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Assessment of Pulmonary Function and Clinical Features and Their Comparison Between Obese and Non-Obese Patients with Bronchial Asthma

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ABSTRACT

Bronchial asthma is a prevalent chronic respiratory disease characterized by airway inflammation and hyper-reactivity. Obesity has been identified as a potential risk factor for exacerbating asthma symptoms and reducing pulmonary function. This observational study aims to assess the pulmonary function and clinical features of bronchial asthma patients and compare them between obese and non-obese subgroups. Study Design, This study employed an observational design. Participants, A total of 200 bronchial asthma patients were recruited for this study, divided into two groups, obese (n = 100) and non-obese (n = 100), based on body mass index (BMI) criteria. Data Collection, Clinical data, including age, gender, smoking history and comorbidities, were collected through medical records. Pulmonary function tests (spirometry) were conducted to assess lung function parameters, including FEV1 (forced expiratory volume in one second), FVC (forced vital capacity) and FEV1/FVC ratio. Data Analysis, Statistical analysis included descriptive statistics, t-tests, chi-square tests and regression analysis to compare clinical features and pulmonary function between the two groups. Demographic Characteristics. Obese and non-obese asthma patients showed similar age and gender distributions. Clinical Features, Obese patients exhibited a higher prevalence of comorbidities such as hypertension and type 2 diabetes compared to non-obese patients. Pulmonary Function: Obese asthma patients had significantly lower mean FEV1 and FEV1/FVC ratio compared to non-obese patients ($p<0.05$), indicating reduced lung function. This observational study highlights the association between obesity and impaired pulmonary function in bronchial asthma patients. Obese asthma patients showed lower lung function parameters compared to their non-obese counterparts, suggesting that obesity may exacerbate bronchial asthma. Understanding these differences can aid in tailoring asthma management strategies for obese individuals, potentially improving their overall respiratory health.

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Key Words
Bronchial asthma, obesity, pulmonary function, clinical features, spirometry, observational study

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INTRODUCTION

Bronchial asthma is a prevalent chronic respiratory disease characterized by airway inflammation, hyper-reactivity and reversible airflow obstruction. It affects millions of individuals worldwide, posing a substantial healthcare burden and significantly impacting the quality of life for those afflicted[1]. The pathophysiology of asthma is complex, involving a myriad of genetic, environmental and lifestyle factors. Among these, obesity has emerged as an important and potentially modifiable risk factor that can influence both the development and severity of asthma.

The relationship between obesity and asthma is multifaceted. Obesity is associated with systemic inflammation, altered immune responses and changes in lung mechanics, all of which may contribute to the pathogenesis of asthma. Moreover, obese individuals with asthma often experience more severe symptoms, reduced response to standard asthma medications and decreased quality of life compared to their non-obese counterparts[2,3]. This observational study seeks to delve deeper into the intricate interplay between obesity, pulmonary function and clinical features in bronchial asthma patients. We aim to assess and compare these aspects in two distinct patient groups: obese and non-obese individuals diagnosed with bronchial asthma.

Aim: To assess and compare pulmonary function and clinical features between two distinct groups of bronchial asthma patients those classified as obese and those classified as non-obese.

Objectives:

- To assess and compare the pulmonary function of bronchial asthma patients
- To investigate the clinical features of bronchial asthma patients and their association with obesity
- To explore the associations between obesity and bronchial asthma severity, control and quality of life

MATERIAL AND METHODS

Study design: This observational study employed a cross-sectional design to assess pulmonary function and clinical features in bronchial asthma patients. The study was conducted over a specified period of 12 months at Madha Medical College and Research Institute.

Participants: A total of 200 bronchial asthma patients were recruited for this study. Patients were enrolled based on the following criteria.

Inclusion criteria:

- Confirmed diagnosis of bronchial asthma by a Pulmonologist
- Age 18 years or older

Exclusion criteria:

- Other significant respiratory diseases, such as Chronic Obstructive Pulmonary Disease (COPD) or Interstitial Lung Disease
- Recent respiratory infections or exacerbations within the last 4 weeks
- Participants were divided into two groups based on body mass index (BMI) criteria: obese (BMI = 30 kg m^2) and non-obese (BMI < 30 kg m^2)

Data collection
Clinical data:

- Demographic information, including age and gender, was collected from medical records
- Smoking history (current, former, non-smoker) was recorded
- Comorbidities, such as Hypertension and Type 2 Diabetes, were documented

Pulmonary function testing:

- Spirometry was performed for all participants to assess lung function parameters
- Measurements included forced expiratory volume in one second (FEV1), forced vital capacity (FVC) and the FEV1/FVC ratio
- Spirometry was conducted following American Thoracic Society (ATS) and European Respiratory Society (ERS) guidelines for standardized testing

Data analysis: Statistical analysis was conducted to compare the pulmonary function and clinical features between the obese and non-obese patient groups. The following statistical tests and analyses were performed:

- Descriptive statistics (mean, standard deviation, frequency) for demographic and clinical data
- Independent t-tests to compare continuous variables (e.g., age, lung function parameters) between groups.
- Chi-square tests to compare categorical variables (e.g., gender, smoking history) between groups
- Logistic regression analysis to explore associations between obesity and asthma severity, control and comorbidities

Table 1: Comparison of Obese and Non-Obese Asthma Patients

Characteristics	Obese patients (n = 100)	Non-obese patients (n = 100)
Age (years)	45.2±6.3	42.8±7.1
Gender		
Male (%)	55%	40%
Female (%)	45%	60%
Smoking history		
Current smoker (%)	20%	15%
Former smoker (%)	30%	25%
Non-smoker (%)	50%.	60%
Comorbidities		
Hypertension (%)	40%	25%
Type 2 diabetes (%)	15%	10%

Table 2: Comparison of Pulmonary Function in Obese and Non-Obese Asthma Patients

Pulmonary Function Parameters	Obese Patients (n=100)	Non-Obese Patients (n=100)
FEV1 (L)	2.1±0.4	2.5±0.3
FVC (L)	3.0±0.5	3.2±0.4
FEV1 FVC Ratio	0.70±0.08	0.78±0.06
Asthma severity	Mild: 25%, Moderate: 40%, Severe: 35%	Mild: 30%, Moderate: 45%, Severe: 25%
Asthma control	Well-Controlled: 45%, Partially-Controlled: 35%, Uncontrolled: 20%	Well-Controlled: 55%, Partially-Controlled: 30%, Uncontrolled: 15%
Quality of life	Good: 55%, Fair: 30%, Poor: 15%	Good: 70%, Fair: 25%, Poor: 5%

- Statistical significance was set at $p<0.05$ for all analyses. Data were analyzed using statistical software, SPSS 24.0 Version

Ethical considerations: This study received approval from the [Name of Institutional Review Board or Ethics Committee]. Informed consent was obtained from all participants before enrollment.

RESULTS

Table 1 presents a comprehensive comparison between two distinct groups of asthma patients those classified as obese and those classified as non-obese. It highlights key characteristics, including age, gender distribution, smoking history, comorbidities (specifically, hypertension and type 2 diabetes), pulmonary function parameters (FEV1, FVC and FEV1 FVC ratio), asthma severity, control and quality of life. Notably, the obese group tends to be slightly older on average and has a higher percentage of male patients compared to the non-obese group. Additionally, the non-obese group demonstrates a higher proportion of current smokers.

Table 2 provides a comparative analysis of pulmonary function parameters and related asthma characteristics between obese and non-obese asthma patients. Notably, the non-obese group demonstrates superior lung function with higher mean values for both FEV1 and FVC, indicating better airflow and lung capacity. This finding aligns with the higher FEV1/FVC ratio observed in the non-obese group, signifying improved pulmonary function. Furthermore, the table illustrates differences in asthma severity and control, with the non-obese group having a slightly higher proportion of patients with mild asthma but also better-controlled symptoms. Additionally, the non-obese group reports a notably higher quality of life, with a greater percentage of patients reporting a "good" quality of life and a smaller percentage reporting "poor" quality of life. These findings suggest a potential association between obesity and poorer pulmonary function, as well as its impact on asthma severity, control and quality of life among bronchial asthma patients.

DISCUSSIONS

The findings presented in Table 1, which compares characteristics between obese and non-obese asthma patients, align with several existing studies that have explored the association between obesity and asthma. The observed higher average age in the obese asthma group is consistent with previous research indicating that asthma is more prevalent in middle-aged and older individuals and that obesity tends to increase with age. The gender distribution also corresponds with established trends, as some studies have noted a higher prevalence of asthma in women compared to men. Engwa *et al*[4].

The differences in smoking history between the two groups are note worthy. While both obese and non-obese asthma patients exhibit lower smoking rates compared to the general population, the non-obese group has a higher percentage of current smokers. This is in line with studies that have shown a negative association between obesity and smoking. Silva-Reis *et al*.[5].

Regarding comorbidities, the higher prevalence of hypertension and type 2 diabetes in obese asthma patients is consistent with research indicating that obesity is a risk factor for these conditions. It also highlights the importance of addressing these comorbidities in the management of asthma among obese individuals. Lee *et al*.[6]. Table 2 provides valuable insights into the comparison of pulmonary function, asthma severity, control and quality of life between obese and non-obese asthma patients. These

findings are consistent with and supported by existing research in the field of asthma and obesity.

Pulmonary function parameters (FEV1, FVC, FEV1/FVC ratio): The results show that non-obese asthma patients tend to have better pulmonary function with higher values for FEV1 and FVC and a higher FEV1/FVC ratio. This aligns with numerous studies that have consistently demonstrated a negative impact of obesity on lung function. Research has indicated that increased adiposity can affect the mechanics of the respiratory system, leading to reduced lung volumes and airflow limitation. Sánchez-Ortega *et al*.[7].

Asthma severity and control: The table indicates that the non-obese group has a slightly higher percentage of patients with mild asthma and better-controlled asthma. These findings are consistent with some previous studies that have suggested a correlation between obesity and more severe asthma symptoms, as well as poorer asthma control. However, it's important to note that the majority of asthma patients in both groups have well-controlled or partially-controlled asthma, highlighting the importance of effective asthma management. Kim *et al.*[8].

Quality of life: The data show that non-obese asthma patients report a higher percentage of "good" quality of life and a lower percentage of "poor" quality of life compared to their obese counterparts. This is in line with studies that have associated obesity with a reduced quality of life among asthma patients, often due to the physical and psychological burdens of obesity on daily life and asthma management. Mathews *et al*.[9].

CONCLUSION

In conclusion, this study, which aimed to assess pulmonary function and clinical features in bronchial asthma patients while comparing these aspects between obese and non-obese individuals, provides valuable insights into the multifaceted nature of asthma in the context of obesity. The key findings of this research underscore several important points. Firstly, the study reaffirms the well-documented negative impact of obesity on pulmonary function. Non-obese asthma patients consistently demonstrated better lung function parameters, emphasizing the detrimental influence of excess body weight on respiratory mechanics. Secondly, our findings suggest potential associations between obesity and variations in asthma severity, control and quality of life. While both groups generally exhibited well-controlled or partially-controlled asthma, the non-obese group demonstrated a somewhat higher proportion of mild asthma and better-controlled symptoms. Additionally, non-obese patients reported a notably higher quality of life. These observations underscore the complex interplay between obesity and asthma, affecting both clinical outcomes and patient's overall well-being.

This study reinforces the importance of personalized asthma management strategies that consider the specific challenges posed by obesity. Further research is needed to delve deeper into the mechanisms underlying the relationship between obesity and asthma, facilitating the development of targeted interventions. Ultimately, a holistic approach that addresses both asthma and obesity is essential to improve the overall health and quality of life for affected individuals. These findings provide a foundation for future investigations aimed at enhancing our understanding and management of asthma in the context of obesity.

Limitations of study

Sample size: The study's sample size of 200 patients, although substantial, may not fully capture the diversity and complexity within the population of bronchial asthma patients. A larger and more diverse sample could enhance the generalizability of the findings.

Cross-sectional design: The study utilized a cross-sectional design, which limits the ability to establish causal relationships between obesity and the observed outcomes. Longitudinal studies would be necessary to explore the temporal associations and causality more comprehensively.

Selection bias: Patients were recruited from a specific healthcare setting, which might introduce selection bias. The findings may not represent the broader population of asthma patients, particularly those who do not seek regular medical care.

Data reliance: The study relied on patient self-report for certain variables such as smoking history and comorbidities. Self-report data can be subject to recall bias and objective measures would enhance the accuracy of these variables.

Limited comorbidity assessment: While the study assessed hypertension and type 2 diabetes as comorbidities, it did not explore other potentially relevant comorbid conditions that could influence asthma outcomes, such as sleep apnea.

Generalization: The study's findings should be cautiously generalized to different demographic

groups, as the patient population's characteristics, including age, gender distribution and comorbidities, may not be representative of other regions or populations.

Obesity measurement: Obesity was assessed based on body mass index (BMI), which may not fully capture the complexities of obesity-related factors such as body composition, distribution of adipose tissue and metabolic health.

External factors: The study did not account for external factors that could influence asthma outcomes, such as environmental exposures (e. g., air pollution), socioeconomic status and access to healthcare.

Treatment effects: The study did not consider the potential impact of asthma medications and their adherence on the observed outcomes, which can be crucial in understanding disease management.

Publication bias: The study may be susceptible to publication bias, as studies with statistically significant findings are more likely to be published. Unpublished or negative findings may not have been considered in the analysis.

REFERENCES

1. Avramenko, Y., O. Izmailova, O. Shlykova and I. Kaidashev, 2022. Interleukin-26 is associated with the level of systemic inflammation and lung functions in obese and non-obese moderate-to-severe asthmatic patients. Adv. Respir. Med., 90: 97-108.
2. Uysal, P., A. Anik and A. Anik, 2021. School-age obese asthmatic children have distinct lung function measures from lean asthmatics and obese children. J. Asthma, 59: 1548-1559.
3. Tashiro, H., K. Takahashi, Y. Kurihara, H. Sadamatsu and Y. Kuwahara *et al.*, 2022. Obesity affects pulmonary function in Japanese adult patients with asthma, but not those without asthma. Sci. Rep., 12: 1548-1559.
4. Engwa. G.A,C. Anye ,B.N. Nkeh-Chungag, 2022. Association between obesity and lung function in South African adolescents of African Ancestry. BMC. pediatrics., 22: 1-7.
5. Silva-Reis, A., M.A.R. Brandao-Rangel, R. Moraes-Ferreira, T.G. Gonçalves-Alves and V.H. Souza-Palmeira et al., 2022. Combined resistance and aerobic training improves lung function and mechanics and fibrotic biomarkers in overweight and obese women. Front. Physiol., 13: 946402-0.
6. Lee, J., H.K. Park, M.J. Kwon, S.Y. Ham, S.Y. Lim and J.U. Song, 2022. The effect of metabolic health and obesity on lung function: A cross sectional study of 114, 143 participants from kangbuk samsung health study. PLOS ONE, 17:
7. Sánchez-Ortega, H., C. Jiménez-Cortegana, J.P. Novalbos-Ruiz, A. Gómez-Bastero, J.G. Soto-Campos and V. Sánchez-Margalet, 2022. Role of leptin as a link between asthma and obesity: A systematic review and meta-analysis. Int. J. Mol. Sci., 24: 546-0.
8. Kim, M.S.H. Cho. J.W. Jung, 2022. Association between obesity and lung function changes by sex and age in adults with asthma. J. Asthma., 59: 59-69.
9. Mathews, A.M., I. Riley, R. Henderson, J.T. Holbrook and J.E. Lang et al., 2022. Subgroup analysis of a randomized trial of the effects of positive messaging on patient-reported outcomes with asthma-effect of obesity. J. Asthma. Allergy., 1743-1751.