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AN OBSERVATIONAL STUDY OF ASSESSMENT OF PULMONARY FUNCTION AND CLINICAL FEATURES, AND THEIR COMPARISON BETWEEN OBESE AND NON-OBESE PATIENTS OF BRONCHIAL ASTHMA

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Abstract

Introduction: Asthma is a medical condition that is characterized by inflammation of the airways, fluctuating lung function, and increased sensitivity of the airways. The prevalence of asthma rises in tandem with the adoption of western lifestyles and urbanization in communities. Given the predicted growth of urban populations, it is expected that the global number of individuals with asthma may increase by an extra 100 million by 2025.[1]

Materials and Methods: Patients treated under Department of Pulmonary Medicine, attached to SSIMS and RC, Davangere, 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: 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)

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, FVC, FEV1, Pulmonary function test, non-obese asthmatics.

INTRODUCTION

Asthma is a medical condition that is characterized by inflammation of the airways, fluctuating lung function, and increased sensitivity of the airways. The prevalence of asthma rises in tandem with the adoption of western lifestyles and urbanisation in communities. Given the predicted growth of urban populations, it is expected that the global number of individuals with asthma may increase by an extra 100 million by 2025.[1]

The annual incidence of disability-adjusted life years (DALYs) attributable to asthma is around 15 million, which is comparable to the DALYs associated with diabetes, cirrhosis of the liver, or schizophrenia. Host variables like as genetics, weight, and sex, as well as environmental factors including allergens, infections, occupational sensitizers, tobacco smoke, outdoor and indoor pollution, and food, all have a role in the development and manifestation of asthma.[2]

Allergen-induced acute bronchoconstriction occurs when mast cells produce mediators, such as histamine, tryptase, leukotrienes, and prostaglandins, in response to IgE. These mediators directly cause the contraction of airway smooth muscle, resulting in the clinical symptoms of asthma. Chronic inflammation results in swelling of the airways, inflammation, excessive production of mucus, and the development of thickened mucus plugs. Additionally, there are structural alterations such as enlargement and increased cell division of the smooth muscles in the airways.[3]

Airway hyper responsiveness refers to an excessive narrowing of the bronchi in response to various stimuli. The factors that contribute to airway hyper responsiveness are many and include inflammation, impaired neuroregulation, and structural alterations. The airway can undergo permanent structural changes, such as thickening of the sub-basement membrane, sub epithelial fibrosis, hypertrophy and hyperplasia of the airway smooth muscle, proliferation and dilation of blood vessels, and hyperplasia and excessive secretion of mucous glands. These changes are

linked to a gradual decline in lung function, obstruction of airflow, increased sensitivity of the airway, and reduced effectiveness of treatment.[4]

Bronchial asthma is diagnosed based on clinical features and spirometry. There is decreased FEV1, decreased FEV1/ 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.[5]

- Intermittent (Symptoms <once a week, FEV1or PEF ≥ 80% of predicted).
- Mild Persistent (Symptoms >once a week <once a day FEV1or PEF ≥ 80% of Predicted).
- Moderate Persistent (Symptoms daily FEV1or PEF 60 to 80% of predicted).
- Severe Persistent (Symptoms daily FEV1or PEF <60 % predicted).

MATERIALS AND METHODS

Patients treated under Department of Pulmonary Medicine, attached to SSIMS and RC, Davangere, 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, SSIMS Davangere 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: SSIMS and RC, Davangere.

Duration of Study: 6 Months (September 2025-February 2026).

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

1. Unstable inpatients/out-patients. (i.e. Acute exacerbation of asthma)

2. Patients with chronic obstructive pulmonary disease, Bronchiectasis and other respiratory diseases.

3. Patients with malignancies, cardiac complications or neuromuscular diseases.

4. Post-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

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)

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 1: Table 1: WHO Classification of BMI (2003)

Classification	BMI (Kg/m2)	Risk of Comorbidities
Under weight	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 2: WHO Asia Pacific Perspective for Asians (WHO IOTF 2003)

	Obese			Non Obese		
PFT Values	**Predicted**	**Observed**	**% of Observed FVC**	**Predicted**	**Observed**	**%**
FVC	2.44 +0.49l/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 3: Comparing PRE FVC, FEV1, FEV1/FVC, FEF (25-75) in Obese and Non-Obese Asthmatics

	Obese		Non Obese	
PFT Values	**Observed**	**% Observed**	**Observed**	**% 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 ±	2.76	71.92 ±

		21.01 %	+1.01	24.00 %

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

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 +8.395years, 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.[6]

The mean BMI of the patients in the obese group was 30.16 +4.63 kilograms/metre^2 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. 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.[7]

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 S et 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. 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.[8]

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. (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.[9]

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. Earlier 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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