

## Original Article

# Association Between Body Mass Index & Asthma Control Among Adult Asthmatics Population in South India: Cross Sectional Observational Study

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### Abstract

**Background:** Optimal asthma control is essential to prevent morbidity and mortality. Several factors including demographical, psychosocial and environmental have been associated with poor control. Obesity, apart from being a risk factor for asthma has also shown to be associated with poor asthma control. Hence the present study was undertaken to correlate Body Mass Index (BMI) with control of Asthma.

**Aim of the study:** To assess the association of BMI with Asthma control.

**Materials and methods:** The study was conducted at Department of Respiratory Medicine, Chettinad Hospital and Research Institute, Chennai, South India. This was a cross sectional observational study from May 2016- October 2016. Total of 49 asthma patients were included and grouped into level of control as per GINA guidelines. Demographic data including BMI were noted. Data analysis was done using appropriate statistical analysis.

**Results:** Mean age was  $33.2 \pm 12.9$  years with slight female preponderance (F: M, 1.1:1). Mean BMI was  $26.4 \pm 4.0$  and majority (42.8%) belonged to overweight group followed by 22.4 % were in the obese group. The percentage of partly controlled and uncontrolled asthma was 44.8% and 55.2% respectively. BMI showed a significant correlation with both partly controlled and uncontrolled asthma (p-value <0.05). However, BMI did not show any significant association with gender.

**Conclusion:** Partly controlled and uncontrolled asthma patients were mostly associated with overweight and obese phenotypes. Hence, achievement of ideal BMI is necessary to achieve optimal asthma control and prevent exacerbation and complication.

**Key Words:** Asthma, Body Mass Index, Partly Controlled, Uncontrolled, Association

### Introduction

Asthma affects 334 million people worldwide<sup>1</sup> with Indian Prevalence of 2-3.5% in adults<sup>2</sup>. Uncontrolled asthma is a socioeconomic burden with significant impact on morbidity and mortality having global prevalence of 30-50%<sup>3</sup>. The risk factors for uncontrolled asthma are multifactorial and vary in different geographic region and races. Demography, BMI, Pollution, patient compliance to treatment, GERD and other comorbidities has been identified with poor asthma control. Obesity has been shown to be not only a risk factor for developing asthma but also associated with inadequate asthma control and poor quality of life. The association of obesity with asthma varies across different age groups, genders and races. The mechanism by which obesity predisposes to asthma and poor control are probably multifactorial ranging from mechanical alteration to systemic and airway inflammation and metabolic dysregulation that influences lung function and response to therapy<sup>4</sup>. Since studies on obesity and

asthma are limited in the Indian population the present study was undertaken to correlate asthma control with BMI.

### Materials and methods

The study was conducted at Department of Respiratory Medicine, Chettinad Hospital and Research Institute, Kancheepuram district, South India. This is a cross sectional observational study from May 2016 – October 2016. Study was conducted after obtaining informed consent and approval from the institutional ethics committee. Data was entered and analyzed with SPSS 17. Categorical variables were analysed with Pearson's chi square test. P - value of <0.05 was taken as statistically significant.

### Inclusion criteria

- Age > 18 years
- Diagnosed with asthma for > 1 year

- Physician-diagnosed asthma: shortness of breath, wheeze, cough, chest tightness, rhonchi on auscultation

And/Or

- Spirometry diagnosed asthma FEV<sub>1</sub>/FVC ratio less than 0.75-0.8 in adults (GINA -Global Initiative of Asthma guidelines)
- Good bronchodilator reversibility (FEV<sub>1</sub> increases by more than 12% and 200 ml post bronchodilator or after 4 weeks of anti-inflammatory treatment)-GINA guidelines-2015.
- Control of asthma was assessed as per GINA guidelines

### Exclusion criteria

Other Causes of Obstructive Airway Disease (OAD) like Post TB sequelae, COPD and Bronchiectasis

### Results

Age and gender distribution: Out of 49 Asthma patients mean age was 33.2 ± 12.9 years with slight female preponderance F: M ratio was 1.1:1. (Fig 1 & 2)

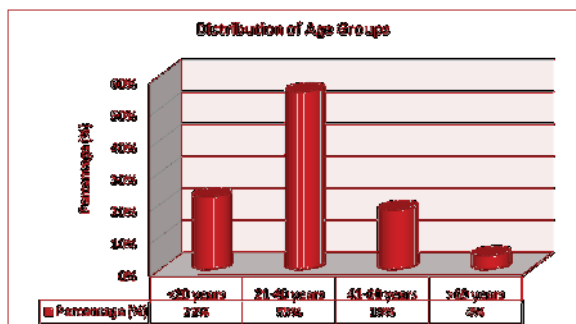


Fig 1: shows distribution of Age

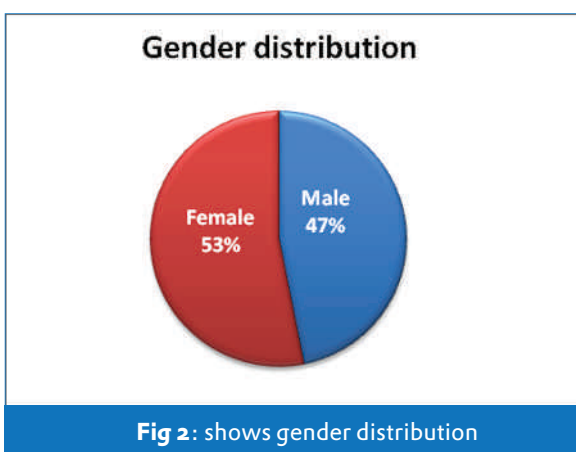


Fig 2: shows gender distribution

### BMI

Mean BMI was 26.38 and majority were in overweight group (42.8%) followed by 22.4 % were in the obese group. (Table 1 & Fig. 3)

Body Mass Index (Kg/m <sup>2</sup> )	No. of Patients	Percentage
Normal (18.5-24.9)	17	32.6%
Over weight (25-29.9)	21	42.8%
Obese (>30)	11	22.4%

Table 1: Distribution of Body Mass Index among Asthma patients

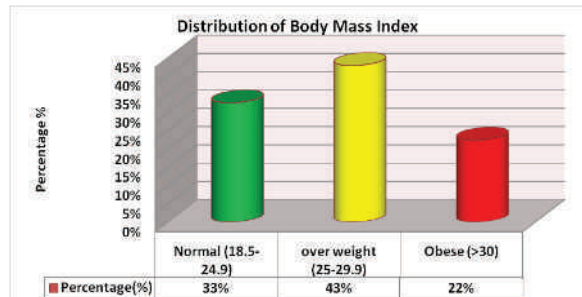


Fig 3: Shows distribution of BMI among Asthma patients

### Association of Asthma control with BMI

The percentages of partly controlled and uncontrolled asthma were 44.8% and 55.2% respectively. BMI showed a significant association with both partly controlled and uncontrolled asthma with p - value < 0.05 as shown in (Table 2 & Fig 4)

Variables	Normal n (%)	Over Weight n (%)	Obese n (%)	p-Value
Partly Controlled	11(50.0)	11(50.0)	10(0)	0.002*
Un controlled	6(22.2)	10(37.0)	11(40.7)	0.003*

Yates' Chi - Square p - value < 0.01 Statistically Highly Significant

Table 2 Association of Asthma Control with BMI

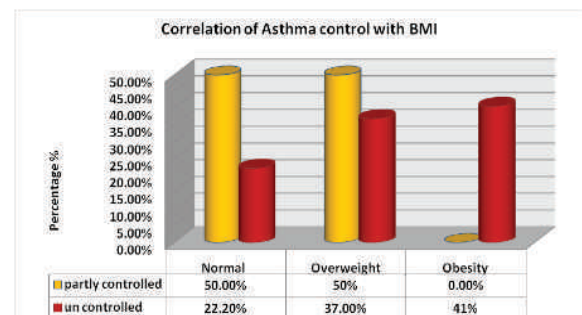


Fig 4: Correlation of Asthma Control with BMI

## Discussion

According to GINA guidelines optimal control of asthma is essential to prevent morbidity and mortality of the disease. Several asthma phenotypes based on risk factors have been identified including allergy, occupation, exercise induced, nocturnal (GERD) and the obesity asthma phenotype<sup>5</sup>. Several studies have shown that asthma and obesity are associated with severity of disease, poor control and inadequate response<sup>6-8</sup>. Research is ongoing regarding mechanisms involved in asthma obesity phenotype.

Our study identified increasing BMI to be associated with both partly controlled and uncontrolled asthma. Overweight and obese subjects were significantly associated with poor asthma control. Similar observation by Barros<sup>9</sup> et al in Brazil showed obese asthmatics to have worse asthma control. Several American studies by Peters<sup>10</sup> et al, Stansford<sup>7</sup> et al and Akerman<sup>11</sup> et al also showed same conclusion. However, studies on the obese asthma phenotype are limited in Indian population. A few contradictory studies by Sclerisme-Beaty<sup>12</sup> et al, Sastre<sup>6</sup> et al have shown no association of BMI with asthma control. The association between BMI and Gender was not statistically significant in our study. Few studies have showed a positive association with BMI and asthma control in women suggesting gender difference in obese individual<sup>14</sup>. Several mechanisms to explain the association of obesity with more severe disease and poor control have been elucidated including mechanical airway changes, leptin adiponectin pathway in systemic inflammation, oxidative stress and steroid resistance.

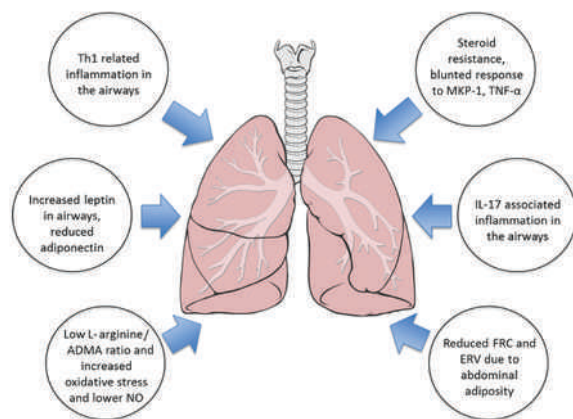


Fig 6: Mechanisms of Obese Asthma<sup>4</sup>.

A variety of mechanisms have been proposed as drivers of the physiologic and clinical observations in obese asthmatics, including changes in adipokines; T-helper type 1 (Th-1) skewed airway inflammation; lower asymmetric dimethylarginine (ADMA) to L-arginine ratio resulting in increased oxidative stress and decreased physiologic nitric oxide (NO), a mediator in smooth muscle dilatation; reduced functional residual capacity and expiratory reserved volume due to excess abdominal adiposity; interleukin-17 (IL-17) associated airway inflammation; steroid resistance and dampened response to mitogen-activated protein (MAP) kinase phosphatase-1 (MKP-1).

Interventional studies evaluating weight loss by surgical and nonsurgical means and on asthma control have shown significant improvement in airway hyperresponsiveness and control<sup>13</sup>. But other studies do not demonstrate similar results<sup>14-15</sup>.

## Conclusion

Obesity and being overweight are risk factors for partly controlled and uncontrolled asthma. Hence large scale follow up studies to determine the effect of interventions to achieve optimum BMI with control of Asthma are needed.

The author declares no conflict of interest.

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