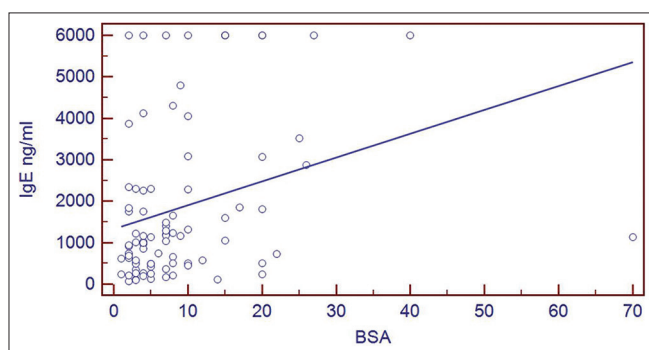




In addition to screening hematological and biochemical investigations, quantitative assessment of serum IgE was performed using chemiluminescent immunoassay using Elecsys<sup>®</sup> and Cobase Analyser (Roch Diagnostic); where normal laboratory reference value for total serum IgE for a healthy adult was 0 to 240 ng/mL. Epidemiological data like age, sex and presence of family history were collected. Clinical parameters like body surface area involvement using the rule of nine, site of involvement, duration of disease, morphological presentation, history of use of topical, oral and injectable steroids were evaluated. Chronic dermatophytosis was defined as the as dermatophytosis in a patient of more than 6 months duration, with or without recurrence, in spite of being treated. Dermatophytosis was considered to be recurrent when there was re-occurrence of the disease (lesions) within less than 6 weeks after completion of the treatment.<sup>5</sup> Less than 6 week clinical remission between recurrence in old lesion or appearance of new lesions was recorded as continuous disease period, relapse beyond 6 week was recorded as new episode of dermatophytosis and duration of that particular episode was captured. Intensity of itch was recorded in patient-reported scale (0 = no itching, 1 = mild itching, 2 = moderate itching, 3 = severe itching.).

Out of the total 87 patients enrolled in this study, with ages ranging from 18 to 64 years (mean age-32.7 years, SD 11.8 years) male to female ratio stood at 2.2:1, in favor of males. Out of the total 87 patients studied, only 10 had total serum IgE levels within the normal laboratory range, rest 77 (88.05%) had high IgE levels. We also observed that 57.4% (n = 50) of the patients had total serum IgE levels four times above the normal laboratory reference range. Eleven patients in the study (12.6%) had IgE levels equal to or above 6000 ng/ml, which was the highest measurable range for undiluted serum. The mean serum IgE levels in males compared to female subjects were significantly higher (mean in males = 2126.6; mean in females = 1226.7;  $P = 0.04$ ).

Table 1 shows the association of serum IgE levels with various clinical parameters. Figure 2 shows the correlation of serum IgE with the body surface area involved. Figure 3 shows the correlation of serum IgE with the duration of the disease.



**Figure 2:** Scatter diagram depicting association of body surface area with total serum IgE levels ( $r = 0.345$ ,  $P = 0.001$ ,  $n = 87$  Spearman's rho)

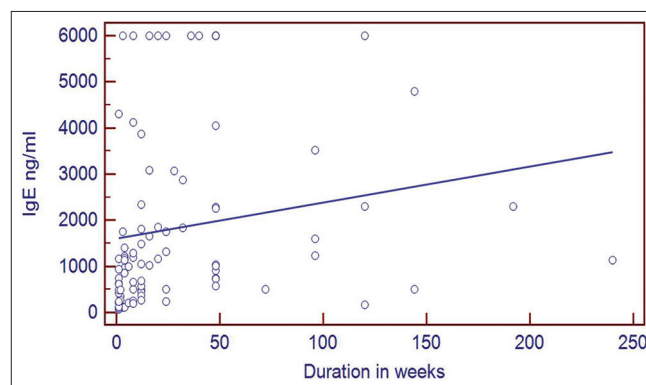
With the present epidemic of dermatophytosis in India, not only there is an increased incidence of cases, but also these are characterized by chronicity, recalcitrant disease, frequent relapses, wide-spread skin lesions and involvement of multiple family members. For effective eradication of any infection along with appropriate antifungal medication, intact host immune response is equally important.

Defense against dermatophytes depends on both innate and acquired immune mechanisms.<sup>6</sup> The presence of elevated IgE in particular, is associated with chronicity.<sup>7</sup> In our study, we observed elevated total serum IgE levels in 88.5% of the patients which is in agreement with another recent study from India by Tigga *et al.* which showed 77% patients having higher IgE levels.<sup>8</sup> Multiple studies on chronic dermatophytosis have observed that localization of host immune response to the humoral arm is an important determinant of chronicity.<sup>9-11</sup> Our study also showed a strong correlation between the duration of disease and serum IgE levels. The second significant observation of higher IgE levels seen with greater extent of body surface area involvement can also be attributed to the absent or incomplete cell-mediated

**Table 1: Association of serum IgE**

Variable	Response	n	Median	Range	P
Use of topical steroid	Yes	32	1107.0	71.0-6000.0	0.552
	No	55	1133.0	102.0-6000.0	
Use of oral steroid	Yes	29	1751.0	198.0-6000.0	0.040
	No	58	1006.5	71.0-6000.0	
Patient reported itch severity	Mild	10	1034.5	243.0-1751.0	0.683
	Moderate	42	1000.5	71.0-6000.0	
	Sever	34	1151.0	110.0-6000.0	
Family member involvement	Yes	49	1038.0	71.0-6000.0	0.401
	No	38	1204.0	102.0-6000.0	
Number of anatomical sites	Single	37	911.0	71.0-6000.0	0.169
	More than one	50	1172.0	111.0-6000.0	
Prior use of topical antifungal	Yes	32	1212.0	110.0-6000.0	0.088
	No	55	965.0	71.0-6000.0	

Detailed statistical analysis using Mann-Whitney *U* test of association of serum IgE level with various parameters



**Figure 3:** Scatter diagram depicting association of duration of diseases (weeks) with total serum IgE levels ( $r = 0.433$ ,  $P = 0.0001$ ,  $n = 87$  Spearman's rho)

immune response which is a pre-requisite for restricting the infection at the site of inoculation. In our study, we did not observe any strong correlation between serum IgE levels and the severity of itching, but this aspect needs to be tested in studies with bigger sample sizes. We compared the serum IgE levels in those patients who had used topical steroids versus those who had never used topical steroids and the difference was insignificant. The role of initial exposure to topical or systemic steroids after infection in preventing the development of cell mediated immune response, which eventually evolves into ineffective humoral type, requires further investigation in an Indian context. Studies specifically designed for investigating the effect of steroid exposure on serum IgE levels in patients of dermatophytosis are needed. However, this kind of study is likely to face ethical hurdles as topical or systemic steroids are not recommended treatment for dermatophytosis.

Our study had certain limitations being that-total serum IgE can only be considered a surrogate biomarker of humoral immune response to *Trichophyton* antigen; further studies using *Trichophyton* specific IgE and other biomarkers for cell-mediated immunity and humoral immunity (like IL4 and INF-gamma) can throw more light on this less explored aspect of dermatophytosis in India. Additionally, case-control studies with carefully selected, matched controls would be helpful in validating the findings. Detailed analysis of the effect of topical corticosteroid usage on immune response to dermatophytes using multiple biomarkers of immunity and comparative study between steroid-naïve and treated patients is also warranted.

To conclude, total serum IgE levels maybe considered a marker of humoral immune response against dermatophyte infection. We found a significant correlation between total serum IgE, duration of disease, and the extent of body surface area involvement in dermatophytosis.

#### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

#### Conflicts of interest

There are no conflicts of interest.

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