RESEARCH ARTICLE

Impact of Obesity on Asthma Morbidity During a Hospitalization

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ABSTRACT

BACKGROUND: Asthma and obesity are 2 common pediatric problems. Obesity is a known risk factor for asthma, and obese children with asthma have higher disease burden. However, little is known on how obesity in urban minority children, mainly Hispanic and African American children, impacts morbidity during pediatric asthma hospitalizations.

METHODS: A retrospective chart review was conducted on children and adolescents age 2 to 18 years hospitalized at the Children's Hospital at Montefiore for an acute asthma exacerbation. We elucidated the association of overweight or obese status with severity of the exacerbation, quantified by length of stay (LOS) and need for intensive care management. Multivariate analysis was conducted to identify independent predictors of LOS.

RESULTS: A total of 975 children met the inclusion criteria, of whom 55% were normal weight and 45% were overweight or obese. Sixty percent were Hispanic, and 37% were African American. The overall average LOS was 2.57 days (range: 0.67–12.92). Overweight or obese status was associated with a higher asthma severity at baseline ($P = .021$). Overweight or obese children had a longer average LOS compared with normal weight children (2.75 vs 2.39 days; $P < .01$) with more PICU stays ($P = .006$), even after adjustment for higher baseline asthma severity. The severity of the exacerbation did not differ by ethnicity.

CONCLUSIONS: Obesity in children hospitalized for asthma is associated with more severe asthma exacerbations, longer LOS, and increased use of PICU level care, independent of their higher baseline disease severity and ethnicity.

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Asthma and obesity are 2 of the most common chronic pediatric diseases in the United States.[1–3] Among children and adolescents in the United States under 18 years of age in 2014, asthma prevalence was 13.4% in African American children and 8.5% in Hispanic children (23.5% in Puerto Rican children).[4] For individuals 2 to 19 years of age in 2011–2014, 21.9% of Hispanic and 19.5% of African American children were obese, compared with 14.5% of non-Hispanic white children.[5] Thus, the disease burden of both asthma and obesity is borne disproportionately by minority children,[3,6] likely because of socioeconomic and environmental factors that coexist with genetic propensity.[1,2,7]

Authors of several studies have identified an association between obesity and asthma among children.[8,9] Children and adults who are obese have an increased risk of developing asthma[10–12] and tend to have more symptoms with worse lung function.[13,14] Obese asthmatic children also have decreased response to controller medications[15–20] and require more β-agonists and oral steroids with an exacerbation.[21] Additionally, the number of pediatric hospitalizations for obesity-related conditions has almost doubled over the last decade.[22–24]

To better define the role of obesity in asthma morbidity, authors of a few studies have examined its impact on the severity of an asthma exacerbation associated with a hospitalization. Authors of studies in which billing codes are used to classify obesity and asthma have consistently found longer length of stay (LOS) among obese children that are associated with higher health care costs.[25–27] On the other hand, authors of studies in which BMI percentiles are used have reported disparate results. Whereas Okubo et al[28] reported longer LOS among obese children with asthma, Bettenhausen et al[29] failed to identify such an association. In a study confined to children hospitalized in the PICU, obese children were slower to recover and had longer LOS.[30] Similar discrepancies were observed for the association of baseline asthma severity with the severity of asthma exacerbation and need for an ICU admission in obese children.[30] However, measures, including the need for terbutaline, aminophylline, or noninvasive ventilation, have not been investigated in these studies.[30] In addition, the majority of these studies conducted in urban minority children included African American children with only small percentages of Hispanic children limiting the generalizability of the information to Hispanic children. Taken together, these studies reveal gaps in current literature on the impact of obesity as determined by BMI percentiles on an urban minority population comprising both African American and Hispanic children who bear a disproportionately higher asthma burden.

To address these gaps, we proposed to investigate the impact of obesity, defined by BMI percentiles, on several measures of severity of an asthma exacerbation during hospitalization and on the hospital course in an urban minority population comprising both Hispanic and African American children, those most affected by both asthma and obesity.[31] We hypothesized that obesity defined by BMI percentiles would be associated with higher severity of asthma exacerbation among urban minority children hospitalized for asthma.

METHODS

Study Population

A retrospective chart review was performed by using a prospectively maintained clinical research database (Clinical Looking Glass) that was queried to identify children and adolescents ages 2 to 18 years admitted to Children's Hospital at Montefiore with a diagnosis of status asthmaticus or asthma exacerbation, defined by using the *International Classification of Diseases, Ninth Revision* codes (all codes under 493), between January 1, 2012, and December 31, 2014. Exclusion criteria included coexisting chronic cardiopulmonary disease, cystic fibrosis, trisomy 21, immunodeficiency or organ transplant, neuromuscular disease, inflammatory bowel disease, sickle cell disease, chronic lung disease requiring medication or home oxygen use, chronic systemic corticosteroid use, cerebral palsy, and/or intellectual disability, as previously determined by studies in which authors investigate the effect of obesity on asthma hospitalization.[30] The study was approved by the Institutional Review Board at the Albert Einstein College of Medicine.

Study Variables

Electronic medical records of the children identified by using Clinical Looking Glass were reviewed. Patient demographic characteristics including age, weight, height, race and/or ethnicity, sex, socioeconomic status (SES), as well as emergency department (ED) triage time and discharge date and time, were extracted by using Clinical Looking Glass. Weight and height were used to calculate age- and sex-specific percentiles for the BMI for all children. These percentiles were used to classify them as normal weight (5th to 85th percentile), overweight (BMI $\geq$85th percentile and $<$95th percentile), or obese (BMI $\geq$95th percentile) on the basis of Centers for Disease Control and Prevention criteria.[32] Underweight children (BMI less than $<$5th percentile) were excluded. SES in Clinical Looking Glass is reported as a *z* score calculated from 6 socioeconomic variables based on the census block and census tract information available on the patient's address.[33] The *z* score represents the deviation of the value from the mean of the New York state population.

Clinical data were extracted by using a uniform digital data extraction document by 4 of the investigators. Audits for uniformity were performed by the principal investigator. Data collected from chart review included asthma controller medication use; frequency of albuterol doses administered during hospitalization; need for PICU hospitalization, terbutaline, or aminophylline; antibiotics; supplemental oxygen; ventilatory support (intubation, bi-level positive airway pressure, or high frequency nasal cannula); diagnosis of coexistent pneumonia; and insurance. Baseline asthma severity was classified on the basis of the National Heart, Lung, and Blood Institute guidelines per provider documentation.[34–36] LOS was defined as the number of days from the time of ED triage to the time of discharge. Seasonality of hospitalization was classified on the basis of meteorological seasons.

Statistical Analysis

The primary outcome variable of interest was LOS. Secondary outcome variables were measures of severity of asthma exacerbation, including time to wean albuterol treatment to every 4 hours and need for PICU hospitalization, continuous albuterol, supplemental oxygen, ventilatory support, aminophylline, or terbutaline. The primary predictor variable was body weight status. BMI percentile and the time variables, including LOS and time to wean albuterol treatment to every 4 hours, was log transformed to achieve normal distribution. Having identified an association of outcome variables with BMI percentile when analyzed as a continuous variable, we grouped the children into normal-weight, overweight, and obese status and used analysis of variance (ANOVA) to identify the differences in outcome variables between these 3 weight categories. Outcome variables that were different by body weight status were driven by differences between normal weight and overweight and normal weight and obese but did not differ between the overweight and obese groups (summarized in Supplemental Tables 5 and 6). We therefore combined the overweight and obese categories and compared them to children in the normal-weight category.

Bivariate analysis between normal-weight and overweight or obese children was done by using the Student's *t* test for the continuous variables (LOS, time to wean albuterol treatment to every 4 hours, age, and SES) and χ^2 test or Fisher's exact test for categorical variables (sex, ethnicity, asthma severity, need for hospitalization in the PICU, supplemental oxygen, ventilatory support, aminophylline, terbutaline, and continuous albuterol). The number of previous admissions was categorized as none, 1, 2, 3, and 4 or more.[37] Because the LOS was collinear with time to wean albuterol treatment to every 4 hours and was associated with the need for a hospitalization in the PICU, we investigated the association of LOS with the above listed predictor variables; correlation coefficients were calculated by using the Pearson test to assess the association of the LOS with the above listed continuous variables. Student's *t* test was applied to analyze the association of LOS with the above listed categorical variables. LOS is reported as geometric mean and range.

On the basis of these bivariate analyses, we conducted multivariable linear regression analysis to identify the role of overweight or obese status as an independent predictor of LOS, when adjusted for age, baseline asthma severity (intermittent asthma was the reference group), baseline use of montelukast, and inhaled steroids, number of previous admits, need for intensive care, and supplemental oxygen. These variables were included as covariates because they were significantly associated with LOS ($P < .05$) in bivariate analysis. Because LOS was analyzed as a log-transformed variable, to report its clinically meaningful interpretation, we calculated the exponent of the β coefficient for the variables that were significant predictors of LOS as derived from the linear regression analysis. Furthermore, the covariates that were associated with LOS and included in multivariable analysis also differed between normal-weight and overweight or obese groups. We therefore repeated the multivariable regression analysis stratified by body weight status to identify the association of these variables with LOS for each weight category. Statistical analysis was conducted on Stata version 14 (Stata Corp, College Station, TX) and statistical significance was set a priori at 0.05.

RESULTS

Demographic and Baseline Asthma Characteristics

The demographics and clinical characteristics of the 975 children who met the inclusion criteria are summarized in Table 1. Fifty-five percent were normal weight, and 45% were overweight or obese. Among the overweight or obese children, 60% were Hispanic. The average LOS for the entire cohort was 2.6 days (0.7–12.9 days). Normal-weight children were younger than overweight or obese children. Baseline asthma severity was higher among the overweight or obese group ($P = .021$) (Table 1). In keeping with the higher baseline severity, overweight or obese children had a higher number of previous hospitalizations ($P = .005$), and a larger proportion were on controller medications compared with normal-weight children ($P = .012$) (Table 1). The highest number of hospitalizations was in the winter months (439 [45%]).

Association of Overweight or Obese Status With Severity of Asthma Exacerbation

Overweight or obese children had a longer LOS, which correlated with time to wean albuterol treatment to every 4 hours ($r = 0.89$; $P = <.001$). Overweight or obese children also had more primary admissions to the PICU from the ED ($P = .010$) and higher need for continuous albuterol ($P = .010$) (Table 2).

Association of Demographic Variables and Baseline Asthma Severity With Severity of Asthma Exacerbation

In addition to its association with overweight or obese status, LOS correlated with age ($r = 0.12$; $P < .001$) and was longer for children with moderate and severe persistent asthma as compared with children with intermittent asthma ($P < .001$) for the entire cohort. It was also longer among children on montelukast as a controller medication (2.7 days [range: 0.7–10.9 days] vs 2.4 days [range: 0.7–12.9 days]; $P < .01$) and approached statistical significance for children on inhaled corticosteroids (2.6 days [range: 0.8–12.9 days] vs 2.5 days [range: 0.7–12.6 days]; $P = .051$). LOS did not differ by sex, ethnicity, or SES and was not associated with the number of previous admits or the season.

Hospitalization in the PICU was associated with a longer LOS in both normal-weight children (4.0 vs 2.3 days; $P < .001$) and overweight/obese children (4.4 vs 2.6 days; $P < .001$). Overweight or obese children took longer to be weaned to albuterol every 4 hours as compared with normal-weight children (1.9 vs 1.6 days; $P < .001$).

Multivariable Analysis

Because factors like age, asthma severity, use of montelukast, and hospitalization in the PICU were associated with LOS in bivariate analysis, we conducted a

TABLE 1 Patient Demographics and Baseline Asthma Characteristics

	Entire Cohort, $N = 975$	Normal Wt., $n = 533$	Overweight or Obese, $n = 442$	P[a]
Patient demographics				
Age, y[b]	7.64 ± 4.11	6.8 ± 4.0	8.6 ± 4.0	<.01
Boys	537 (55)	294 (55)	243 (55)	.96
Girls	438 (45)	239 (44.8)	199 (45)	
Hispanic	590 (60.5)	324 (61)	266 (60.2)	.95
African American and/or non-Hispanic	362 (37.1)	192 (36)	170 (38.5)	
Ethnicity declined	23 (2.4)	17 (3)	6 (1.3)	
SES, z score[b]	−4.3 ± 2.7	−4.3 ± 2.7	−4.3 ± 2.7	.89
Measures of baseline asthma severity				
Intermittent	146 (15)	86 (16)	60 (14)	.02
Mild persistent	262 (27)	150 (28)	112 (25)	
Moderate persistent	256 (26)	124 (23)	132 (30)	
Severe persistent	85 (9)	38 (7)	47 (11)	
Unknown	226 (23)	135 (25)	91 (20)	
No previous hospitalization	298 (31)	169 (32)	129 (29)	<.001
1 previous hospitalization	201 (21)	131 (25)	70 (16)	
2 or 3 previous hospitalizations	179 (18)	108 (20)	71 (16)	
4 or more previous hospitalizations	260 (27)	106 (20)	154 (35)	
Unknown previous hospitalizations	37 (3)	19 (3)	18 (4)	
Controller medication use	571 (59)	293 (55)	278 (63)	.01
Inhaled corticosteroids	546 (56)	280 (53)	266 (60)	.02
Montelukast	315 (32)	143 (27)	172 (39)	<.01
Season at time of hospitalization				
Spring	192 (19.69)	113 (21.2)	79 (17.9)	<.01
Summer	154 (15.79)	97 (18.2)	57 (12.9)	
Fall	190 (19.49)	124 (23.3)	66 (14.9)	
Winter	439 (45.03)	199 (37.3)	240 (54.3)	

[a] P value was derived by t test for continuous variables and by χ^2 or Fisher's exact test for categorical variables.
[b] These variables are reported as mean ± SD. All other variables are reported as a proportion of the cohort, n (%).

multivariable analysis to identify the independent factors associated with LOS (Table 3). We found that overweight or obese status, higher age, need for hospitalization in the PICU, supplemental oxygen, and ventilatory support remained independent predictors of LOS, after adjusting for baseline asthma severity, including controller medication use. Although LOS was longer by 1.1 days for overweight or obese children, it was longer by 1.2 days for those that were hospitalized to the PICU, by 1.5 days for those that needed supplemental oxygen, and 1.5 days that needed ventilator support.

Because variables including age, asthma severity, use of montelukast, and hospitalization in the PICU that were associated with LOS in bivariate analysis also differed between overweight or obese and normal-weight children (Tables 1 and 2), we further assessed if factors associated with LOS differed by weight status. Among normal-weight children with asthma, the association of LOS with hospitalization in the PICU was rendered nonsignificant after adjusting for baseline asthma severity suggesting that baseline asthma severity was the main variable predictor of LOS. In overweight or obese children with asthma, hospitalization in the PICU remained a significant predictor of LOS, even after adjusting for baseline asthma severity (Table 4).

DISCUSSION

In an urban minority population with high asthma disease burden, we found that overweight or obese children have a higher baseline asthma severity and a more severe exacerbation with a longer LOS when compared with normal-weight children. Although the LOS among normal-weight children was associated with their baseline asthma severity, among overweight or obese children, it was associated with the severity of the exacerbation, including the need for hospitalization in the PICU, independent of their higher baseline disease severity. With these findings, we suggest that overweight or obese children with asthma have both higher severity of asthma at baseline and more severe exacerbations than normal-weight children with asthma.

Our findings of longer LOS and need for PICU among overweight or obese children can be used to support previous evidence that

TABLE 2 Inpatient Asthma Severity Measures Among Normal-Weight and Overweight or Obese Children

	Entire Cohort, $N = 975$	Normal Wt., $n = 533$	Overweight or Obese, $n = 442$	P[a]
LOS, d[b]	2.6 (0.67, 12.92)	2.4 (0.67, 10.88)	2.8 (0.75, 12.92)	<.01
Admission to wean to albuterol treatment every 4 h, d[b]	1.70 (0.01, 12.32)	1.54 (0.01, 10.56)	1.86 (0.03, 12.33)	.01
Transfer from floor to PICU	36 (4)	14 (2.6)	22 (5.0)	.053
Admission from ED to PICU	103 (10.6)	44 (8.3)	59 (13.3)	.01
Received supplemental oxygen	336 (34)	171 (32)	165 (37)	.09
Use of aminophylline	10 (1)	5 (1)	5 (1.1)	.77
Use of terbutaline	6 (0.6)	3 (0.6)	3 (0.7)	.82
Received ventilatory support	47 (5)	22 (4.1)	25 (5.7)	.27
Need for continuous albuterol	97 (10)	41 (7.7)	56 (12.7)	.01
Pneumonia	106 (11)	64 (12)	42 (10)	.21
Azithromycin	96 (10)	48 (9)	48 (11)	.33
Other antibiotics	107 (11)	64 (12)	43 (10)	.26

[a] P value was derived by t test for continuous variables and by χ^2 or Fisher's exact test for categorical variables and reflects the comparison between normal-weight and overweight or obese groups.
[b] These variables are reported as geometric mean (range). All other variables are reported as a proportion of the cohort, n (%).

children with asthma who are obese or overweight have a higher disease burden than normal-weight children, likely because of higher baseline disease severity.[38–40] With our study, we also validated earlier studies in which researchers found longer LOS in obese asthmatic children[25,26,29] and build on existing literature by investigating several factors that may be used to explain these 2 aspects of asthma morbidity. We found the need for PICU hospitalization, an objective measure of severity of the exacerbation, as the most pertinent factor associated with longer LOS in overweight or obese asthmatic children, replicating findings reported by Carroll et al[30] who studied only children hospitalized to the ICU and found overweight or obese children to have a longer LOS. Although we found that overweight or obese children took longer to recover as measured by the time to wean albuterol treatments to every 4 hours, we did not find a difference in the need for aminophylline, terbutaline, or antibiotics suggesting that the response to albuterol is delayed in overweight or obese children, but their severity of presentation is not associated with a higher need for aminophylline or terbutaline. Our findings of slower response to albuterol in the setting of an exacerbation have been reported in the outpatient setting by McGarry et al[41] who studied a predominantly Hispanic population.[42]

TABLE 3 Multivariable Analysis of Predictors of LOS for the Entire Cohort

	β (95% CI)	P
Overweight or obese status as compared with normal wt	.03 (0.01 to 0.06)	.01
Age	.01 (0.001 to 0.01)	<.01
Admit from ED to PICU as compared with those who did not get admitted to PICU	.06 (0.02 to 0.11)	.01
Received supplemental oxygen as compared with those who did not receive oxygen	.17 (0.14 to 0.19)	<.001
Received supplemental ventilatory support as compared with those who did not receive supplemental support	.18 (0.12 to 0.24)	<.001
On inhaled steroid therapy before admission as compared with those not previously on inhaled steroid therapy	.03 (−0.01 to 0.05)	.10
On montelukast therapy before admission as compared with those not previously on montelukast	−.004 (−0.04 to 0.03)	.81
Mild persistent as compared with intermittent asthma	−.02 (−0.05 to 0.02)	.32
Moderate persistent as compared with intermittent asthma	−.01 (−0.04 to 0.04)	.94
Severe persistent as compared with intermittent asthma	.03 (−0.02 to 0.09)	.20

CI, confidence interval.

Our findings of a longer LOS among overweight or obese children differ from observations reported by other studies,[28,43] which may be explained by several factors. Few studies have included baseline asthma severity.[43,44] Because our study population had higher baseline asthma severity, and a larger proportion needed a PICU hospitalization than that of the population studied by Aragona et al,[43] the higher baseline severity and severity of exacerbation in our population may be used to explain the disparate findings. In keeping with higher disease severity, LOS was >2 days in 67.2% of our cohort as compared

TABLE 4 Multivariable Analysis of Predictors of LOS Among Normal-Weight and Overweight or Obese Children

Predictor variables	Normal Wt		Overweight or Obese	
	β (95% CI)	*P*	β (95% CI)	*P*
Age	.01 (0.001 to 0.01)	.01	.004 (−0.0003 to 0.009)	.07
Admit from ED to PICU as compared with those who did not get admitted to PICU	.05 (−0.02 to 0.12)	.17	.08 (0.02 to 0.14)	.01
Received supplemental oxygen as compared with those who did not receive supplemental oxygen	.18 (0.12 to 0.22)	<.001	.16 (0.12 to 0.20)	<.001
Received supplemental ventilatory support as compared with those who did not receive supplemental support	.18 (0.08 to 0.28)	<.001	.19 (0.10 to 0.27)	<.001
On inhaled steroid therapy before admission as compared with those not previously on inhaled steroid therapy	.01 (−0.03 to 0.05)	.59	.05 (−0.003 to 0.09)	.052
On montelukast therapy before admission as compared with those who were not previously on montelukast	.01 (−0.04 to 0.05)	.80	−.02 (−0.07 to 0.03	.45
Mild-persistent asthma persistent as compared with intermittent asthma	−.01 (−0.06 to 0.03)	.55	−.02 (−0.07 to 0.03)	.43
Moderate-persistent asthma persistent as compared with intermittent asthma	−.01 (−0.06 to 0.04)	.71	.01 (−0.05 to 0.07)	.67
Severe-persistent asthma persistent as compared with intermittent asthma	.04 (−0.04 to 0.13)	.29	.04 (−0.04 to 0.13)	.32

CI, confidence interval.

with 50.7% in the study by Aragona et al.[43] In addition, our cohort was composed of more Hispanic than African American children as compared with those included in reports by Bettenhausen et al[28] and Aragona et al.[43] We did not find a difference by ethnicity in disease morbidity and its association of body weight, which is different than the findings of Carroll et al,[44] who reported that a higher proportion of Hispanic children were obese. However, they also did not find an independent association of ethnicity with longer LOS. Lastly, our sample size is larger than that of any of these studies affording us higher statistical power to detect significant differences between overweight or obese and normal-weight children. Despite using a population with known higher disease burden, our results were similar to those studies in which authors used national data sets in which *International Classification of Diseases, Ninth Revision* codes were used to identify patients who were obese.[25–27] With our study, we add to this growing body of literature that higher severity of the asthma exacerbation is associated with a hospitalization, and this severity was independent of baseline asthma severity.

In keeping with observations of Shanley et al,[26] we found a difference in LOS of nearly a half day for overweight or obese pediatric patients, which was longer than other studies in which authors reported mean differences of 0.09 days, 0.24 days, and 6 hours.[25,28,29] A half-day increase in LOS is associated with ∼$2000 higher mean charges for patients admitted with status asthmaticus[27] further supporting the reports of higher health care expenditure due to obesity-related asthma.[25]

We speculate that the longer LOS may be driven by a distinct pathophysiology of asthma among obese children as compared with their normal-weight counterparts. The pathophysiology of asthma in normal-weight individuals has been well described in which atopic airway inflammation results in hyperresponsiveness, obstruction, increased mucus production, and airway wall remodeling. Asthma phenotype differs in the obese population and can be distinguished by age of onset and markers of T helper 2 inflammation.[24–26] Although obese patients with early-onset asthma have more atopic disease, higher immunoglobulin E levels, and greater bronchial hypersensitivity, later-onset of asthma among obese individuals is associated with lower immunoglobulin E levels, decreased bronchial hypersensitivity, and lower levels of T helper 2 cells.[45–47] There is evidence of nonatopic T helper 1 inflammation in urban minority children with obesity and asthma suggesting inflammation in obese children with asthma is distinct from their normal-weight counterparts.[48] These factors may come together to influence the pharmacokinetics of medications and need further investigation.

Additionally, lifestyle factors including physical activity may play a role in the association in disease burden in overweight or obese children as compared with normal-weight children. We and others have found that obese children have lower ability to perform physical activity, a limitation that is linked to their adiposity rather than lower lung function.[49,50] Moreover, obese asthmatic children tend to be more sedentary than normal-weight children with asthma.[51–53] The extent to which their baseline asthma severity is associated with these behaviors needs further investigation.

Our findings, in the context of previous literature, can be used to suggest that physicians who care for children who are obese and asthmatic during an inpatient hospital stay should be aware that these children may have higher baseline asthma severity, longer LOS, and a slower response to albuterol. Given that there are no specific treatments geared toward this population it might be reasonable to suggest that the inpatient physicians provide counseling on weight status and ensure patients have follow-up to assess adequate daily asthma control to prevent further hospitalizations.

Our study has certain limitations. This is a single-institution study and may not be generalizable to other institutions. It was done retrospectively, and baseline asthma severity classification was dependent on provider documentation leading to ~25% of our cohort lacking a clear classification. In keeping with this limitation, we did not have information on the rates of children who received an influenza vaccination. In addition, the population served by our hospital is primarily minority and inner city, which may impact the generalizability of our findings to more affluent or white populations. Additionally, compared with studies in which authors have investigated future risk of ED visits and hospitalizations, we focused on severity of asthma exacerbation.[43,54] The burden of both obesity and asthma are higher in populations such as ours, we believe our findings are pertinent to managing obese children with asthma. Additionally, the detailed investigation of the association of body weight status with inpatient interventions such as supplemental oxygen, ventilatory support, aminophylline, and terbutaline add information on interventions that may have similar or different responses in normal-weight and overweight or obese asthma.

CONCLUSIONS

With our study, we are the first to report higher severity of asthma exacerbation in overweight or obese children, independent of their baseline disease severity. We add to current literature that obese children with asthma differ from their normal-weight counterparts and highlight the importance of these differences in hospitalized children. Further investigation is needed to understand the phenotype of overweight or obese children with asthma, given the existing literature of baseline higher disease severity and our findings of more severe exacerbations.

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