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Original Research Article

Atopic dermatitis in children: a clinico epidemiological study and the role of dietary restrictions in disease severity

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ABSTRACT

Background: Atopic dermatitis is chronic or chronically relapsing inflammatory dermatoses. Immune sensitization to food derived allergens play an important role in its pathogenesis. Aim of this study was to assess the clinical and epidemiological aspects of atopic dermatitis in children below 12 years of age, the role played by dietary modifications in the severity of disease and to correlate serum IgE levels with clinical severity and dietary modifications.
Methods: Seventy five patients, diagnosed as atopic dermatitis in age group of 1-12 years who attended Dermatology department in a tertiary care hospital during a 1 year period were selected. The clinico epidemiological features were noted. Patients were asked to avoid milk, egg and food containing milk and egg and other precipitating food for 3 weeks. SCORAD index and serum IgE levels was assessed initially and after 3 weeks..
Results: Of the 75 children with atopic dermatitis majority had pruritus and typical morphology of lesions .It was seen that 44% had food as their main precipitant; 26.7% inhalants, 22.7% seasonal variations and 6.7% had other precipitants including alternative medication. Mean SCORAD index of the cases and mean serum IgE values were decreased after 3 weeks of dietary restrictions.
Conclusions: Food was found to be the major precipitant, followed by inhalants, seasonal variations and other medications. Egg, fish and milk were found to be the major precipitants amongst food. There was a decline in SCORAD index and mean serum IgE after 3 weeks of dietary restriction.

Keywords: Atopic dermatitis, Diet, Serum IgE

INTRODUCTION

Atopic dermatitis (AD) is itchy, chronic or chronically relapsing inflammatory dermatoses. The rash is characterized by itchy papules and occasionally vesicles in infants, which become excoriated and lichenified, and typically having flexural distribution. It is frequently associated with other atopic condition in the individual or family members.[1] Diagnosis is based on the constellation of clinical findings described by Hanifin and Rajka.[2]

In the pathogenesis of atopic eczema immune sensitization to food derived allergens play an important role.[3] The infantile intestine shows increased permeability to macromolecules and this is greater in atopic infants. This may be due to inherent 'leakiness' and transient deficiency of IgA. So IgA mediated clearance mechanisms are less effective, allowing greater entry of food derived macromolecules into systemic circulation. They may induce immunological sensitization, particularly in those born of atopic parents, leading to

increased production of IgE antibodies and atopic eczema in later life.[1] Food derived antigens may activate immature T cells to become skin homing , or skin homing lymphocytes are stimulated as a result of their target antigens reaching the skin via the circulation.[4] This led to the proposition that atopic state could be avoided if the infants were not exposed to potent food allergens, for example milk and egg, during the susceptible period.

Evidence of allergen sensitization is not a proof of clinically relevant allergy. In patients with atopic dermatitis the rate of sensitization to food allergens ranges from 30-80 percentage but actual rate of confirmed food allergy is much lower.[4-7] So to confirm clinical reactivity, food challenges need to be performed especially in young children, since unnecessary avoidance of food allergens can put growing children at nutritional risk.[8]

METHODS

This was a cohort study of 75 patients, who attended the Department of Dermatology, Government Medical College, Kozhikode during a period of 1 year, from April 2014-March 2015. All AD patients in age group of 1- 12 years who satisfied Hanifin and Rajka criteria were included in the study. Patients with age less than one year and more than 12 years, patients with co-existing systemic diseases and patients who had taken systemic steroids or immunosuppressants in the last one month were excluded. Clearance for the study was obtained from the institutional ethics committee. Individual study subject was recruited after obtaining a written informed consent from the guardian. A preset proforma was used to collect data. The age, sex and area of residence of each patient were noted. The age of onset of the disease along with the frequency of flare ups and associated precipitating factors were documented. Family history as well as personal history of atopy was enquired and noted.

At the time of recruitment of the patient, severity of the disease was determined using a standardized assessment method, the SCORAD a composite index for severity scoring of atopic dermatitis proposed by European Task Force on Atopic Dermatitis. Along with this, the serum IgE level of each patient was measured at the baseline and recorded. Patients were asked to avoid milk, egg and all food items containing milk and egg for a period of three weeks. Patients who had a history of exacerbation of disease to any particular food item were asked to avoid that as well. All were advised to adhere to the treatment they were receiving at the start of the study without any change. At the end of three weeks, the study group was reassessed using SCORAD index and serum IgE levels. The data thus obtained, was assessed using appropriate statistical software with respect to the following factors

- Correlation between disease severity (as per SCORAD) and serum IgE levels
- Role of dietary modifications on disease severity and serum IgE levels.

RESULTS

In this study, 75 cases of atopic dermatitis between the age of 1 and 12 years were included and were advised to follow certain dietary eliminations. Of them, 64% were under the age of 1 year and 36% were above 1 year of age (Figure 1). In the below one year age group, majority developed it at 6 months or below. In the above 1 year category, majority developed it at 1 year of age.

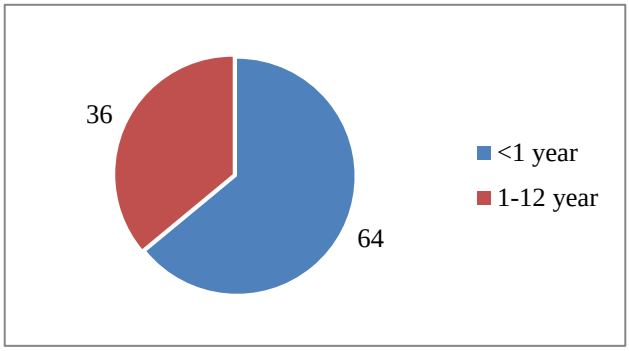

Figure 1: Classification based on age of onset.

Majority were males (Table 1).Twenty seven (67.5%) of the males had moderately severe disease as compared to 60% (21) of females.

Table 1: Distribution of sample according to sex.

Sex	Number	Percentage
Male	40	53.3
Female	35	46.7

Table 2: Comparison between disease severity and age of onset.

Age of onset	Disease severity		
	Mild	Moderate	Total
<1 year number	16	32	48
Percentage	33.3	66.67	
1 year & above number	11	16	27
Percentage	40	59.25	
Total number	27	48	75
Percentage	36	64	

Disease of moderate severity was seen more in those below one year of age (Table 2).

Itching was the most common symptom and it was present in all patients.

In the study group 54.7% of children had typical morphology as described for their age; 63.8% of the cases under 2 years had typical morphology of the lesions as

compared to 46% above 2years. All patients had dry skin. Oozing was present only in 20% of the cases (Figure 2).

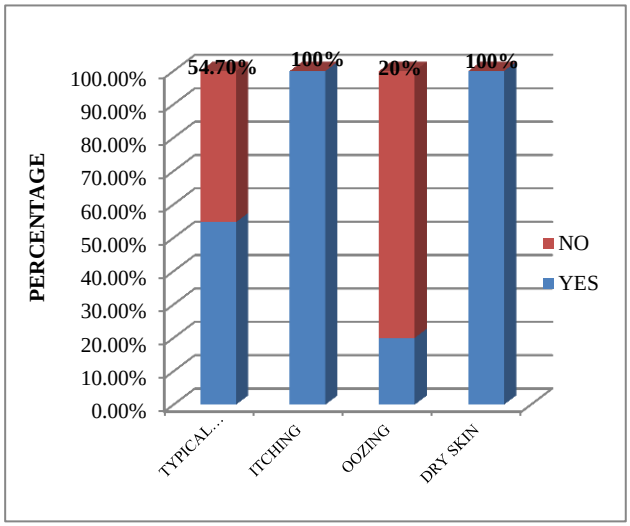

Figure 2: Frequency of clinical features observed.

Figure 3: Clinical picture at baseline.

Figure 4: Clinical picture after 3 weeks of dietary restriction.

It was seen that 40% of the study population gave history of recurrent cutaneous bacterial infections. Pityriasis alba and palmar hyper linearity co-existed with atopic dermatitis in 26.7% and 9.3% of patients respectively.

In the past one year 34.7% of the cases had 3 or less than 3 flare ups while 57.3% of them had 4-6 flare up. Only 8% of the cases had more than 7 flare up. The maximum number of flare ups noticed was 10 and minimum is 1. Twelve (46.15%) of the cases with flare ups less than 3 had disease of mild severity, 14 (32.6%) of the cases with flare ups between 4 and 6 had mild severity while only one patient (16.7%) with flare ups greater than 7 in the past one year had mild disease.

A history of atopic diathesis was seen in 48% of the study population. Twenty four patients had a history of allergic rhinitis and of them 5 (18%) had mild disease. A history of bronchial asthma was present in 18 patients and of them 4 (4.8 %) had disease of mild severity.

It was observed that 96% of the cases were on a non vegetarian diet as compared to 3% on vegetarian diet. Sixty one (81%) patients took milk and 49(65.3%) of the cases had egg every day. The various disease precipitants included food, inhalants, change of season and alternative drug use (Table 3). The food precipitants included egg (main precipitant) followed by fish and milk. Both egg and milk acted as precipitants in 9.09% of the cases. For the rest other food items acted as precipitants (Table 4).

Table 3: Frequency of each precipitant of AD.

Precipitant	Number	Percent
Food	33	44
Inhalant	20	26.7
Season	17	22.7
Others	5	6.7

Of the 75 patients, 68 had a positive family history of atopy which included a family history of bronchial asthma in 29, of allergic rhinitis in 20 and of atopic dermatitis in 19 patients. Disease of moderate severity was seen in 61.8% of those with a family history of atopy and 85% of those without a positive family history.

Table 4: Frequency of each food precipitant amongst cases.

Food	Number	Percent
Egg	11	33.33
Fish	9	27.27
Pulses	1	3
Milk	5	15.15
Grains	2	6.06
Chicken/meat	2	6.06
Egg and milk	3	9.09

The median and mean values of SCORAD calculated during the initial period declined after 3 weeks. This difference was statistically significant (Table 5).

Table 5: Comparison of mean SCORAD value.

SCORAD	Mean	SD	N	Paired t	P
Initial	27.885	6.437	75	9.724	0.000
After 3 weeks	21.553	7.207	75		

It was seen that 36% of the cases fell in the mild category as per SCORAD index initially while 64% of the cases were of moderate nature. There was no case that could be classified as severe. After 3 weeks, it was seen that 65.3% of the cases became mild while 34.7% remained moderate (Table 6).

While comparing the SCORAD index for individual cases in the initial phase and after 3 weeks, it is seen that for 81.3% of the cases the index decreased in value but for 18.7% it had increased. It was also observed that SCORAD values decreased for 80.5% (29) of the patients under the age group of 2, after 3 weeks, and for 82% (32) of patients in the age group of 2-12 of the 33 cases that had food as the major precipitant of Atopic dermatitis, it was seen that initially 57.57% (19) of the cases had moderate severity but after three weeks of dietary restriction, it was seen that only 30% (10) of the cases had moderate severity (Table 6).

Table 6: Comparison of SCORAD category.

SCORAD category	Initial		After 3 weeks	
	Number	Percent	Number	Percent
Mild	27	36	49	65.3
Moderate	48	64	26	34.7

Considering the 19 cases with egg or milk or both as the major precipitant, it was seen that only 36.84% (7) cases were of mild severity initially but after three weeks, 68.4% (13) cases were seen to be of mild severity.

Table 7: Change in serum IgE.

IgE	Mean	SD	N	Paired t	p
Initial	2331.8	3540.97	75	1.249	0.215
After 3 Weeks	2140.72	3040.43	75		

It was seen that the initial IgE mean showed a decline compared to that after 3 weeks. Even though there was a decline, it was not statistically significant (p= 0.215) (Table 7).

The lowest serum IgE recorded initially was 13 and the highest was 19850 while after three weeks it was 32 and 16000. While comparing the change in serum IgE for each individual case, after 3 weeks, it is seen that for 58.7% of them it decreased while for 41.3% it increased.

The serum IgE levels decreased after 3 weeks for 61% (22) of the under 2 age group and for 56.4% (22) of the cases above 2 years of age.

DISCUSSION

The true prevalence of AD varies between 10% and 30%, of this 80 % have mild eczema.[9] A gradual increase in the prevalence of AD has been observed recently and the upward trend is also true in Indian context.[10] AD is the commonest dermatosis in children registered in paediatric dermatology clinic where it constituted 28.46% of all registered patients.[11] Numerous aggravating factors and possible etiological agents have been proposed as triggers for atopic dermatitis. The possible role of dietary factors in this regard has been emphasized by recent controlled studies. A total of 75 children 1-12 years old diagnosed to have atopic dermatitis according to Hanifin and Rajka criteria were included in our study and were advised to follow certain dietary modification for the prescribed time period.

Gender ratio is varied in different studies, but majority show male preponderance in children.[12-14] In our study majority were males ,with a male to female ratio of 1.14:1.

Pruritus, one of the major criteria, was seen in all 75 patients. Sarkar and Kanwar in their study reported similar finding, where itching was present in 100% of patients.[13]

Typical morphology and distribution - edematous papules and papulo vesicles on the cheeks (often sparing the central face) in patients under the age of 2 years and flexural eczema in those between 2 and 12 years of age- was seen in 54.7% of the cases. On further evaluation of under 2 years cases, 63.8% had involvement of face with typical morphology of lesions. This is similar to the study in which 80.8% of the under 2 year age group children had face involvement.[13] Above 2 years of age, 46% of patients had typical morphology of lesions with more involvement of flexures. A study by Sarkar and Kanwar reported 45.4% of cases with more involvement of flexures as in our study.[13]

Chronically relapsing nature of the disease was assessed based on the number of flare ups that the patient had over the last one year. In this study, we obtained that 34.7% of the cases had less than 3 flare ups in the past one year while 57.3% of them had 4-6 flare up. Only 8% of the cases had more than 7 flare ups. The minimum number of flare up episodes was seen to be 1 while the maximum was 10. It was also seen that 46.15% (12) of the cases with flare ups less than 3 had disease of mild severity. It was also seen that 32.6%(14) of the cases with flare ups between 4 and 6 had mild severity while only 16.7% of cases with flare ups greater than 7 in the past one year had mild disease, which in turn points to an increase in

severity of the disease with the increase in number of flare up episodes for the patient.

Dhar et al reported a personal history of atopy in 18.5% patients; a history of allergic rhinitis was present in 12.3% and bronchial asthma in 4.7%.[15] In the present study, 48% of the cases had history of atopy, of which allergic rhinitis and bronchial asthma showed a prevalence of 32% and 24% respectively and both are higher than what observed in the above study. While trying to find a relation between history of atopy and severity of the disease, it was seen that 18% (5) case of allergic rhinitis had mild disease while 39.5% (19) of the cases had it of moderate severity. In the case of those with bronchial asthma 14.8% (4) of the cases had disease of mild severity while 29.1% (14) of them had moderate disease. This showed that those with a personal history of atopy stood a greater chance of having a more severe form of the disease as was the result in many other similar studies done earlier.[16]

Family history of atopy was reported by Sarkar et al in 36.37% and Karthikeyan et al in 35.35%.[13,17] In the present study 90.7% of study population gave a family history of atopy which is much greater than the other studies.[16] Nineteen children had family history of atopic dermatitis, 29 gave a family history of bronchial asthma and 20 showed a family history of allergic rhinitis. Although studies have proven a positive family history as an indicator for more severe disease, in our study only 61.8% of those with positive family history were in the moderate category while 85% of those without history had disease of moderate severity.[25] This may be attributed to the very small population that had been studied.

In the present study majority (64%) of study population developed the disease below 1 year of age. Wurthrich et al reported similar finding.[11] In the below one year age group it, majority developed it at 6 months or below it. In the above 1 year category, majority developed it at 1year of age. The importance of this finding lies in the fact that early onset is often a predictor of more severe course as seen in our study. Of the cases that had onset before 1 year of age 66.67% had moderate severity of disease as compared to 59.25% of those who had it after 1 year. Kumar et al reported a similar finding where children of younger age group had higher SCORAD.[18]

Xerosis was found in all 75 cases. This was in accordance with findings of Sarkar and Kanwar.[13] Acute stage eczema characterised by oozing was seen only in 20% of the cases. Sarkar et al reported acute stage eczema in 65.4% children under 2 years.[13] In this study it was seen that 7 cases under the age of 2 years (19.4%) had oozing lesions. This contradiction might be due to the small sample size of this study. Similar to findings in study conducted by Sarkar et al it was seen that 40% of the cases gave history of recurrent cutaneous infections.[13]

Clinical studies have revealed that more than 50% of all children with AD can have exacerbation of the disease by certain foods, and will react with a worsening of skin eczema.[19] In the present study 44% of patients showed a food induced exacerbation of atopic dermatitis, while rest 56% never noticed an exacerbation of atopic dermatitis related to food. Out of 75 patients 13 gave a history of exacerbation of AD on taking egg, 9 with fish 6 with milk, 2 with wheat containing diet, for 2 with chicken or meat and 1with soya bean. The most common food item exacerbating atopic dermatitis was egg followed by fish and milk.

Seventy two (96%) children were on a non-vegetarian diet. Cow's milk was included in the daily diet by 81.3% of the cases and egg by 65.3%; the rest avoided them due to the fear of exacerbation of lesions.

While looking into the precipitants of the disease, it was seen that 44% of the cases had food as the main precipitant, 26.7% had inhalants and 22.7% had change of season (usually winter) as precipitants. Sarkar et al reported that 62% of the study population having an aggravation during winter.[13] Atherton et al demonstrated that a milk and egg free diet had a highly beneficial effect in 70% of their patients.[20] This beneficial effect could not be confirmed in other, similarly designed studies wherein improvement was achieved in only 25% of the cases.[21-23] An open-pilot study conducted in India by Dhar et al in which patients were advised to strictly adhere to a diet excluding milk and milk products, nuts and nut-containing foods, egg and egg-containing foods, sea fish and prawns, brinjal and soyabean for a period of 3 weeks, showed a statistically significant reduction in severity scores after dietary elimination alone.[15] A study conducted by Sloper et al, at London offering a food elimination diet concluded that a standard elimination diet avoiding cows' milk, egg, tomatoes and possibly colours and preservatives will help up to three-quarters of patients, and this diet may be considered in all children with moderate or severe eczema.[24]

A recent cochrane review of nine randomized controlled trials of food allergy in patients with AD showed that there appears to be no benefit of an egg and milk-free diet in unselected participants with atopic eczema.[25]

In the present study the mean SCORAD initially was 27.885 and at the end of 3 weeks after dietary restriction 21.553. The SCORAD was reduced from a baseline mean of 27.885 to 21.553 at the end of trail period. And the difference is statistically significant (p=0.000). The median value of SCORAD calculated during the initial period was 27.4 which declined to 20.4 after 3 weeks. On further classifying the cases as mild, moderate and severe based on the value of SCORAD, It was seen that 36% of the cases fell in the mild category as per SCORAD index initially while64% of the cases were of moderate nature. There was no case that could be classified as severe. In this study while comparing the SCORAD index for

individual cases in the initial phase and after 3 weeks, it is seen that for 81.3% of the cases the index decreased in value but for 18.7% it had increased. It is also observed that for 80.5% (29) of the under 2 age group SCORAD decreased after 3 weeks, for 82% (32) of 2-12 age groups it decreased, which can be read as a greater chance for the above 2year age group to have a decline in severity with restriction. It is also seen that for 77.5% (31) of the males it decreased while for 85% (30) of the females SCORAD decreased after 3 weeks.

The effectiveness of dietary restriction can also be inferred from the 33 cases that had food as the major precipitant. It was seen that initially 57.57% of the cases had moderate severity but after three weeks of dietary restriction, it was seen that only 30% of the cases had moderate severity. Considering the 19 cases with egg or milk or both as the major precipitant, it was seen that only 36.84% cases were of mild severity initially but after three weeks, 68.4% cases were seen to be of mild severity.

In the study by Ahmed et al, it was seen that 70% of the study population had elevated serum IgE.[26] In this study, all cases except one had elevated serum IgE levels; it was seen that 2331.8 was the initial mean serum IgE level and after three weeks it declined to 2140.7. But the difference was not statistically significant. The median value of IgE obtained initially was 789 while after 3 weeks it was found to be 980, which is actually an increment, contrary to what was expected. The lowest serum IgE recorded initially was 13 and the highest was 19850 while after three weeks it was 32 and 16000, showing the wide range within which the values fell. While comparing the change in serum IgE for each individual case, after 3 weeks, it is seen that for 58.7% of them it decreased while for 41.3% it increased, which shows there was a decline in total, even though it was not significant. It was seen that 61% of patients under 2 years and 56.4% of the cases above 2 years showed a decline in serum IgE levels after 3 weeks, contradictory to the findings in relation to SCORAD index. The serum IgE value decreased after 3 weeks in52.5% males in 65.7% of the females which just like SCORAD index, shows a higher probability of females to have a decline in serum IgE level with dietary restrictions, as compared to males.

CONCLUSION

Atopic dermatitis was found to be more prevalent among males. All cases presented with pruritus and dry skin with majority having typical morphology and distribution. Majority of the patients had an age of onset below 1 year of age with a maximum number having it at 6 months of age. Early age of onset, increased number of disease flares and personal history of atopy correlated positively with disease severity. Food was found to be the major precipitant; egg, fish and milk were found to be the major precipitants amongst food. There was a decline in SCORAD index after 3 weeks of dietary restriction and the decline was statistically significant implying that dietary restrictions do have a role in decreasing the severity of the disease. Even though there was a decline in mean serum IgE after 3 weeks, it was not statistically significant which shows there is no absolute relationship between the severity of the disease and serum IgE. The greatest difficulty we faced during this study was the difficulty to implement a restrictive diet to the children even for a short period of three weeks. So we recommend further large scale clinical trials to develop a consensus regarding dietary restrictions in atopic dermatitis, as blind dietary eliminations may lead to nutritional deficiencies in children.

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