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COMPARISON OF PREVALENCE, CLINICAL PRESENTATION AND SPIROMETRY IN BRONCHIAL ASTHMA IN OBESE AND NON-OBESE PATIENTS

G. Aruna¹, K. Sateesh Kumar², Neethi Chandra³

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ABSTRACT: BACKGROUND: Asthma is one of the most prevalent chronic health conditions affecting approximately 300 million people worldwide, up to 1 in 10 adults and 1 in 3 children are affected in some countries. Obesity is a life style disorder which is rapidly increasing and has been called a "Modern Epidemic", especially in developed countries and urban India. Obesity often appears to affect respiratory function and evidence that obesity precedes the development of asthma raises the possibility of a causal association. This study is an attempt to understand the relation between prevalent and nebulous diseases and to observe if the relationship between the two is deeper than previously thought. **MATERIAL AND METHODS:** This is a cross-sectional, analytical study conducted at the Department of Pulmonary Medicine, S.V.R.R. Govt. General Hospital, Tirupathi, between January 2014 and April 2015. Study sample was the total number of obese and non-obese patients with asthma who presented to the Outpatient and Emergency departments of the Department of Pulmonary Medicine, S.V.R.R. Govt. General Hospital, Tirupathi, during the study period. **SUMMARY:** Out of 97 asthmatics, 23(23.7%) were obese and 74(76.28%) were non-obese. Age group (33-35 Years) and gender distribution (more females than males) was almost similar in the obese and non-obese groups. However, breathlessness was more severe and present in 100% of the obese group in comparison to non-obese group (98%) the duration of disease was significantly found to be longer in the obese group (6.6years) compare to the non-obese group (4.62years) pointing to an early onset of asthma. Severe persistent grade of asthma was slightly higher in the obese group (47.8%) compare to the non-obese group (45%). Absolute Eosinophil Count of obese group (688.7) was significantly higher than the obese group (344.5).

KEYWORDS: Comparison, Clinical presentation, Spirometry, Obese and Non-obese Asthmatics.

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 with in 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 Asthma in the obese is more difficult to control⁴ and is associated with poor quality of life and requires more health care resources than in non-obese asthmatics

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.⁵

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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.⁶:

- Intermittent (Symptoms <once a week, FEV₁ or PEF ≥ 80% of predicted).
- Mild Persistent (Symptoms >once a week <once a day FEV₁ or PEF ≥ 80% of Predicted).
- Moderate Persistent (Symptoms daily FEV₁ or PEF 60 to 80% of predicted).
- Severe Persistent (Symptoms daily FEV₁ or PEF <60 % predicted).

Body Mass Index (BMI) is a simple index of weight for height that classifies individuals as underweight, overweight and obese. It is defined as the weight in kilograms by the square of the height in meters.⁷

$$\text{BMI (Metric)} = \frac{\text{Weight in kgs}}{(\text{Height in meter}^2)}$$

$$\text{Ex. BMI} = \frac{70 \text{ Kgs}}{(1.75 \text{ m})^2} = \frac{70}{3.06} = 22.9$$

The WHO classification of obesity classifies individuals as underweight (BMI <18.5), normal (BMI 18.5 to 24.9), over weight (BMI > 25) and obese (BMI >30).

However, for Asians and Indians, modification of the above has been suggested and one such is the CONSENSUS STATEMENT for diagnosis of obesity for Asian Indians by Misra et al.⁸

Normal BMI – 18.0 to 22.9 kg/m²

Over weight – 23.02 to 24.9 kg/m²

Obesity - > 25 kg/m²

This new cut off will give an additional 10 to 15 % increased diagnosis of overweight or obese individuals, as this study was conducted in a tertiary care government hospital where most of the patients are from the low income and the less privileged class. Thus this classification was adopted.

MATERIAL AND METHODS:

Study Design: Cross sectional, analytical study.

Study Setting: Department of Pulmonary Medicine, S.V.R.R.G.H. Tirupathi.

Period of Study: January 2014 to April 2015.

Sample Size: Total number of obese and non-obese Asthmatics who presented to the Outpatient and Emergency departments of the Department of Pulmonary Medicine, S.V.R.R.G.H. Tirupathi, in the study period.

CRITERIA FOR PATIENT SELECTION:

ESSENTIAL CRITERIA: Any four features of the following:

- Wheezing or whistling in chest.
- Attacks of breathlessness on and off.
- No symptoms in between attacks.
- Family history of atopy.
- FEV₁ < 80% of predicted.
- Post bronchodilator FEV₁ reversibility of more than 12% and 200ml.

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Inclusion Criteria: Age 18 to 50 years, willing to participate in study, normal chest X ray.

Exclusion Criteria: Age <18>50, unwilling to participate in the study. Smokers, Chest X ray with lesions, patients with past history of Pulmonary TB.

97 asthmatics that satisfied the essential criteria were recruited into the study and their Body Mass Index calculated by the given formula. They were placed into one of the two groups obese and non-obese, based on the classification of Misra et al for Asian Indians. Those with BMI less than 22.9kg/m² were considering non-obese and those with BMI above 23.0kg/m² were considered obese. A detailed history was taken and patients investigated.

INVESTIGATIONS DONE:

- Complete blood picture, fasting and post prandial blood sugars.
- Absolute Eosinophil count.
- Chest x-ray PA view.
- Body Mass Index= weight in kgs/height in m².
- Spirometry (Model Spirowin Version 0.2).

STATISTICAL ANALYSIS: The data was analysed using MS EXCEL and EPI-INFO-3.5.4 Version. The differences between means were tested using Student's unpaired 't' test or pooled 't' test. The differences between proportions were analysed using chi-square test. A 'P' value of less than 0.05 was considered to be statistically significant.

RESULTS: In this study, out of 97 asthmatics, 23 (23.7%) were obese and 74(76.28%) were non-obese. All patients were aged between 30 and 50 years.

Fig. 1: Obese and non-obese asthamatics

In both the obese and non-obese groups, there were a higher proportion of females – 65.2% and 52.7 % respectively.

Cough was more in the non-obese group (50-67.6%) when compared to the obese group (9-39.1%). However, breathlessness was more in the obese group (23-100%) when compared to non-obese group (70 - 94.9%). This was however not statistically significant.

Wheeze, seasonal variation, family history of atopy was similar in both the groups.

Mean duration of disease in years in the obese group was more (6.60±5.33 years) when compared to the non-obese group (4.62±3.28 years). 'P' 0.03 is statistically significant.

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n=97				
Sl. No.	Variable	Obese (n=23)	Non-obese (n=74)	p value
1	Cough	9 (39.1%)	50 (67.6%)	0.014 S
2	Breathlessness	23 (100%)	70 (94.9%)	0.57 N S
3	Wheeze	16 (69.6%)	63 (85.1%)	0.09 N S
4	Seasonal variation	22 (95.7%)	72 (97.3%)	0.69 N S
5	Family History of atopy	11 (47.8%)	29 (39.2%)	0.16 N S
6	Duration of Disease	6.60 ± 5.33 years	4.62 ± 3.28 years	0.03 S

Table I: Clinical features and variables compared between obese and non-obese groups

Moderate and severe persistent grade of asthma were found to be slightly higher in the obese group (43.5% and 47.8%) compared to non-obese group (43.2% and 47.3%). However, this was not statistically significant (p=0.99 N S).

Severity of Asthma	Obese n=23	Non-Obese n=74	Total n=97
Intermittent FEV ₁ ≥ 80%	0	6(8.1%)	6(6.2%)
Mild persistent FEV ₁ 80%	2(8.7%)	1(1.4%)	3(3.1%)
Moderate persistent FEV ₁ 60 to 80 %	10(43.5%)	32(43.2%)	42(43%)
Severe persistent FEV ₁ <59%	11(47.8%)	35(47.3%)	46(47.4%)

Table II: Severity of bronchial asthma in obese and non-obese groups

The mean absolute eosinophil count of obese group was found to be higher (688.7) compared to that of non-obese group (344.5) and the difference was statistically significant. (P=0.01 S)

Group	No. of subjects	Absolute eosinophil count	
		Mean	S.d.
Obese	23	688.7	96.7
Non-obese	74	344.5	85.2

Table III: Mean absolute eosinophil count of obese and non-obese groups

t=2.57; p=0.01 S.

The mean pre bronchodilator FEV₁ and FVC were comparable in both the groups, but the mean pre - FEV₁/FVC % was found to be higher in non-obese group (97.9) compared to the obese group(93.4). However this was not statistically significant p=0.15 N S.

Group	No. Of subjects	Pre - fev ₁ /fvc %	
		Mean	S d
Obese	23	93.4	14.8
Non-obese	74	97.9	12.3

TABLE IV: PRE - FEV₁/FVC % in obese and non-obese patients

p=0.15 N S.

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DISCUSSION: Data was collected from 97 patients of whom, 23 were obese and 74 were non-obese. The mean BMI of obese group was 29.0 and non-obese group was 18.6. Since the study was done in a government hospital, which caters to poorer people, the number of obese patients was far less than the non-obese. Because of this, true figures regarding prevalence could not be obtained.

In the obese group the mean age was 33.6 years and in the non-obese group it was 35.3 years.⁹ It was found that the number of female asthmatics was more in both obese and non-obese groups.¹⁰

67.6% of non-obese asthmatics had troublesome cough while only 39.1% of the obese group had such a complaint. Obese people experience more dyspnea because of the metabolic over load placed on their gas transport system and changed chest wall mechanics. In our study shortness of breath was seen in 100% of obese group and 95% of non-obese group, though this was not statistically significant.

The obese group showed mean duration of asthma of 6.6 years suggesting earlier onset compared to non-obese group at 4.62 years and this was statistically significant ($p=0.03$). Wheeze, family history and seasonal variation were similar in both the groups.

In the present study, more patients had moderate and severe persistent asthma in the obese group (43.5% and 47.8%) when compared to non-obese group (43.2% and 47.3%). However symptomatology among females was similar in both men and women in contrast to other studies where women were seen to be more symptomatic.

Absolute eosinophil count was more in the obese group (688.7) when compared to the non-obese group (344.5) this was statistically significant $p=0.01$.

Obesity has been known to reduce expiratory reserve volume (ERV) and functional residual capacity (FRC) because of alterations in chest wall mechanics. In the present study pre FEV₁, FVC AND FEV₁/ FVC % were all higher in the non-obese group.

Broadly speaking the findings of the present study were in congruence with other such studies done worldwide. However in contrast to other studies, the present study showed that severity of symptoms was not greater in females when compared with males. Most of our patients showed no clinical evidence of gastro-oesophageal reflux; sleep disordered breathing and coronary artery disease.

CONCLUSIONS:

1. Onset of bronchial asthma seems to be far earlier in obese asthmatics when compared to non-obese asthmatics. Duration of illness was seen to be longer in the obese group.
2. Breathlessness is more severe in obese asthmatics.
3. At spirometry obese asthmatics showed a marginally increased incidence of moderate and severe persistent asthma when compared to the non-obese group. FEV₁/ FVC % was lower in the obese group.
4. Even absolute eosinophil count was far greater in the obese group.
5. However cough was more in the non-obese group. Wheeze, history of atopy and seasonal variation were more in the non-obese group.

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AUTHORS:

1. G. Aruna
2. K. Sateesh Kumar
3. Neethi Chandra

PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of Pulmonary Medicine, S. V. Medical College, Tirupathi.
2. Post Graduate, Department of Pulmonary Medicine, S. V. Medical College, Tirupathi.
3. Assistant Professor, Department of Pulmonary Medicine, S. V. Medical College, Tirupathi.

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NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. G. Aruna,
Associate Professor,
Department of Pulmonary Medicine,
S. V. Medical College,
Tirupathi-517807,
Andhra Pradesh.
E-mail: popuriravi@rediffmail.com

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