Section: Pulmonary Medicine

Original Research Article

COMPARATIVE STUDY ON PREVALENCE, CLINICAL PRESENTATION AND PULMONARY FUNCTION TEST IN BRONCHIAL ASTHMA IN OBESE AND NONOBESE PATIENTS

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Abstract

Background: Asthma is a heterogeneous disease, usually characterized by chronic airway inflammation. It is defined by the history of respiratory symptoms such as wheeze, shortness of breath, chest tightness and cough that vary over time and in intensity, together with variable expiratory airflow limitation. Asthma in obese is more challenging to control and is associated with poor quality of life and requires more health care resources than in nonobese asthmatics. Bronchial asthma diagnosed based on clinical features and spirometry. There is decreased FEV1, decreased FEV1/FVC and reversibility is more than 12% and 200 ml after 15 minutes of inhaled bronchodilators administration. **Materials and Methods:** This is a Cross-sectional, analytical study was conducted in the Department of pulmonary medicine, Tertiary Care Teaching Hospital over a period of 1 year. Sixty asthmatics who satisfied the essential criteria were recruited into the study. **Result:** In this study FEV1 mild (>80% predicted) obese 1(10%) non obese 4(8%), moderate (50-80% predicted) obese 6(60%) non obese 20(40%), severe(30-50% predicted) obese 2(20%) non obese 23(46%) , very severe (<30% predicted) obese 1(10%) non obese 3(6%). In this study FVC (>80% predicted) obese 1(10%) non obese 8(16%), (50- 80% predicted) obese 7(70%) non obese 35(70%), severe(30-50% predicted) obese 2(20%) non obese 6(12%) , very severe (<30% predicted) obese 0(0%) non obese 1(2%). In this study, FEV1/ FVC >0.7 more in obese group 7(70%) compared to nonobese group 28(56%), FEV1/FVC<0.7 more in nonobese group 22(44%) compared to obese group 3(30%). **Conclusion:** The onset of bronchial asthma is early in obese asthmatics when compared to non-obese asthmatics. Breathlessness is more severe in obese asthmatics. However, cough with expectoration was more in the obese group. Wheeze, chest tightness, history of atopy and seasonal variation, family history of asthma were more in the non-obese group. Uncontrolled asthma is seen more commonly in obese asthmatics. At spirometry, obese asthmatics showed an increased FEV1/FVC ratio with decreased FEV1 and more decreased FVC.

INTRODUCTION

Asthma is a heterogeneous disease, usually characterized by chronic airway inflammation. It is defined by the history of respiratory symptoms such as wheeze, shortness of breath, chest tightness and cough that vary over time and in intensity, together with variable expiratory airflow limitation.[1]

Obesity is one of the important global issues for human health because of its increasing prevalence each year worldwide. Obesity is one of the severe phenotypes of asthma.2 Unfortunately, specific treatments other than weight reduction are not established because of the complexity of the severity mechanisms.[2] Clinical features of asthma with obesity are heterogeneous and affected by age at onset, the type of dominant airway inflammation, triggers of asthma, and race differences, which are consistent with the fundamental difference in obesity itself between Asian and Western countries.[3] The present review addresses the clinical characteristics, severity mechanisms, and the targeted factors for specific treatment in asthma patients with obesity, focusing especially on the phase of onset, whether

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early onset or adult onset of asthma, phenotypes of airway inflammation such as type 2 high or low or non-type 2, and race differences. Finally, possible therapies are discussed referring to recent clinical and basic studies.[4]

According to WHO, in 2008, over 1.4 billion adults older than 20 years of age were overweight; among them, approximately 200 million men and 300 million women were obese. In India, 12.1% of males and 16% of females are obese.[5]

Asthma in obese is more challenging to control and is associated with poor quality of life and requires more health care resources than in nonobese asthmatics.[6]

Respiratory symptomatology is more in obese asthmatics because of alteration 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.[7]

Bronchial asthma diagnosed based on clinical features and spirometry. There is decreased FEV1, decreased FEV1/FVC and reversibility is more than 12% and 200 ml after 15 minutes of inhaled bronchodilators administration.[8]

It is one of many distinctive asthma phenotypes, more common amongst adult women, is more likely to be nonatopic and characterized by a later onset. Childhood obesity-induced asthma phenotype has also been proposed. It is generally characterized by primary and predominantly atopic asthma, and the presence of obesity increases the severity of asthma in this phenotype.

MATERIALS AND METHODS

This is a Cross-sectional, analytical study was conducted in the Department of pulmonary medicine, Tertiary Care Teaching Hospital over a period of 1 year.

Criteria for Selection

- Patients with episodic symptoms of wheeze, breathlessness, chest tightness.
- Patients with symptoms with a family history of atopy.
- Spirometry showing significant reversibility (FEV1 reversibility more than 12% and 200 ml)

Inclusion Criteria

- Age 10 to 80 years
- Willing to participate in the study
- Normal chest x-ray

Exclusion Criteria

- Age <10 years > 80 years
- Unwilling to participate in the study
- Smokers
- Chest x-ray with lesions
- Patients with a past history of pulmonary tuberculosis

Study Procedure

- Sixty asthmatics who satisfied the essential criteria were recruited into the study.
- They were placed into one of the two groups obese and nonobese based on WHO BMI classification.
- Those with a BMI of less than 30 were considered nonobese, and those with BMI above or equal to 30 were considered obese.
- A detailed history and physical examination were done.

Patients Investigated for

- Complete blood picture
- Chest x-ray PA view
- Body mass index =weight in kg/height in meter2
- Koko spirometry was used

Spirometry Procedure

Initially explain the patient regarding the procedure

Ask the patient to put the mouthpiece into his mouth and ask the patient to take a deep breath and start blowing out hard and fast at least for 6 seconds

After blowing out, ask the patient to take a breath in and remove the mouthpiece.

Repeat the procedure till three acceptable flow volume curves obtained

Provided 200-400 mcg salbutamol (bronchodilator) through the inhaler

Wait for 10 minutes and repeat the procedure.

Repeat the procedure to three flow volume curves obtained.

Save the results and print the results.

Statistical Analysis of Data: The data has been entered into MS-Excel, and statistical analysis has been done by using IBM SPSS Version 24.0. For categorical variables, the data values are represented as numbers and percentages. To test the association between the groups, the chi-square test was used. For continuous variables, the data values are shown as mean and standard deviation. To test the mean difference between two groups, Student's t-test was used. All the p values having less than 0.05 are considered as statistically significant.

RESULTS

A total of 60 patients were included in the study and various aspects of the study Were analyzed as follows:

Table 1: Sex distribution of the patients in the study.

Group					**Total**
Obese				**Non-Obese**	
Sex	Female	Count	6	35	41
		% within SEX	14.6%	85.4%	100.0%
		% within GROUP	60.0%	70.0%	68.3%

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	Male	Count	4	15	19
		% within SEX	21.1%	78.9%	100.0%
		% within GROUP	40.0%	30.0%	31.7%
Total		Count	10	50	60
		% within SEX	16.7%	83.3%	100.0%
		% within GROUP	100.0%	100.0%	100.0%

Chi-square value = 0.385, P value = 0.535 (Not Sig.)
Asthma more common in females both in obese 6(60%), nonobese 35(68.3%) people.

Table 2: Asthma classification in patients in the study

Group					**Total**
Obese				**Non- Obese**	
Asthma Classification	Controlled	Count	1	8	9
		% within Asthma Classification	11.1%	88.9%	100.0%
		% within GROUP	10.0%	16.0%	15.0%
	Partially Controlled	Count	1	18	19
		% within Asthma Classification	5.3%	94.7%	100.0%
		% within GROUP	10.0%	36.0%	31.7%
	Uncontrolled	Count	8	24	32
		% within Asthma Classification	25.0%	75.0%	100.0%
		% within GROUP	80.0%	48.0%	53.3%
Total		Count	10	50	60
		% within Asthma Classification	16.7%	83.3%	100.0%
		% within GROUP	100.0%	100.0%	100.0%

Chi-square value = 3.579, P value = 0.167 (Not Sig.)

In this study group uncontrolled asthma common in obese group 8(80%) compared to non obese group 24(48%), partially controlled more common in non obese 18(36%) compared to obese group 1(10%), controlled more common in non obese 8 (16%) compared to obese 1(10%) group.

Table 3: patients FEV1 (POST BD) in the study Crosstab.

Group					**Total**
Obese				**Non-Obese**	
FEV1 (POST BD)	> 80	Count	1	4	5
		% within FEV1(POST BD)	20.0%	80.0%	100.0%
		% within GROUP	10.0%	8.0%	8.3%
	50-80	Count	6	20	26
		% within FEV1(POST BD)	23.1%	76.9%	100.0%
		% within GROUP	60.0%	40.0%	43.3%
	30-50	Count	2	23	25
		% within FEV1(POST BD)	8.0%	92.0%	100.0%
		% within GROUP	20.0%	46.0%	41.7%
	< 30	Count	1	3	4
		% within FEV1(POST BD)	25.0%	75.0%	100.0%
		% within GROUP	10.0%	6.0%	6.7%
Total		Count	10	50	60
		% within FEV1(POST BD)	16.7%	83.3%	100.0%
		% within GROUP	100.0%	100.0%	100.0%

Chi-square value = 2.361, P value = 0.501 (Not Sig.)

In this study FEV1 mild (>80% predicted) obese 1(10%) non obese 4(8%), moderate (50-80% predicted) obese 6(60%) non obese 20(40%), severe(30-50% predicted) obese 2(20%) non obese 23(46%) , very severe (<30% predicted) obese 1(10%) non obese 3(6%).

Table 4: Patients FVC (POST BD) in the study.

Group					**Total**
Obese				**Non-Obese**	
FVC (POST BD)	> 80	Count	1	8	9
		% within FVC (POST BD)	11.1%	88.9%	100.0%
		% within GROUP	10.0%	16.0%	15.0%
	50-80	Count	7	35	42
		% within FVC (POST BD)	16.7%	83.3%	100.0%
		% within GROUP	70.0%	70.0%	70.0%
	30-50	Count	2	6	8
		% within FVC (POST BD)	25.0%	75.0%	100.0%
		% within GROUP	20.0%	12.0%	13.3%
	< 30	Count	0	1	1
		% within FVC (POST BD)	0.0%	100.0%	100.0%
		% within GROUP	0.0%	2.0%	1.7%

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Total	Count	10	50	60
	% within FVC (POST BD)	16.7%	83.3%	100.0%
	% within GROUP	100.0%	100.0%	100.0%

Chi-square value = 0.80, P value = 0.849 (Not Sig.)

In this study FVC (>80% predicted) obese 1(10%) non obese 8(16%), (50- 80% predicted) obese 7(70%) non obese 35(70%), severe(30-50% predicted) obese 2(20%) non obese 6(12%) , very severe (<30% predicted) obese 0(0%) non obese 1(2%).

Table 5: PatiensFEV1/ FVC (POST BD) in the study

Group					**Total**
Obese				**Non-Obese**	
FEV1/FV C (POST BD)	> 0.7	Count	7	28	35
		% within FEV1/FVC (POST BD)	20.0%	80.0%	100.0%
		% within GROUP	70.0%	56.0%	58.3%
	< 0.7	Count	3	22	25
		% within FEV1/FVC (POST BD)	12.0%	88.0%	100.0%
		% within GROUP	30.0%	44.0%	41.7%
Total		Count	10	50	60
		% within FEV1/FVC (POST BD)	16.7%	83.3%	100.0%
		% within GROUP	100.0%	100.0%	100.0%

Chi-square value = 0.672, P value = 0.412 (Not Sig.)

In this study, FEV1/ FVC >0.7 more in obese group 7(70%) compared to nonobese group 28(56%), FEV1/FVC<0.7 more in nonobese group 22(44%) compared to obese group 3(30%).

Table 6: Descriptive of T-Test

N			**Mean**	**Std. Deviation**
AGE	Obese	10	51.10	17.792
	Non-Obese	50	50.02	18.329
	Total	60	50.20	18.096
BMI	Obese	10	33.8560	3.41124
	Non-Obese	50	22.5364	4.02753
	Total	60	24.4230	5.77448
NEUTROPHIL S (%)	Obese	10	69.10	5.195
	Non-Obese	50	62.08	12.710
	Total	60	63.25	12.052
EOSINOPHIL S (%)	Obese	10	3.00	2.000
	Non-Obese	50	6.74	6.050
	Total	60	6.12	5.743
DURATION OF STAY IN HOSPITAL	Obese	10	4.90	2.846
	Non-Obese	50	5.10	4.586
	Total	60	5.07	4.325
DURATION OF ASTHMA(yrs)	Obese	10	8.90	8.048
	Non-Obese	50	7.24	10.413
	Total	60	7.52	10.016

In this study mean age group in obese 51.10±17.792 and in nonobese 50.02±18.329.

- Mean BMI in obese 33.8560±3.41124 and in non obese 22.5364±4.02753
- Mean Neutrophils (%) in obese 69.10±5.195 and nonobese 62.08±12.710
- Mean Eosinophil (%) in obese 3±2 and nonobese 6.74±6.050
- Mean Duration of stay in hospital in obese 4.90±2.846 and nonobese 5.10±4.586
- Mean Duration of asthma (yrs) in obese 8.90±8.048 and nonobese 7.24±10.413

DISCUSSION

In this study group uncontrolled asthma common in obese group 8(80%) compared to non-obese group 24(48%), partially controlled more common in non-obese 18(36%) compared to obese group 1(10%), controlled more common in non-obese 8 (16%) compared to obese 1(10%) group.

A study conducted by Moses DM et al,[10] shown that obese adults were more likely to have poor asthma specific quality of life & poor asthma control than those with normal BMI. A study by Shannon novosad et al,[11] Obese asthmatics has poor asthma control and more severe asthma the mechanism behind poor asthma control in obese subjects, which remains unclear.

A study by Peter G et al,[12] shown that the obese asthma phenotype features poor asthma control, limited response to corticosteroids. A study by Magdelena muc et al,[13] shown obesity is a risk factor for asthma, and obese asthmatics have lower disease control and increased symptom severity.

In this study FEV1 mild obstruction (>80% predicted) obese 1(10%) non obese 4(8%), moderate

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(50-80% predicted) obese 6(60%) non obese 20(40%), Severe (30-50% predicted) obese 2(20%) non obese 23(46%), Very severe (<30% predicted) obese 1(10%) non obese 3(6%).

Sin et al,[14] in this study, the risk of airflow obstruction was no difference between the two BMI categories suggesting that obesity increases asthma symptoms and drug use but has little impact on airway obstruction.

Aruna et al,[15] Showed that patients with increased BMI (mean 29) who presented to the emergency room with acute exacerbations had higher FEV1(% predicted). Strine TW et al,[16] showed that patients with increased BMI (mean 29) who presented to the emergency room with acute exacerbations had higher FEV1(% predicted). Umusozbey et al,[17] The obese respondents, had a lower mean FVC, FEV1, FEV1/FVC values when compared to the respondents with normal weight ($p<0.05$).

In this study, FEV1 values are higher in the obese group compared to the nonobese group this study similar to other studies conducted by Aruna et al,[15] but opposite to studies conducted by Umusozbey et al.[17] No difference in FEV1 in both obese and nonobese in a study conducted by Sin et al.[14]

In this study FVC (>80% predicted) obese1(10%) non obese 8(16%), (50- 80% predicted) obese 7(70%) non obese 35(70%), severe (30-50% predicted) obese 2(20%) non obese 6(12%), very severe (<30% predicted) obese 0(0%) non obese 1(2%).

A study conducted by Aruna et al,[15] shown that pre-FVC higher in the non- obese group compared to the obese group. The study by Magdelena muc et al,[13] shown Mechanical restriction of the chest and increased intake of corticosteroids.

Umusozbey et al,[17] the obese respondents, had a lower mean FVC, FEV1, FEV1/FVC values when compared to the respondents with normal weight ($p<0.05$).

In this study, FVC values are higher in the nonobese group compared to the obese group. These results are similar to other studies. This indicates that due to mechanical restriction, FVC values are more decline in the obese group compared to the nonobese group.

In this study FEV1/FVC >0.7 more in the obese group, 7(70%) compared to nonobese group 28(56%), FEV1/FVC<0.7 more in nonobese group 22(44%) compared to obese group 3(30%).

A study conducted by Aruna et al,[15] shown that pre-FEV1/ FVC % higher in the non-obese group compared to the obese group.

Leone et al,[18] conducted a study in 121965 patients who referred to their clinics between 1999 and 2006; a significant decrease was noted in PFT as BMI values increased. Umusozbey et al,[17] The obese respondents, had a lower mean FVC, FEV1, FEV1/FVC values when compared to the respondents with normal weight ($p<0.05$)

In this study, the FEV1/FVC ratio higher in the obese group compared to the nonobese group. These results were opposite to all other compared studies. An increase in the FEV1/FVC ratio indicates a restrictive pattern in the obese group due to changes in chest wall mechanics.

Limitations of the Study

In our study, it is a cross-sectional study and done in Indian set up as the number of obese individuals is lesser compared to nonobese individuals and out of total asthma patients (60) who satisfied inclusion criteria obese (10) and nonobese were (50) it is the main limitation of our study. The sample size is small to represent the general population and larger studies involving more number of people to strengthen our conclusion.

CONCLUSION

The onset of bronchial asthma is early in obese asthmatics when compared to non-obese asthmatics. Breathlessness is more severe in obese asthmatics. However, cough with expectoration was more in the obese group. Wheeze, chest tightness, history of atopy and seasonal variation, family history of asthma were more in the non-obese group. Uncontrolled asthma is seen more commonly in obese asthmatics. At spirometry, obese asthmatics showed an increased FEV1/FVC ratio with decreased FEV1 and more decreased FVC.

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