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THE EVALUATION OF SERUM IMMUNOGLOBULIN E AND PERIPHERAL EOSINOPHIL COUNTS IN HEALTHY CHILDREN IN THE SAMSUN REGION OF TURKEY*

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Though immunoglobulin E (IgE) plays an important role in the anaphlactoid type of hypersensitivity reactions, it was first recognized in 1921 by Prausnitz and Kustner[1] as a skin sensitizing factor of serum, but its structural identity, so different from other immunoglobulins, was first discovered in 1966[2-3]. IgE, which is one of the most important factors in certain disorders, has a much lower concentration in normal subjects compared with other types of immunoglobulins[4].

Host factors such as genetic predisposition, age, cellular arrangement and environmental components as physicochemical features and the antigenic load of the environment play an important role in stimulating the production of IgE[5]. Therefore, serum IgE levels have been reported to fluctuate individually according to geography and socio-economic status of country[6].

In the studies carried out in Ankara[7] and then in Trabzon[8], the serum IgE levels of healthy children were found to be higher in the latter group. However, a higher incidence of parasitic infestations in the Trabzon region might have affected the results. The aim of this study was to determine the serum IgE levels of healthy children whose ages ranged from 0 to 15 years and who lived in Samsun and its environs. In cases with increased IgE levels, the observation of eosinophilia[9] led us to investigate the eosinophil counts of healthy children living in this region.

Material and Methods

This study consisted of 76 boys and 76 girls (a total 152 healthy subjects) randomly selected from children seen at the Out-patient Clinics of the Department of Pediatrics at Ondokuz Mayıs University in addition to students

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attending Sakarya Primary School and the Ondokuz Mayıs University School of Nursing. The subjects had no personal or family history of atopy, the physical findings were normal the stools were negative for ova and parasites and there was no history of parasitosis in the last six months.

In order to ascertain if there were any traces of familial or personal atopy, each subject was given a questionnaire to be filled out. After each child was given a physical examination, the hemoglobin, white blood cell and total eosinophil counts were determined and the peripheral blood smears were taken. In order to detect the serum IgE levels, 2cc blood was drawn. After the separation of the serums, the samples were kept frozen at −20 °C for at the most one month.

The total serum IgE levels were determined by the "Elisa" method[10]. In this study, the Abbot Tandem-IgE-Hybritech kit was used.

The patients' samples containing IgE were reacted with a plastic bead (solid phase) coated with a monoclonal antibody directed towards a unique antigenic side on the IgE molecule, and with an enzyme labeled monoclonal antibody directed against a distinctly different antigenic site on the same IgE molecule. Following the formation of the solid phase/IgE/labeled antibody sandwich, the bead was washed to remove the unbound labeled antibody and was then incubated with an enzyme substrate. The amount of substrate turnover was determined colormetrically by measuring the absorbence of the quenched reaction which is directly proportional to the concentration of IgE in the test sample. The results were read against water of a wavelength of 405 nm on the Labsystem Uniskan II spectrophotometer. The peripheral blood total eosinophil counts were determined by using the method described by Dacie[11] and the results were recorded as total eosinophil counts per mm^3.

Statistical analysis was carried out by the t test to determine the differences between the mean values and percentages in cases of scattered distribution of findings. In cases where it was impossible to maintain parametric test conditions, we applied geometric logarithmic values and the correlation between the total IgE and eosinophil counts was estimated through regression-correlation analysis[12].

Results

The distribution of cases according to age-group, IgE value and peripheral blood total eosinophil count is shown in Tables I-III.

When comparing each age-group individually for IgE values, a significant difference was only noticed between the 0-1 year and other age-groups ($p<0.01$). In addition the IgE values remained the same for both sexes ($p>0.05$). In assessing each group individually for total eosinophil values, significant differences were recorded between the 0-1, 12, and 13-15 year-old age-groups ($p<0.05$).

TABLE I: Distribution of Cases by Age-Group

Age group (yrs.)	Number of cases
0- 1	20
2- 6	18
7- 8	20
9	18
10	20
11	20
12	18
13-15	18
Total	**152**

TABLE II: Ige Values in Age-Groups Ranging from 0 to 15 Years

Age group (yrs.)	Number of cases	Lower limit IU/ml	Upper limit IU/ml	Geometric mean value IU/ml	Standard deviation
0- 1	20	11.8	58.1	27.42	13.52
2- 6	18	23.3	214	121.34	52.32
7- 8	20	71.4	298.1	118.76	99.11
9	18	35	329.2	112.88	90.78
10	20	39	330.1	124.81	69.65
11	20	37	303.2	111.75	81.61
12	18	38	311.2	132.60	79.36
13-15	18	40	334	122.87	84.19

TABLE III: Peripheral Blood Total Eosinophil Counts in Age-Groups Ranging from 0 to 15 Years

Age group (yrs.)	Number of cases	Lower limit mm^3	Upper limit mm^3	Geometric mean value mm^3	Standard deviation
0- 1	20	100	400	191.55	93.13
2- 6	18	100	600	221.85	144.14
7- 8	20	100	600	232.46	142.19
9	18	100	500	236.15	121.44
10	20	100	600	244.79	132.12
11	20	100	600	251.94	127.34
12	18	100	600	298.12	129.15
13-15	18	100	600	302.45	134.17

TABLE IV: IgE Values in Samsun and Ankara

ANKARA[7]			SAMSUN		
Age group (yrs.)	Number of cases	Geometric mean values IU/ml	Age group (yrs.)	Case no.	Geometric mean value IU/ml
0- 1	21	26.02	0- 1	20	27.42
2- 6	23	48.51	2- 6	18	121.34
7- 9	42	129.15	7- 9	38	126.88
10-13	65	104.94	10-12	58	126.65
14-17	64	101.34	13-15	18	122.87

However there was no difference noted between the sexes in the total eosinophil levels ($p>0.05$) in all of these age groups in our study.

All of the age-groups were subjected to correlation-regression analyses to determine the total IgE and eosinophil values. A significant, positive correlation was found between the two variables ($r = 0.82$).

Discussion

The evaluation of serum IgE levels facilitates the identification of allergies in asymptomatic atopic children[13], the differentiation of atopic dermatitis from contact dermatitis[14], and the diagnosis of rare disorders characterized by high IgE concentrations such as aspergillosis[15], pemphigus[16], and some T-cell deficiencies[17]. If the IgE levels are measured in a newborn in the first few days of life or from the cord blood, the results obtained can be beneficial in the predictive diagnosis of atopy.

Serum IgE levels may vary according to region, country, or socio-economic group. Turner and Voller[18] demonstrated that the serum IgE levels in Africans were higher than those in Europeans. Godfrey[19] revealed that non-atopic Gambian children living in rural areas had IgE levels around 368 IU/ml, which is considerably high. Very few studies have been conducted in our country regarding the IgE levels in healthy children of different age-groups. The IgE levels of a total 215 cases in the 0 to 17 year-old age groups were evaluated in Ankara. The IgE values in the Ankara and Samsun studies are summarized in Table IV. As indicated, the IgE levels in the 2-6 year-old age group in Samsun are higher than those in Ankara in the same age-grouping. However, the IgE level is at a maximum in the 7-9 year-old age-group[13] in Ankara and in Samsun.

The reason that the IgE value is lower in the 0-1 year-old age-group as compared to the other age-groups lies in the fact that the subjects in these age-groups had not yet been exposed to allergens and parasites. It is known that in parasitosis, the IgE levels increase more than those of atopic diseases[5], and even long after parasitosis therapy, the IgE levels remain high[20].

There are many reports concerning the close relationships between atopic symptoms and blood eosinophil levels. The peripheral total eosinophil counts up to 300 per mm^3 were considered to be normal, those ranging between 400 to 600/mm^3 were defined as moderate eosinophilia and above 600/mm^3 as marked eosinophilia[21-22]. In another study, the average eosinophil level was found to be correlated moderately with age and sex and high levels were attained in boys[23]. In addition, eosinophilia might be detected in cases of IgE increments. In our study groups, the mean total eosinophil values varied between 191 to 302/mm^3. Though the values were within acceptable limits, in some of our cases the upper values reached 600/mm^3. This might have been due to former parasitic infestations or other conditions. In our study we could not find any difference between the sexes regarding total eosinophil values. In addition, the correlation between IgE and total eosinophils conforms with the literature (Fig.1).

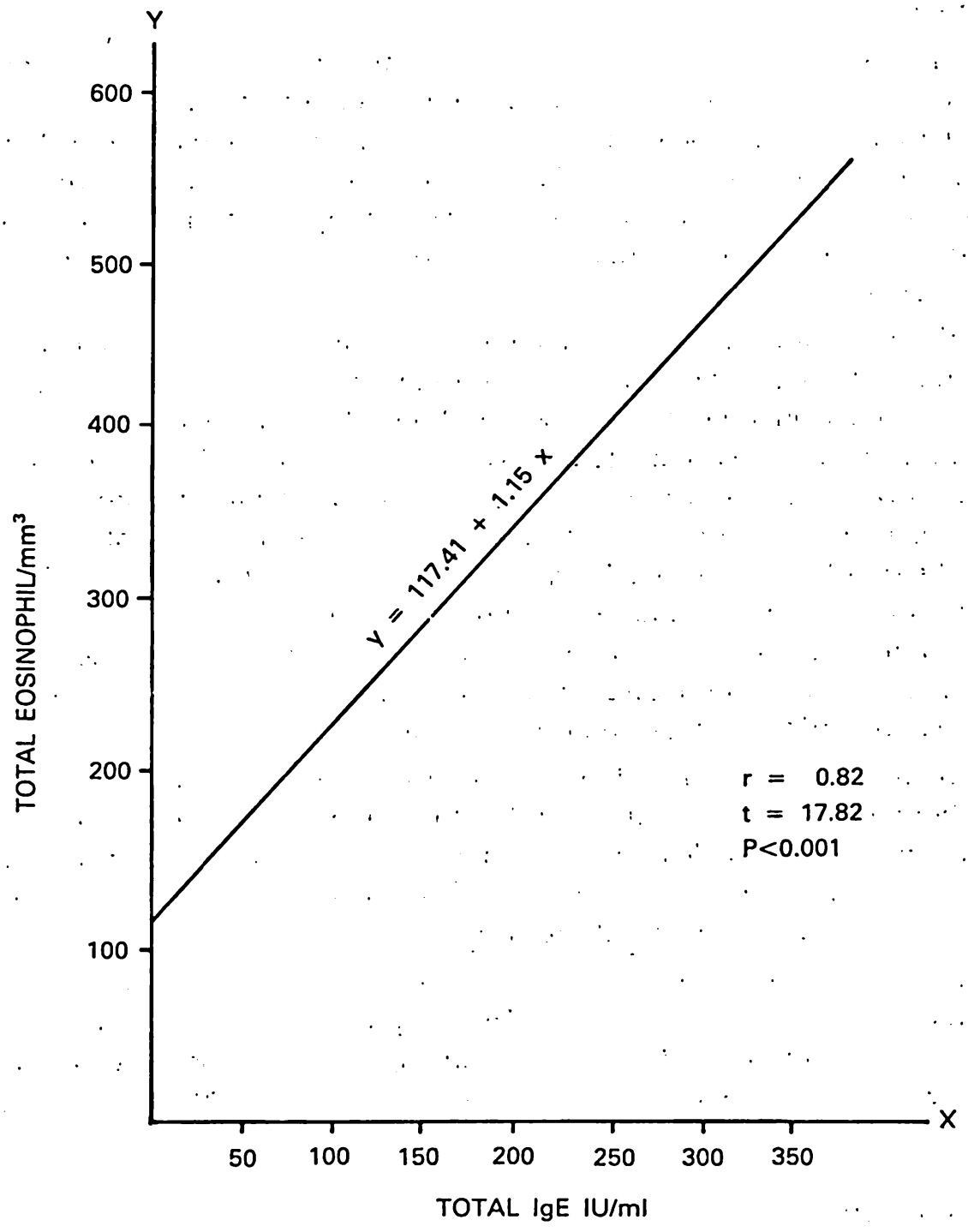

Fig.1: Relationship between total eosinophil and immunoglobulin E levels.

Summary

In 152 healthy children living in Samsun and its environs, the serum IgE and total eosinophil counts in peripheral blood were determined. Children whose ages ranged between 0 to 15 were classified into eight groups according to age. When comparing all the age groups together, the serum IgE and total eosinophil levels in the peripheral blood were found to range between 11.8 to 334 IU/ml and 100 to

600/mm^3, respectively. In the 12-year-old age-group, the IgE values were at a maximum level. The total eosinophil counts in peripheral blood formed a peak in the 13-15 year-old age-group.

In this study, the importance of the assessment of serum IgE levels and total eosinophil counts in the peripheral blood in healthy children and in the diagnosis of atopic diseases has been emphasized.

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