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PERIPHERAL AND NASAL EOSINOPHILIA AND SERUM TOTAL IMMUNOGLOBULIN E LEVELS IN CHILDREN WITH ASCARIASIS*

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SUMMARY: Yazıcıoğlu M, Öneş Ü, Yalçın I. (Allergy, Clinical Immunology and Infectious Disease Unit, Department of Pediatrics, İstanbul University Faculty of Medicine, Çapa-İstanbul, Turkey). Peripheral and nasal eosinophilia and serum total immunoglobulin E levels in children with ascariasis. Turk J Pediatr 1996; 38: 477-484.

In order to evaluate peripheral and nasal eosinophilia and serum total IgE levels in ascariasis, 30 children between two and 12 years of age whose fecal samples were found to contain Ascaris lumbricoides, and 30 children between 1.5 and 12 years of age who did not have ascaris in their fecal samples, were enrolled in the study. Peripheral eosinophil counts and serum total IgE levels were significantly higher in the study group, but there was no significant difference between the nasal eosinophil counts of the two groups. Since total serum IgE levels differ according to age, the patients and the control groups were also evaluated within three age-groups. Peripheral eosinophil counts and serum total IgE levels of patients with ascariasis in all age ranges were significantly higher, but nasal eosinophil values did not differ significantly. These results show that in ascariasis the presence of peripheral eosinophilia and high total serum IgE levels are similar to those in atopic diseases, and some allergic symptoms such as nasal itching can be caused by parasites. However, nasal itching does not correlate with nasal eosinophilia in ascariasis. This is an important feature in the differential diagnosis. *Key words: ascariasis, peripheral eosinophil counts, nasal eosinophil counts, total serum IgE levels, children.*

In diseases mediated by type 1 hypersensitivity reactions, the increase in serum total IgE levels and peripheral eosinophilia are well-known findings[1].

Parasitic infections are also associated with high IgE level and peripheral eosinophilia in children[1,2]. Thus parasitic infections are important to consider in the differential diagnosis of allergic diseases with eosinophilia[3]. In Turkey, ascariasis in particular is frequently seen[4]. Furthermore, ascaris infestations may also cause asthma symptoms. Allergic rhinitis symptoms usually accompany asthma. Nasal itching and eosinophilia help to diagnose allergic rhinitis. In children with ascariasis, itching of the nose is frequently seen[5-7]. Therefore, our study aimed to reveal the value of nasal eosinophilia in the differential diagnosis of ascariasis by investigating serum total IgE levels and peripheral and nasal eosinophil counts.

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Material and Methods

Thirty children who were seen at the Department of Pediatrics at İstanbul University Faculty of Medicine and whose fecal samples were found to contain Ascaris lumbricoides were enrolled in the study. There were 16 female and 14 male patients ranging in age from one to 12 years. Thirty children within the same age-groups but without ascaris in their fecal samples were accepted as the control group. The children and the families in the patient and control groups had no histories of allergic disease or infections.

The history, symptoms and physical findings of each patient were recorded, laboratory tests leukocyte counts and peripheral blood smears were done and eosinophil counts were calculated. In order to examine nasal cytology, a specimen of nasal secretions was transferred to a glass slide and stained with Hansel's stain. Eosinophil ratios were calculated by counting 100 cells under oil immersion. Total serum IgE concentrations were measured by Enzymoimmunoassay (Bio Merieux Total IgE kit, France).

Statistical analyses were done by using the chi-square test, Student's t-test and Mann-Whitney test.

Results

The data on age and sex and the results of peripheral and nasal eosinophil values, total serum IgE determinations and nasal symptoms of the patient and control gorups are displayed in Tables I and II. The mean (± SD) ages of the patient and control groups were 6.48 ± 3.3 and 5.4 ± 3.2 years, respectively. There was no significant difference in either age or sex distribution between the two groups (Table III).

Since total serum IgE levels differ according to age, the patient and control groups were evaluated within three different age-groups consisting of one to three, four to five, and six to 12-year-old children. In the study group, peripheral eosinophil counts and total serum IgE levels were found to increase with age, but only the total serum IgE levels of children between six and 12 years of age were found to be significantly higher.

Peripheral eosinophil numbers and serum total IgE levels of patients in all age ranges were higher than controls. The differences were significant for peripheral eosinophil counts for those between one and three ($0.001 < p < 0.01$), four to five ($p < 0.001$), and six to 12 years of age ($0.001 < p < 0.01$). When the serum total IgE levels of the study and control groups were compared by the Mann-Whitney test (one-tailed), significant differences were found in one to three, ($p = 0.0029$), four to five ($p = 0.04$) and six to 12-year-olds ($p = 0.0014$).

Table I: Characteristics of the Patient Group

Case no.	Age (years)	Sex	Peripheral eosinophilia (/mm^3)	Nasal eosinophilia (%)	Total serum IgE
1	10	M	704	0	235
2	3	M	162	0	34
3	4	F	364	0	54
4	9	M	420	1	250
5	9	M	434	0	143
6	11	M	395	6	120
7	9	M	534	0	128
8	3	M	432	0	57
9	2	F	384	0	74
10	4	F	660	2	260
11	10	M	528	0	151
12	2	F	496	2	136
13	5.5	F	426	0	74
14	3	F	584	1	175
15	5.5	F	572	2	98
16	2	F	288	0	162.5
17	2.5	F	364	0	129.5
18	7	F	700	1	725
19	4	M	336	0	48
20	10	M	250	7	53
21	7	F	320	0	125
22	11	F	576	0	116
23	11	F	308	0	30
24	10	F	352	0	172.5
25	9	M	376	0	160
26	12	M	270	0	117
27	5	M	248	2	121
28	3	M	68	0	33
29	5.5	F	240	5	95
30	5.5	F	460	0	52.5

Table II: Characteristics of the Control Group

Case no.	Age (years)	Sex	Peripheral eosinophilia (/mm^3)	Nasal eosinophilia (%)	Total serum IgE (IU/ml)
1	2.5	M	208	1	69
2	5	F	280	0	115
3	5	M	210	0	25
4	4	F	160	4	33
5	2.5	F	140	0	29.5
6	5	M	80	2	17
7	2.5	F	184	0	16
8	2	F	94	0	3
9	5	F	40	3	29.5
10	2	F	62	0	26
11	10	F	124	2	17
12	10	M	184	0	58
13	5.5	M	204	0	48
14	12	M	330	2	98
15	4	M	114	0	44
16	2	F	108	0	34
17	10	M	318	0	138
18	6	M	78	0	10
19	7	M	268	0	106
20	9	F	150	0	45
21	8	M	208	0	43
22	5.5	F	172	1	90
23	4	F	264	0	104
24	3	M	130	0	33
25	1	F	166	1	25
26	4	F	188	2	90
27	1.5	F	224	0	93
28	3	M	168	0	25
29	11	M	252	5	84
30	10	M	156	2	85

Table III: Comparison of Clinical and Laboratory Data in Patient and Control Groups

	Age (years) Mean ± SD (Range)	Sex F/M	Peripheral eosinophilia (/mm^3) Mean ± SD (Range)	Nasal eosinophilia (%) Mean ± SD (Range)	Total serum IgE (IU/ml) Mean ± SD (Range)	Nasal itching Number (%)
Patient group (n = 30)	6.48 ± 3.3 (2-12)	16/14	408.37 ± 153.69 (68-704)	0.97 ± 1.87 (0-7)	137.63 ± 127.11 (30-725)	11/30 (36.6%)
Control group (n = 30)	5.4 ± 3.2 (1.5-12)	15/15	175.47 ± 73.43 (40-330)	0.83 ± 1.34 (0-5)	54.4 ± 36.61 (3-138)	(–)
Statistical evaluation	t = 1.287 p = 0.203 NS	X^2 = 0.000 p = 1 NS	t = 7.489 p < 0.001	t = 0.33 p = 0.742 NS	u = 748.5 z = 4.413 p < 0.05	

Nasal eosinophil values were comparable in the two groups, and no significant difference was found when compared using Student's t-test ($p > 0.05$).

Nasal eosinophilia was investigated in cases with the symptom of nasal itching; the percentages of eosinophils were found to be five, six and seven percent in three of the cases. In these cases severe nasal itching was reported.

Discussion

Ascariasis has an important place in the differential diagnosis of allergic diseases presenting with eosinophilia and elevations of total serum IgE levels. Although many studies that investigated the relation between allergic diseases and ascariasis have been reported, many problems remain inconclusive[8-11].

Tullis[8] reported that 99 percent of this patients with bronchial asthma had one of the three intestinal parasites Ascaris lumbricoides, Strongyoides stercoralis or Necator americanus, and concluded that the worms were an important cause of asthma; others have not confirmed his findings, however[9].

It has been suggested that helminthic infections can suppress allergic reactions to environmental allergens, Turton[10] has proved this hypothesis by describing his self-infection with Necator americanus, which cured his seasonal hay fever. In another study, the skin-test reactivity to common inhalant allergens was found to be low in populations heavily parasitised with Ascaris lumbricoides; it was concluded, however, that other influences, such as racial, cultural, nutritional and environmental factors, also affect the expression of the atopic state in the tropical environment[11].

In a recent study, Lynch et al.[12] reported that helminthic infection does increase IgE synthesis and that this increase, when moderate, can enhance allergic reactivity; however, when it is excessive, it can actually be suppressive through both saturation of mast-cell FCE receptors and inhibition of specific IgE antibody synthesis.

Ascaris lumbricoides can cause diseases such as asthma, angioneurotic edema, wheezing and anaphylactic shock syndrome. Urticarial reactions, which are most prominent during pulmonary migration, have also been reported[13-15].

A symptom which is found in ascariasis and has similarities with allergic diseases is nasal itching. Although it is reported as a frequent symptom in ascariasis, no studies on this subject have yet been reported.

Since there are similarities between ascariasis and allergic diseases, it is important to establish the differences between these two diseases. In this study peripheral eosinophil counts were observed to be higher in the study than the control group. The serum total IgE levels in cases infected with Ascaris were found to be higher than the controls, but these levels did not exceed 260 IU/ml except in one case (Table I, Case no: 18).

Nasal itching was experienced by 36.6 percent of the patient gorup. When the cases with nasal itching were evaluated for nasal eosinophilia, only three cases (Table I, Cases no: 6, 20, 29) had values greater than normal. However, there were no significant statistical differences between the patient and control groups with respect to nasal eosinophilia. This result shows that nasal eosinophilia is not a prominent finding in children with ascariasis. In children with allergic rhinitis, nasal eosinophilia is more common. In our study nasal itching was not associated with nasal eosinophilia in children with ascariasis. On the other hand, nasal itching is seen in children with allergic rihinitis and correlates with nasal eosinophilia.

Allergic reactions associated with Ascaris infestations are reported to be mediated by reaginic antibody[16]. Aerosolization of the Ascaris antigen stimulates local IgE antibody production in the respiratory system, and this event is followed by the release of mediators and clinical symptoms. Ascaris-induced pneumonic reactions are the result of contact of the parasite and host tissues, which is a local effect induced during larval migration. Urticarial reactions are thought to be due to generalized hypersensitivty reactions which are associated with high IgE levels[13]. Ascaris-induced anaphylactic shock syndrome has been recognised and the finding of degranulated mast cells throughout the body tissues were ascribed to the release of a mast cell degranulator by the worms or a reagin-ascaris allergen interaction at the mast cell surface[14].

Nasal itching seen in ascariasis can be explained by the distant effects of parasites and immediate hypersensitivity reactions, but is not associated with nasal eosinophilia. Eosinophilic chemotactic factor A (ECF-A) released by the parasite when larvae migrate to the nose can induce eosinophil accumulation, but larval migration to the nose is well known to be rare. The reason we could not detect eosinophils in nasal secretions in ascariasis may be due to the fact that we did not examine the cases while the allergic symptoms were more significant, during the migration of the larvae, or we could not detect the brief period of tissue eosinophilia.

In conclusion, the presence of peripheral eosinophilia and high serum IgE levels in ascariasis are similar to that in atopic diseases, and some allergic symptoms such as nasal itching could be an effect of parasites. However, nasal itching is not correlated with nasal eosinophilia in ascariasis. This is an important feature in the differential diagnosis of ascariasis and allergic rhinitis.

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