



CLINICAL PROFILES AND PULMONARY FUNCTION ASSESSMENT IN ADULT-ONSET ASTHMA PATIENTS

Respiratory Medicine

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ABSTRACT

Introduction: Asthma, influenced by age of onset, varies significantly between childhood and adulthood. Adult-onset asthma is notable with an incidence of 12 cases per 1,000 person-years. This study aims to examine the clinical profiles of adult-onset asthma patients, focusing on demographics, comorbidities, and lung function. **Materials & Methods:** Conducted over 18 months at Heritage Institute of Medical Sciences, Varanasi, this cross-sectional study included 150 patients over 20 years old, meeting GINA criteria. Data collected comprised demographics, medical history, asthma symptoms, and results from blood tests, chest X-rays, sputum eosinophil counts, and spirometry. Analysis was performed using SPSS version 26.0, with $p < 0.05$ considered significant. **Results:** The study found that 54.7% of patients were aged 21-40 years, with 61.3% being male. Common symptoms included cough (65.33%) and breathlessness (54.66%). Comorbidities were present in 24.7%, with hypertension (11.3%) and diabetes (8.66%) most common. Post-bronchodilator FEV1 assessment showed 32.66% had normal lung function, while others had varying impairments. Blood eosinophil counts were normal in 88%, though 16% had raised sputum eosinophils. **Conclusion:** Adult-onset asthma predominantly affects younger adults and males, with cough and breathlessness being common symptoms. Most patients had mild to moderate lung function impairment post-bronchodilator, with significant improvements observed. Personalized management strategies are crucial for treating adult-onset asthma.

KEYWORDS

Adult-onset asthma; Clinical profiles; Pulmonary function; Eosinophil counts; Bronchodilator response; Asthma management strategies

INTRODUCTION

Asthma, a heterogeneous disorder, exhibits significant variations influenced by the age of onset.[1] While the majority of asthma research focuses on allergic asthma initiating in childhood, adult-onset asthma is notable with an incidence of 12 cases per 1,000 person-years. [2,3] Advanced clustering methods have identified distinct asthma phenotypes based on clinical characteristics. In the Severe Asthma Research Program, five phenotypes were identified using 34 clinical variables, with 80% of subjects assignable to a cluster using just three variables: baseline forced expiratory volume in 1 second (FEV1) before bronchodilation, maximum FEV1 post-bronchodilation, and age of asthma onset. [4,5] Among these, a phenotype comprising exclusively adult-onset asthma patients was characterized predominantly by obese females. [6] Another phenotype, indicative of the most severe asthma cases, also predominantly featured adult-onset disease, exhibiting the most severe baseline airflow limitation and significant residual limitation post-bronchodilation. These findings corroborate earlier observations linking adult-onset asthma with a more rapid decline in lung function. [7] Despite substantial evidence supporting the emergence of asthma in adults without prior childhood respiratory symptoms, controversy persists regarding the recognition of adult-onset asthma as a distinct entity.

Eosinophils, as mediators of allergic inflammation, play a crucial role in the pathophysiology of a diverse array of illnesses, including organ-specific diseases, hyper-eosinophilic syndromes, asthma, neoplasms, and parasitic infections. Evaluating eosinophilic inflammation is therefore vital for accurate diagnosis and effective management. Eosinophilic inflammation and airway remodeling are hallmark features of asthma; however, the relationship between these two phenomena remains poorly understood. Normally, eosinophil counts are less than 500 cells per μL of blood or constitute less than 5% of the total white blood cell count. Eosinophils present in sputum serve as reliable direct indicators of airway irritation, and assessing sputum eosinophil counts can provide insights into the severity of the disease and the effectiveness of treatment. Elevated sputum eosinophil levels ($\geq 3\%$) are commonly used to diagnose eosinophilic asthma, though there is no universally accepted cutoff.

In the context of asthma, particularly adult-onset asthma, the role of eosinophils becomes even more critical. Sputum eosinophilia has been linked to steroid responsiveness, making it a valuable biomarker for guiding therapy. Despite advancements in understanding the inflammatory processes underlying asthma, there remain unresolved

questions about the illness, particularly regarding adult-onset asthma (AOA). Clinicians must gain a comprehensive understanding of all facets of the condition to develop optimal, individualized management plans and make informed decisions about current or novel treatment modalities. This study aimed to examine the clinical profiles of adult-onset asthma patients by analyzing their demographics, comorbidities, smoking history, disease severity, and lung function. By investigating these attributes, the study seeks to enhance the understanding of AOA, providing a foundation for improved patient management and tailored therapeutic strategies. This focus on adult-onset asthma is crucial, given its unique characteristics and the significant impact it has on affected individuals.

MATERIALS & METHODS

This cross-sectional study was conducted over 18 months at the Department of Respiratory Medicine, Heritage Institute of Medical Sciences, Varanasi. The study aimed to evaluate the clinical profiles and pulmonary function of adult-onset asthma patients. Patients over 20 years of age presenting with asthma symptoms and meeting the GINA diagnostic criteria were included. Exclusions were made for those with active pulmonary infections, inability to perform PFT, or inability to consent. A total of 150 patients, diagnosed based on PFT reversibility (FEV1 or FVC $\geq 12\%$ and ≥ 200 ml), were selected.

After obtaining ethical approval (IEC letter no. HIMS/IEC/119/2022, dated 22/11/2022) and informed consent, comprehensive assessments were conducted. Data collected included demographics, medical history, and asthma symptoms. Investigations included blood tests (CBC, eosinophils), chest X-rays, sputum eosinophil counts, and spirometry (RMS Helios 702). Pre- and post-bronchodilator spirometry tests were performed, with asthma severity assessed per GINA guidelines. Data analysis was done using SPSS version 26.0. Quantitative data were expressed as mean \pm standard deviation, and qualitative data as frequencies (percentages). The chi-square test compared categorical variables, with a p -value < 0.05 considered significant.

RESULTS

Table 1 represents the demographic and clinical profiles of adult-onset asthma patients. The age distribution shows that 54.7% of patients are between 21-40 years, 26.0% are between 41-60 years, and 19.3% are between 61-80 years. Gender distribution indicates that 61.3% of the patients are male, and 38.7% are female. In terms of occupation, 27.3% are farmers, 20.0% are students, 18.0% are housewives, 12.0% are

laborers/workers, 9.3% are in business, and 13.3% fall into other categories. Regarding socioeconomic status, 39.3% are from the middle class, 27.3% are from the upper class, and 33.3% are from the lower class. The total sample size is 150 patients.

Variables	Frequency	Percentage
AGE (Years)		
21-40	82	54.7%
41-60	39	26.0%
61-80	29	19.3%
Gender		
Male	92	61.3%
Female	58	38.7%
Occupation		
Farmer	41	27.3%
Student	30	20.0%
Housewife	27	18.0%
Labourer/Worker	18	12.0%
Business	14	9.3%
Others	20	13.3%
Socioeconomic Status		
Middle Class	59	39.3%
Upper Class	41	27.3%
Lower Class	50	33.3%
Total	150	100.0%

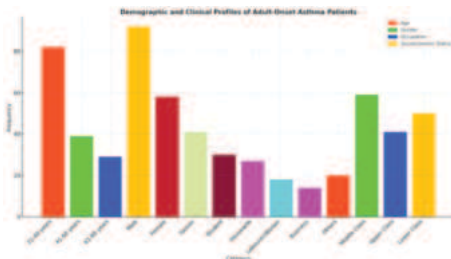


Table 2 represents the distribution of symptoms among adult-onset asthma patients. The majority of patients (65.33%) experienced cough, followed by 54.66% who reported breathlessness. Chest pain was present in 41.33% of the patients, while expectoration was observed in 29.33%. Wheeze was reported by 14% of the patients, and other symptoms were noted in 17.33%. This comprehensive breakdown highlights the prevalence of various symptoms in the study population.

Symptoms	Yes n(%)	No n(%)	Total N(%)
Cough	98 (65.33%)	52 (34.67%)	150 (100%)
Breathlessness	82 (54.66%)	68 (45.44%)	150 (100%)
Chest Pain	62 (41.33%)	88 (59.67%)	150 (100%)
Expectoration	44 (29.33%)	106 (70.67%)	150 (100%)
Wheeze	21 (14%)	129 (86%)	150 (100%)
Others	26 (17.33%)	124 (82.67%)	150 (100%)

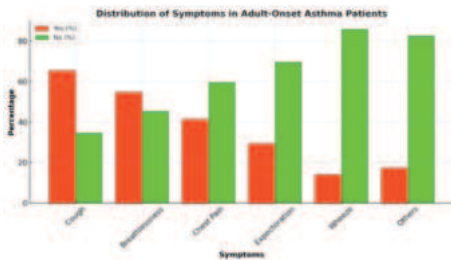


Table 3 represents the distribution of comorbidities, risk factors, past COVID status, and chest X-ray findings among adult-onset asthma patients. Comorbidities were present in a subset of patients, with 75.3% having none, 11.3% with hypertension, 8.66% with diabetes, 2.7% with coronary artery disease, and 2.0% with other conditions. Risk factors included no risk factor (42.7%), rhino-sinusitis (22.0%), obesity (11.3%), post-TB (9.3%), GERD (6.7%), nasal polyp (4.0%), psychological issues (3.33%), and respiratory infection (0.7%). Regarding past COVID status, 28.7% had a positive history, while 71.3% did not. Chest X-ray findings were mostly normal (74.7%), with hyperinflated lungs (11.33%), bronchiectasis (5.33%), pleural thickening (4.66%), fibrotic changes (2.66%), opacity (0.7%), and haziness (0.7%) also noted.

Category	Subcategory	Frequency	Percent
Comorbidities	None	113	75.3%
	Hypertension	17	11.3%
	Diabetes	13	8.66%
	Coronary artery disease	4	2.7%
	Others	3	2.0%
Risk Factors	No Risk Factor	64	42.7%
	Rhino-Sinusitis	33	22.0%
	Obesity	17	11.3%
	Post Tb	14	9.3%
	GERD	10	6.7%
	Nasal Polyp	6	4.0%
	Psychological	5	3.33%
Past COVID Status	No	107	71.3%
	Yes	43	28.7%
Chest X-ray Findings	Normal	112	74.7%
	Hyper inflated Lungs	17	11.33%
	Bronchiectasis	8	5.33%
	Pleural Thickening	7	4.66%
	Fibrotic Changes	4	2.66%
	Opacity	1	0.7%
	Haziness	1	0.7%

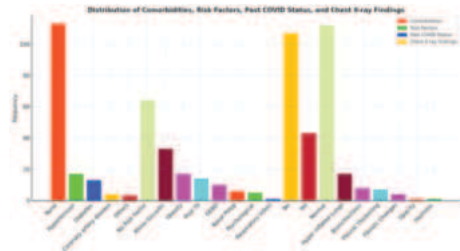


Table 4 found that post-bronchodilator FEV1 severity assessment based on ERS criteria showed that 32.66% of patients had normal lung function (>80% FEV1), while 26.0% had mild impairment (>70%). Moderate impairment (60-69%) was observed in 15.33% of patients, moderately severe impairment (50-59%) in 10.66%, severe impairment (35-49%) in 12.66%, and very severe impairment (<35%) in 2.66%.

FEV1 Range	Frequency	Percentage
Normal >80%	49	32.66%
Mild >70%	39	26.0%
Moderate 60-69%	23	15.33%
Moderately Severe 50-59%	16	10.66%
Severe 35-49%	19	12.66%
Very Severe <35%	4	2.66%

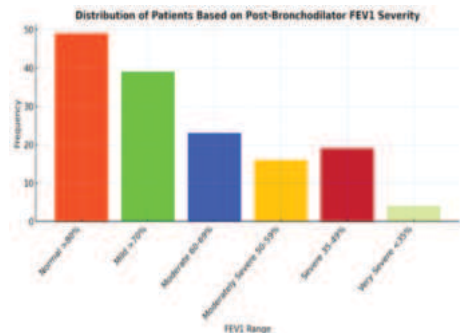
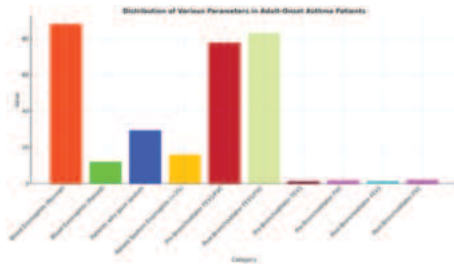


Table 5 assessed various parameters among adult-onset asthma patients. Blood eosinophil counts were normal in 88% of patients, with 12% showing elevated levels. Sputum analysis revealed that 29.33% of patients provided sputum samples, and among them, 16% had raised sputum eosinophils (>3%). The mean pre-bronchodilator FEV1/FVC ratio was 77.6, improving to 83.0 post-bronchodilator, both changes being statistically significant ($p < .001$). The mean pre-bronchodilator FEV1 was 1.24 with a standard deviation of 0.11, while the mean FVC was 1.58 with a standard deviation of 0.23. Post-bronchodilator values for FEV1 and FVC were 1.56 and 1.83, respectively, with standard deviations of 0.86 and 0.76, indicating significant improvements post-treatment.

Category	Frequency/ Value	Percentage/ SD	P-value
Blood Eosinophils (Normal)	132	88%	-
Blood Eosinophils (Raised)	18	12%	-
Total Patients	150	100%	-
Patients who gave sputum	44	29.33%	-
Raised Sputum Eosinophils (>3%)	24	16%	-
Pre-Bronchodilator FEV1/FVC	77.6	9.16	<.001
Post-Bronchodilator FEV1/FVC	83.0	7.36	<.001
Pre-Bronchodilator FEV1	1.24	0.11	0.065
Pre-Bronchodilator FVC	1.58	0.23	0.065
Post-Bronchodilator FEV1	1.56	0.86	0.867
Post-Bronchodilator FVC	1.83	0.76	0.867



DISCUSSION

The present study found that most adult-onset asthma patients were aged 21–40 years (54.7%), with 61.3% male and 38.7% female. The majority were farmers (27.3%), followed by students (20.0%) and housewives (18.0%). Socioeconomically, 39.3% were middle class, 33.3% lower class, and 27.3% upper class. Compared to Singh et al. [8] (2015), who reported more patients in the younger age group (20–30 years), and Kumar et al. (2023), who found higher asthma incidence in the 31–50 years age group, the present study shows regional age distribution differences. Gender distribution aligns with Kumar et al. [9] (2023), reporting a male predominance of 60%.

The study observed that 65.33% of patients experienced cough, 54.66% breathlessness, 41.33% chest pain, 29.33% expectoration, 14% wheeze, and 17.33% had other symptoms. Agrawal et al. [10] (2013) reported similar cough (70%) and breathlessness (60%) incidences, reflecting the present study's 65.33% and 54.66%, respectively. However, chest pain and wheeze incidences were lower in Agrawal's study, suggesting regional symptom variability.

The study found 75.3% of patients had no comorbidities, while 11.3% had hypertension and 8.66% diabetes. Risk factors included no risk factor (42.7%), rhino-sinusitis (22.0%), and obesity (11.3%). 28.7% had past COVID-19, and 74.7% had normal chest X-rays. Renymol et al [11] (2017) reported higher hypertension (15%) and diabetes (10%) rates, contrasting with 11.3% and 8.66% in the present study. Obesity was higher in Renymol's study (20%) versus 11.3% in the present study. Torrent et al. [12] (2007) found structural lung changes less common in early-life asthma, aligning with the present study's predominantly normal chest X-rays.

This study found that post-bronchodilator FEV1 severity assessment based on ERS criteria showed that 32.66% of patients had normal lung function (>80% FEV1), while 26.0% had mild impairment (>70%). Moderate impairment (60–69%) was observed in 15.33% of patients, moderately severe impairment (50–59%) in 10.66%, severe impairment (35–49%) in 12.66%, and very severe impairment (<35%) in 2.66%. This distribution highlights the varying degrees of airway obstruction among the studied patients. Singh et al. [8] (2015) reported different patterns in the severity of asthma. Their study did not specifically focus on the post-bronchodilator FEV1 ranges but highlighted that the majority of patients had moderate to severe asthma based on clinical symptoms and treatment response. Similarly, Kumar et al. [9] (2023) observed a higher prevalence of moderate to severe asthma in their patient population, with fewer patients exhibiting normal lung function post-bronchodilator. This suggests that regional and demographic factors might influence the severity of asthma presentations.

Additionally, the study assessed various parameters among adult-onset

asthma patients. Blood eosinophil counts were normal in 88% of patients, with 12% showing elevated levels. Sputum analysis revealed that 29.33% of patients provided sputum samples, and among them, 16% had raised sputum eosinophils (>3%). The mean pre-bronchodilator FEV1/FVC ratio was 77.6, improving to 83.0 post-bronchodilator, both changes being statistically significant ($p < .001$). The mean pre-bronchodilator FEV1 was 1.24 with a standard deviation of 0.11, while the mean FVC was 1.58 with a standard deviation of 0.23. Post-bronchodilator values for FEV1 and FVC were 1.56 and 1.83, respectively, with standard deviations of 0.86 and 0.76, indicating significant improvements post-treatment. This finding shows that 88% of patients had normal blood eosinophil counts aligns with Renymol et al [10] (2017) study, which also observed that a significant proportion of late-onset asthma patients had normal eosinophil levels. However, the prevalence of raised sputum eosinophils in the present study (16%) is lower than what was reported by Renymol, where around 25% of patients exhibited elevated sputum eosinophils. This discrepancy might be due to differences in patient selection criteria and regional variations in the inflammatory profiles of asthma patients. Agrawal et al. [11] (2013), also reported significant improvements in lung function parameters post-bronchodilator in their study of adult asthma patients. Agrawal et al. noted mean pre-bronchodilator FEV1/FVC ratios similar to the present study, with marked improvements post-treatment. This highlights the effectiveness of bronchodilator therapy in improving airway function in adult-onset asthma patients.

CONCLUSION

This study revealed that adult-onset asthma predominantly affects younger adults (21–40 years) and males, with cough and breathlessness being the most common symptoms. While most patients had mild to moderate lung function impairment post-bronchodilator, significant improvements were observed, confirming treatment efficacy. Normal blood eosinophil levels were found in the majority, although raised sputum eosinophils indicated airway inflammation in some patients. These findings emphasize the need for personalized management strategies in treating adult-onset asthma.

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