

Original Research Article

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Expression and clinical significance of IL-6 in patients with allergic rhinitis

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ABSTRACT

Background: Allergic rhinitis is a chronic inflammatory disease with a high incidence affecting the quality of life of patients. The objective of the study was to explore the expression and clinical significance of IL-6 in patients with allergic rhinitis.

Methods: This cross-sectional analytical study was conducted in the department of ENT, H&NS, Government Medical College, Srinagar. A total of 180 patients were included in the study, out of them 90 patients with allergic rhinitis were cases and 90 patients comprised the control group who did not have allergic rhinitis. The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA).

Results: A total of 184 patients participated in the study. The mean age in case group was 35.7 ± 15.46 years compared to control group which was 37.1 ± 12.89 years. There was male dominance in both the groups. Comparison of IL-6 levels as per severity of allergic rhinitis was assessed in this study and it was found that in patients with severe allergic rhinitis the mean IL-6 levels were 65.2 ± 5.32 ; in moderate, patients had IL-6 levels of 52.8 ± 5.84 and in mild patients had IL-6 levels of 46.7 ± 6.81 .

Conclusions: Clinical testing of IL-6 is likely to improve the diagnostic rate of early allergic rhinitis and help in halting the progression of disease and improve the patients prognosis and reduce symptoms and morbidity. Higher the levels of IL-6 more severe will be the allergic rhinitis.

Keywords: Allergic rhinitis, Interleukin-6 (IL-6), ARIA

INTRODUCTION

Allergic rhinitis is a non-infectious chronic inflammatory disease of the nasal mucosa that indicated by IgE and triggered by a variety of cytokines after the atopic body is exposed to allergens. The main symptoms of the disease include nasal itching, nasal congestion, running nose, sneezing and headache and in severe cases, hypoxemia and other complicated diseases that can affect the quality of life of patients.¹ Allergic diseases have become major health problems worldwide,

resulting in significant economic and social burden.² The incidence of allergic rhinitis in India is currently 20-30%, and its incidence is increasing.³ With the further development of molecular biology and immunology, some scholars have found that the onset of allergic rhinitis is closely related to the immune imbalance of cell adhesion molecules and cytokines.⁴ Interleukin (IL)-6 is a lymphokine produced by activated T cells and fibroblasts, and has become an important biomarker for the detection of inflammation and infectious diseases. Related studies have reported that IL-6 is

involved in allergies, and plays an important role in the process of occurrence and development of allergies.⁵ New expression of IL-6 can cause chronic inflammatory disorders and potentially fatal hyperinflammation as seen in advanced coronavirus disease 2019.^{6,7} More and more evidence shows that IL-6 can modulate the differentiation and activation of T cells and induce the production of Th2 cytokines, which is an important signal for coordinating chronic inflammation and adaptive immunity.⁸ Previous studies have found that IL-6 is related to the occurrence of allergic diseases such as asthma and atopic dermatitis and it also has been shown that IL-6 can increase nasal secretion in patients with allergic rhinitis.^{9,10}

Objectives

Objective of current study was to explore the expression and clinical significance of IL-6 in patients with allergic rhinitis.

METHODS

This cross-sectional analytical study was conducted in patients with allergic rhinitis, who presented to the Department of ENT, H&NS, government medical college, Srinagar from September 2021 to September 2022. Patients fulfilling the inclusion criteria and who gave consent to participate in the study were included.

Inclusion criteria

Inclusion criteria for current study were; patients with clinical symptoms suggestive of allergic rhinitis, Patients with complete clinical data, patients who had not taken drugs that affect IL-6 levels, or had not received relevant treatment before being included in the study.

Exclusion criteria

Exclusion criteria for current study were; patients with previous history of asthma, rhinitis, or sinusitis and patients with Alzheimer's disease.

A total of 90 patients with allergic rhinitis were finally included in the study and comprised the cases group. A total of 90 patients without allergic rhinitis, who underwent physical examination in our hospital during the same period, comprised the control group. According to the classification criteria of Allergic Rhinitis and its Impact on Asthma (ARIA), patients in the observation group were further divided into 3 groups as follows: the mild group with mild allergic rhinitis (N=33), the moderate group (N=30), and the severe group (N=27).

Detection methods of IL-6 levels

During the study, after taking consent participants were subjected to immunological analysis in the microbiology department of SMHS hospital.

Statistical methods

The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Continuous variables were expressed as Mean \pm SD and categorical variables were summarized as frequencies and percentages. Graphically the data was presented by bar diagrams. Student's independent t-test or and ANOVA was employed for comparing continuous variables. Chi-square test was applied for comparing categorical variables. Karl Pearson's correlation coefficient was used for assessing correlation between IL-6 levels and ARIA classification criteria. A p value of less than 0.05 was considered statistically significant.

RESULTS

In the present study a total of 180 patients were enrolled equally divided into two groups viz. Cases (N=90) and Controls (N=90).

Table 1: Age distribution of cases and controls.

Group	N	Mean	SD	Range	P value
Cases	90	35.7	15.46	14-65	0.512
Controls	90	37.1	12.89	15-68	

The mean age of patients in cases group was 35.7 ± 15.46 years with a range of 14-65 years compared to controls group where the mean age of patients was 37.1 ± 12.89 years with a range of 15-68 years.

Table 2: Gender distribution of cases and controls.

Gender	Cases		Controls		P value
	N	%	N	%	
Male	58	64.4	52	57.8	
Female	32	35.6	38	42.2	0.359
Total	90	100	90	100	

The difference observed was statistically insignificant ($p=0.512$). There was male dominance in both the groups. There were 64.4% (N=58) males in Cases Group compared to 35.6% (N=32) females. In controls group, males constituted 57.8% (N=52) compared to 42.2% (N=38) females. The difference observed was again statistically insignificant ($p=0.359$). Mean IL-6 levels in cases group was 53.6 ± 7.93 compared to 21.4 ± 5.49 in controls group. When compared statistically significant difference was found with a p value of <0.001 . Comparison of IL-6 levels as per severity of allergic rhinitis was also assessed in this study and it was found that in patients with severe allergic rhinitis the mean IL-6 levels were 65.2 ± 5.32 , moderate allergic rhinitis patients had IL-6 levels of 52.8 ± 5.84 and in patients with mild allergic rhinitis mean IL-6 levels were 46.7 ± 6.81 . The difference observed was found to be statistically significant with a $p < 0.001$. The Karl Pearson's correlation showed that the levels of IL-6

in the serum were positively correlated with ARIA classification criteria (r value=0.619; p <0.001).

Table 3: Comparison based on IL-6 levels in cases and controls.

Group	N	Mean	SD	Range	P value
Cases	90	53.6	7.93	14-65	<0.001*
Controls	90	21.4	5.49	15-68	

*Statistically significant difference (p <0.05).

Table 4: Comparison of IL-6 levels as per severity of allergic rhinitis in study cases.

Severity	N	Mean	SD	P value
Mild	37	46.7	6.81	
Moderate	29	52.8	5.84	<0.001*
Severe	24	65.2	5.31	

*Statistically significant difference (p <0.05).

DISCUSSION

Allergic rhinitis not only affects the nasal cavity but may also induce headaches, sleep disorders, cognitive dysfunction, and other functional disorders, affecting the quality of life of patients. Some scholars believe that allergic inflammation is not limited to the site where it initially occurs, and can be secondary to non-allergic reactions throughout the body.¹¹ A number of reports have indicated that if not treated in time, allergic rhinitis can be complicated with asthma, sinusitis, otitis media, pharyngitis, conjunctivitis, and other diseases.¹²⁻¹⁴ According to previous reports, more than 50% of asthma patients have a history of allergic rhinitis, which indicates that the early diagnosis and treatment of allergic rhinitis is of significance for preventing the progression of related diseases.¹⁵ In our study, mean age of patients in cases group was 35.7 ± 15.46 years with a range of 14-65 years compared to controls group where the mean age of patients was 37.1 ± 12.89 years with a range of 15-68 years. The difference observed was statistically insignificant (p 0.512). There was male dominance in both the groups. There were 64.4% (N=58) males in Cases Group compared to 35.6% (N=32) females. In controls group, males constituted 57.8% (N=52) compared to 42.2% (N=38) females. The difference observed was again statistically insignificant (p =0.359). Gao et al did a study in which there were 92 males and 88 females in the observation group, aged 25-73 years old, with an average age of 48.31 ± 3.21 years.¹⁶ The control group comprised 95 males and 93 females aged 27-76 years, with an average age of 48.44 ± 3.33 years. There was no statistically significant difference in general information, such as sex and age, between the observation and control groups (p >0.05). In our study, mean IL-6 levels in cases group was 53.6 ± 7.93 compared to 21.4 ± 5.49 in controls group. When compared statistically significant difference was used with a p value of <0.001. Comparison of IL-6 levels as per

severity of allergic rhinitis was also assessed in this study and it was found that in patients with severe allergic rhinitis the mean IL-6 levels were 65.2 ± 5.32 , moderate allergic rhinitis patients had IL-6 levels of 52.8 ± 5.84 and in patients with mild allergic rhinitis mean IL-6 levels were 46.7 ± 6.81 . The difference observed was found to be statistically significant with a p value of <0.001. The Karl Pearson's correlation showed that the levels of IL-6 in the serum were positively correlated with ARIA classification criteria (r value=0.619; p value <0.001). Gao et al did a study in which according to the classification criteria of allergic rhinitis and its impact on asthma (ARIA), patients in the observation group were further divided into 3 groups as follows: the mild group with mild allergic rhinitis (N=66), the moderate group (N=60), and the severe group (N=54).¹⁶ VCAM-1, IL-6, and IL-17A levels in the observation group were significantly higher than those in the control group, and the difference was statistically significant (p <0.05). Comparison results of VCAM-1, IL-6 and IL-17A levels among the 3 groups were as follows: mild group < moderate group < severe group, and the differences between the three groups were significant (P <0.05). Pearson linear correlation showed that serum levels of VCAM-1, IL-6 and IL-17A were positively correlated with ARIA (p <0.05). Parent history of allergic rhinitis, living environment pollution, abnormally elevated VCAM-1, abnormally elevated IL-6 and abnormally elevated IL-6 were the related risk factors for inducing allergic rhinitis (p <0.05).

Limitations

Limitation of current study was the in vitro effects of IL-6 on nasal mucosa cells need to be further studied.

CONCLUSION

In conclusion, clinical testing of IL-6 should be increased to improve the diagnostic rate for early allergic rhinitis, prevent disease progression, and improve patient prognosis.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Incorvaia C, Cavaliere C, Frati F. Allergic rhinitis. J Biol Regul Homeost Agents 2018;32:61-6.
2. Asher MI, Montefort S, Björkstén B, Lai CK, Strachan DP, Weiland SK, et al. Worldwide time trends in the prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and eczema in childhood: ISAAC Phases One and Three repeat multicountry cross-sectional surveys. Lancet. 2006; 368(9537):733-43.
3. Campo P, Eguiluz-Gracia I, Plaza-Serón MC, et al. Bronchial asthma triggered by house dust mites in

patients with local allergic rhinitis. *Allergy.* 2019;74: 1502-10.

- 4. Wallace DV, Dykewicz MS. Seasonal Allergic Rhinitis: A focused systematic review and practice parameter update. *Curr Opin Allergy Clin Immunol.* 2017;17:286-94.
- 5. Meng Y, Wang C, Zhang L. Recent developments and highlights in allergic rhinitis. *Allergy.* 2019;74: 2320-8.
- 6. Castro M, Mathur S, Hargreave F, Boulet LP, Xie F, Young J, et al. Reslizumab for poorly controlled, eosinophilic asthma: a randomized, placebo-controlled study. *Am J Respir Crit Care Med.* 2011; 184(10):1125-32.
- 7. Spencer S, Köstel Bal S, Egner W, Lango Allen H, Raza SI, Ma CA, et al. Loss of the interleukin-6 receptor causes immunodeficiency, atopy, and abnormal inflammatory responses. *J Exp Med.* 2019; 216(9):1986-98.
- 8. Mehta P, McAuley DF, Brown M, Sanchez E, Tattersall RS, Manson JJ; HLH Across Speciality Collaboration, UK. COVID-19: consider cytokine storm syndromes and immunosuppression. *Lancet.* 2020;395(10229):1033-1034.
- 9. Rincon M, Irvin CG. Role of IL-6 in asthma and other inflammatory pulmonary diseases. *Int J Biol Sci.* 2012; 8(9):1281-90.
- 10. Zhang Z, Xiao C, Gibson AM, Bass SA, Khurana Hershey GK. EGFR signaling blunts allergen-induced IL-6 production and Th17 responses in the skin and attenuates development and relapse of atopic dermatitis. *J Immunol.* 2014;192(3):859-66.
- 11. Gentile DA, Yokitis J, Angelini BL, Doyle WJ, Skoner DP. Effect of intranasal challenge with interleukin-6 on upper airway symptomatology and physiology in allergic and nonallergic patients. *Ann Allergy Asthma Immunol.* 2001;86(5):531.
- 12. Pfaar O, Klimek L, Jutel M, Akdis CA, Bousquet J, Breiteneder H, et al. COVID-19 pandemic: Practical considerations on the organization of an allergy clinic- An EAACI/ARIA Position Paper. *Allergy.* 2021;76(3): 648-676.
- 13. Adegbiji WA, Olajide GT, Olajuyin AO. Pattern of allergic rhinitis among children in Ekiti, Nigeria. *Int J Pediatr Otorhinolaryngol.* 2018;106:75-9.
- 14. Saranz RJ, Lozano A, Lozano NA. Subclinical lower airways correlates of chronic allergic and non-allergic rhinitis. *Clin Exp Allergy* 2017;47:988-97.
- 15. Bocsan IC, Muntean IA, Ureche C. Characterization of patients with allergic rhinitis to ragweed pollen in two distinct regions of Romania. *Medicina.* 2019; 55:712.
- 16. Cardona V, Luengo O, Labrador-Horillo M. Immunotherapy in allergic rhinitis and lower airway outcomes. *Allergy.* 2017;72:35-42.
- 17. Gao S, Yu L, Zhang J, Li X, Zhou J, Zeng P, Zhang X. Expression and clinical significance of VCAM-1, IL-6, and IL-17A in patients with allergic rhinitis. *Ann Palliat Med.* 2021;10(4):4516-22.

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