Effect of BMI on Bronchial Asthma in Indian Adults

Original Research Article

Vishal Patidar, Sanjay Tandon, ST Nagdeote, Daksh Sharma
Department of Pulmonary Medicine, People's College of Medical Sciences & Research Centre, Bhopal (MP)

ABSTRACT

Asthma and obesity are main public health problems. The association between severity of asthma and obesity remains controversial and is limited to small studies. The aim of our study was to investigate the role of BMI on asthma severity.

All patients of age 18 years and above, attending the Department of Pulmonary Medicine, People's Hospital (a tertiary Care Hospital of People's College of Medical Sciences & Research Centre, Bhopal) with symptoms or diagnosis of asthma were included in the study. Patients were selected prospectively over a period of 1 year and 6 months and were classified according to BMI (Body Mass Index) and asthma severity. Seventy five patients were included in the study and there were 37(49.3%) female patients. Mean age was 36.8 years. Patients were grouped according to Global Initiative for Asthma (GINA) staging in which 26.7% patients were classified with intermittent asthma, 24% mild persistent asthma, 33.3% moderate persistent asthma and 16% with severe persistent asthma. In our study obesity (BMI) and asthma severity (GINA staging) showed statistically significant positive correlation (p-value<0.05). It is inferred that obesity is a potentially preventable factor for asthma control.

KEY WORDS: asthma, BMI (Body Mass Index), FEV1, obesity, prevalence, severity

INTRODUCTION:

Asthma and obesity are important public health problems[1-2]. In recent decades, the prevalence of obesity has increased in Asia, US and most of the European countries[3]. Obesity is associated with chronic diseases such as diabetes and cardiovascular disease and thus constitutes a major public health problem. Presently, asthma is also a major health problem estimated to affect more than 300 million people of all ages worldwide.

Epidemiologic studies published previously have demonstrated higher risk of asthma and asthma-like symptoms in obese individuals. Obesity is related to increased asthma severity in both children and adults[1,4]. Obese asthmatics are associated with increased daily asthma symptoms, missed workdays, increased use of bronchodilator and an overall increase in asthma severity.

Corresponding Author:
Dr Sanjay Tandon
Professor & Head,
Department of Pulmonary Medicine,
People's College of Medical Sciences & Research Centre, Bhanpur,
Bhopal - 462037
Phone No.: 0755-4004055
E-mail: vishalpatidar07@gmail.com, pulmedph@gmail.com

The parallel increase in the occurrence of obesity and asthma in the past 2−3 decades has led some researchers to propose a causal relationship between the two conditions[5]. Obesity has also been associated with impaired pulmonary function and airway hyperresponsiveness[6,7,8], but not in all studies [9].

Obesity is an obstacle in both, control of asthma and favorable response to current asthma therapy[10,11]. Preliminary data suggest that obese asthmatics reveal different asthma phenotypes compared to patients of normal weight. The obese-asthma phenotype can be reversed by weight reduction with improvement in lung function, decreased asthma severity, and by that, overall asthma control as well as decreased drug utilization and hospitalizations[12].

The aim of our study was to investigate the role of BMI on asthma severity.

MATERIAL AND METHODS:

Ours was a prospective, cross-sectional study, with a sample size of seventy five patients. The study was conducted at the Department of Pulmonary Medicine, People's Hospital (People's College of Medical Sciences & Research Centre) Bhopal, over a

period of one year and six months (January 2016 to June 2017). People's Hospital is a tertiary care and referral center in central India. All patients aged 18 years and above coming to pulmonary medicine OPD and admitted at hospital during study period and who fulfilled the asthma diagnostic criteria according to Global Initiative for Asthma (GINA) were included in study. Evaluation of patient was done by medical interview, physical examination, height, weight, ECG, Chest X-Ray, and spirometry. Exclusion criteria were obstructive diseases other than asthma (emphysema, chronic bronchitis, bronchiectasis), inhaled or oral steroid intake in preceding 1 month, current medications for obesity, patients with associated lung disease. e.g. presence of pulmonary infection, active pulmonary tuberculosis, pleural effusion, pulmonary embolism, pulmonary artery hypertension, contraindication or inability to perform required tests, uncooperative patient or unwilling to give informed written consent.

Medical history was taken through a questionnaire applied by a single investigator according to proforma. Data obtained included age, gender, height, weight, duration of asthma, comorbid conditions, smoking history, history of allergy, history of inhaled corticosteroid use, and variation in breathlessness. Smoking history was determined as current smoker, ex-smoker and non smoker. Smoking intensity was expressed in pack-years which was number of cigarette or bidi packs per day per year of smoking. Patients who had stopped smoking less than 12 months prior to the evaluation were considered to have a current smoking history. Breathlessness history was based on patient's response to the question: "Do you have more breathlessness at night"? (yes/no).

The diagnosis of asthma was confirmed by symptoms of asthma (wheeze, breathlessness, chest tightness and/or cough) reversible airflow obstruction with improvement of 12% or more and 200 ml in FEV1. If a patient was not able to perform spirometry or there was no bronchodilator reversibility of airflow obstruction then patient was excluded. Spirometry was done by a trained professional at screening station using Schiller sensors SP-260 (Schiller sensors SP-260 work on pneumotachometer method). Instrument and biological quality control were conducted periodically via trained staff for quality assurance.

Spirometry was performed in sitting position before and after 20 minutes of 400 micrograms of inhaled Salbutamol given via nebulizer. Three to four trials were given. Best of all trials was included where expiration continued for >6 sec with acceptable flow/volume loop. FEV1 and symptoms were considered for asthma severity assessment. GINA guidelines for asthma severity classification were used.

We calculated BMI as weight in kilograms divided by square of height in meters (kg/m^2) and also classified BMI for the study population as per obesity status. Several studies in India have suggested that Indian population is at higher risk of obesity-related co-morbidities at a lower level of BMI that is recommended by WHO[13-15]. Classification of BMI were as follows: underweight: <18.5 kg/m^2; normal weight: 18.5-22.9 kg/m^2; overweight: 23.0-24.9 kg/m^2; pre-obese: 25.0-29.9 kg/m^2; class I obesity 30.0-34.9 Kg/m^2; class II obesity 35.0-39.9 Kg/m^2 and class III obesity ≥40 Kg/m^2.

Statistical analysis was done using Statistical Package for Social Science (SPSS Version 20). Data comparison was done by applying specific statistical tests to find out the statistical significance of the comparisons. The statistical test employed for obtained data in our study were Chi-Square Test: p-value <0.05 was considered significant.

RESULTS:

Seventy five patients were included in the study and there were 37(49.3%) female patients. Mean age was 36.8 years. 46.7% patients were either underweight or normal weight, 53.3% asthmatics had weight higher than normal. Patients were grouped according to GINA staging in which 26.7% patients were classified in intermittent asthma, 24% mild persistent asthma, 33.3% moderate persistent asthma and 16% in severe persistent asthma. Two groups were made for asthma patients (1. intermittent + mild persistent, 2. moderate persistent + severe persistent), similarly two groups were made for obesity (1. Underweight + Normal weight, 2. Overweight + Preobese + Obese). The group of intermittent and mild persistent asthma had 22 patients which belong to underweight and normal weight, 16 patients were in overweight, preobese and obese group. Second group of Moderate persistent and severe persistent asthma had 13 patients which belong to underweight and normal weight, 24 patients were in overweight, preobese and obese group.In our study, obesity (BMI) and asthma severity (GINA staging) showed statistically significant positive correlation (p-value<0.05) , that is, with increasing obesity, severity of asthma also increased (Table 2).

DISCUSSION:

Majority of the studies found a positive correlation

Table 1: Characteristics of study population.

Variable's	Number of Patients (75)	Percentage
AGE		
18 to 30 years	25	33.3
31 to 45 years	34	45.3
46 to 60 years	12	16
Above 60 years	4	5.3
GENDER		
Female	37	49.3
Male	38	50.7
SOCIOECONOMIC STATUS		
Lower	8	10.7
Lower middle	29	38.7
Middle	28	37.3
Upper middle	10	13.3
Upper	0	0
SMOKING STATUS		
Current smoker	14	18.7
Ex-smoker	2	2.7
Nonsmoker	59	78.7
BMI		
< 18.5 (Underweight)	6	8
18.5 -22.9 (Normal weight)	29	38.7
23 - 24.9 (Overweight)	12	16
25 - 29.9 (Pre-Obese)	13	17.3
30 - 34.9 (Class I Obesity)	11	14.7
35 - 39.9 (Class II Obesity)	4	5.3
=40 (Class III Obesity)	0	0
FEV1		
<60%	12	16
60 - 80%	25	33.3
> 80%	38	50.7
GINA STAGING		
Intermittent	20	26.7
Mild persistent	18	24
Moderate persistent	25	33.3
Severe persistent	12	16

between obesity and asthma[16]. The literature examining obesity and severity of asthma is controversial. Results of various published studies vary due to, small sample size, variable asthma definitions, and different asthma severity outcomes.

Only a few studies have demonstrated an association between obesity and increased asthma severity classification in adults[17-18].

In this study, odds of an obese individual having severe persistent asthma was 1.86 compared to nonobese (OR 1.86). Statistically significant correlation (p-value<0.05) was found between BMI and severity of asthma, that is with increasing BMI, severity of asthma increased. Similar result was seen in a cohort study done by Mary Helen Black et al. However, the study was conducted on children (≤ 19 year of age)[1].

Table 2: Relation of BMI and severity of asthma.

Variables	BMI	
GINA STAGING	Underweight + Normal	Overweight + Preobese + Obese
Intermittent + mild persistent	22	16
Moderate persistent + Severe persistent	13	24
Chi square value = 3.9016	p-value = 0.0482	Odds ratio = 1.86

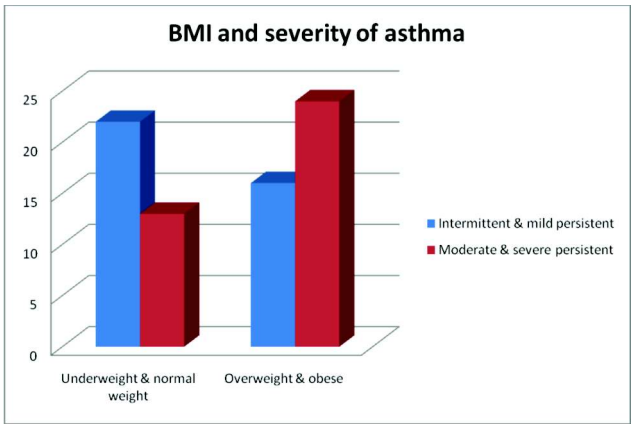

Figure 1: Relation of BMI and severity of asthma.

The result of our study is consistent with previous studies. In children, majority of studies support an association between obesity and asthma severity[1]. Whereas, literature is controversial in adults, Taylor B, et al[19] found a significant association between the increase of BMI and the worsening of asthma severity in 3,095 asthmatic adults. In contrast, other studies have failed to demonstrate such a relationship[20,21].

Using the 1997 National Heart, Lung, and Blood Institute guidelines for asthma severity, Akerman et al demonstrated an increased possibility of obesity in adults with both moderate and severe persistent asthma, compared to adults with mild intermittent asthma[22]. Nadi E, et al (2007) found a negative association between BMI and asthma severity, as they consider different BMI classification for obesity (BMI ≥26 for obesity).

Gabriele Carra Forte et al (2013) found that asthmatic subjects who were obese were more likely to have a higher FEV1 than normal weight asthmatics. Asthma severity and asthma control were similar in both obese and non-obese subjects. One possible explanation for this finding was the more difficult control of the disease in obese patients, despite better pulmonary function[23].

Camargo et al[24], in a prospective cohort study using obtained data from the nurse's health study (85,911 female nurses), found that women who gained weight after 18 year of age were at a higher risk of developing asthma. They also found that the relative risk of developing asthma increased with increasing levels of BMI. (relative risk: 2.7 for BMI_30.0 vs. BMI 20.0–22.4; 95% CI: 2.3–3.1).

Our study has few strengths; we considered both clinical and spirometric findings in our study. Consideration was given to history of ICS (inhaled corticosteroid) therapy that is the major factor which affects spirometric finding and clinical features. We also classified BMI for our study population (Indian Asian population) as obesity in Indian people is different from that of other countries. Several Indian studies suggest that Indian population is at higher risk of obesity related co-morbidities at a lower level of BMI that is recommended by WHO[13-15].

CONCLUSION:

The findings of our study show that BMI and asthma severity (GINA staging) are positively correlated. Obesity is a potentially preventable factor which may help in asthma control. Asthma education programs could also include counseling about weight reduction.

It is recommended that a follow-up study is required in which obese asthmatics are reassessed for severity of asthma after reduction of weight.

LIMITATIONS OF THE STUDY:

1.Only BMI was taken as a measure of obesity. 2. Waist to hip ratio, waist circumference, and other parameters were not considered. It is already known that central obesity is associated with spirometric abnormalities. 3. We also had a small sample size. 4. This study was a hospital-based cross-sectional study; hence, we cannot apply results of our study to general population.

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Cite this article as: Patidar V, Tandon S, Nagdeote ST, Sharma D: Effect of BMI on Bronchial Asthma in Indian Adults. PJSR ;2018:11(1):1-5.
Source of Support : Nil, Conflict of Interest: None declared.