

Eye Manifestations among Atopic Dermatitis in Children

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Abstract

Background: Atopic Dermatitis is the most common type of dermatitis among children. In severe form besides skin changes, patient is prone to develop eye changes due to excessive rubbing on eyes. In such situations, ophthalmologist consultation is needed to reduce ocular comorbidities.

Objective: To determine the association of eye manifestations of Atopic Dermatitis with the severity of Atopic Dermatitis in children up to 14 years of age.

Methods: This retrospective study was conducted in Dermatology and Ophthalmology department, Sahiwal Teaching Hospital, Sahiwal from Jan to Dec 2024. Patients fulfilling the Atopic Dermatitis diagnostic criteria (Williams UK working party) of age less than 14 years and either sex were selected in the study. A sample size of 114 patients and nonprobability consecutive sampling technique was used. Clinical severity of Atopic disease was categorized into mild, moderate and severe by using SCORAD index. All data regarding patient demographics, cutaneous and eye examination findings were recorded on a specially designed proforma. The data was analyzed by using SPSS version 25. The association between eye changes and different severity (mild, moderate, severe) of Atopic Dermatitis (SCORAD index) was determined by using χ^2 test. If p-value is equal to or less than 0.5, it will be considered significant.

Results: Out of total 114 participants, majority belonged to male (65%) gender and mean age with SD was 4.68 ± 2.67 years. Most of children were of moderate (58%) severity. Eyelid changes frequently observed were dryness of eyelid (65%) followed by blepharitis (42%). Among conjunctival finding, keratoconjunctivitis were most commonly reported (33%). No statistically significant (p-value=0.897) association of eyelid changes with disease severity was observed. Although conjunctival changes and disease severity association was statistically demonstrated significantly (p-value 0.005).

Conclusion: Ocular changes were common in children with atopic dermatitis. While eyelid findings did not correlate with disease severity, conjunctival involvement increased with more severe dermatitis.

Keywords: Atopic dermatitis, Children, Eye manifestations.

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Introduction

Atopic dermatitis (AD) is a chronic inflammatory skin disease characterized by itchy papulovesicles, excoriation, weeping lesions leading to lichenification usually involving flexural sites and fissuring occurs in chronicity.¹ It has remission and relapses. It starts in infancy and may

persists after adolescence up to 86 years with predominance of adult age >19 years (51%).² Prevalence of AD in adult ranges from 2.1% to 4.9% and in children it ranges from 1-23% in different countries.^{3,4} Multiple factors are involved in etiopathogenesis of this disease including genetics, maternal, pregnancy, environmental, immune dysregu-

lation, immuno-globulins and infection.⁵ It is associated with asthma, other autoimmune disorders like Alopecia areata, vitiligo and inflammatory bowel disease in the individual or other family members.⁶

In children with chronic and severe form, due to repeated scratching and rubbing of the face may result into cutaneous and eye lesions. Thus, requiring continuous dermatologic and eye care to prevent skin and eye complications.⁷ If not treated timely, these children are prone to develop various ocular complications. The eye complications which may occur are dermatitis of the eyelids, blepharitis, keratoconjunctivitis, keratoconus, dry eyes, cataract, retinal detachment and ocular herpes simplex.^{8, 9, 10}

Dermatologist having knowledge of these ocular complications may refer these patients to Ophthalmologist so that early diagnosis and management could be started. Similarly, when such patients come for seeking eye treatment from an Ophthalmologist, they could be sent to Dermatologists for their cutaneous lesion treatment.

The main rationale of carrying out this study was to determine the association of eye manifestations with the severity of atopic dermatitis in children. Thus, both dermatologist and ophthalmologist can help the patient with atopic dermatitis in getting early diagnosis and timely management of both cutaneous as well as eye manifestations or complications. This was first type of such study that was being conducted in this region of Punjab, Pakistan.

This study was conducted with objective of finding the association of eye manifestations of Atopic Dermatitis with the severity of Atopic Dermatitis in children up to 14 years of age.

Methods

This retrospective study was carried out in Dermatology and Ophthalmology department Sahiwal Teaching Hospital, Sahiwal after approval from Institutional Review Board. Prior informed written consent regarding the study and photographs was taken from the parents/guardian. Sample size of 114 patients was calculated from Open Epi

version 3 with a confidence level of 95%, a margin of error 5% and frequency of eye changes in atopic dermatitis among children was hypothesized to be 92% based on Raffa et al, study.¹³

One hundred and fourteen patients meeting the Atopic Dermatitis diagnostic criteria (Williams (U.K. Working party) of age less than 14 years and either sex were enrolled in the study. Severity of atopic dermatitis was calculated by using SCORAD index. SCORAD index was used to assess the clinical severity of AD into mild, moderate and severe. Nonprobability consecutive sampling technique was used. Patients with history of intake of systemic steroids 4 weeks prior to study, hypersensitivity to topical preparations and psychiatric illness were excluded from the study.

Demographic information of the patient along with clinical data including the detailed history and cutaneous examination was performed. Complete Eye examination including slit lamp examination and indirect ophthalmoscopy done. All information regarding cutaneous findings and eye manifestations were noted on a study designed proforma.

The data was analyzed by using SPSS version 25. Among demographic variables age was calculated by using mean and standard deviation and sex was presented in simple descriptive statistics as frequency. Duration of cutaneous and duration eye changes was analyzed as mean and standard deviation. The association between eye changes and different severity (mild, moderate, severe) of Atopic Dermatitis (SCORAD index) was determined by using χ^2 test. If p-value is equal to or less than 0.5, it will be considered significant.

Results

Among the 114 study participants, majority were male (65%) and under 5 years of age (67.5%). Mean age with SD was 4.68 ± 2.67 years. Average duration of skin changes at time of presentation was 1.09 ± 0.89 years and eye changes were noted for mean 0.70 ± 0.84 years. (Table 1) According to SCORAD Severity Score most of children were of moderate (58%) severity and median severity score of 39.85 (Figure 1).

Most common eyelid change was dryness of eyelid skin (64.9%) followed by blepharitis (42%). Keratoconjunctivitis was predominant conjunctival finding observed in 33.3% of participants. (Table 2) No clinical or statistically significant association between eyelid changes and disease severity was noted (p-value = 0.897) but statistically significant association between conjunctival changes and disease severity was observed

Table 1: Demographic and clinical variables of study participants.

| Gender | Frequency (Percentage) | Number (n=114) |
|--------------------------|------------------------|--------------------|
| Male | 64.9% | 74 |
| Female | 35.1% | 40 |
| Age Group | Frequency (Percentage) | Number (n=114) |
| 1-3 years | 39.5% | 45 |
| 4-5 years | 28% | 32 |
| 6-14 years | 32.5% | 37 |
| Parameter | Mean | Standard Deviation |
| Age | 4.68 years | 2.67 years |
| Duration of eye changes | 0.70 years | 0.84 years |
| Duration of skin changes | 1.09 years | 0.89 years |
| SCORAD | 39.85 | 47.18 |

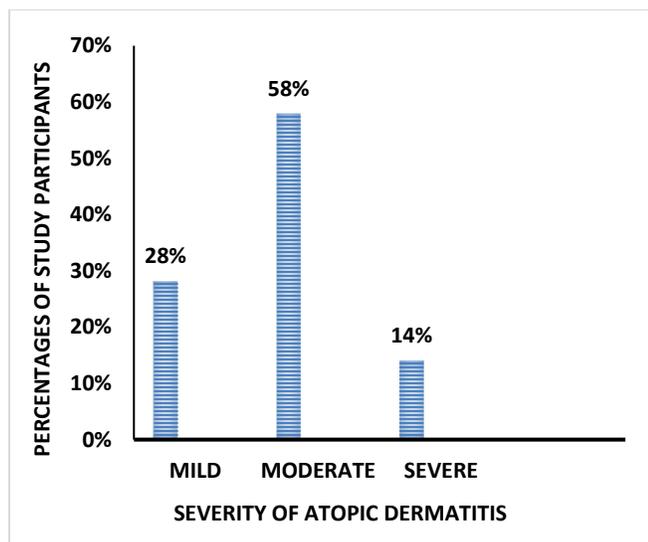


Figure 1: SCORAD Severity Score of study participants.

Table 2: Frequency of different eye changes in study participants.

| Eyelid changes | Percentage (%) | Number (n) |
|------------------------|----------------|------------|
| Dryness of eyelid skin | 64.9 | 70 |
| Blepharitis | 42.1 | 48 |
| Dennie-morgan folds | 26.3 | 30 |
| Periorbital darkening | 16.7 | 19 |
| Loss of eyelashes | 7.9 | 9 |
| Conjunctival changes | | |
| Keratoconjunctivitis | 33.3 | 38 |
| Conjunctivitis | 21.1 | 24 |

Table 3: Association of frequency of eye changes and SCORAD (Fisher Exact statistics).

| SCORAD | No change | >1 change | >2 changes | P Value |
|----------------------|-----------|-----------|------------|---------|
| Eyelid changes | | | | |
| >6 months | 15.6% | 43.8% | 40.6% | 0.897 |
| 6 months to 1 Year | 15.2% | 34.8% | 50% | |
| >1 year | 18.7% | 31.3% | 50% | |
| Conjunctival changes | | | | |
| >6 months | 25.0% | 65.6% | 9.4% | 0.005 |
| 6 months to 1 Year | 56.1% | 40.9% | 3% | |
| >1 Year | 75.9% | 25% | 0% | |



Picture 1: Various Eyes changes among children in Atopic Dermatitis

a) Dryness of eyelids. b) Dennie morgan fold. c) Blepharitis. d) Erythema and mild scaling in periorbital region.

(p-value 0.005) (Table 3). Both eyelid changes and conjunctival changes association with duration of

disease were not found to be statistically significant (Table 4).

Table 4: Association of frequency eye changes and duration of disease (Fisher Exact Statistics).

| Duration of Disease | No Change | >1 Change | >2 Change | P Value |
|-----------------------------|-----------|-----------|-----------|---------|
| Eyelid changes | | | | |
| >6 months | 24.4% | 36.6% | 39% | |
| 6 months to 1 Year | 13.6% | 45.5% | 40.9% | 0.238 |
| >1 year | 9.8% | 33.3% | 56.9% | |
| Conjunctival changes | | | | |
| >6 months | 51.2% | 46.3% | 2.4% | |
| 6 months to 1 Year | 36.4% | 54.5% | 9.1% | 0.50 |
| >1 Year | 54.9% | 41.2% | 3.9% | |

Discussion

Atopic dermatitis is a chronic inflammatory condition characterized by remission and recurrence. Various studies have demonstrated the associations between Atopic dermatitis and numerous ophthalmic manifestations.⁸ These ocular changes may present without any symptoms, thus may not be recognized and missed during a routine cutaneous examination. In chronic cases, recurrent scratching and rubbing of the face especially among children are prone to develop ocular manifestations. As eye is very vital organ so knowing the frequency and importance of these eye manifestations may help in early diagnosis and management. Male (65%) gender out number female (35%) among patients in this study. Likewise, male gender predominance in Atopic patients with eye changes were reported in the various studies carried out previously.^{7,9,13,14} In contrast, Carmo et al, in his study, observed more female (56%) population as compared male (54%) among atopic dermatitis with ocular manifestations.¹⁵ In present study, most of atopic children were below age of 5 years with median age and SD was 4.68 ± 2.67 years. Raffa et al, in his study, reported higher mean age

(10.48±3.6 years).¹³ While lower mean age (36.2 months, 40.4 months) was seen in the studies conducted by Carmi and Özer et al, respectively.^{9,14} In current study, mean SCORD index was 39.85±47.18. Similarly, Raffal et al, observed mean SCORD index of 35.75. Whereas, Ozer et al, reported lower mean SCORD index (23.2 ±7.0).¹⁴

Variation exists in frequency of eye changes among atopic dermatitis children. It is estimated that frequency ocular manifestations in Atopic dermatitis ranges from 25% to 50% in various studies performed previously.^{7,8,13} Among different eye abnormalities reported in atopic dermatitis, eyelid or peri-orbital skin changes are commonly seen. In present study, frequency of eyelid changes varies from 64% (dryness of skin) to loss of eyelashes (8%). Riffa et al, demonstrated frequency of eyelid changes 54%.¹³

Dryness of skin around eyes leads to peri-orbital dermatitis in Atopic patients. This is observed in both paediatric and adult Atopic patients. Nocturnal itching associated with Atopic dermatitis may lead to rubbing or scratching the eyelids during sleep, thus can cause skin changes surrounding the eye.¹⁶ The periocular skin besides inflammatory skin conditions may be involved in infections, systemic disease, drug reactions, benign and malignant lesions.¹⁷ In our study, Periorbital darkening was observed 16.7% of study patients. While, Mendiratta et al, and Sehgal et al, reported higher frequency (29% and 58% respectively) of periorbital darkening of skin in their studies.^{18,19}

Dennie-Morgan Fold (DMF) are excessive skin markings or lines of below lower eyelids. It may occur in Atopic patients, allergic rhinitis and atopy. Its pathophysiology is not known exactly. It is postulated that edema of skin and muller muscle of eyelid spasm due to hypoxia associated with decreased vascular circulation.²⁰ In current study, 26.3% of patients had Dennie-morgan folds. Similarly, Gan et al, and Raffa et al, showed in their studies this ocular change in frequency of 21% and 22% respectively closer to our study findings.^{13,21} In contrast, higher proportion of DMF ranging from 48% to 72% had been reported in the studies carried out previously.^{16,22} Lower frequency (11%)

of Dennie -Morgan folds had been observed in the study conducted by Raffa et al.¹³ It had been reported in the literature that statistically significant association of combination of xerosis and Dennie-Morgan fold with atopic dermatitis. Combined occurrence of both peri-ocular changes was 43% in this study.⁷

Multiple factors including immune related disturbances, colonization of eyelids with bacteria and meibomian gland malfunctioning have been implicated in pathogenesis of blepharitis. It had been reported in study conducted by Govind et al, atopic patients prone to develop blepharitis 50% when compared with normal population.²³ Atopic patients with prior history of allergic rhinitis, head and neck sites of involvement and raised IGE levels have greater risk of ocular surface diseases.²⁴ In present study, blepharitis was observed in 42% of study patients. This finding was in concordance with results of study carried out by Yamamoto, et al, where 41% of Atopic patients develop blepharitis.²⁵ In contrast, low frequency (2%) of blepharitis was observed in a Malaysian study conducted by Gan et al.²¹ Bermond et al, and Carmo et al, reported higher frequency (65%, 50.2%) of blepharitis in their studies respectively.^{26,15}

Conjunctivitis is commonly reported eye condition in pediatric population.²⁷ Conjunctivitis has been observed in both adult and pediatric AD population. Bayat et al, reported substantial changes in conjunctival histopathology among children of Atopic dermatitis. These changes clinically noticed in the tests used to measure the tear film. Dry eye was observed in such patients.²⁸ It is categorized into infectious and non-infectious conjunctivitis. Bacterial conjunctivitis constitutes bulk of infective etiology cases. Allergic conjunctivitis mediated by type I hypersensitivity reaction affecting one in five children. It results mostly due to airborne allergens such as pollen, dust, dander.²⁷ In present study, conjunctivitis was observed in 21.1% of study patients. This finding was close to the result (27%) of study conducted Carmo et al. While, lower frequency of conjunctivitis (7%, 12.9%) had been reported by Kajualgi et al, and Mendiratta et al, respectively among AD patients in their studies.^{7,22} Conjunctivitis of higher fre-

quency ranging from 50 to 75% in Atopic dermatitis was demonstrated in the previous studies.^{15,29}

Keratoconjunctivitis is an inflammatory condition of eye affecting cornea and conjunctiva. Multiple etiological factors including viral, bacterial, and autoimmune and allergies have been postulated. It clinically manifests as conjunctivitis, corneal ulceration, superficial punctate keratitis, and corneal neovascularisation.²⁶ It may result into loss of vision if not treated timely.³⁰ Atopic Keratoconjunctivitis has been observed in children.²⁶ In current study, it was found to be in 33.3% of study participants. These findings were concordance with range 20% to 40% Atopic keratoconjunctivitis reported in the past studies. AKC of higher frequencies had been shown in the previous literature.^{13,26}

This study was limited by its inability to perform indirect ophthalmoscopy due to patient non-cooperation (likely due to young age and existing secondary skin infections). Large sample size and multicenter studies will elaborate results for future studies.

This study highlight need of the importance of Dermatologists to have knowledge of common eye comorbidities while dealing with AD patients of pediatric population. In order to achieve this a collaborative and multidisciplinary approach should be adopted through close liaison between ophthalmologists and dermatologists, elective rotations of the postgraduate residents of both specialties and making combined protocols for management eye manifestations in AD patients.

Conclusion

Ocular changes were common in children with atopic dermatitis, particularly eyelid dryness, blepharitis, and keratoconjunctivitis. While eyelid findings did not correlate with disease severity, conjunctival involvement increased with more severe dermatitis, underscoring the need for timely ophthalmologic assessment in affected children.

Ethical Approval

The study was approved by Institutional Review Board (IRB) Sahiwal Medical College and Allied Teaching Hospital vide letter no, 93/IRB/SLMC/SWL dated 21/12/2023.

Conflict of Interest: There was no conflict of interest to be declared by any author.

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Author's Contribution

ZR: Acquisition of data, conception & design of study, analysis & interpretation of data, drafting of article, critical review of the article for important intellectual content, final approval of the version to be published.

AZJ: Acquisition of data, conception & design of study, analysis & interpretation of data, final approval of the version to be published.

SH: Acquisition of data, conception & design of study, analysis & interpretation of data, final approval of the version to be published.

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US: Conception & design of study, analysis & interpretation of data, final approval of the version to be published.

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