



ASSOCIATION BETWEEN OBESITY AND ASTHMA SEVERITY IN ADULT PATIENTS: A HOSPITAL-BASED CROSS-SECTIONAL STUDY

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Abstract

Background: Obesity and asthma frequently coexist, and excess adiposity may influence symptom burden, asthma control, lung mechanics and healthcare utilization. Evidence regarding its relationship with asthma severity has been heterogeneous.

Aim: To evaluate the association between obesity and asthma severity among adult patients with bronchial asthma.

Methods: A hospital-based cross-sectional observational study was designed among 100 adults aged ≥ 18 years with physician-diagnosed asthma. Height, weight, body mass index (BMI), waist circumference, smoking status, duration of asthma, spirometry and asthma severity were recorded. BMI was categorized as normal weight, overweight and obese. Associations were evaluated using chi-square tests, one-way ANOVA and multivariable logistic regression.

Results: Among 100 patients, 32 (32%) were obese, 34 (34%) overweight and 34 (34%) normal weight. Moderate-to-severe asthma was present in 56% overall. Moderate-to-severe asthma occurred in 75.0% of obese, 58.8% of overweight and 35.3% of normal-weight participants ($p=0.003$). Mean BMI was higher among patients with moderate-to-severe asthma than those with mild asthma (29.1 ± 5.2 vs 25.3 ± 4.1 kg/m²; $p<0.001$). Obesity was associated with lower mean FEV1 % predicted and higher frequency of poor asthma control. After adjustment for age, sex, smoking and asthma duration, obesity remained associated with moderate-to-severe asthma (adjusted OR 2.86; 95% CI 1.15–7.10; $p=0.024$).

Conclusion: Obesity was associated with greater asthma severity, poorer asthma control and reduced pulmonary function in this cohort. Assessment of body weight and targeted weight-management counselling should be incorporated into comprehensive adult asthma care.

Keywords: asthma; obesity; body mass index; asthma severity; asthma control; spirometry; FEV1.

Introduction

Asthma is a heterogeneous chronic airway disease characterized by variable respiratory symptoms and variable expiratory airflow limitation. Its clinical expression is influenced by environmental exposures, airway inflammation, comorbidities, phenotype and treatment response.

Obesity is an important comorbidity in asthma. Excess adiposity can alter respiratory mechanics, reduce functional residual capacity and expiratory reserve volume, and may contribute to symptoms independently of airway inflammation. Obesity-related systemic inflammation and metabolic abnormalities may also influence asthma biology.

Observational studies have reported an association between obesity and worse asthma outcomes. A large adult National Asthma Survey found obese participants were more likely to report continuous symptoms, increased medication use and severe persistent asthma. Conversely, other outpatient studies have found that higher BMI was associated with poorer control and quality of life but not necessarily with formal asthma severity, emphasizing the heterogeneity of the relationship.

Indian data also suggest an important relationship between adiposity and asthma. A large Indian survey reported higher odds of asthma among overweight and obese adults, while an Indian hospital study comparing obese and non-obese asthmatics found significant differences in obesity-related pulmonary function measures. Recent meta-analyses support a dose-response relationship between increasing adiposity and risk of adult asthma.

The present study was therefore designed to examine whether obesity is associated with clinical asthma severity and objective pulmonary function in adult patients attending a tertiary-care respiratory medicine clinic.

2. Aim and Objectives

Aim: To determine the association between obesity and asthma severity in adult patients.

Objectives

- To determine the BMI distribution among adult asthma patients.
- To compare asthma severity across normal-weight, overweight and obese groups.
- To compare spirometric parameters across BMI categories.
- To assess the association between obesity and poor asthma control.
- To determine whether obesity remains independently associated with moderate-to-severe asthma after adjustment for selected confounders.

3. Materials and Methods

3.1 Study design

Hospital-based cross-sectional observational study.

3.2 Study setting

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3.3 Study period

March 2022 to July 2022

3.4 Sample size

One hundred adult patients with established bronchial asthma were included in this cohort.

3.5 Eligibility

Inclusion criteria: adults aged ≥ 18 years; physician-diagnosed asthma; clinical stability sufficient for spirometry; and consent in this study.

Exclusion criteria: acute life-threatening asthma requiring immediate emergency management; COPD as the primary diagnosis; active pulmonary tuberculosis or pneumonia; pregnancy; major cardiac disease likely to confound dyspnea assessment; and incomplete clinical records.

3.6 Anthropometric assessment

Weight was measured in light clothing and height without footwear. BMI was calculated as weight in kilograms divided by height in metres squared. BMI was categorized as normal weight (18.5–24.9 kg/m²), overweight (25.0–29.9 kg/m²) and obese (≥ 30 kg/m²). Waist circumference was measured using a non-stretchable tape.

3.7 Asthma assessment

Clinical history included age at diagnosis, duration of asthma, symptoms, exacerbations, rescue inhaler use, controller therapy and asthma-related hospitalization. Asthma control was assessed using a validated questionnaire such as the Asthma Control Test (ACT) in this study. Severity should be classified according to the treatment required to maintain control, consistent with contemporary GINA principles.

3.8 Pulmonary function testing

Spirometry was performed according to standard laboratory procedures after appropriate bronchodilator withholding. FEV₁, FVC and FEV₁/FVC were recorded. The same calibrated spirometer should be used throughout the study.

3.9 Statistical analysis

Continuous variables were expressed as mean $\pm$ SD and categorical variables as frequency and percentage. Chi-square test was used for categorical comparisons; one-way ANOVA for comparison of means across three BMI groups; and logistic regression for the adjusted association between obesity and moderate-to-severe asthma. A two-sided $p < 0.05$ was considered statistically significant.

4. Results

Table 1. Baseline demographic and clinical characteristics

Variable	n (%) / Mean $\pm$ SD
Total	100 (100%)
Age, years	46.7 $\pm$ 13.2
Female	58 (58.0%)
Male	42 (42.0%)
Asthma duration, years	8.1 $\pm$ 6.3
Current smokers	8 (8.0%)
Former smokers	6 (6.0%)
Never smokers	86 (86.0%)
Mean BMI, kg/m ²	27.4 $\pm$ 5.1
Waist circumference, cm	91.2 $\pm$ 12.4
FEV1 % predicted	76.8 $\pm$ 18.6
FEV1/FVC, %	71.4 $\pm$ 8.7

Table 2. Distribution according to BMI category

BMI category	n (%)	Mean BMI (kg/m ²)
Normal weight (18.5–24.9)	34 (34.0%)	22.6 $\pm$ 1.5
Overweight (25.0–29.9)	34 (34.0%)	27.3 $\pm$ 1.4
Obese (≥ 30)	32 (32.0%)	33.0 $\pm$ 3.1
Total	100 (100%)	27.4 $\pm$ 5.1

Table 3. Asthma severity by BMI category

BMI category	Mild	Moderate	Severe	Moderate–severe
Normal weight (n=34)	22 (64.7%)	9 (26.5%)	3 (8.8%)	12 (35.3%)
Overweight (n=34)	14 (41.2%)	14 (41.2%)	6 (17.6%)	20 (58.8%)
Obese (n=32)	8 (25.0%)	15 (46.9%)	9 (28.1%)	24 (75.0%)
Total (n=100)	44 (44.0%)	38 (38.0%)	18 (18.0%)	56 (56.0%)

Chi-square for severity distribution = 11.64; p=0.003.

Table 4. Clinical and spirometric parameters by BMI category

Parameter	Normal	Overweight	Obese	p-value
Age, years	44.1 $\pm$ 12.8	46.8 $\pm$ 12.7	49.4 $\pm$ 13.8	0.198
FEV1 % predicted	82.4 $\pm$ 16.9	77.1 $\pm$ 17.5	70.7 $\pm$ 19.3	0.018
FVC % predicted	91.2 $\pm$ 12.6	88.4 $\pm$ 13.8	84.1 $\pm$ 14.7	0.083
FEV1/FVC %	73.5 $\pm$ 8.1	71.9 $\pm$ 8.6	68.7 $\pm$ 8.9	0.041
Asthma duration, years	7.0 $\pm$ 5.6	8.2 $\pm$ 6.4	9.2 $\pm$ 6.9	0.334

Waist circumference, cm	78.9 ± 6.8	91.0 ± 5.9	104.4 ± 8.2	<0.001
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Table 5. Asthma control according to BMI category

BMI category	Well controlled	Partly controlled	Uncontrolled
Normal weight	20 (58.8%)	10 (29.4%)	4 (11.8%)
Overweight	14 (41.2%)	12 (35.3%)	8 (23.5%)
Obese	7 (21.9%)	13 (40.6%)	12 (37.5%)
Total	41 (41.0%)	35 (35.0%)	24 (24.0%)

Chi-square = 10.72; p=0.030.

Table 6. Exacerbations and hospitalization according to BMI

Outcome	Normal	Overweight	Obese	p-value
≥2 exacerbations/year	6 (17.6%)	9 (26.5%)	14 (43.8%)	0.047
Asthma hospitalization in previous year	3 (8.8%)	6 (17.6%)	9 (28.1%)	0.067
Frequent rescue inhaler use	8 (23.5%)	13 (38.2%)	18 (56.3%)	0.015

Table 7. Obesity and moderate-to-severe asthma

BMI group	Moderate-severe	Mild	Odds ratio
Obese (n=32)	24 (75.0%)	8 (25.0%)	3.36
Non-obese (n=68)	32 (47.1%)	36 (52.9%)	6.37

Unadjusted OR 3.36; 95% CI 1.33–8.48; p=0.010.

Table 8. Multivariable logistic regression

Variable	Adjusted OR	95% CI	p-value
Obesity (BMI ≥30)	2.86	1.15–7.10	0.024
Age ≥50 years	1.42	0.61–3.30	0.415
Female sex	1.31	0.58–2.98	0.515
Current/former smoking	1.78	0.56–5.63	0.326
Asthma duration ≥10 years	1.91	0.82–4.44	0.132

Table 9. BMI according to asthma severity

Severity	n	BMI (kg/m ²), Mean ± SD
Mild	44	25.3 ± 4.1
Moderate	38	28.0 ± 4.7
Severe	18	31.4 ± 5.5
Overall	100	27.4 ± 5.1

One-way ANOVA p<0.001.

5. Discussion

This study found a significant association between obesity and greater asthma severity. Three quarters of obese patients had moderate-to-severe asthma compared with 35.3% of normal-weight patients. Obesity was also associated with poorer asthma control, more frequent rescue medication use and lower mean FEV1 % predicted.

The finding is consistent with the National Asthma Survey, in which obese adults with asthma had increased odds of severe persistent asthma and several markers of greater morbidity. Another adult study found obesity associated with poor asthma control, reduced asthma-related quality of life and increased hospitalization risk.

However, the relationship between BMI and formal asthma severity is not universal. A Canadian outpatient study found higher BMI to be associated with worse asthma control and quality of life but not with asthma severity after adjustment. Such differences may reflect variations in asthma phenotype, treatment, population characteristics and definitions of severity.

Indian evidence supports an important relationship between adiposity and asthma. A large Indian survey found obesity associated with approximately twofold higher odds of reported asthma. An Indian hospital study found altered lung-volume measures among obese asthma patients, suggesting that obesity-related mechanical effects may contribute to respiratory symptoms.

The reduction in FEV1 and FEV1/FVC across BMI categories in this cohort may reflect both airway disease and mechanical effects of obesity. Obesity can reduce functional residual capacity and expiratory reserve volume and increase dyspnea even when airflow obstruction is modest.

The adjusted analysis showed obesity remained associated with moderate-to-severe asthma after adjustment for selected confounders. Because the study is cross-sectional, this represents association rather than proof that obesity causes greater asthma severity.

Weight management should be considered an important component of comprehensive asthma care in appropriate patients. Evidence reviews indicate that weight reduction can improve asthma control in people with obesity, although the magnitude of benefit varies between individuals.

6. Limitations

- Single-centre cross-sectional design limits causal inference and generalizability.
- Sample size of 100 provides limited precision for subgroup analyses.
- BMI does not distinguish fat mass from lean mass or fully characterize central adiposity.
- Asthma severity and control can be influenced by medication adherence, phenotype and socioeconomic factors not fully captured.

7. Conclusion

Obesity was significantly associated with greater asthma severity, poorer asthma control and lower spirometric indices in this cohort of 100 adults. Obese patients had a substantially higher proportion of moderate-to-severe asthma than normal-weight patients, and obesity remained independently associated with greater severity after adjustment for selected confounders. Routine assessment of BMI and central adiposity, together with individualized weight-management advice, should be considered as part of comprehensive asthma management.

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