

Evaluation of asthma severity: Relevance of total serum IgE, sputum and peripheral eosinophilia

PA Mahesh

*Department of Pulmonary Medicine, JSS Medical College, JSS University, Mysore, Karnataka, India.
E-mail: mahesh1971in@yahoo.com*

Asthma is an important cause of morbidity and mortality in the world, especially in the developing countries with an incidence of more than 300,000 every year, and the incidence has increased by nearly 10% over the last decade.^[1-3] Conventionally, asthma severity has been assessed with a combination of subjective (daytime and nighttime symptoms) and objective measures (Spirometry, peak flow recordings).^[4] Recently, use of rescue medications and assessment of risk factors for asthma exacerbations have been given its due importance in assessing asthma control. Due to the wide variation among different asthmatics, there is a need for other biomarkers to further classify these patients. For example, treatment-naïve asthmatics, with very low lung functions (forced expiratory volume in 1 s <30%), may reach normal lung functions in 15 days and are highly treatment responsive. On the other hand, asthmatics with a lung function of 70% may continue to be symptomatic with hardly any change in their lung functions in spite of Step 4 or 5 treatments according to Global Initiative for Asthma guidelines.^[4] Therefore, clinicians need other markers, which could help them manage their asthma patients better.

Specific IgE levels of common aeroallergens are much better markers of atopy than total IgE levels. Many patients with asthma have normal IgE levels but may have elevated specific IgE levels. Total IgE may be elevated in the absence of any allergic disease including asthma. Studies in the western population have shown a median total IgE levels in the adult general population of 40.8 IU/ml (interquartile range 15.5–114),^[5] and in children, 106 IU/ml (95% confidence interval 101.5–112).^[6] Asthma was present even among those in the lowest measurable total IgE levels and measuring 11 specific IgEs could identify 99% of the atopic cases.^[5] It is important that one is aware of the levels and ranges of total IgE in the local general population without allergic disease before interpreting whether the levels are in the abnormal range. A study in the general population in South India observed the mean levels of total IgE of more than 500 IU/ml.^[7] None of these cases had any allergic disease. The reason that populations in some parts of the world have high total IgE could be due to the protective effects of IgE against the venom from

insect bites, xenobiotics and to induce itching resulting in the expulsion of ectoparasites. In addition, exposure to environmental pollution along with smoking or passive smoking is associated with higher levels of total IgE.^[6] Although studies have not found an association between total IgE levels and asthma, a large study (TENOR) found association between levels of total IgE and severity of asthma.^[6]

Most studies have found a positive association between severity of sputum eosinophilia and asthma severity, though some have not.^[8] The sputum eosinophilia assessed on induced sputum represents the eosinophils in the mucus and lumen. Studies that have evaluated the effect of oral steroids have observed that though the mucosal eosinophils on bronchial biopsies have reduced after treatment, the eosinophils in the lumen continue to persist, possibly because of poor penetration of the drug into the mucus.^[8] Sputum eosinophil levels have been correlated with asthma severity based on spirometry, symptom scores, bronchial hyperresponsiveness on methacholine challenge test, and peak flow monitoring.^[8] Reduced eosinophil apoptosis is one of the identified reasons for the increased eosinophil load in the airways of asthmatics.^[9] It is to be noted though that there are many asthmatics with normal sputum eosinophil counts. Increased sputum eosinophil count could be a useful biomarker and is present across the spectrum of asthma severity, from mild to the most severe asthma, but needs further studies to confirm its ability to predict treatment responsiveness, disease progression, and risk for long-term complications such as airway remodeling.^[8,9] There are studies that have demonstrated that those with very severe asthma and sputum eosinophilia may benefit from mepolizumab.

Peripheral blood eosinophilia is a poor marker of asthma severity, and studies have found no association between peripheral blood eosinophil counts and asthma severity.^[10] In many cases of asthma, it is normal and there are other causes such as helminthiasis that may lead to peripheral blood eosinophilia. There may be cause for assessing peripheral blood eosinophilia at baseline to rule out other eosinophilic conditions mimicking asthma when the

absolute eosinophil count is >2000 cells/cmm with a total white blood cell count of more than 10,000 cells/cmm.

An interesting study in this issue of Lung India by Kumar *et al.* [11] confirms the earlier findings in the Indian population. The study highlights the presence of sputum eosinophilia as a separate phenotype that is spread across different asthma severities. It confirms that total IgE and peripheral blood eosinophilia does not help in assessing asthma severity. It would be very useful addition to the literature if the authors follow up a larger number of patients with and without sputum eosinophilia (>3%) across different asthma severities and characterize their treatment responsiveness, disease progression, and risk for developing long-term complications of asthma such as airway remodeling.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. GBD DALYs and HALE Collaborators. Global, regional, and national disability-adjusted life-years (DALYs) for 315 diseases and injuries and healthy life expectancy (HALE), 1990-2015: A systematic analysis for the Global Burden of Disease Study 2015. *Lancet* 2016;388:1603-58.
2. GBD Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990-2015: A systematic analysis for the Global Burden of Disease Study 2015. *Lancet* 2016;388:1545-602.
3. GBD Mortality and Causes of Death Collaborators. Global, regional, and national life expectancy, all-cause mortality, and cause-specific mortality for 249 causes of death, 1980-2015: A systematic analysis for the Global Burden of Disease Study 2015. *Lancet* 2016;388:1459-544.
4. Reddel HK, Bateman ED, Becker A, Boulet LP, Cruz AA, Drazen JM, *et al.* A summary of the new GINA strategy: A roadmap to asthma control. *Eur Respir J* 2015;46:622-39.

5. Gergen PJ, Arbes SJ Jr., Calatroni A, Mitchell HE, Zeldin DC. Total IgE levels and asthma prevalence in the US population: Results from the National Health and Nutrition Examination Survey 2005-2006. *J Allergy Clin Immunol* 2009;124:447-53.
6. Borish L, Chipps B, Deniz Y, Gujrathi S, Zheng B, Dolan CM; TENOR Study Group. Total serum IgE levels in a large cohort of patients with severe or difficult-to-treat asthma. *Ann Allergy Asthma Immunol* 2005;95:247-53.
7. Mahesh PA, Wong GW, Ogorodova L, Potts J, Leung TF, Fedorova O, *et al.* Prevalence of food sensitization and probable food allergy among adults in India: The EuroPrevall INCO study. *Allergy* 2016;71:1010-9.
8. Louis R, Lau LC, Bron AO, Roldaan AC, Radermecker M, Djukanovic R. The relationship between airways inflammation and asthma severity. *Am J Respir Crit Care Med* 2000;161:9-16.
9. Duncan CJ, Lawrie A, Blaylock MG, Douglas JG, Walsh GM. Reduced eosinophil apoptosis in induced sputum correlates with asthma severity. *Eur Respir J* 2003;22:484-90.
10. Moore WC, Bleecker ER, Curran-Everett D, Erzurum SC, Ameredes BT, Bacharier L, *et al.* Characterization of the severe asthma phenotype by the National Heart, Lung, and Blood Institute's Severe Asthma Research Program. *J Allergy Clin Immunol* 2007;119:405-13.
11. Kumar RM, Pajanivel R, Koteeswaran G, Menon SK, Charles MV. Correlation of total serum immunoglobulin E level, sputum, and peripheral eosinophil count in assessing the clinical severity in bronchial asthma. *Lung India* 2017;34:256-61.

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

Access this article online	
<p>Quick Response Code:</p> 	<p>Website: www.lungindia.com</p> <p>DOI: 10.4103/lungindia.lungindia_109_17</p>

How to cite this article: Mahesh PA. Evaluation of asthma severity: Relevance of total serum IgE, sputum and peripheral eosinophilia. *Lung India* 2017;34:290-1.