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Original Research Article

Clinical Profile and Bronchodilator Reversibility Pattern in 100 Patients with Bronchial Asthma: A Prospective Observational Study

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Abstract

Background: Bronchial asthma is a chronic inflammatory airway disorder characterized by variable airflow obstruction and bronchodilator reversibility. Clinical characteristics and spirometric response patterns vary across populations. Aim is to study the clinical profile, comorbidities, and bronchodilator reversibility pattern in 100 patients with bronchial asthma.

Methods: This prospective observational study was conducted at a tertiary care hospital over 2 years. One hundred clinically diagnosed asthma patients attending chest OPD/IPD were included. Detailed history, examination, laboratory investigations, chest radiography, PEFR, and spirometry were performed. Bronchodilator reversibility (BDR) testing was conducted using inhaled salbutamol. An increase in FEV_1 ≥12% and ≥200 mL was considered significant.

Results: The mean age was 41.67 years. Males constituted 54% and females 46% (M:F = 1:0.85). Most patients (42%) were aged 21–40 years. Seasonal pattern was observed in 53% and seasonal-on-perennial in 28%. Upper respiratory symptoms were present in 78%, inhalant allergy in 53%, and positive family history in 35%. Comorbidities were present in 26%, with hypertension (15%) being most common. Sputum eosinophilia was seen in 47%, while AEC >500 cells/mm^3 was noted in 11%. After bronchodilator therapy, mean FEV_1 improved by 20%, FVC by 32%, and PEFR by 12%. Significant bronchodilator reversibility was observed in 86% of patients.

Conclusion: Bronchial asthma commonly affects young adults with male predominance in this cohort. Seasonal variation, inhalant allergy, and upper respiratory symptoms were frequent associations. Spirometry with bronchodilator reversibility remains a reliable diagnostic and monitoring tool in asthma.

Keywords: Bronchial asthma, Spirometry, Bronchodilator reversibility, FEV_1, PEFR, Clinical profile.

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Introduction

Bronchial asthma is a heterogeneous disease characterized by chronic airway inflammation and variable expiratory airflow limitation. It manifests clinically with wheeze, dyspnea, chest tightness, and cough that vary in intensity and over time. According to the Global Initiative for Asthma (GINA), asthma is defined by a history of respiratory symptoms along with variable airflow obstruction. [1,2]

Asthma affects approximately 300 million people worldwide and represents a significant public health burden. In India, the estimated burden exceeds 15 million individuals. Despite advances in therapy, asthma continues to cause morbidity due to poor disease control, environmental exposures, and comorbidities. Bronchodilator reversibility (BDR) testing using spirometry remains central to confirming diagnosis and assessing severity.

An increase in FEV_1 ≥12% and ≥200 mL after inhaled short-acting β2 agonist supports the diagnosis. [3,4]This study was undertaken to evaluate the clinical profile, comorbidities, laboratory parameters, and bronchodilator reversibility pattern in 100 patients with bronchial asthma attending a tertiary care hospital.

Materials and Methods

This prospective observational study was conducted in the Department of TB and Chest at a tertiary care teaching hospital over a period of two years. A total of 100 patients diagnosed with bronchial asthma were enrolled. The study protocol was approved by the Institutional Ethics Committee prior to commencement. Written informed consent was obtained from all participants, and confidentiality of patient data was maintained throughout the study. The diagnosis of asthma was based on clinical history, physical examination, and objective demonstration of variable airflow obstruction on spirometry.

Patients aged ≥10 years presenting with symptoms of cough, dyspnea, and wheeze, along with the presence of rhonchi on auscultation, were included. Patients with acute severe asthma, known cardiac disease (ruled out by electrocardiography), or other significant pulmonary pathology were excluded. All participants underwent detailed clinical evaluation, laboratory investigations (including hemogram and absolute eosinophil count), chest radiography, peak expiratory flow rate (PEFR), and spirometry. Bronchodilator reversibility testing was performed using inhaled salbutamol.

Baseline and post-bronchodilator spirometric parameters (FVC, FEV_1, FEV_1/FVC ratio, and PEFR) were recorded, and percentage improvement was calculated. Significant bronchodilator reversibility was defined as an increase in FEV_1 ≥12% and ≥200 mL. Data were entered into Microsoft Excel and analyzed using descriptive statistics. Continuous variables were expressed as mean ± standard deviation, and categorical variables as percentages.

Results

A total of 100 patients with bronchial asthma were included in the study. The mean age was 41.67 ± 13.8 years (range: 13–71 years). Males constituted 54% and females 46% (M:F = 1:0.85). Most patients were in the 21–40 year age group. Seasonal variation of symptoms was observed in more than half of the study population. Bronchodilator reversibility was demonstrated in the majority of patients. Detailed results are presented below.

Table 1: Age and Sex Distribution

Age Group (years)	Male	Female	Total (%)
10–20	7	5	12 (12%)
21–40	21	21	42 (42%)
41–60	16	16	32 (32%)
>60	10	4	14 (14%)
Total	**54**	**46**	**100 (100%)**

The highest prevalence (42%) was seen in the 21–40 year age group.

Table 2: Clinical Profile of Patients

Parameter	Number (%)
Sudden onset	40 (40%)
Insidious onset	60 (60%)
Late night/early morning symptoms	72 (72%)
Seasonal pattern	53 (53%)
Seasonal on perennial	28 (28%)
Perennial	19 (19%)
Upper respiratory complaints	78 (78%)
Inhalant allergy	53 (53%)
Positive family history	35 (35%)

Most patients had late night or early morning symptoms (72%). Seasonal or seasonal-on-perennial pattern was observed in 81% of cases.

Table 3: Laboratory and Radiological Findings

Parameter	Number (%)
AEC 101–200 cells/mm^3	50 (50%)
AEC >500 cells/mm^3	11 (11%)
Sputum eosinophilia	47 (47%)
Prominent BVM on X-ray	69 (69%)
Hyperinflation	29 (29%)

Peripheral eosinophilia >500 cells/mm^3 was noted in 11% patients. Sputum eosinophilia was present in 47%.

Table 4: Bronchodilator Reversibility (Post-Salbutamol)

Parameter	Mean % Improvement	Patients with Significant Response (%)
PEFR	12%	71% (>6% improvement)
FVC	32%	82% (>11% improvement)
FEV_1	20%	86% (>12% improvement)

Significant bronchodilator reversibility (≥12% and ≥200 mL increase in FEV_1) was observed in 86% patients.

In addition, comorbidities were present in 26% patients, with hypertension (15%) being the most common, followed by diabetes (10%), obesity (4%), and GERD (3%). Majority of patients (44%) had duration of disease between 1–10 years, while 50% had asthma for more than 10 years.

Discussion

Bronchial asthma is a heterogeneous inflammatory airway disorder characterized by variable airflow obstruction and reversibility. The present study evaluated the clinical profile, laboratory characteristics, and bronchodilator reversibility in 100 patients from a tertiary care center. The findings highlight that asthma predominantly affects young and middle-aged adults, with seasonal variation and allergic associations being common. Spirometric evaluation with bronchodilator testing proved essential in confirming diagnosis and assessing severity. The overall pattern observed aligns with established epidemiological and physiological characteristics of asthma. [5,6]

In our study, the maximum number of patients (42%) were in the 21–40 year age group, with a mean age of 41.67 years. Similar findings were reported by Jindal et al. in a multicentric Indian study, where asthma prevalence was higher among young adults. Harpalsinh Dhabhi (2004) also reported a predominance in the 25–44 year group. International data from the ISAAC study demonstrated higher prevalence in adolescents and young adults. The slight male predominance (54%) observed in our study is consistent with findings by Niranjane (2008), although Western literature suggests gender equalization in adulthood. [7,8]

Seasonal variation was observed in 53% of patients, while 28% had seasonal-on-perennial symptoms. This correlates well with findings by R. Vishwanathan, who reported seasonal exacerbations in nearly half of Indian asthmatics. Similar seasonal trends have been described internationally, particularly in temperate climates due to pollen exposure. The predominance of late night and early morning symptoms (72%) in our study mirrors the findings of R.C. Bhasin, who documented nocturnal symptoms in 78.6% patients. Circadian variation in endogenous corticosteroids and epinephrine levels likely explains this pattern. [9,10]

Upper respiratory complaints were present in 78% of patients, and inhalant allergy in 53%. Jindal et al. reported strong association of allergic rhinitis with asthma in Indian populations. International studies have consistently demonstrated the "one airway, one disease" concept linking rhinitis and asthma. Positive family history was present in 35% of patients, comparable to the 38% reported by Vishwanathan. Genetic predisposition and atopy are well-established contributors in both Indian and global studies. [11,12]

Peripheral eosinophilia (>500 cells/mm^3) was seen in 11%, while sputum eosinophilia was present in 47% of patients. Gibson et al. demonstrated similar sputum eosinophil prevalence in asthmatics. Harpalsinh Dhabhi reported average AEC values comparable to our findings. These observations suggest that while blood eosinophilia may not always be elevated, airway eosinophilia remains an important inflammatory marker. Radiologically, 69% had prominent bronchovascular markings and 29% hyperinflation, similar to patterns described in classical radiologic studies of uncomplicated asthma. [13]

Bronchodilator reversibility was significant in 86% of patients, with mean FEV_1 improvement of 20% and FVC improvement of 32%. Raj Kumar reported FEV_1 improvement of 28% and similar reversibility trends. International spirometric guidelines emphasize ≥12% and ≥200 mL increase in FEV_1 as diagnostic, which was fulfilled in the majority of our patients. PEFR improved by 12%, slightly lower than some previous Indian studies, possibly due to inclusion of chronic longstanding cases. Overall, spirometry remains a reliable and indispensable tool in asthma diagnosis and management. [14]

Conclusion

Bronchial asthma commonly affects young adults with slight male predominance. Seasonal variation, inhalant allergy, and upper respiratory symptoms are frequent associations. Spirometry with bronchodilator reversibility testing remains a reliable and essential diagnostic and monitoring tool.

Early diagnosis, patient education, and adherence to therapy are critical in reducing morbidity.

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