

## Research Article



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## RELATIONSHIP BETWEEN ASTHMA SYMPTOMS CONTROL, WAIST CIRCUMFERENCE AND BODY MASS INDEX IN INDIAN POPULATION

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### ABSTRACT

**Background:** There is little information in the literature about the relationship between abdominal obesity and asthma symptoms.

**Aim:** To evaluate the relationship between asthma symptom management and waist circumference and BMI in Indian patients attending medical facilities.

**Methods:** Based on WHO and Indian guidelines, the study measured the waist circumference of 220 patients with asthma to determine how well their symptoms were controlled and how severe they were.

**Results:** According to Indian criteria, the percentage of normal, overweight, and obese participants with poorly managed asthma was 2.24 percent (n=4), 15.73 percent (n=28), and 82.0 percent (n=146), respectively. In comparison, 14.28% (n=6), 23.80% (n=10), and 61.9 percent (n=26) of the participants had asthma that was under control (p=0.04). Asthma was not well managed in 43.63% (n=96) and 1.81% (n=4) of the research participants who had abdominal obesity, respectively. Poor and well-controlled asthma symptoms were present in 19.09% (n=42) and 0.90% (n=2) study subjects for moderately severe spirometry, 1.81% (n=4) and 0.90% (n=2) study subjects for severe spirometry, and 19.09% (n=42) and 1.81% (n=4) study subjects for very severe spirometry, respectively, for poor and well-controlled asthma symptoms.

**Conclusion:** The waist parameter is a crucial and straightforward measure to assess in obese asthmatic people. However, compared to WHO standards, Indian criteria for BMI and waist circumference are shown to be superior for assessing asthma symptoms in Indians.

**Keywords:** Waist circumference, body mass index, and abdominal obesity

### INTRODUCTION

In India, between 30 and 65 percent of adults are either overweight, obese, or have abdominal obesity. Cardiovascular diseases (CVDs) and metabolic syndrome are on the rise in the Indian population in proportion to the incidence of overweight and obesity, placing the population at a high risk of acquiring this dangers.<sup>1</sup>

Asian Indians, compared to Caucasians, have greater rates of abdominal obesity and body fat percentage at the same BMI (body mass index) levels. Obesity is one of the known and acknowledged risk factors for the onset of asthma. Compared to persons with a normal BMI, obese subjects are more likely to have asthma. According to earlier research statistics, obesity also raises the likelihood of having asthma by 2.5–2 times in adult subjects and kid subjects, respectively.<sup>2</sup> Due to distinct inflammatory phenotypes and a reduced atopic response, obese patients with asthma

often have poor control of their asthmatic state. Excessive abdominal fat is another important asthma risk factor, with people with greater abdomen fat reporting worse asthma control and a higher prevalence of the disease. The prior literature's evidence for this association is, however, few and restricted. Fewer studies have examined the incidence of abdominal obesity in Indian asthmatic participants using Indian obesity criteria and its impact on asthma management.<sup>3</sup>

Therefore, the purpose of the current study was to evaluate the relationship between waist circumference and BMI and the management of asthma symptoms in participants visiting healthcare facilities in India.

## **METHODS AND MATERIALS**

The purpose of the current study was to evaluate the relationship between waist circumference and BMI and the management of asthma symptoms in individuals visiting healthcare facilities in India. Participants in the research were chosen from the Institute's outpatient department.

The inclusion criteria for the study were subjects of age >18 years, asthma on spirometry, previously confirmed asthma diagnosis, wheeze history that changed over time, tightness in the chest, breathlessness, cough, and meeting Abdominal obesity or BMI criteria of 2009 and Asian Indian-specific overweight, obesity and abdominal obesity consensus statement.

Those whose spirometry could not be performed, pregnant women, and those in exacerbation were excluded from the research. All participants' verbal and written informed permission was obtained after a thorough explanation of the study's precise design. The GINA (Global initiative for asthma) 2018 guidelines<sup>4</sup> were used to identify the asthma. Variable expiratory airflow restriction was determined based on a decreased FVC/FEV1 and a >12% and >200ml higher FEV1 following the injection of salbutamol in doses of 200-400mcg during spirometry. A turbine sensor spirometer was used for the spirometry. According to FEV1 values of > 70%, 60-69%, 50-59%, 35-49%, and 35%, respectively, the participants were categorized as having mild, moderate, moderately severe, severe, and very severe asthma. BMI (kg/m<sup>2</sup>) was assessed from height in cm and weight in kg. The flexible and non-stretchable tape was used to measure the waist circumference in a horizontal position at the midpoint of the lowermost rib and the iliac crest in erect and fasting conditions at normal expiration end. Normal BMI was 18-22.9kg/m<sup>2</sup>, obesity in >25kg/m<sup>2</sup>, and overweight as 23-24.9kg/m<sup>2</sup>. Abdominal obesity was considered at >90 cm waist circumference in males and >80cm in females, whereas, with WHO, >102 in males and >88 in females shows abdominal obesity.

The GINA classification of 2018 was used to assess the asthma control during the previous four weeks using 4 parameters, including activity restriction, more than twice as many reliever medications, night waking, and more than twice as many episodes of daytime asthma, where 1 point was assigned to each symptom present. Subjects were categorized as uncontrolled (three to four parameters), partially controlled (one to two parameters), or well-controlled (no parameters), depending on the results. All of the individuals underwent spirometry, waist circumference, and BMI measurements. All of the individuals with newly discovered asthma were administered either a DPI (dry powder inhaler) or an MDI, spacer included or not. The treatment was carried out in accordance with GINA recommendations and included corticosteroid inhalational therapy with/without LABA (long-acting beta 2 agonists) and either low dosage Formoterol or SABA (short-acting beta 2 agonist).

Statistical analysis of the acquired data was performed using SPSS version 20 from Chicago Inc., the United States. The information was presented as percentages, numbers, means, and standard deviations. The significance threshold was held at 0.05.

## **RESULTS**

The objective of the current clinical investigation was to evaluate the relationship between waist circumference and BMI and the management of asthma symptoms in patients attending healthcare facilities in India. 220 asthmatic individuals of both sexes were evaluated in the research. The study's participants ranged in age from 19 to 76 years, with a mean age of 40.1±9.83. In the current study, there were 56.36% (n=124) females and 43.63% (n=96) men. The averages for the study participants' height, weight, and BMI were 157.73 cm, 70.03 kg, and 28.4 kg/m<sup>2</sup>, respectively. According to Table 1, the mean FEV1 was 58.46±11.8, or 60%, the mean FVC was 82.29±13.20, or substantially conserved, and the FEV1/FVC was 68.57±10.76.

According to Indian standards for determining BMI, participants with normal, overweight, and obese BMIs had asthma that was poorly managed in 2.24% (n=4), 15.73% (n=28), and 82.02% (n=146) of the cases, well controlled in 14.28% (n=6), 23.80% (n=10), and 61.90% (n=26) of the cases, respectively. P=0.04 indicates that this was statistically significant. According to WHO standards, the percentage of normal, overweight, and obese people with poorly managed asthma was 17.97% (n=32), 51.68% (n=92), and 30.33% (n=54), respectively. In contrast, Table 2

shows that well-controlled asthma was detected in 38.09% (n=16), 47.61% (n=20), and 14.28% (n=6) participants, respectively.

Concerning waist circumference and asthma control, it was seen in subjects with normal waist circumference, asthma was well controlled in 50.90% (n=112) study subjects and was poorly controlled in lesser subjects with 3.63% (n=8) subjects. In subjects with abdominal obesity, asthma was poorly controlled in 43.63% (n=96) subjects and was poorly controlled in 1.81% (n=4) study subjects respectively as depicted in Table 3.

For mild spirometry severity (FEV1 value >60%), poorly controlled asthma was found in 18.18% (n = 40) study participants and well-controlled asthma was seen in 6.36% (n = 14) people, but poorly and well-controlled asthma were seen in 27.72% (n = 50) and 9.09% (n = 20) patients, respectively, for moderate severity. For FEV1 of 60%, poor and well-controlled asthma symptoms were found in 19.09% (n=42) and 0.90% (n=2) subjects for moderately severe spirometry, 19.09% (n=42) and 1.81% (n=4) study subjects for severe spirometry, and 1.81% (n=4) study subjects and 0.90% (n=2) study subjects for very severe spirometry, respectively (Table 4).

## DISCUSSION

220 asthmatic individuals of both sexes were evaluated in the research. The study's participants ranged in age from 19 to 76 years, with a mean age of 40.1 9.83. In the current study, there were 56.36% (n=124) females and 43.63% (n=96) men. The averages for the study participants' height, weight, and BMI were 157.73 cm, 70.03 kg, and 28.4 kg/m<sup>2</sup>, respectively. FEV1/FVC was 68.57±10.76, the mean FEV1 was 58.46±11.8, the mean FVC was 82.29±13.20, and the average FEV1/FVC was 60%. These demographic and illness features matched those of the participants evaluated in Juel CT et al.<sup>5</sup> study from 2012 and Dias-Junior SA et al.<sup>6</sup> study from 2014, which also evaluated subjects with the same demographic and disease characteristics.

According to Indian standards for determining BMI, the percentage of normal, overweight, and obese participants with poorly managed asthma was 2.24 percent (n=4), 15.73 percent (n=28), and 82.0 percent (n=146), respectively, whereas the percentage of subjects with well-controlled asthma was 14.2 percent (n=6), 23.70 percent (n=10), and 61.9 percent (n=26). With a p value of 0.04 this was statistically significant. According to WHO standards, the percentage of normal, overweight, and obese participants with poorly managed asthma was 17.97% (n=32), 51.68% (n=92), and 30.33% (n=54), respectively. In contrast, the percentage of patients with well-controlled asthma was 38.09% (n=16), 47.61% (n=20), and 14.28% (n=6). These findings were in line with studies conducted by Ciprandi G et al<sup>7</sup> in 2018 and Zillmer LR et al<sup>8</sup> in 2014, which found a similar connection between BMI and asthma.

Asthma was found to be well controlled in 50.90% (n=112) of study participants with normal waist circumference, whereas it was found to be poorly controlled in 3.63% (n=8) of those with less normal waist circumference. Asthma was not well managed in 43.63% (n=96) and 1.81% (n=4) of the research participants who had abdominal obesity, respectively. These results were consistent with those of Jiang D et al<sup>10</sup> in 2019 and McCallister JW et al<sup>9</sup> in 2013, who observed a similar connection between asthma control and waist circumference in their investigations.

Asthma was found to be poorly controlled in 18.18% (n = 40) and well-controlled in 6.36% (n = 14) of the study participants with mild spirometry severity, respectively, while it was found to be poorly and well-controlled in 27.72% (n = 50) and 9.09% (n = 20) of the participants with moderate spirometry severity. Poor and well-controlled asthma symptoms were found in 19.09% (n=42) and 0.90% (n=2) of subjects with moderately severe spirometry for FEV1 60%, 1.81% (n=4) and 0.90% (n=2) of subjects with severe spirometry, and 19.09% (n=42) and 1.81% (n=4) of subjects with very severe spirometry for poor and well-controlled asthma symptoms, respectively. These results were similar to the findings of Lv N et al<sup>11</sup> in 2014 and Jesus JPV et al<sup>12</sup> in 2018.

## CONCLUSION

Given its limitations, the current study draws the conclusion that the waist parameter is a crucial and straightforward parameter to assess in obese asthmatic people. However, compared to WHO standards, Indian criteria for BMI and waist circumference are shown to be superior for assessing asthma symptoms in Indians. The present study did, however, have certain drawbacks, such as a limited sample size, a brief monitoring period, and geographic region biases. A firm conclusion will thus be reached with the aid of more longitudinal studies that have a bigger sample size and a longer monitoring period.

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**TABLES**

| <b>Gender</b>            | <b>%</b>    | <b>N=220</b> |
|--------------------------|-------------|--------------|
| Males                    | 43.63       | 96           |
| Females                  | 56.36       | 124          |
| <b>Mean age (years)</b>  | 40.1±9.83   |              |
| <b>Age range (years)</b> | 19-76       |              |
| <b>Mean Height (cm)</b>  | 157.73±8.06 |              |
| <b>Mean weight (kg)</b>  | 70.03±8.06  |              |
| <b>Mean BMI (kg/2)</b>   | 28.4±4.03   |              |
| <b>FEV1</b>              | 58.46±11.8  |              |
| <b>FVC</b>               | 82.29±13.20 |              |
| <b>FEV1/FVC</b>          | 68.57±10.76 |              |

**Table 1: Demographic and asthma characteristics of the study subjects**

| <b>BMI classification</b> | <b>BMI criteria</b> | <b>Poorly controlled n (%)</b> | <b>Well-controlled n (%)</b> | <b>p-value</b> |
|---------------------------|---------------------|--------------------------------|------------------------------|----------------|
| <b>Indian</b>             | <b>Normal</b>       | 4 (2.24)                       | 6 (14.28)                    | <b>0.04</b>    |
|                           | <b>Overweight</b>   | 28 (15.73)                     | 10 (23.80)                   |                |
|                           | <b>Obese</b>        | 146 (82.02)                    | 26 (61.90)                   |                |
| <b>WHO</b>                | <b>Normal</b>       | 32 (17.97)                     | 16 (38.09)                   | 0.107          |
|                           | <b>Overweight</b>   | 92 (51.68)                     | 20 (47.61)                   |                |
|                           | <b>Obese</b>        | 54 (30.33)                     | 6 (14.28)                    |                |

**Table 2: Correlation of asthma symptoms control and BMI in study subjects**

| <b>Waist circumference</b> | <b>Poorly controlled n (%)</b> | <b>Well-controlled n(%)</b> | <b>p-value</b> |
|----------------------------|--------------------------------|-----------------------------|----------------|
| <b>Normal</b>              | 8 (3.63)                       | 112 (50.90)                 | 0.67           |
| <b>Abdominal obesity</b>   | 4 (1.81)                       | 96 (43.63)                  |                |

**Table 3: Correlation of asthma symptoms control and waist circumference in study subjects**

| <b>FEV1 value</b> | <b>Asthma spirometry severity</b> | <b>Poorly controlled n (%)</b> | <b>Well-controlled n (%)</b> | <b>Odds ratio</b> | <b>p-value</b> |
|-------------------|-----------------------------------|--------------------------------|------------------------------|-------------------|----------------|
| <b>&gt;60%</b>    | <b>Mild</b>                       | 40 (18.18)                     | 14 (6.36)                    | 4.18              | <b>0.01</b>    |
|                   | <b>Moderate</b>                   | 50 (27.72)                     | 20 (9.09)                    |                   |                |
| <b>&lt;60%</b>    | <b>Moderately severe</b>          | 42 (19.09)                     | 2 (0.90)                     |                   |                |
|                   | <b>Severe</b>                     | 42 (19.09)                     | 4 (1.81)                     |                   |                |
|                   | <b>Very severe</b>                | 4 (1.81)                       | 2 (0.90)                     |                   |                |

**Table 4: Correlation of asthma symptoms control and asthma severity**