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Research Article

PREVALENCE, CLINICAL CHARACTERISTICS, AND QUALITY OF LIFE IN PHENOTYPIC AND ENDOTYPIC ASTHMA PATIENTS AT A TERTIARY CARE HOSPITAL, KURNOOL

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ABSTRACT

Asthma was a chronic inflammatory airway disease characterized by variable airflow obstruction, bronchial hyperresponsiveness, and symptoms such as wheezing, cough, and shortness of breath. It was recognized as a heterogeneous condition with different phenotypic and endotypic variations. The present study was conducted to determine the prevalence, clinical characteristics, and quality of life among patients with different asthma phenotypes and endotypes in a tertiary care hospital. A prospective observational study was carried out among diagnosed asthma patients, and data related to demographics, clinical history, risk factors, and laboratory parameters were collected. Asthma control and quality of life were assessed using standard clinical assessment tools and established guidelines. The study findings indicated that asthma was more common among middle-aged individuals and females. The most frequently observed symptoms included shortness of breath, cough, wheezing, and chest tightness. Environmental exposure, occupational factors, and obesity were identified as major risk factors. Eosinophilic type of asthma was found to be predominant. Improvement in disease control and quality of life was observed following treatment. The study concluded that identification of asthma phenotypes and endotypes was essential for better disease management, and early diagnosis along with individualized treatment significantly improved patient outcomes and quality of life.

Keywords: Asthma Control Test, Asthma, Endotype, Eosinophilia, Phenotype, Quality of Life.

INTRODUCTION

Asthma is a chronic inflammatory disorder of the respiratory system characterized by airway inflammation, bronchial hyper responsiveness, and reversible airflow obstruction. It is one of the most common chronic respiratory diseases worldwide and represents a major public health concern due to its increasing prevalence and associated healthcare burden. Asthma affects individuals of all age groups, including children and adults, and significantly impacts physical health, daily functioning, and overall quality of life. Global estimates suggest that hundreds of millions of people suffer from asthma, and its prevalence continues to rise due to factors such as urbanization, environmental pollution, industrialization, and changing lifestyle patterns. In developing countries, the burden of asthma is particularly significant because of limited healthcare access, poor awareness, and inadequate disease management (Abdo E. Q, 2025) Asthma is recognized as a heterogeneous disease with diverse clinical manifestations and underlying biological mechanisms. The observable clinical characteristics of asthma are referred to as phenotypes, which include factors such as age of onset, disease severity, triggers, frequency of exacerbations, and response to treatment. Several asthma phenotypes have been identified through clinical and epidemiological studies. Allergic asthma is the most common phenotype and often begins during childhood, frequently associated with other allergic conditions such as allergic rhinitis, eczema, and food allergies (Agache I, 2016) Non-allergic asthma occurs in individuals without a clear allergic background and is associated with different inflammatory

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pathways (Agache I, 2016) Late-onset asthma typically develops during adulthood and may present with more severe symptoms and reduced responsiveness to standard therapy (Bel E. H, 2004) Other phenotypes include obesity-related asthma, where increased body mass index influences airway inflammation and respiratory mechanics, and exercise-induced asthma, which is characterized by bronchoconstriction triggered by physical activity (Kumar R, 2015).While phenotypes describe the clinical presentation of asthma, endotypes refer to the underlying biological and molecular mechanisms responsible for the disease. Advances in immunology and molecular biology have enabled the identification of different asthma endotypes, among which eosinophilic and neutrophilic asthma are the most commonly recognized. Eosinophilic asthma is associated with elevated eosinophil levels and type-2 immune responses involving cytokines such as interleukin-4, interleukin-5, and interleukin-13 (Kumar R, 2015) This endotype generally responds well to corticosteroids and targeted biological therapies (Porpodis K, 2022) In contrast, neutrophilic asthma involves neutrophil-mediated inflammation and is often less responsive to conventional corticosteroid treatment (Haldar P, 2010).

Clinically, asthma presents with symptoms such as wheezing, cough, chest tightness, and shortness of breath, which may vary in frequency and severity among individuals and often worsen at night or early morning. Various environmental and physiological factors can trigger asthma symptoms, including allergens, air pollution, tobacco smoke, respiratory infections, cold air, and physical exertion. Diagnosis of asthma is based on clinical history, physical examination, and objective investigations such as spirometry to demonstrate airway obstruction and reversibility after bronchodilator administration (Global Initiative for Asthma, 2023).

Assessment of asthma control and its impact on patients' daily lives is an essential aspect of disease management. Tools such as the Asthma Control Test (ACT) and the Asthma Quality of Life Questionnaire (AQLQ) are widely used to evaluate symptom control and the effect of asthma on physical, emotional, and social well-being. In recent years, the concept of precision medicine has gained importance in asthma management, emphasizing individualized treatment based on clinical phenotypes, inflammatory profiles, and genetic factors. This approach has led to the development of targeted therapies aimed at specific inflammatory pathways (Qaid E. Y A, 2025). Understanding the relationship between asthma phenotypes, endotypes, and patient quality of life is essential for improving disease management and treatment outcomes. Therefore, the present study was conducted to evaluate the prevalence, clinical characteristics, and quality of life among phenotypic and endotypic asthma patients in a tertiary care hospital.

MATERIALS AND METHODS

Study Design

The present study was designed as a prospective observational study aimed at evaluating the prevalence, clinical characteristics, and quality of life among patients with different asthma phenotypes and endotypes.

Study Site

The study was conducted in the Department of Respiratory Medicine at Government General Hospital (GGH), Kurnool, Andhra Pradesh, India.

Study Duration

The study was carried out over a period of six months.

Sample Size

During the study, A total of 100 patients diagnosed with asthma were included in the study.

Data Collection

Patient data were collected using a structured proforma that included demographic details, clinical symptoms, risk factors, laboratory findings, and treatment outcomes. Asthma control and quality of life were assessed using ACT, AQLQ, and GINA.

RESULTS AND DISCUSSION

We have collected total 110 number of cases among them;10 patients were lost to follow up. The age-wise distribution of the study population revealed that the majority of patients belonged to the 31-40 years age group (33%), followed by 51-60 years (27%), while the least number of patients were observed in the age group above 60 years (8%). The mean age of the patients was found to be 44.04 ± 12.91 years, indicating that asthma was more prevalent among the middle-aged population. Gender-wise distribution showed a predominance of female patients (74%) compared to males (26%), suggesting a higher burden of asthma among females in the study population. With respect to the area of living, a greater proportion of patients were from rural areas (77%), whereas only 23% belonged to urban regions, indicating a higher prevalence in rural populations. The analysis of symptom distribution demonstrated that shortness of breath was the most common symptom, reported in 96% of patients, followed by cough (82%), chest tightness (79%), wheezing (76%), and cold (66%). These findings highlight the typical clinical presentation of asthma in the studied population. Evaluation of risk factors showed that occupational exposure (59%) and environmental factors (56%) were the major contributors to asthma, followed by obesity (38%),

eczema (20%), and exercise-induced asthma (9%). This indicates that external environmental and occupational factors play a significant role in disease occurrence.

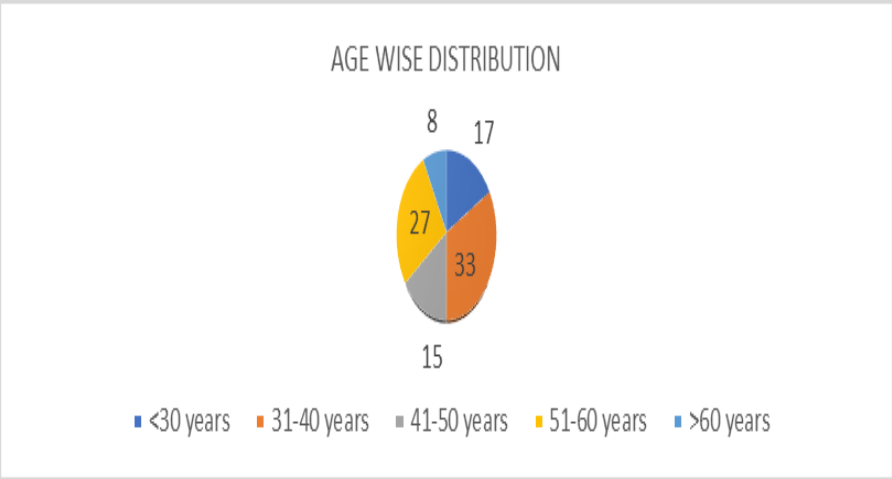

Figure 1. Age wise Distribution.

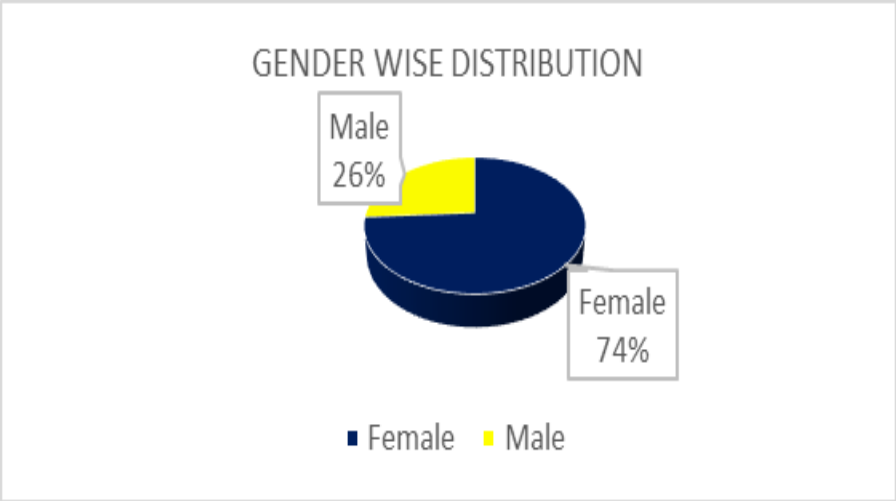

Figure 2. Gender wise Distribution.

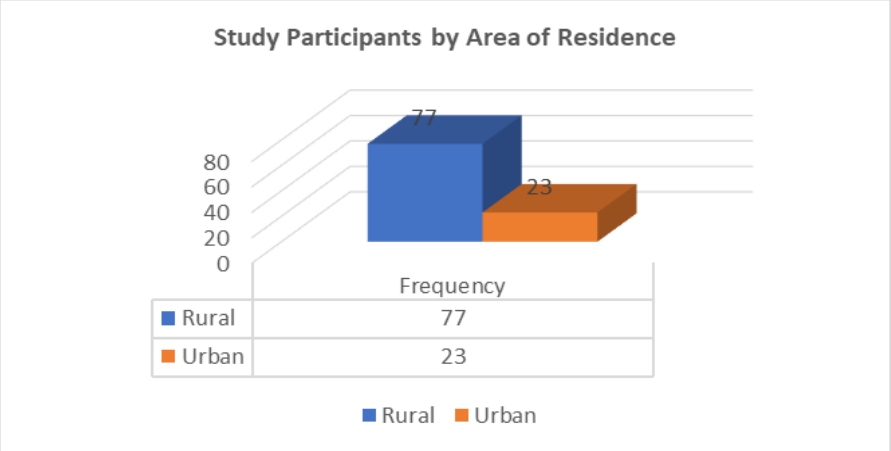

Figure 3. Distribution of Study Participants by Area of Residence.

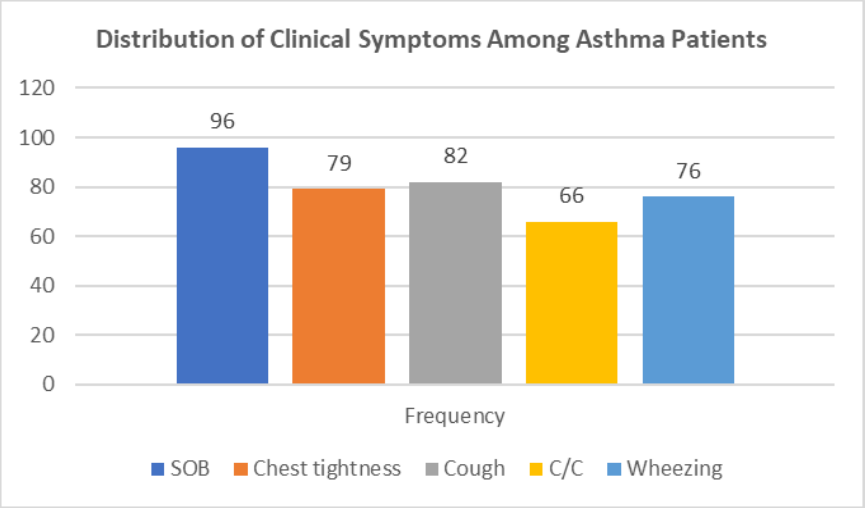

Figure 4. Frequency and Distribution of Clinical Symptoms Among Asthma Patients.

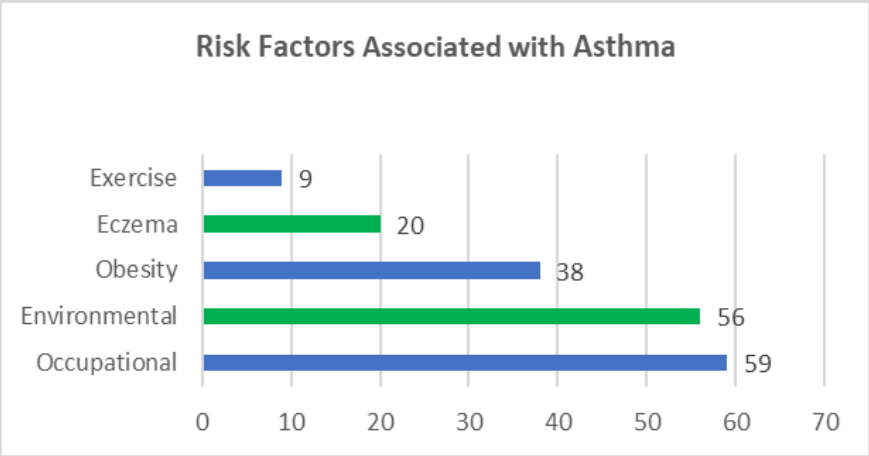

Figure 5. Risk Factors Associated with Asthma.

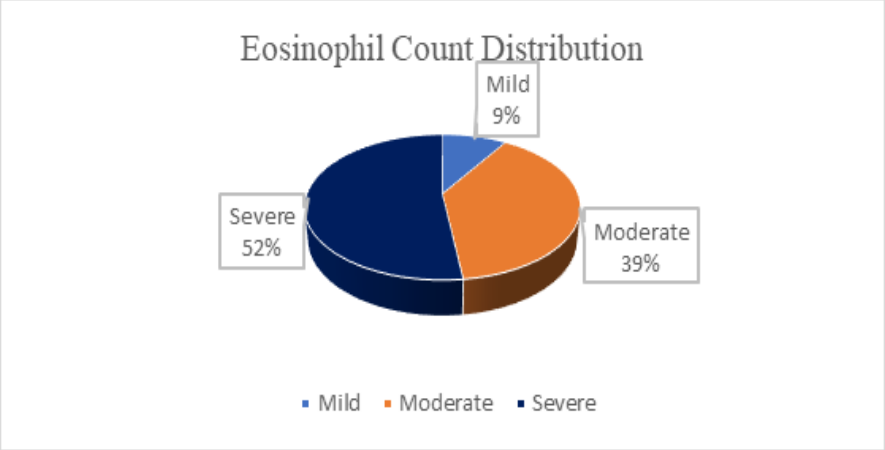

Figure 6. Eosinophil Count Distribution.

In contrast, eosinophil counts were elevated in a significant number of patients, with 52% showing severe eosinophilia, 39% moderate, and 9% mild, with a mean eosinophil count of 574.79 ± 230.39, indicating a predominance of eosinophilic asthma (Figure 1-6).

Table 1. Duration of Illness.

Duration less than 1 year	Frequency	Percentage
Yes	80	80
No	20	20
Total	100	

A majority of patients (80%) had a disease duration of less than 1 year, indicating early diagnosis or recent onset.

Table 2. Asthma Control Test (ACT). ACT chi-square test**.**

ACT_ pre o.p	ACT _ Post o.p		Total No. (%)	Chi-square P value
	Moderate No. (%)	Better control No. (%)		
Minimal	29 (37.2)	49 (62.8)	78	11.520
Moderate	0 (0)	7 (100)	7	
Better control	0 (0)	15 (100)	15	0.003
Total	29 (29)	71 (71)	100	

The chi-square test analysis ($\chi^2 = 11.520$, $p = 0.003$) demonstrated that the improvement observed between pre-operative and post-operative ACT scores was statistically significant. This confirms that the intervention had a meaningful impact on enhancing asthma control among the study population (Table 1).

Table 3. Asthma quality of life questionnaire (AQLQ).

AQLQ _ pre o.p	AQLQ _Post o.p				Total No. (%)	Chi-square P value
	Mild No. (%)	Minimal No. (%)	Moderate No. (%)	Severe No. (%)		
Moderate	5 (62.5)	3 (37.5)	0 (0)	0 (0)	8	10.553
Severe	15 (16.3)	51 (55.4)	20 (21.7)	6 (6.5)	92	
Total	20	54	20	6	100	0.014

The chi-square test results ($\chi^2 = 10.553$, $p = 0.014$) confirmed that the improvement in AQLQ scores was statistically significant. Therefore, the intervention played a crucial role in improving the quality of life of asthma patients (Table 2).

Table 4. Global initiative for asthma (GINA).

GINA scale	Pre OP		Post OP	
	Frequency	Percentage	Frequency	Percentage
0	0	0	3	3
1	11	11	87	87
2	36	36	10	10
3	51	51	0	0
4	2	2	0	0
Total	100	100	100	100

GINA Chi – square test

GINA scale_pre	GINA scale _Post			Total No. (%)	Chi-square P value
	0 No. (%)	1 No. (%)	2 No. (%)		
1	3 (27.3)	8 (72.7)	0 (0)	11	26.096
2	0 (0)	32 (88.9)	4 (11.1)	36	

3	0 (0)	45 (88.2)	6 (11.8)	51	<0.001
4	0 (0)	2 (100)	0 (0)	2	
Total	3	87	10	100	

The chi-square analysis ($\chi^2 = 26.096$, $p < 0.001$) showed a highly significant difference between pre-operative and post-operative values. This indicates that the intervention was highly effective in reducing asthma severity.

Table 5. Paired Student t-Test for All Scales.

Paired Samples Statistics				
		Mean	**Std. Deviation**	**T test P value**
Pair 1	ASTHMA CONTROL TEST_PRE O. P	2.493	.9241	22.037
	ASTHMA CONTROL TEST_POST O. P	4.100	.3411	<0.001
Pair 2	AQLQ_PRE O. P	2.165	1.0758	39.959
	AQLQ_POST O. P	5.4160	.88674	<0.001
Pair 3	GINA SCALE_PRE O. P	2.44	.715	19.030
	GINA SCALE_POST O. P	1.07	.355	<0.001

The paired Student t-test analysis further analyzed these findings by comparing mean scores before and after intervention. The ACT mean score increased from 2.493 to 4.100, indicating improved asthma control. Similarly, the AQLQ mean score increased from 2.165 to 5.416, reflecting better quality of life. In contrast, the GINA mean score decreased from 2.44 to 1.07, indicating reduced disease severity. In our study of 100 asthma patients, 56% were found to be employed in high-risk occupations involving exposure to dust, fumes, or chemical irritants—such as agriculture, construction, and manufacturing. This figure is higher than previously reported estimates, where occupational asthma has been attributed to approximately 15–25% of adult cases, as documented by earlier studies (Bel E. H, 2004, Haldar P, 2008). The elevated prevalence in our sample may reflect occupational patterns and regional exposures specific to our study population. We observed eosinophilic asthma in 47% of patients, consistent with the findings that emphasized eosinophilic inflammation as a predominant asthma phenotype (Wenzel S. E, 2012).

Supporting this, our data showed a higher frequency of sputum eosinophilia and elevated absolute eosinophil counts among those in high-risk occupations. This reinforces the utility of simple inflammatory markers in phenotype classification, as also noted in previous studies (Gibson P. G,2001), and underscores their role in guiding anti-eosinophilic therapies. The allergic phenotype, characterized by elevated serum IgE and positive skin prick tests, was present in 63% of patients. This aligns with previous work that identified IgE-mediated mechanisms as dominant in early-onset allergic asthma (Bel E. H, 2004, Holgate S. T, 2008). Our findings support the use of serum IgE as a practical biomarker, particularly when considering targeted therapies such as anti-IgE monoclonal antibodies in sensitized individuals. The present study evaluated the prevalence, clinical characteristics, and quality of life among asthma patients in a tertiary care hospital setting. The results revealed that the majority of patients belonged to the 31–40-year age group, indicating that asthma significantly affects individuals in their productive years. Gender distribution showed that females were more affected than males. Similar findings have been reported in previous studies where hormonal factors, environmental exposure, and healthcare-seeking behavior may contribute to higher prevalence among females (Pavord I. D, 2018). The study also demonstrated that rural residents constituted a higher proportion of the study population. This may be due to increased exposure to dust, agricultural allergens, biomass fuel smoke, and limited healthcare accessibility in rural regions.

Shortness of breath and cough were the most frequently reported symptoms, which are classical manifestations of asthma (Holgate S. T, 2008). Elevated eosinophil levels were observed in a significant proportion of patients, suggesting eosinophilic inflammation as a predominant asthma endotype. Quality of life assessment using ACT, AQLQ, and GINA scales showed significant improvement after treatment, highlighting the importance of proper pharmacotherapy and regular follow-up in asthma management (Global Initiative for Asthma, 2023, Global Initiative for Asthma, 2024). The study findings indicate that eosinophilic asthma was the most prevalent subtype. Occupational and environmental exposures played an important role in asthma exacerbations. Quality of life improved significantly following treatment, which is consistent with global asthma management strategies (Global Initiative for Asthma, 2024).

CONCLUSION

The findings of the present study emphasize the importance of identifying different asthma phenotypes and endotypes in order to improve the overall management of asthma. Asthma is a heterogeneous disease characterized by diverse clinical presentations, triggers, and inflammatory pathways,

which means that patients may respond differently to standard therapies. Identification of asthma phenotypes and endotypes is important for personalized treatment strategies. Early diagnosis and appropriate therapy can significantly improve patient outcomes and quality of life.

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CONFLICT OF INTERESTS

The authors declare no conflict of interest

ETHICS APPROVAL

Not applicable

FUNDING

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AI TOOL DECLARATION

The authors declares that no AI and related tools are used to write the scientific content of this manuscript.

DATA AVAILABILITY

Data will be available on request

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