

Correlation Between Clinical Severity and Eosinophilic Count in Asthmatic Patients

1. Munir Hussain Siddiqui 2. Akhtar Ali Baloch 3. Afzal Qasim 4. Babar Bashir
5. Jawad us Salam

1. Asstt. Prof. of Medicine, DIMC, 2. Assoc. Prof. of Medicine, DIMC, 3. Asstt. Prof. of Cardiology, DIMC,
4. Asstt. Prof. of Medicine, DIMC, 5. Asstt. Prof. of Neurology, DIMC, DUHS, Karachi

ABSTRACT

Objective: To determine the correlation between the blood eosinophil count and the severity of symptoms in asthmatic patients.

Study Design: Prospective observational study

Place and Duration of Study: This study was carried out in Dow General Hospital, Dow University of Health Sciences from 1st January 2011 to 31st December 2011

Materials and Methods: Asthmatic patients who were admitted in Dow General Hospital, Dow University of Health Sciences, and those who fulfilled the inclusion criteria were enrolled in the study. Physical examination was carried out and the severity of the symptoms was gauged by using Peak Expiratory flow meter and absolute eosinophil count. The data thus collected was analyzed using SPSS Version 15.

Results: Among 56 patients who were enrolled in the study 29(51.8%) were male and 27(48.2%) were female. Ages were between 13 and 70 years. The absolute eosinophil count ranged between 70/mm³ and 1400/mm³. Based on the definition of asthma severity, 20 patients (35.7%) had mild asthma, 17(30.4%) had moderate and 19(33.9%) patients had severe asthma.

Conclusion: Statistical analysis showed that no relationship exist between blood eosinophil count and the severity of asthma. ($p < 0.003$).

Key Words: Asthma, Bronchial asthma, Absolute eosinophil count

INTRODUCTION

Asthma has emerged as a common cause of disability^{1,2}. It is defined as a chronic disease involving inflammation of airways along with the increased response resulting in reversible lower airway obstruction.³ Its etiology is multifactorial.⁴ IgE, mast cells, basophils, and eosinophils are essential components of allergic inflammation⁵.

According to WHO it is the most common chronic disease, affecting around 235 million people currently, worldwide. It has more than 10% prevalence worldwide⁶. The worldwide ISAAC study showed that the prevalence of asthma among Pakistani children is 8%.⁷ The patho-physiology of asthma runs a gamut of multi-facet dimensions. It is clinically heterogeneous with several factors mediating its onset.⁸

MATERIALS AND METHODS

This was a prospective observational study was carried out with patients presenting with asthmatic symptoms to Dow General Hospital, Dow University of Health Sciences between the period of one year from 1st January 2011 to 31st December 2011. The study included 56 patients with asthma who were admitted in Department of Medicine, Dow General Hospital, DUHS. Inclusion criteria was Symptom resolution with bronchodilator therapy confirms the

diagnosis, Peak Expiratory Flow (PEF) demonstrate reversibility and any Alternative diagnosis are excluded. Exclusion criteria were Upper respiratory disease, Foreign body in trachea or bronchus, Vocal cord paralysis, Mechanical obstruction of the airways. (Foreign body or tumor lymph nodes), Heart disease, Chronic Obstructed Pulmonary disease, Pulmonary embolism, Pulmonary infiltrations with eosinophilia and cough secondary to drugs. Patients were included with their clinical history fulfilling the criteria for the asthma and previous episodes of asthma their History, clinical examination and the therapeutics regime was noted. Physical examination and hematological assessment was carried out in every case according to Performa attached. Patients having asthma were observed using their Peak Expiratory Flow. Mild Asthma PEF value $\geq 80\%$ of the predicted value, Need for inhaled β -agonist short acting every 8 hours or more and no Night times symptoms. Moderate Asthma; PEF value 60 – 80% of the predicted value, Need for inhaled β -agonist short acting every 4 – 8 hours with mild Night times symptoms. Severe Asthma; PEF value $< 60\%$ of the predicted value, Need for inhaled β -agonist short acting every 2 – 4 hours And severe Night times symptoms. Blood eosinophil count was recorded and the severity of the asthma was evaluated according to the definition of severity. Eosinophil count has been divided in three categories: Group I i.e. $< 500/\text{mm}^3$,

Group II i.e. 501-1000/mm³ and Group III i.e. >1000/mm³. Both the count and the severity were analyzed using Chi-square using SPSS (version 10.0) software.

RESULTS

56 (Fifty six) patients with asthma were included in the study. Among those who were enrolled in the study 29(51.8%) were male and 27(48.2%) were female. The subjects included in the study aged between 13 years and 70 years with the mean age of 42.75 years. The severity of asthma was gauged on clinical examination and Peak Expiratory Flow (PEF). The absolute count of eosinophil was also sent. The absolute count of eosinophil ranged between 70/mm³ and 1400/mm³ with a mean count of 436.73/mm³ (Table 1). 20 patients (35.7%) had mild asthma, 17(30.4%) had moderate and 19(33.9%) patients had severe asthma (Table 2). As the objective of the study was to evaluate absolute eosinophil count as a marker of severity, it was found that the relationship between the two parameters was not significant (Table 3).

Table No.1: Range of Absolute Eosinophilic Counts in Study Subjects

Maximum	Mean	Std. Deviation	N	Minimum
1400.00	436.7321	225.7487	56	70.00

Table No.2: Severity of asthma in study subjects

	Frequency	Percent
Mild	20	35.7
Moderate	17	30.4
Severe	19	33.9
Total	56	100.0

Table No.3: Eosinophil distribution along with asthma findings on the basis of severity.

Eosinophil distribution	Asthma findings			Total
	Severe	Moderate	Mild	
< 500	2 3.6%	0 0%	0 0%	2 3.6%
501-1000	7 12.5%	11 19.6%	19 33.9%	37 66.1%
> 1000	10 17.9%	6 10.7%	1 1.8%	17 30.4%
Total	19 33.9%	17 30.4%	20 35.7%	56 100.0%

$\chi^2 = 16.37$, d.f = 4, $p < 0.003$, Statistically significant difference

The data revealed independence between both findings at $P < 0.05$

Graph 4: Age Distribution

N	Mean	Minimum	Maximum
56	42.7500	13.00	70.00

DISCUSSION

Asthma is a chronic inflammatory disease of airway. It affects 14 to 15 million people in United States, and affected 4.5 million children. In Pakistan in a study conducted in 2007, prevalence of asthma in school going children between the ages of 3-15 years was found to be 15.8%⁹. The increasing prevalence of asthma and recognition of burden it imposes, has led to extensive research into its cause, pathophysiology and management.¹⁰

This study was conducted to evaluate absolute eosinophil count as marker of severity of asthma in patients.

In this study conducted over a period of six months, 56 patients diagnosed with asthma were enrolled. 20 patients (35.7%) had mild, 17 (30.4%) and 19 (33.9%) patients were found to have severe asthma. When their absolute eosinophil count as marker of severity of asthma was evaluated, no significant relationship was found between the two parameters.

In a study conducted by Barry showed total eosinophil count to be related with asthma activity and for early detection of exacerbations and also found it to be useful in regulating in steroid dosage¹¹. Similar results were concluded in another study by Christoph Walker, where they found close correlation between severity of asthma and serum eosinophil count and T cell activation.¹²

In another research conducted in 2009-2010 in Sweden on 12,406 subjects,¹³ also found blood eosinophil counts and exhaled nitric oxide levels to be independently associated with wheeze and asthma events in patients, although only intermediate or high blood eosinophil counts were found to be associated with emergency department visits. Also another study conducted in 2006 concluded that there is a direct relation between late phase asthmatic reactions and blood eosinophil count.¹⁴

In a study published in 2012 studied variability of blood eosinophils count in patients with moderate asthma during 24 hour¹⁵, found significant variability among the levels of eosinophil count, putting the utility of single eosinophil count in question. Similarly another study conducted in London in 2013 showed blood eosinophil count to be not a reliable marker of inflammatory process in children with severe asthma¹⁶, as 86% patients with severe asthma had normal blood eosinophil count.

These observations suggest that there may be a direct association between eosinophils and airway reactivity in subjects who develop late-phase

CONCLUSION

This study was conducted to evaluate the relationship of eosinophil count in the blood and the severity of the

condition. However, the study did not show any relationship between these two variables and it seems that both peripheral eosinophil count and the severity of asthma are independent of each other. The limitation of study is that differentiation between intrinsic and extrinsic asthma is not clearly made as extrinsic asthma have predisposition to form IgE antibodies and intrinsic asthma may form IgE antibodies. Secondly the starting age of study group in thirteen years and above when atopic asthma tend to diminish. Thirdly sample size is small so larger scale study is needed to support this conclusion.

REFERENCES

1. van Schayck CP, Chavannes NH. Detection of asthma and chronic obstructive pulmonary disease in primary care. *ERJ* 2003;21(39 suppl):16s-22s.
2. Murray CJL, Lopez AD. Global mortality, disability, and the contribution of risk factors: Global Burden of Disease Study. *The Lancet* 1997;349(9063):1436 – 1442.
3. Fireman P. Understanding asthma pathophysiology. *Allergy Asthma Proc* 2003;24(2):79-83.
4. Subbarao P, Mandhane PJ, Sears MR, ChB MB. Asthma: epidemiology, etiology and risk factors. September 14, 2009, doi:10.1503/cmaj.080612 *CMAJ* 2009;181(9):E181-E190.
5. Stone KD, Prussin C, Metcalfe DD. IgE, mast cells, basophils, and eosinophils. *The J of Allergy and Clin Immunol* 2010;125 (2 Supplement): S73-S80.
6. Magnan A, Romanet S, Vervloet D. Rhinitis, nasosinus polyposis and asthma: clinical aspects. *Eur Respir Mon* 2001; 18: 101–114.
7. The International Study of Asthma and Allergies in Childhood (ISAAC) Steering Committee. Worldwide variation in prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and atopic eczema: ISAAC. *Lancet* 1998; 351: 1225–1232.
8. McGrath KW, Icitovic N, Homer A. Boushey A Large Subgroup of Mild-to-Moderate Asthma Is Persistently Noneosinophilic. *Am J of Respir and Critical Care Med* 2012;185(6): 612-619.
9. Hasnain SM, Khan M, Saleem A. Prevalence of Asthma and Allergic Rhinitis Among School Children of Karachi, Pakistan 2007;46(1):86-90.
10. Bousquet J, Khaltaev N. Allergic Rhinitis and its Impact on Asthma (ARIA) 2008;63(Supplement s86) :8–160.
11. Horn BR, Robin ED, Theodore J, Kessel AV. Total Eosinophil Counts in the Management of Bronchial Asthma; *N Engl J Med* 1975;292:1152-1155.
12. Walker C, Kaegi MK, Braun P. Activated T cells and eosinophilia in bronchoalveolar lavage from subjects with asthma correlated with disease severity, *J of Allerg and Clin Immunol* 1991;88(6): 1991:935–942.
13. Malinovschi A, Fonseca JA, Jacinto T, Alving K, Janson C, Exhaled nitric oxide levels and blood eosinophil counts independently associate with wheeze and asthma events in National Health and Nutrition Examination Survey subjects. *J Allergy Clin Immunol* 2013;132(4):821-827.
14. Durham SR, Eosinophils ABK. bronchial hyperreactivity and late-phase asthmatic reactions; DOI: 10.1111/j.1365-2222.1985.tb02290.x.
15. Spector SL, Tan RA. Is a single blood eosinophil count a reliable marker for "eosinophilic asthma?". *J Asthma* 2012;49(8):807-10.
16. Ullmann N, Bossley CJ, Fleming L, Silvestri M, Bush A, Saglani S, Blood eosinophil counts rarely reflect airway eosinophilia in children with severe asthma. *Allergy* 2013;68(3):402-6.

Address for Corresponding Author:

Dr. Munir Hussain Siddiqui

B-59, Blocks N, North Nazimabad, Karachi
Dow University of Health Sciences, Karachi
Cell Phone: 0345-2160441/6641059