



Original Article


Correlation between symptom control (ACT) and lung function (spirometry) in Asthma patients – A 24 weeks prospective study

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ABSTRACT

Background: Asthma control assessment commonly includes symptom-based tools such as the Asthma Control Test (ACT) and objective measurements like spirometry. However, discordance may exist between symptom perception and lung function. This study aimed to evaluate the correlation between ACT scores and spirometric parameters in patients with bronchial asthma over 24 weeks.

Materials and Methods: This prospective study was conducted in the Department of Respiratory Medicine at Rohilkhand Medical College and Hospital over a period of six months. A total of 138 patients diagnosed with bronchial asthma according to Global Initiative for Asthma 2025 guidelines were included. ACT scores and spirometric parameters were assessed at baseline and after 24 weeks of treatment.

Results: At baseline, 95% patients had ACT scores between 15–19 and 79% had FEV1 <60% predicted, indicating poorly controlled asthma with severe airflow limitation. After 24 weeks, 59.4% patients achieved ACT scores >19, while only 19.6% patients had FEV1 >80%. Improvement in ACT scores correlated with improvement in spirometric parameters; however, discordance between symptomatic control and lung function persisted in some patients.

Conclusion: Combined assessment using ACT and spirometry provides a more comprehensive evaluation of asthma control than either modality alone. Significant airflow limitation despite symptomatic improvement highlights the importance of objective lung function assessment for optimizing treatment, reducing exacerbation risk, and supporting progression towards asthma remission.

Keywords: Asthma; Asthma Control Test; Spirometry; FEV1; Asthma control; Bronchial asthma.

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INTRODUCTION

Asthma is defined as a “heterogeneous disease characterized by chronic airway inflammation. It is associated with the history of respiratory symptoms like wheeze, shortness of breath, chest tightness and cough that vary over time and in intensity, along with variable expiratory airflow limitation”.¹

Asthma can affect people of all ages.²

In India, asthma poses a substantial public health challenge. Approximately 34 million people in India are estimated to suffer from asthma, with mortality and disability-adjusted life years (DALYs) rates markedly higher than global averages.

³ Despite this high burden, diagnostic and monitoring tools such as spirometry are under-utilized, with reported utilisation rates as low as 9 – 18 % in clinical practice, contributing to underdiagnosis and delayed optimal management.³

Asthma Management goals are: - 1) To achieve good control of symptoms 2) To maintain normal activity levels 3) To minimize the risk of-Exacerbations, Persistent airflow limitation, Side-effects of medications, Asthma-related death.⁴

A patient is said to have uncontrolled asthma if he fulfils following criteria: ⁵

1. Daytime symptoms more than twice/week for past 4 weeks
2. Any night awakening in past 4 weeks
3. Use of reliever medication more than twice a week in past 4 weeks
4. Any kind of limitation in activity because of asthma in past 4 weeks

The Asthma Control Test (ACT) is a validated and widely used patient-administered questionnaire designed to assess asthma symptom control.⁶ It consists of five questions evaluating symptoms, rescue medication use, and the impact of asthma on daily activities over the previous four weeks. ACT is simple, practical, and correlates reasonably well with physician assessment of asthma control.⁶ However, symptom-based assessment alone may not accurately reflect the severity of airway obstruction, as some patients may have poor perception of symptoms or adapt to chronic airflow limitation.⁷

Spirometry is considered the gold standard objective tool for assessing airflow limitation in asthma.⁸ Parameters such as forced expiratory volume in one second (FEV1), forced vital capacity (FVC), and the FEV1/FVC ratio provide quantitative assessment of pulmonary function and are essential for diagnosis, monitoring, and prognostication.⁸ Several studies have demonstrated discordance between symptom-based asthma control scores and spirometric findings, suggesting that reliance on either assessment method alone may lead to underestimation or overestimation of disease control.^{7,9} Therefore, combining ACT with spirometric evaluation may provide a more comprehensive assessment of asthma control.

Although many studies have independently evaluated asthma control using ACT or spirometry, relatively few studies have combined both modalities to comprehensively assess barriers to asthma control. A combined ACT and spirometry-based evaluation may help identify patients with significant airflow limitation despite apparently controlled symptoms, as well as patients with significant symptom burden despite near-normal lung function.^{7,9} Such an integrated approach may improve individualized treatment strategies and optimize asthma management.

Therefore, the present study aims to evaluate the barriers in achieving asthma control using a combined assessment based on ACT scores and spirometric parameters. Understanding the relationship between subjective symptom perception and objective lung function may provide valuable insights into factors associated with poor asthma control and contribute to improved asthma management practices.

MATERIALS AND METHODS

Study Design - Prospective Study

Study Setting and Duration - The study was carried out in respiratory medicine department in Rohilkhand Medical College & Hospital, Bareilly, Uttar Pradesh for a period of 6 months.

Study population - Patients diagnosed as Bronchial Asthma, who come under inclusion criteria, in the respiratory medicine department, Rohilkhand Medical College and Hospital, Bareilly, U.P

Sample Size- The minimum sample size of the study is 138.

Inclusion Criteria:

1. All the patients diagnosed as Bronchial Asthma as per GINA 2025 guidelines.
2. Patients who were able to perform acceptable spirometry
3. Patients who were willing to give informed consent.

Exclusion Criteria:

1. Patients with any other concomitant respiratory illness like old or active tuberculosis, COPD, pneumonia, bronchiectasis, malignancies, interstitial lung disease etc.
2. Patients with comorbidities like cardiac illness or any other chronic disease.
3. Patients presenting in acute exacerbations.
4. Patients with history of smoking.

METHODOLOGY

Informed written consent was taken. Detailed clinical history, physical examination & relevant investigation were done as and when required. After diagnosing the patients with Bronchial Asthma as per GINA 2025, patients were assessed further with spirometry and Asthma Control Test (ACT) at the time of diagnosis and at 6 months follow up.

Asthma Control Test

All 138 patients were evaluated after six months of treatment using the ACT, a patient-completed questionnaire of five items with five response options investigating limitations at work or school due to asthma, the presence of day-time or night-time symptoms, the use of rescue medications, and the subjective perception of the level of asthma control during the previous four weeks.¹⁰ Depending on ACT score, the patients were categorised into three groups- A score between 20 and 25 represents well controlled asthma, while a score of 19 or below represents not well controlled asthma, and a score less than 16 indicates very poorly controlled asthma.¹¹

Spirometry

Maximal expiratory flow volume curves were obtained as per the American Thoracic Society (ATS) recommendations.¹² Dynamic lung volumes, like forced vital capacity (FVC) and forced expiratory volume in one second (FEV1) were measured as per guidelines.¹² The bronchodilator testing was done 20 minutes after 400mcg inhaled salbutamol, according to ATS recommendations.¹²

The values for evaluated as per the following¹³-

- FEV1 >80% = well controlled
- FEV1 60–80% = partly controlled
- FEV1 <60% = poorly/uncontrolled asthma

STATISTICAL ANALYSIS

The data was coded and entered, its clearing and compiling was done on a Microsoft excel spreadsheet and then it was imported into statistical package for social sciences (SPSS) version 23.0 for statistical analysis.

RESULTS

Table 1: - Asthma Control Test Scores at Different Time Points.

ASTHMA CONTROL TEST		N	%
Baseline	>19 score	0	0.0%
	15-19 score	131	95.0%
	<15	7	5.0%
24 Weeks	>19 score	82	59.4%
	15-19 score	79	57.2%
	<15	3	2.2%

At baseline, 95% participants had a score between 15-19 on the ACT and 5% patients had score <15. At 24 weeks, 59.4% had a score above 19, and 57.2% patients had ACT between 15-19 and 2.2% patients had ACT <15.

Table 2: - Spirometry Results at Different Time Points w.r.t. FEV1%

SPIROMETRY (FEV1 %)		N	%
Baseline	>/=80	0	0.0%
	>60 or <80	29	21.0%
	<60	109	79.0%
24 Weeks	>/=80	27	19.6%
	>60 or <80	107	77.5%
	<60	4	2.9%

At baseline, 79% of participants showed FEV1 less than 60%, while 21% exhibited FEV1 between 60-80%. At 24 weeks, 77.5% of participants FEV1 between 60-80%, while 2.9% had FEV1 <60%, with 19.6% showing FEV1 greater than or equal to 80%.

Table 3: - Comparison of Asthma Control by Spirometry and ACT Score

Asthma Control Category	ACT Score n (%)	Spirometry (FEV1%) n (%)
Controlled	82 (59.4%)	27 (19.6%)
Partially Controlled	53 (38.4%)	107 (77.5%)
Uncontrolled	3 (2.2%)	4 (2.9%)

At the end of the study, according to ACT, 59.4% patients had well controlled Asthma while only 19.6% patients had well controlled asthma according to Spirometry.

DISCUSSION

The present prospective study evaluated the correlation between symptom control assessed by the Asthma Control Test (ACT) and objective lung function measured by spirometry in patients with bronchial asthma over 24 weeks. The

findings demonstrated significant improvement in both ACT scores and spirometric parameters following treatment, while also highlighting significant airflow limitation in a subset of patients despite symptomatic improvement.

At baseline, 95% of patients had ACT scores between 15–19, indicating poorly controlled asthma, while 5% had very poorly controlled asthma. After 24 weeks of treatment, 59.4% achieved well-controlled asthma (ACT >19) while 2.2% patients had very poorly controlled asthma. These findings are comparable to the study by Nathan Robert A. et al., who demonstrated that ACT is a reliable tool for monitoring improvement in asthma control over time.⁶ Similarly, Schatz et al. reported that improvement in ACT scores correlates with clinically meaningful improvement in asthma outcomes.¹¹

Spirometric assessment in the present study revealed that 79% of patients had baseline FEV1 <60% predicted, reflecting severe airflow limitation and uncontrolled asthma. Following treatment, only 19.6% achieved FEV1 >80% predicted while 2.9% continued to have FEV1 <60%. These findings support the usefulness of spirometry in objectively assessing treatment response and airway obstruction. Similar observations were reported by the American Thoracic Society guidelines, which emphasize spirometry as the gold standard for asthma diagnosis and monitoring.^{8,12}

An important observation in the present study was the discordance between ACT scores and spirometric findings in significant number of patients. Although symptom control improved substantially, a considerable proportion of patients continued to demonstrate abnormal spirometry at follow-up. This finding is consistent with previous studies by Juniper et al. and Price et al., which showed that symptom perception may not always correlate with the degree of airflow limitation.^{7,9} Some patients may adapt to chronic symptoms or have poor perception of bronchoconstriction, resulting in apparently better controlled symptoms despite persistent airway obstruction, as seen by spirometry, which is an important risk factor for Asthma exacerbations.

Also, it is seen that in India, some patients with asthma may underreport symptoms or overestimate symptom control, potentially due to reluctance toward regular inhaler use.

The findings of the present study emphasize that incorporation of spirometry or other objective assessments along with symptom-based tools allows more accurate evaluation of asthma control and treatment response. Objective assessment helps to identify patients with significant airflow limitation who may otherwise be misclassified as controlled based on symptoms alone. Early identification of such patients, who are at risk of future exacerbations, may enable timely optimization of inhaled therapy, improve adherence and inhaler technique, reduce exacerbation risk, and enhance long-term clinical outcomes. Recent asthma management strategies increasingly emphasize achieving clinical remission, characterized by sustained symptom control, absence of exacerbations, and optimized lung function. Therefore, combining ACT with spirometry may contribute towards achieving better asthma control and progression towards asthma remission.

However, the study had certain limitations. It was conducted at a single tertiary care centre with a relatively short follow-up duration of 24 weeks. Larger multicentric studies with longer follow-up are needed to further validate these findings.

CONCLUSION

The present study demonstrated significant improvement in both Asthma Control Test (ACT) scores and spirometric parameters after 24 weeks of treatment in patients with bronchial asthma. However, discordance between symptom-based assessment and objective lung function was observed in significant number of patients, with significant airflow limitation despite symptomatic improvement which is an important risk factor for future exacerbations. These findings suggest that ACT alone may not adequately reflect airway obstruction and reinforce the importance of spirometry as an objective tool for monitoring asthma control and treatment response. Combined assessment using ACT and spirometry may help optimize therapy, reduce exacerbation risk, and support progression toward asthma remission.⁶⁻¹³

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