Original Research Article

A hospital based cross sectional observational study of assessment of pulmonary function and clinical features, and their comparison between obese and non-obese patients of bronchial asthma in a tertiary care hospital

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Abstract

Introduction: Asthma is a heterogeneous, inflammatory disorder of airways and is associated with airway hyper responsiveness that leads to recurrent episodes of wheezing, breathlessness, chest tightness and coughing particularly at night or in the early morning. These episodes are usually associated with wide spread but variable airflow obstruction within the lung that is often reversible either spontaneously or with treatment[1]. The incidence of obesity has doubled worldwide since 1990[2]. In India 12.1% males and 16% females are obese[3]. **Materials and Methods:** Patients treated under Department of Pulmonary Medicine, Bidar institute of Medical Sciences, Bidar with bronchial asthma, fulfilling the inclusion & exclusion criteria were included in the study after obtaining written informed consent. Demographic data, history, clinical examination and details of investigations like Pulmonary function test, Complete hemogram (Hemoglobin, Total leukocyte count and Differential leukocyte count), Chest X-ray (Postero-anterior view), Electrocardiogram, Lipid profile -Triglyceride, Total cholesterol, High density lipoprotein (HDL) and low density lipoprotein (LDL),Sputum AFB, Renal function test. Sample size taken for convenience. **Results:** In this study, out of 50 patients 55% were males, and 45% were females with higher total cholesterol and triglycerides in obese asthmatics compared to non-obese asthmatics. The most common symptoms were breathlessness followed by cough and wheeze. In this study, it was found that breathlessness, cough, wheeze are more common in obese asthmatics than non-obese asthmatics. There was significant difference of waist circumference (W.C.), hip circumference (H.C.) and waist to hip ratio (W.H.R.) between obese and non-obese asthmatics. Hypertension and diabetes mellitus more prevalent in obese group than non-obese. FVC, FEV1, and FEF25-75 % values were reduced in obese asthmatics compared to non-obese asthmatics in contrast toFEV1/FVC which was higher in obese asthmatics compared to non-obese asthmatics. It was observed that increased in BMI causes impaired pulmonary function**. Conclusion:** The increasing prevalence of asthma and obesity has suggested an association between the two. The most common symptoms observed in this study were breathlessness, cough and wheeze. PR (Pulse Rate) SBP (Systolic Blood Pressure), DBP (Diastolic Blood Pressure), RR (Respiratory Rate), TLC (Total Leucocyte Count), AEC (Absolute Eosinophil Count), LP (Lipid Profile) were higher in obese asthmatics. Diabetes mellitus and hypertension were more prevalent in obese asthmatics. FVC, FEV1 are decreased in obese asthmatics but the amount of reversibility is more for non-obese asthmatics. It was also observed that increased BMI causes impaired pulmonary function.

Key Words: Asthma, HDL, LDL, FVC, FEV1

Introduction

Asthma is a heterogeneous, inflammatory disorder of airways and is associated with airway hyper responsiveness that leads to recurrent episodes of wheezing, breathlessness, chest tightness and coughing particularly at night or in the early morning. These episodes are usually associated with wide spread but variable airflow obstruction within the lung that is often reversible either spontaneously or with treatment[1].

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The incidence of obesity has doubled worldwide since 1990[2]. In India 12.1% males and 16% females are obese[3]. Asthma in the obese is more difficult to control[4] and is associated with poor quality of life and requires more health care resources than in non-obese asthmatics[2].Respiratory symptomatology is more in obese asthmatics because of alterations in chest wall mechanics and also because of associated comorbidities like hormonal imbalance, GERD, increased truncal fat and decreased exercise tolerance. Despite these observations, obesity alone has not been shown to cause dyspnea in persons at rest[3].

Bronchial asthma is diagnosed based on clinical features and spirometry. There is decreased FEV_1, decreased FEV_1/ FVC and reversibility is more than 12% and 200ml after 15 minutes of inhaled bronchodilator administration. For the convenience of management GINA (Global Initiative for Asthma) has classified asthma into the following categories[4,5,6].

- Intermittent (Symptoms <once a week, FEV_1 or PEF $\geq$ 80% of predicted).

- Mild Persistent (Symptoms >once a week <once a day FEV_1 or PEF ≥ 80% of Predicted).
- Moderate Persistent (Symptoms daily FEV_1 or PEF 60 to 80% of predicted).
- Severe Persistent (Symptoms daily FEV_1 or PEF <60 % predicted).

Materials and methods

Patients treated under Department of Pulmonary Medicine, Bidar institute of Medical Sciences, Bidar with bronchial asthma, fulfilling the inclusion & exclusion criteria were included in the study after obtaining written informed consent. Demographic data, history, clinical examination and details of investigations like Pulmonary function test, Complete hemogram (Hemoglobin, Total leukocyte count and Differential leukocyte count), Chest X-ray (Postero-anterior view), Electrocardiogram, Lipid profile -Triglyceride, Total cholesterol, High density lipoprotein (HDL) and low density lipoprotein (LDL),Sputum AFB, Renal function test. Sample size taken for convenience.

Source of Data

The study was conducted in Department of Pulmonary Medicine, Bidar institute of Medical Sciences, Bidar on patients with Stable obese and non-obese Bronchial Asthma patients who were diagnosed with bronchial asthma as per GLOBAL Initiative for Asthma (GINA) guidelines1undergoing pulmonary function test on inpatient or outpatient basis.

Study Design

A Hospital based cross sectional observational study.

Place of Study

Department of Pulmonary Medicine, Bidar institute of Medical Sciences, Bidar.

Duration of Study

One year (January 2020 –December 2020).

Sampling Technique

Convenient sampling.

Sample Size

A total of 50 study subjects-25 obese and 25 non-obese asthmatic adults.BMI <22.9 is taken as Non-Obese and >23 as Obese as per WHO Asia Pacific perspective for Asians (WHO IOTF 2003) Inclusion Criteria[1]. All individuals above 18 years of age.[2] All adults diagnosed with Bronchial asthma as per GINA1guidelines.[3] All asthmatic adults who are obese (which included at risk, Obese I and Obese II) and non-obese (underweight and normal) as per WHO Asian pacific perspective for Asians.4.Patients who are willing to participate. Exclusion Criteria Unstable inpatients/out-patients. (i.e. Acute exacerbation of asthma)2Patients with chronic obstructive pulmonary disease, Bronchiectasis and other respiratory diseases.3Patients with malignancies, cardiac complications or neuromuscular diseases.4Post-operative patients, individuals with serious systemic illnesses like chronic renal failure or complicated diabetes mellitus etc.

Statistical Methods

Data was entered in Microsoft excel and analyzed using EPI INFO version 6 software. Descriptive statistics like proportions, percentages and standard deviation are used. For comparison between the groups chi square test, Independent 't' test, ANOVA were used. P value of less than 0.05 is considered as statistically significant.

Results

Table 1: WHO Classification of BMI (2003)

Classification	BMI (Kg/m2)	Risk of Comorbidities
Underweight	Less than 18.5	Low-but risk of other clinical problems increased
Normal Range	18.5-24.9	Average
Over weight	>25	
Pre Obese	25-29.9	Increased
Obese Class I	30-34.9	Moderate
Obese Class II	35-39.9	Severe
Obese Class III	>40	Very Severe

Table 2: WHO Asia Pacific Perspective for Asians (WHO IOTF 2003)

Classification	BMI (Kg/m2)	Risk of Comorbidities
Underweight	Less than 18.5	Low-but risk of other clinical problems increased
Normal Range	18.5-24.9	Average
Over weight	>25	
At Risk	25-29.9	Increased
Obese Class I	30-34.9	Moderate
Obese Class II	35-39.9	Severe

Table 3: Comparing PRE FVC, FEV1, FEV1/FVC, FEF (25-75) in Obese and Non-Obese Asthmatics

	Obese			Non Obese		
PFT Values	**Predicted**	**Observed**	**% of Observed FVC**	**Predicted**	**Observed**	**%**
FVC	2.44 +0.49 l/s	1.61 +0.38 l/s	66.87±13.69%	2.82 +0.73l/s.	2.26+0.88l/s.	79.76±22.04%
FEV1	2.10 +0.40.	1.13 +0.24	55.04±11.35%	2.47 +0.66	1.50 +0.65.	59.72±18.80%
FEV1/FVC	86.10 +4.84	70.40 +8.01	86.10 +4.84%	87.08 +4.42	65.03 +7.34.	87.08+4.42%
FEF(25-75)	3.20 +0.55	1.31 +0.62	42.23±21.05%	3.87 +0.78	1.59 +0.76	40.80±17.14%

Table 4: Comparing POST FVC, FEV1, FEV1/FVC, FEF (25-75) in Obese and Non-Obese Asthmatics

	Obese		Non Obese	
PFT Values	**Observed**	**% of observed**	**Observed**	**% of observed**
FVC	1.92 +0.45 l/s	79.58 ± 13.83 %	2.56+0.80 l/s.	91.65 ± 21.26 %
FEV1	1.47 +0.33	70.85 ± 13.04 %	1.94 +0.72	78.20 ± 21.26 %
FEV1/FVC	77.07 +7.92	-	74.38 +9.41	-
FEF (25-75)	1.93+0.68	61.35 ± 21.01 %	2.76 +1.01	71.92 ± 24.00 %

A total of 50 bronchial asthma patients diagnosed as per GINA guidelines were taken up for the study. Out of 50 patients, 25 were obese bronchial asthma patients (n =25) and remaining 25 were non-obese bronchial asthma patients (n=25). In this study of 50 patients, the age of patients ranged from 20-59 years, the age of patients in obese group ranged from 28-59 years with a mean of 40.27+8.395 years, in non-obese group it ranged from 20-50 years with a mean of 32.57+7.583 years. Out of total 50 asthmatic patients studied, in obese asthmatic group 9(36.6%) were male patients and 16 (63.4%) were female patients and in non-obese asthmatic group 18 (73.3%) were males and 7 (26.7%) were females. The association between the groups is statistically significant. (p=0.009)

Hypertension-Out of 50 patients studied, 8 (30%) obese asthmatics and 2(6.66%) non obese asthmatics had previous history of hypertension. There was significant association seen between the groups (p=0.02)b) Diabetes Mellitus-Out of 50 patients studied, 23.3% obese asthmatics and 6.66% non-obese asthmatics had previous history of diabetes mellitus.

The mean percentage change in reversibility of spirometric values in non-obese population is 34.07% whereas in obese population it is 29.24%. The student t test applied found that the p value between the groups for this variable is not statistically significant. (p=0.23776) Bronchodilator response is found to be more in non-obese asthmatic group compared to obese asthmatics, however it was not statistically significant.

Discussion

In this study of 50 patients with bronchial asthma, the age of patients ranged from 20-59 years, the mean age of patients in obese group was 40.27 +8.395 years, in non-obese group was 32.57+7.583 years. Nearly two thirds in obese group were female and male in non-obese group. The mean weight of the patients in the obese group was 72.53 +12.822 kgs. And in the non-obese group with a mean of 54.13 +9.464 kgs. Castro-Rodriguez et al.,14(2001) demonstrated that girls becoming overweight or obese between 6 and 11 years of age had increased odds of developing new asthma symptoms. The mean BMI of the patients in the obese group was 30.16 +4.63 kilograms/metre2 and in the non-obese group was 20.55 +2.689 kg/m2. The study findings is similar to the study done by Dosi R et al[8].

Beuther et al (2007) have demonstrated a clear dose response relationship between BMI and asthma, suggesting that asthma risk increases further as body weight increases. In addition, he had shown that the odds of incidence of asthma in overweight and obese men and women were similar. Most common symptom in both groups was breathlessness which was present in all patients in obese group and 90% of non-obese group, which was followed by cough and wheeze. The present study showed significant association of cough and seasonal variation between obese and non-obese asthmatic patients as comparable with the study done by Aruna G et al. The presence of comorbid condition like diabetes and hypertension was more common in obese compared to non-obese which was consistent with the study by Pakhale Set al (2010).Our study shows there is significant difference of Absolute eosinophil count between the groups. (p=0.05) but it was contrast with the finding of the study done by Aruna G et al[9].

The mean of Forced expiratory volume in 1st second (FEV1) and Forced vital capacity (FVC), in obese asthmatics is 1.13 ± 0.24 l/s and1.61 +0.38 l/s respectively and in non-obese it is 1.50 +0.65 l/s and 2.26 +0.88 l/s. In the present study FEV1, FVC is lower in obese asthmatics compared to non-obese asthmatics which is comparable with the studies done by Pakhale s et al.(2010) Dosi R et al, Razi et al. The mean percentage change of reversibility in spirometric values (FEV1) among non-obese population is 34.07%, whereas in obese population it is 29.24%.but was not statistically significant.

Conflict of Interest: Nil Source of support: Nil

(p=0.23776) which was in contrast with the study done by Sharma L, et al which showed highly significant difference found in the spirometric variables in obese and non-obese asthmatics. Our study also compared mean value of FEV1/FVC % observed for the obese and non-obese groups which was 70.40 +8.01 and 65.03 +7.34 respectively. This finding is similar to the study done by Sharma et al whereas it is contrast with the findings of the study done by Dosi et al. The mean of FEF 25-75% in the present study among obese asthmatics is 1.31 +0.62 l/s and in non-obese it is 1.59 +0.76 l/s. The values were lower compared to non-obese asthmatics which was comparable with the study done by Zied et al.21Earlier studies showed (Sharma L, et al) the mean percentage change in reversibility of spirometric values in non-obese population highly significant, but our study shows the contrast[10].

Conclusion

The increasing prevalence of asthma and obesity has suggested an association between the two. The most common symptoms observed in this study were breathlessness, cough and wheeze. PR (Pulse Rate) SBP (Systolic Blood Pressure), DBP (Diastolic Blood Pressure), RR (Respiratory Rate), TLC (Total Leucocyte Count), AEC (Absolute Eosinophil Count), LP (Lipid Profile) were higher in obese asthmatics. Diabetes mellitus and hypertension were more prevalent in obese asthmatics. FVC, FEV1 are decreased in obese asthmatics but the amount of reversibility is more for non-obese asthmatics. It was also observed that increased BMI causes impaired pulmonary function.

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