

Association of ABO Blood Groups and Early T2-Inflammatory Biomarkers in Pediatric Asthma: A Case–Control Study from Najaf, Iraq

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ABSTRACT

Background: Asthma is a long-term inflammatory disease of the airways that is prevalent mostly in children, and its early diagnosis is not easy because of the similarity of the disease to other respiratory diseases. **Objective:** This paper examines the interaction between the ABO blood groups and the early diagnostic biomarkers- FeNO, serum IgE, periostin, TSLP, and T2 cytokines in asthma in children. **Methods:** A total of 50 children with established asthma were recruited as well as 30 children with intermittent asthma-like symptoms recruited in Najaf teaching hospitals. **Results:** Asthmatic children, compared to the intermittent group, had significant increases in FeNO, IgE, periostin, TSLP, and T2 cytokines. There was a greater prevalence of blood group A in asthmatic children. The findings point to the possibility of using blood group distribution in conjunction with T2-inflammation biomarkers to improve the ability to detect asthma early and phenotype it in children. **Conclusions :** High levels of FeNO, IgE, periostin, TSLP, and T2 cytokines have a strong association with pediatric asthma. A- Splenic blood group A seems to be more prevalent in asthmatic children. The incorporation of the biomarkers with the ABO phenotyping can help to enhance early diagnosis of asthma.

Keywords: ABO Blood Groups, Inflammatory Biomarkers, Pediatric Asthma.

INTRODUCTION

Asthma is a category of airway diseases that are most prevalent in children and are manifested by frequent wheezing, coughing, airway hyperresponsiveness, and airflow variability [1]. Although earlier detection of asthma in children is still challenging

because similar symptoms are exhibited by viral infections, frequent wheezing, and exposure to the environment [2]. In recent research the attention has been on the type-2 (T2) inflammatory mechanisms that are of central role in asthma among children. Fractional exhaled nitric oxide (FeNO), total IgE, TSLP, periostin, and T2 cytokines (IL-4, IL-5, IL-13) have been considered as the key biomarkers to characterize the disease, to determine the presence of eosinophilic inflammation, and to predict the response to therapy [3-6]. These indicators are gradually integrated into customized asthma treatment and choice of biologic therapies [7,8]. The other developing field of interest is the relationship between ABO blood groups with inflammatory and allergic illnesses. The differences in the antigen expression determine immune responses, vulnerability to respiratory infections, and inflammatory phenotypes [9,10]. Various researchers have proposed that patients in blood group A are potentially at a greater risk of atopy, eczema, or asthma, but the results are conflicting [11-12]. Pediatric asthma has been on the increase in Iraq, particularly in urban areas like Najaf. Early biomarkers that can be used to differentiate between asthma and intermittent wheezing are vital in reducing underdiagnosis and better clinical outcomes.

This study aimed to: Compare T2-inflammatory biomarkers (T2 cytokines-FeNO, IgE, periostin, and TSLP) in asthmatic and intermittent-symptom children, evaluate the ABO blood group occurrence of the two groups, and Test biomarker-indicating asthma severity correlations.

MATERIALS AND METHODS

Study Design and Setting

A case-control study in: January -May 2025. Al-Najaf Teaching Hospital, Teaching hospital, Najaf, Iraq.

Study Groups

Asthma group (n = 50): a diagnosis made by a pulmonologist in children, based on GINA guidelines. Intermittent group (n = 30): intermittent wheezing, other than asthma.

Inclusion Criteria

- * Age 5-14 years
- * None in the last 3 weeks
- * No acute infection in the past 3 weeks
- * None in the last 10 days of corticosteroid therapy.

Exclusion Criteria

- * Congenital lung disease
- * Immunodeficiency
- * Chronic sinusitis
- * Prematurity

Biomarker Measurements

- * FeNO: was measured with NIOX VERO analyzer.
- * ELISA method. Total serum IgE.
ELISA kit (cloud-clone).
- * TSLP: ELISA.
- * T2 cytokine (IL-4, IL-5, IL-13) through multiplex immunoassay.
- * ABO blood group: standard agglutination analysis.

Statistical Analysis

- * T-test -Independent, continuous.
- * Chi-square test of blood groups.
- * Pearson correlation
- * Significance at $p < 0.05$

RESULTS

Table 1. shows the baseline characteristics of ages mean and males parentage who’s participant of the asthma and intermittent groups were similar, which means that demographic factors are unlikely to have any impact on biomarkers.

Table 1: Baseline data for ages and sex of the asthma and intermittent groups.

Parameters	Asthma (n=50)	Intermittent (n=30)	p-value
Age (years)	9.1 ± 2.4	8.6 ± 2.8	0.42
Males (%)	56%	53%	0.78

Table 2. indicated the comparison of biomarkers between asthma and intermittent groups, the results were confirmed in asthma by showing all measured inflammatory biomarkers significantly higher in asthmatic children than in the intermittent groups.

Table 2: The comparison of biomarkers between asthma and intermittent groups.

Biomarkers	Asthma	Intermittent	p-value
FeNO (ppb)	45.8 ± 8.2	27.9 ± 6.1	<0.001
IgE (IU/mL)	210 ± 40	118 ± 32	<0.001
Periostin (ng/mL)	65.3 ± 9.8	39.7 ± 8.4	<0.001
TSLP (pg/mL)	32.4 ± 5.6	18.3 ± 4.9	<0.001
T2 cytokines	9.1 ± 1.4	4.8 ± 1.1	<0.001

Table 3. indicated ABO blood groups distribution among asthmatic children, blood group A was more common and this indicates that blood group might be a contributory factor to asthma

Table 3: The comparison ABO blood groups distribution asthma and intermittent groups.

Blood Groups	Asthma (%)	Intermittent (%)	p-value
A	44%	27%	0.04
B	24%	30%	0.51
AB	10%	7%	0.62
O	22%	36%	0.09

Table 4. Indicated the Associations between FeNO and Biomarkers, FeNO had strong positive correlations with other T2-inflammatory biomarkers, which supported FeNO as a non-invasive measure of airway inflammation in children with asthma.

Table 4: The Associations between FeNO and Biomarkers.

Biomarkers	r-value	p-value
IgE	0.61	<0.001
Periostin	0.54	<0.001
TSLP	0.59	<0.001
T2 cytokines	0.63	<0.001

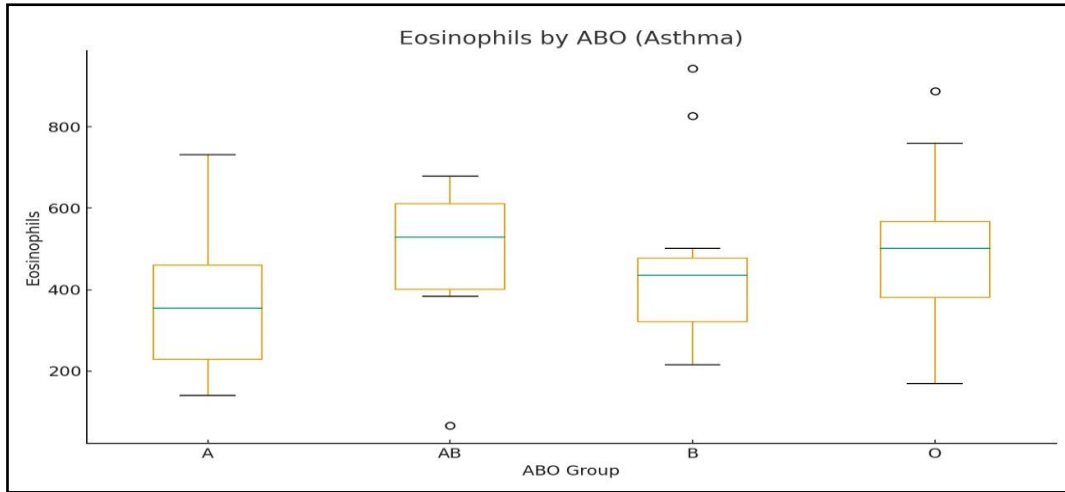


Figure 1: The comparison of eosinophils levels according ABO blood groups in Asthma patients.

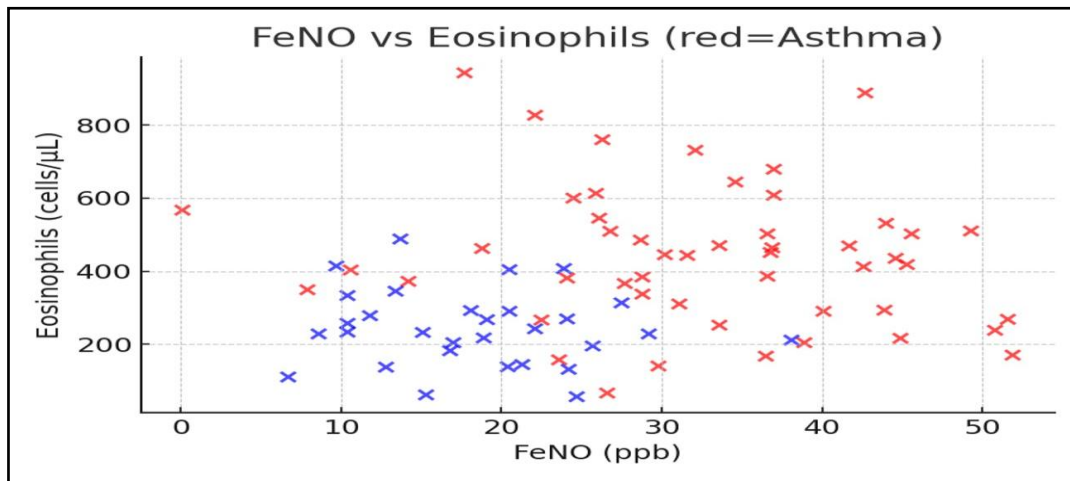


Figure 2: The comparison of scatter plot between eosinophils and FeNO in Asthma patients.

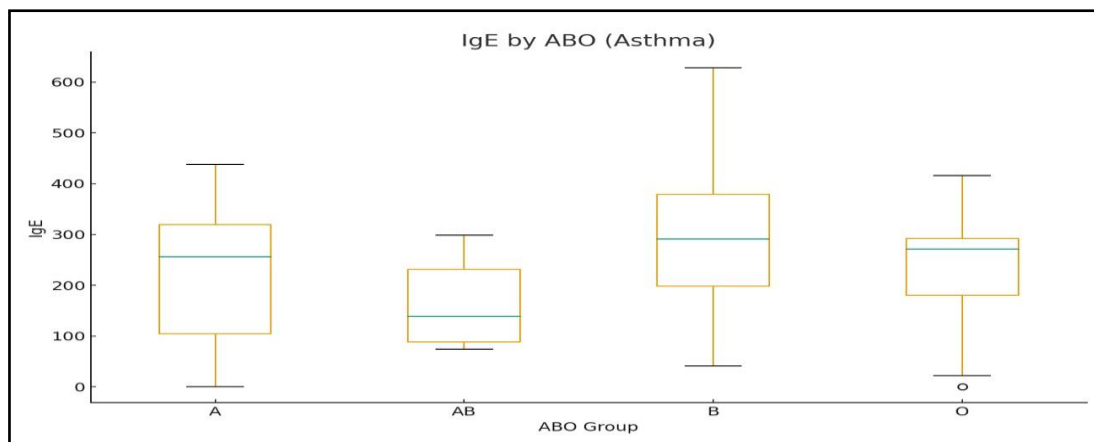


Figure 3: The comparison of IgE levels according ABO blood groups in Asthma patients.

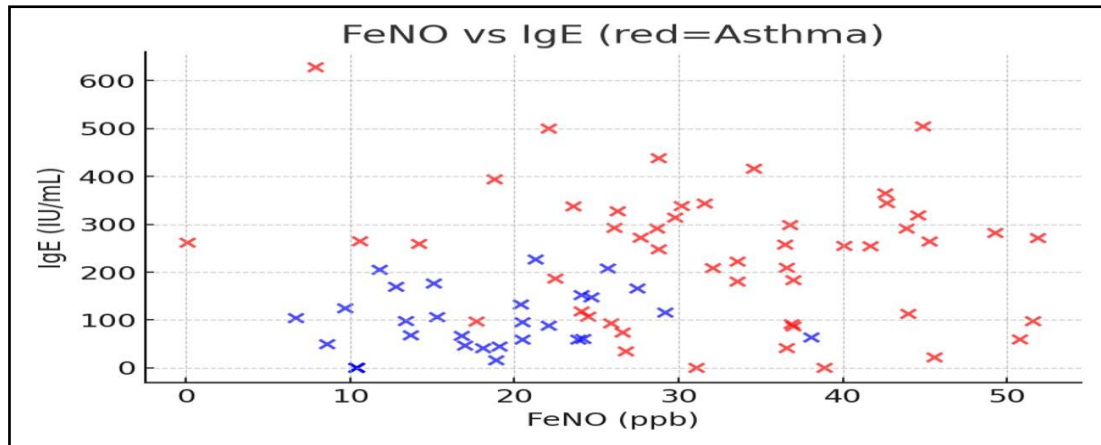


Figure 4: The comparison of scatter plot between IgE and FeNO in Asthma patients.

DISCUSSION

This research depicts high levels of all the analyzed T2-inflammatory biomarkers in the sample of asthmatic children in contrast to intermittent symptomatic children. The findings support the already proven value of FeNO as a non-invasive, reliable measure of eosinophilic airway inflammation [15,16]. Its high association with IgE, periostin, TSLP, and T2 cytokines also confirm its usefulness as a core biomarker to be used in the assessment of asthma in children. The great increase of TSLP and periostin in this experiment agrees with literature that they can contribute to airway remodeling, epithelial stimulation, and the onset of asthma [17-19]. Such indicators can be used to distinguish between actual asthma and the non-asthma wheezing disorders.

The most remarkable observation is that blood group A is more prevalent in asthmatic children. The same associations have been reported, indicating that antigenic structure of blood group A might get people more prone to allergic sensitization or eosinophilic reactions [20-22]. The mechanisms are, however, unknown. On the whole, the integration of blood group typing with T2-biomarker profiling can be useful to improve the early detection and risk stratification of pediatric asthma, especially in the context of low resource settings.

CONCLUSIONS

High levels of FeNO, IgE, periostin, TSLP, and T2 cytokines have a strong association with pediatric asthma, A- Splenic blood group A seems to be more prevalent

in the asthmatic children, The incorporation of the biomarkers with the ABO phenotyping can help to enhance early diagnosis of asthma.

Ethical approval

The present study, which was conducted by Dr. Zainab Sajid, was approved by the local Department of the Faculty of Pharmacy -Ethics committee, University of Kufa.

Conflict of interests

The authors declare no competing interests.

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