Hence, physicians must be diligent in identifying obesity and providing weight loss counseling. Despite this evidence, the rate of weight counseling has declined dramatically. For example, it was found that weight counseling declined from 7.8% to 6.2% of primary care visits from the years of 1995–1996 to 2007–2008.<sup>7</sup>

There are barriers that may contribute to the decline in weight loss management identified by our subjective provider survey. First, lack of resources was identified as a physician barrier. Our study showed that the office location where patients were seen was also significantly associated with whether a diagnosis of obesity was given. The location where obesity is most often diagnosed has two full-time dietitians available and may demonstrate how availability of pertinent resources allows consistent obesity diagnosis and treatment. Our study also demonstrated that the diagnosis of obesity was very provider specific, which may demonstrate individual provider diagnosis tendencies and/or factors. Also identified was the physicians' perceived lack of time to address obesity. Time constraints hindering physicians' ability to address obesity have been shown in the adult population as well.<sup>5</sup> Additionally, we identified that a minority of physicians may not want to make the patient uncomfortable regarding their diagnosis of obesity. Previous research has actually demonstrated the opposite; adult patients prefer that providers are frank about this diagnosis.<sup>10</sup> Perhaps, this demonstrates a difference between pediatric and adult providers when posed with the need to diagnose obesity in their patients.

## Limitations

The strengths of this study include that it is the first known study to assess how often obesity is diagnosed at a new visit in a pediatric gastroenterology outpatient setting. There are also several limitations to this study. First, subjects were identified using the "report" option in "Epic." Consequently, all patients seen during our study period may not have been accurately identified, leading to a smaller sample size. Second, the BMI used for data analysis was extracted from the clinical visit documentation and not re-measured for this study. Third, the study included a relatively small sample size (n = 132), although this study is the largest study to date. Additionally, all data extracted was not available for all subjects identified. This is especially true when assessing pertinent lab data. Fourth, the physician survey was only completed by 73% of providers. Thus, the barriers identified by the physician survey do not accurately reflect the opinions of all providers assessed. Fifth, it was not addressed in this study whether these children had obesity acknowledged at subsequent follow-up visits, even if it was not addressed at the first new patient visit. Sixth, this study only identifies whether obesity was acknowledged via documentation in the patient chart. It is possible that the provider may have addressed obesity at the patient visit without documentation of the discussion in the chart. Therefore, the results may give

falsely low numbers regarding whether obesity was acknowledged in this study.

## Conclusion

This study demonstrates the underdiagnoses and treatment of obesity in the pediatric gastroenterology outpatient setting. The results, trends, and physician barriers identified are similar to those previously reported in primary care settings for adult patients. Further investigation of barriers and of optimal provider education is urgently required to increase opportunities for addressing childhood obesity in the pediatric gastroenterology outpatient setting.

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## Declaration of conflicting interests

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