Original Article

The Relationship between Asthma Severity and Blood Biomarkers: Serum Periostin and IgE Levels in Iraqi Population

Aula Hamod and Zahraa Abdulaali Al-Mudhafar

ABSTRACT

Objective: To investigate the relationship between asthma severity and two blood biomarkers, serum periostin and IgE levels in Iraqi patients with asthma.

Study Design: Cross-sectional study

Place and Duration of Study: This study was conducted at the Department of Physiology, College of Medicine, University of Kufa from 1st January 2024 to 31st December 2024.

Methods: One hundred and fifty three asthmatic patients were enrolled. Individuals diagnosed with asthma, according to GINA criteria patients should meet the criteria; history of respiratory symptoms, such as wheeze, persistent dry cough or dyspnea at rest or on exertion that fluctuate in terms of duration and severity and low respiratory indices. Asthma severity was classified based on predicted FEV1 values: mild (>80%), moderate (60-80%), and severe (<60%). Serum periostin and IgE levels were measured. Statistical analysis included ANOVA and Chi-square tests.

Results: A significant association was found between asthma severity and IgE levels ($p = 0.046$), with higher IgE levels in severe cases. Although serum periostin levels increased with asthma severity, the difference was not statistically significant ($p = 0.051$). Mild cases had the lowest mean periostin levels, while severe cases had the highest.

Conclusion: Serum IgE levels showed a significant correlation with asthma severity, supporting its role in identifying allergic phenotypes. Serum periostin levels increased with severity, suggesting a potential role in airway remodeling, although statistical significance was not achieved. The combined use of these biomarkers may enhance asthma characterization and support personalized management strategies.

Key Words: Asthma, Serum periostin, IgE, Biomarkers, Airway remodeling, Asthma severity

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INTRODUCTION

Asthma affects millions worldwide and poses significant health, social and economic burdens. Its heterogenous nature means that clinical presentations and responses to standard treatments vary considerably among patients. A better understanding of the underlying immunological and inflammatory processes has led to the identification of specific biomarkers, such as serum IgE and Periostin, that are associated with allergic inflammation and airway remodeling.[1,2]

Periostin, an extracellular matrix protein its production enhanced by interleukin-13 (IL-13), has emerged as an indicator for type 2 (Th2-high) hypersensitivity reaction in asthma.[3] The higher levels of serum periostin are produced in patients with severe asthma, particularly in eosinophilic asthma. Matsusaka and colleagues[4] discovered that patients with severe asthma had considerably elevated serum periostin levels, which were also found to be connected with specific phenotypic characteristics though they were not consistently linked to total IgE concentrations.

Immunoglobulin E plays the main antibody that is involved allergic sensitization and pathogenesis o allergic asthma of atopic asthma. It is synthesized by B lymphocytes in response to allergens and is pivotal in stimulation of mast cells and basophils to release pro-inflammatory mediators. However, the association between total serum IgE and asthma severity is less robust than for periostin. Some studies indicate a weak or inconsistent relationship. For instance, in the study by Scichilone et al[5], higher IgE levels were observed in severe cases, but periostin had a stronger correlation with eosinophilic inflammation and disease control.

Interestingly, Tajiri et al[6] demonstrated that both serum periostin and immunoglobulin E could be a useful

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biomarkers to monitor treatment response to anti-IgE monoclonal antibody; omalizumab, particularly in cases of severe asthma, suggesting that combined biomarker strategies may offer more nuanced insights into disease monitoring.

Periostin is extensively researched as a biomarker for eosinophilic asthma. It is secreted by airway epithelial cells following Interleukin-4 and Interleukin-13 stimulation. Elevated periostin levels in asthmatic patients are indicative of chronic subepithelial fibrosis, a process that contributes to airway remodeling and fixed airflow limitation. Clinical studies have further linked high periostin levels to asthma exacerbations and a decline in lung function over time.[7,8]

Reviewed literature indicates that periostin serves as both a predictive and prognostic biomarker. In asthma, patients with high baseline periostin levels show a better response to anti–IL-13 therapies, suggesting that periostin could guide personalized treatment strategies.[2] Moreover, studies have demonstrated that periostin levels correlate with lung function decline in both asthma and IPF, reinforcing its value as a marker of disease progression.[9]

The elevated synthesis of IgE in response to allergen exposure is mediated by the activation of type 2 T-helper cells and the release of IL-4 and IL-13. The binding of IgE to high-affinity receptors on effect or cells stimulate the secretion of inflammatory mediators such as histamine, leukotrienes, and prostaglandins. These mediators induce bronchoconstriction, mucus production, and airway edema - all hallmarks of an asthma attack. Several studies have referred to the relations between asthma severity and blood IgE level where increasing IgE levels suggest a robust allergic inflammatory response that parallels clinical worsening.[10,11]

In parallel, periostin contributes to the structural changes observed in chronic asthma. Under the influence of IL-13 and IL-4, airway epithelial cells up-regulate periostin production. This protein then facilitates subepithelial fibrosis by interacting with extracellular matrix (ECM) components and promoting collagen cross-linking2. Through its effects on fibroblast differentiation into myofibroblasts and modulation of collagen deposition, periostin fundamentally drives the remodeling process that leads to persistent airway narrowing.[12,13]

IgE is predominantly responsible for the initiation and enhancement of allergic reaction, periostin predominantly reflects the downstream consequences of chronic inflammation - namely, tissue remodeling and fibrosis. Both biomarkers, however, are up-regulated in response to a type 2 inflammatory environment. This shared immunological pathway suggests that an integrative assessment of serum IgE and periostin levels may provide complementary information. Whereas IgE levels indicate the extent of active allergic inflammation, periostin levels provide insights into long-term structural changes in the airways. Such a dual biomarker approach could potentially enhance the clinician's ability to both tailor treatment strategies and predict disease progression.[14]

While periostin and IgE may not correlate directly with each other, both serve important but distinct roles in asthma characterization. Periostin is more directly associated with airway remodeling and Th2-driven eosinophilic inflammation, while IgE reflects systemic atopic status. In the Swedish GA²LEN cohort, James et al[15] found that periostin related more closely to type 2 inflammation and lung function than total IgE, reinforcing the differential diagnostic utility of these markers.

METHODS

This cross-sectional study includes 153 patients from Alhilla Pulmonology outpatient clinic recruited from 1st January 2024 to 31st December 2024. This research is authorized by Ethical Approval Committee at Kufa College of Medicine. Individuals diagnosed with asthma, according to GINA criteria patients should meet the following criteria: i) a history of respiratory symptoms, such as wheeze, persistent dry cough or dyspnea at rest or on exertion that fluctuate in terms of duration and severity, and ii) low respiratory indices were included. Respiratory diseases other than asthma, malignancy, and heavy smokers were excluded. Statistical analysis has been performed utilizing SPSS-27. Independent test was used to compare means between two groups we used t-test. ANOVA test was used to compare means among three groups. Pearson Chi-Square test has been used to find the relationship between categorical variables. P value ≤ 0.05 was considered as significant.

RESULTS

Table No.1: Distribution of Asthmatic patients according to socio-demographic characteristics (N=153)

Variable	No.	%
Age (years)		
15-25	34	22.2
26-45	52	34.0
46-65	49	32.0
≥65	18	11.8
Gender		
Male	59	38.6
Female	94	61.4
Body mass index (Kg/m^2)		
Underweight (18.5)	1	0.7
Normal (18.5-24.9)	36	23.5
Overweight (25-29.9)	59	38.6
Obese (≥ 30)	57	37.3

Table No.2: The association between GINA severity grades and IgE (kU/l) level (N=153)

IgE (kU/l)	GINA severity grades			Total	P value
	Mild (>80%) (N=42)	Moderate (60-80%) (N=58)	Severe (< 60 %) (N=53)		
< 100	27 (64.3%)	26 (44.8%)	21 (39.6%)	74 (48.4%)	0.046
> 100	15 (35.7%)	32 (55.2%)	32 (60.4%)	79 (51.6%)	
Total	42 (100%)	58 (100%)	53 (100%)	153 (100%)	

Table No.3: The comparison among Asthma severity according to serum periostin (ng/ml) (N=153)

Asthma Severity	S. Periostin ng/ml	P value
Mild (PRED.FEV1 > 80) [N=42]	58.81±7.61	0.051
Moderate (PRED.FEV1 60 ≤ FEV1 ≤ 80) [N=58]	62.50±6.31	
Severe (PRED FEV1 < 60) [N=53]	67.99±10.05	

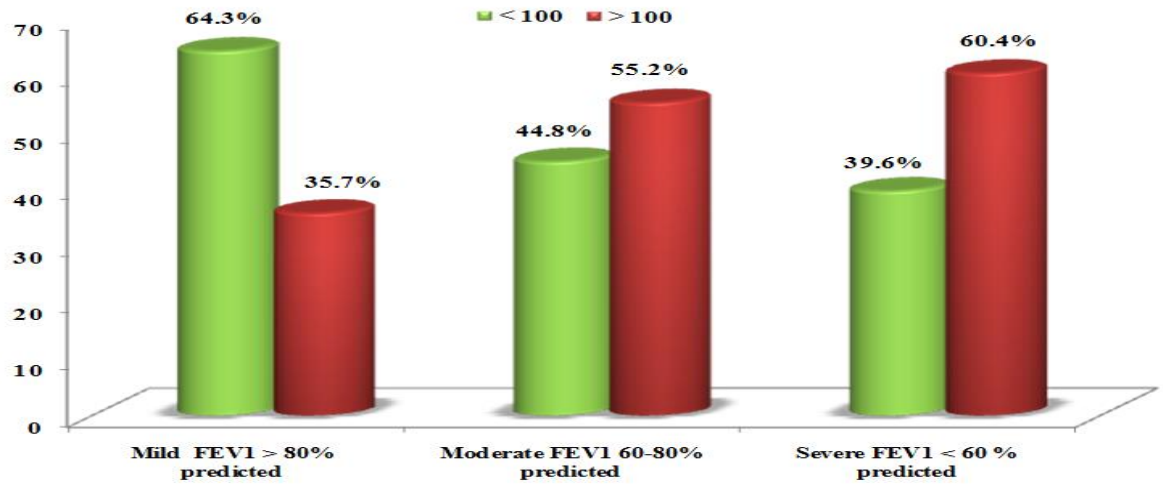

Figure No. 1: The association between asthma severity and IgE (kU/l) level

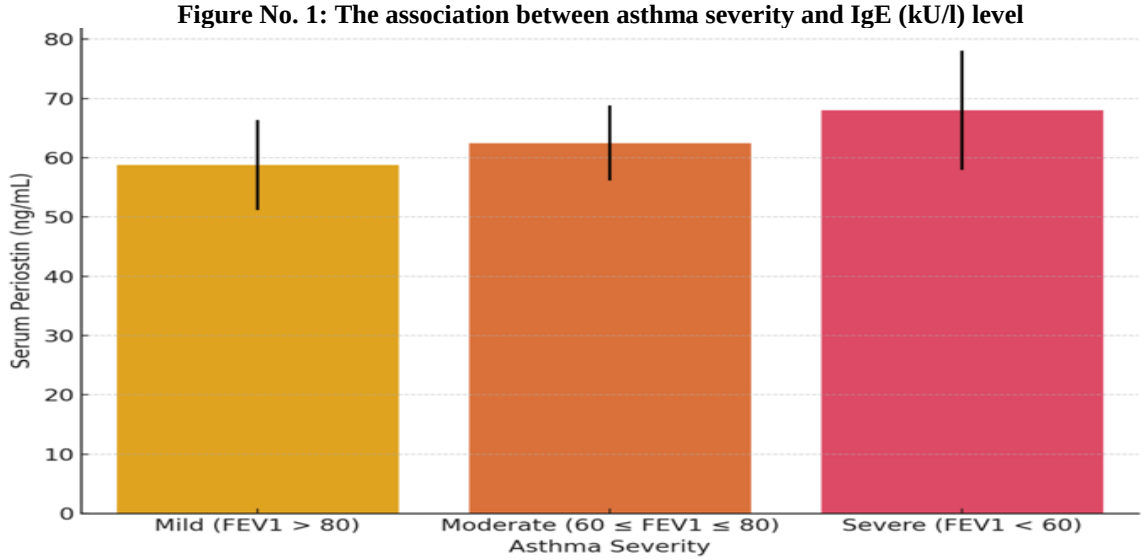

Figure No. 2: The comparison among GINA severity grades according to serum periostin (ng/ml)

Mean age of patients was 40.99±17.51 years, older patient was 83.0 years and younger patient was 15.0 years. More than one third of patients (N=52, 34.0%) presented with age group (25-45 years). Less than two third of patients were females (N=94, 61.4%). Mean body mass index was 28.61±5.38 Kg/m^2, with maximum value was 46.87 Kg/m^2 and minimum value was 15.21 Kg/m^2. Obese patients represent 57 patients (37.3%) [Table 1].

The association between Asthma severity including (Mild FEV1 predicted > 80%, Moderate FEV1 predicted (60-80%) and Severe FEV1 < 60 % predicted) and IgE (kU/l) level including (< 100 and > 100). There is significant relation between Asthma severity and IgE (kU/l) level. Majority of patients with Mild grade (N=27, 64.3%) presented with IgE (< 100 kU/l), while majority of patients with severe grade (N=32, 60.4%) presented with IgE (> 100 kU/l) [Table 2].

The comparison among Asthma severity including (Mild FEV1 predicted > 80%, Moderate FEV1 predicted (60-80%) and Severe FEV1 predicted (< 60 %) according to serum periostin (ng/ml). There was no significant mean difference of serum periostin (ng/ml) according to Asthma severity (Table 3). These values emphasize that serum IgE serves as a reliable laboratory parameter to distinguish between varying degrees of asthma severity. The increasing mean serum IgE levels support the notion that as the degree of chronic inflammation and allergic sensitization intensifies, so does the production of IgE (Fig. 2).

DISCUSSION

Clinically, serum IgE levels have been utilized to confirm an allergic phenotype in asthmatic patients. Elevated levels indicate that allergic mechanisms are contributing to the disease process, thereby guiding the clinician's choice of therapy, including the use of biologic therapies targeting IgE. Such targeted therapies, like omalizumab, act by neutralizing circulating IgE, thereby reducing airway inflammation.[16,17]

Although most studies on serum IgE and asthma severity have been conducted in populations outside Iraq, these findings offer a significant foundation for hypothesis development. In Iraq, environmental allergens such as dust and other pollutants may modulate IgE responses differently due to regional differences in exposure. Therefore, a similar study conducted in the Iraqi population could verify whether the same correlations hold true and might reveal unique patterns pertinent to this specific group.[18-20]

The Iraqi population presents unique challenges such as: Environmental Factors: High levels of dust and industrial pollutants may influence baseline levels of inflammatory biomarkers. Genetic Variability: Ethnic and genetic factors might affect IgE and periostin expression and should be accounted for by including a diverse sample representative of different Iraqi regions.

Resource Limitations: Assay costs and laboratory infrastructure may vary; therefore, it is essential to collaborate with regional medical centers and, if possible, integrate cost-effective yet reliable biomarker assessment techniques.

CONCLUSION

Serum periostin has proven to be a more specific and dynamic biomarker for assessing asthma severity, particularly in Th2-high and eosinophilic subtypes. In contrast, IgE remains valuable in identifying atopy but lacks consistent correlation with severity metrics. Integrating both biomarkers, possibly alongside others such as FeNO and eosinophil counts, could enhance asthma phenotyping and guide biologic therapy selection in clinical practice.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Aula Hamod, Zahraa Abdulaali Al-Mudhafar
Drafting or Revising Critically:	Aula Hamod, Zahraa Abdulaali Al-Mudhafar
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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