



CORRELATION OF C-REACTIVE PROTEIN WITH FREQUENCY OF ASTHMA EXACERBATIONS: A HOSPITAL-BASED OBSERVATIONAL STUDY

General Medicine

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ABSTRACT

Background: Bronchial asthma is a chronic inflammatory disease of the airways with heterogeneous severity. Obesity and systemic inflammation are known contributors to worsening asthma. C-reactive protein (CRP), a marker of systemic inflammation, has been associated with asthma severity, but its relationship with frequency of exacerbations is less studied in the Indian context. **Objective:** To evaluate the correlation between CRP levels and frequency of asthma exacerbations in adult patients with bronchial asthma. **Methods:** This observational study was conducted over 24 months at Sri Siddhartha Medical College, Tumkur. Fifty-six asthmatic patients aged 20–60 years were enrolled. Participants were categorized into BMI groups (underweight, normal, overweight, obese). Data collected included clinical evaluation, spirometry, CRP levels, and history of exacerbations. Patients were grouped into those with ≥ 2 exacerbations and < 2 exacerbations in the past year. Statistical analysis was performed using chi-square and correlation tests, with significance set at $p < 0.05$. **Results:** Of the 56 patients, 25 (44.6%) experienced ≥ 2 exacerbations. Mean CRP levels increased progressively with BMI categories. Patients with ≥ 2 exacerbations had significantly higher CRP levels compared to those with fewer exacerbations ($p < 0.05$). A positive correlation ($r = +0.45$, $p < 0.001$) was found between CRP levels and exacerbation frequency. Obese patients (BMI ≥ 30) had the highest prevalence of frequent exacerbations (83.3%) with mean CRP 9.0 ± 1.2 mg/L. **Conclusion:** Elevated CRP levels are strongly correlated with increased frequency of asthma exacerbations. CRP may serve as a simple biomarker to identify patients at higher risk of poor asthma control, particularly in obese individuals. Weight management and anti-inflammatory strategies may be critical in reducing exacerbation burden.

KEYWORDS

Asthma, C-reactive protein, Obesity, Exacerbations, Pulmonary function.

INTRODUCTION

Bronchial asthma is a chronic inflammatory airway disorder characterized by reversible airflow obstruction and bronchial hyperresponsiveness. Globally, it affects an estimated 300 million individuals and contributes substantially to morbidity and healthcare burden^[1]. Exacerbations of asthma—episodes of worsening symptoms requiring additional treatment—represent a key determinant of quality of life and healthcare costs^[2].

Systemic inflammation is increasingly recognized as an important contributor to asthma severity. C-reactive protein (CRP), a sensitive biomarker of inflammation, has been shown to be elevated in asthmatic patients, particularly in obese individuals^[3]. Elevated CRP may reflect both airway and systemic inflammation, contributing to frequent exacerbations and poor control^[4].

While previous studies have assessed CRP in relation to asthma diagnosis and severity, there is limited data on the association between CRP and exacerbation frequency, especially in Indian populations where obesity and asthma prevalence are rising. This study aimed to evaluate the correlation of CRP with frequency of asthma exacerbations in obese and non-obese individuals.

METHODS

Study Design And Setting

This was a hospital-based observational study conducted in the Department of General Medicine, Sri Siddhartha Medical College, Tumkur, over a period of 24 months (2023–2025).

Participants

Fifty-six patients with physician-diagnosed bronchial asthma aged 20–60 years were included. Inclusion criteria were history of asthma symptoms (dyspnea, wheeze, nocturnal worsening) with spirometry confirmation. Exclusion criteria were: other respiratory conditions (COPD, ILD), smoking, pregnancy, ischemic heart disease, heart failure, and valvular disorders.

Data Collection

Demographic data (age, gender), BMI, clinical history, frequency of exacerbations, spirometry parameters (FEV1, FVC, FEV1/FVC ratio), and serum CRP levels were recorded using a structured proforma. BMI was categorized using WHO criteria. Exacerbations were defined as worsening of symptoms requiring systemic corticosteroids, ER visits, or hospitalization. Patients were grouped into ≥ 2 and < 2 exacerbations.

Laboratory Analysis

CRP levels were measured using standard immunoassay techniques. A mean CRP of 3 mg/L was considered normal.

Statistical Analysis

Data were analyzed using MS Excel and SPSS. Continuous variables were expressed as mean \pm SD. Categorical variables were analyzed using chi-square test. Correlation between CRP and exacerbation frequency was assessed using Pearson's correlation coefficient. A p -value < 0.05 was considered statistically significant.

RESULTS

Demographics

Of the 56 participants, 33 (59%) were male and 23 (41%) female. Majority (34%) were in the 41–50 years age group.

CRP And BMI

BMI Category	Mean CRP (mg/L)
Underweight (< 18.5)	3.0 ± 0.5
Normal (18.5–24.9)	4.0 ± 0.6
Overweight (25–29.9)	7.0 ± 0.8
Obese (≥ 30)	9.0 ± 1.2
p-value	< 0.001

CRP And Exacerbations

BMI Category	≥ 2 Exacerbations n (%)	< 2 Exacerbations n (%)
Underweight (< 18.5)	1 (16.7%)	5 (83.3%)
Normal (18.5–24.9)	7 (31.8%)	15 (68.2%)
Overweight (25–29.9)	7 (43.8%)	9 (56.3%)
Obese (≥ 30)	10 (83.3%)	2 (16.7%)
Total	25 (44.6%)	31 (55.4%)

Correlation Analysis

Variable	Correlation coefficient (r)	p-value
CRP vs Exacerbations	+0.45	< 0.001

DISCUSSION

This study demonstrates that higher CRP levels are significantly correlated with increased frequency of asthma exacerbations. Obese patients had the highest CRP levels and exacerbation burden, consistent with previous evidence linking obesity to systemic inflammation and worse asthma outcomes^[5,6].

CRP reflects systemic inflammatory activity and may represent a link

between obesity, airway inflammation, and poor asthma control^[7]. Elevated CRP has also been associated with steroid resistance and neutrophilic inflammation, mechanisms common in obesity-associated asthma^[8].

Our findings are in line with studies by Atashbaste et al.^[9], who reported higher CRP in severe asthma, and Raj et al.^[10], who found obesity to be strongly associated with uncontrolled asthma. The present study adds to the literature by demonstrating a clear association between CRP and exacerbation frequency.

Clinical Implications:

CRP could serve as a simple, low-cost biomarker for risk stratification of asthma patients. Targeted interventions such as weight management, dietary modifications, and anti-inflammatory therapies may help reduce exacerbation burden.

Limitations: The study is limited by its small sample size, single-center design, and use of CRP alone as an inflammatory marker. Larger multicentric studies incorporating additional biomarkers (IL-6, TNF- α) are warranted.

CONCLUSION

Serum CRP levels are positively correlated with the frequency of asthma exacerbations. Elevated CRP, particularly in obese individuals, identifies patients at higher risk for poor asthma control. CRP measurement may aid in risk stratification and guide targeted management strategies.

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