INTERNATIONAL JOURNAL
of PEDIATRIC DERMATOLOGY

Vol 1. Iss. 2 (July-December, 2024)
ISSN 3035-1006 online

Observational Study

A cross-sectional study to assess the association of minor criteria of Hannifin and Rajka with age and gender in pediatric Atopic Dermatitis population

G. Bansal[1], R. Bansal[2]

[1] Department of Dermatology & STD, F.H Medical College, Agra, Uttar Pradesh, India
[2] Department of Pediatrics, FHMC, Agra, Uttar Pradesh, India

KEYWORDS

Atopic dermatitis, Hannifin and Rajka criteria

CORRESPONDING AUTHOR

Garima Bansal MD,
Assistant Professor,
Department of Dermatology & STD, F.H Medical College, (affiliated with Government of Uttar Pradesh), Agra, Uttar Pradesh, India
drgarimabansal2011@gmail.com

Atopic dermatitis is a chronic relapsing dermatitis characterized by intense itching. Hanifin and Rajka criteria is the most commonly used diagnostic criteria in hospital setup, consisting of 4 major and 23 minor criteria. To estimate the frequency of distribution of Hanifin and Rajka minor criteria in the pediatric age group. To assess the association of age with minor criteria of AD. To assess the association of gender with minor criteria of AD. A cross-sectional study of 150 pediatric patients (≤16 years) was conducted in the Department of Dermatology, who were diagnosed with AD based on history, clinical and ophthalmological examination. Serum IgE was also assessed. The age and gender analysis were done using a chi-square test. The most common clinical features were orbital darkening 133(88.7%), Dennie-Morgan infraorbital fold 126(84%), xerosis 102(68%), keratosis pilaris 101(67.3%), hyperlinear palm 98(65%). Serum IgE was elevated at 26%. The majority presented with high readings with no obvious keratoconus. Male children (88%) presented predominantly with orbital darkening (90.9%) and had an exacerbation in winters (18.2%) in comparison to females (62%) p≤0.05. Children > 1 year (141%) presented mostly with keratosis pilaris (71.6%), non-specific hand-foot dermatitis (49.6%), and facial erythema (34.8%) than in infants (9%) p≤0.05. Minor criteria are useful for the diagnosis of AD. Male children are more affected and manifest with orbital darkening with Dennie -Morgan infraorbital fold as the chief clinical finding in both groups. Factors such as ethnic/racial, environmental, and diet have a role in AD.

1. Introduction

Atopic dermatitis (AD) is a chronic or chronically relapsing hypersensitive manifestation of the skin with itching as a predominant feature. AD constitutes 28.46% of all pediatric dermatoses in pediatric dermatology and is the most common dermatosis registered in children (1). The prevalence of AD in our hospital is 5%. This is due to the variation of the prevalence of clinical features and intensity of AD symptoms with genetic background, climate, geographical regions, food habits, socioeconomic status, availability of healthcare facilities, and others (2, 3). These factors led Hanifin and Rajka to propose a criterion commonly known as "Hanifin and Rajka's diagnostic criteria for AD" (4). Indian literature in research on epidemiology, etiopathogenesis and management of AD is not robust. The overall hygiene being poor and various infections in childhood being rampant in India, AD is less prevalent and less severe. However, in the last four decades, there has been rapid urbanization and improved lifestyle taking place in emerging India that may lead to increased prevalence of AD, if the role of hygiene hypothesis in the pathogenesis of AD is valid and is to be believed (5, 6).

2. Objectives

1. To estimate the frequency of distribution of Hanifin and Rajka minor criteria in the pediatric age group.

2. To assess the association of age with minor criteria of AD.

3. To assess the association of gender with minor criteria of AD.

3. Materials and methods

A cross-sectional study of 150 pediatric patients under 17 years was conducted for 6 months from 20th December 2023 to 19th June 2024, newly diagnosed with AD based on history, clinical and ophthalmological examination. Serum IgE was also assessed.

In every patient, a detailed history concerning the present age, age of onset of the disease (early age of onset was defined as the onset of symptoms of eczema before the age of 5 years, similar to Nagaraja et al. (7, 8), a tendency toward cutaneous infections (described as the presence of at least two episodes of folliculitis/furunculosis/impetiginisation or diagnosed herpes simplex infection in the past 1 year) and nonspecific hand/foot dermatitis (defined as the presence of itchy lesions on one or both hands/feet with erythema and papules/vesicles or scaling, with or without oozing, crusting, fissures, or lichenification), recurrent conjunctivitis, itch when sweating, intolerance to wool and lipid solvents, food hypersensitivity, and influence of environmental and/or emotional factors on the course of the disease was obtained from the parents. Clinical examination was done to record the presence of xerosis, ichthyosis, palmar hyperlinearity (defined by the presence of more than 5 prominent lines longer than 1 cm running across the palm, similar to Böhme et al.) (8), keratosis pilaris (more than 20 follicular, keratotic papules involving at least posterolateral aspects of upper arms or thighs) (8), nipple eczema, cheilitis, Dennie–Morgan infraorbital folds (defined as present when at least one of the infraorbital creases running laterally crossed the pupillary midline, as described by Mevorah et al. (9) orbital darkening, facial pallor or erythema (facial erythema was defined as erythema over cheeks without papules/scaling and facial pallor as skin pallor which is often accentuated peri nasally and/or periorally), pityriasis alba, anterior neck folds (defined as prominent horizontal skin crease(s) on the anterior aspect of the neck, when head is upright), perifollicular accentuation (defined as dermatitis enhanced around hair follicles in ≥2 areas with a diameter >5 cm) (8), and white dermographism. Ophthalmological evaluation to see for the presence of keratoconus and anterior subcapsular cataract was performed by an ophthalmologist. Blood test to assess serum immunoglobulin E (IgE) level was conducted at the laboratory.

4. Statical analysis

Data was entered into the Microsoft Excel software (Window-10). Frequency, percentage, mean, and standard deviation were calculated. The Bar diagram and multiple bar diagram were prepared. A chi-square test was applied. The P-value was judged at 5% level of significance. Jamovi software was used for the test of significance.

5. Results

A total of 150 children were enrolled in the study; of these 88 were males and 62 were females. The mean age was 5.63(SD±3.21) years as shown in Table I.

Table I. Baseline characteristics of the participants.

Characteristics	**Statistics (Measure)**	
Age	Mean ± sd (Rang)	5.63±3.21 (1-15)
Gender	Females (%)	62 (41.3%)
	Males (%)	88 (58.7%)

The distribution of clinical features of minor criteria of Hannifin and Rajka is shown in Table II and Figure 1 the most common features were orbital darkening (88.7%), Dennie-Morgan infraorbital fold (84%), xerosis (68%), keratosis pilaris (67.3%), hyper linear palm (65%), facial pallor (63.3%), pityriasis alba (60.7%.), winter variation was seen more frequently (52.7%) than in summer exacerbation (26%), cheilitis (52%), itching when sweating (52%), tendency for cutaneous infection (48%), prominent anterior neck fold (48%), non-specific hand feet dermatitis (47.3%), perifollicular accentuation (45.3%), facial erythema (37.3%), intolerance to wool and lipid solvent (17.3%). Serum IgE was elevated in 56.7%. Eye symptoms (1.3%), recurrent conjunctivitis (2.7%), nipple eczema (0.7%), white dermographism, and food hypersensitivity were not observed. High reading was observed in (2.7%) with suspect keratoconus in (2%) children. No obvious keratoconus was seen.

Table II. Distribution of minor criteria (percentage values).

Minor Criteria	**Frequency**	**Percentage**
Early age of onset	43	28.7
Tendency for cutaneous infections	72	48
Tendency to nonspecific hand/ foot dermatitis	71	47.3
Xerosis	102	68
Ichthyosis	92	61.3
Hyperlinear palms	98	65.3
Keratosis pilaris	101	67.3
Nipple eczema	1	0.7
Cheilitis	78	52
Dennie-Morgan infraorbital fold	126	84

Recurrent conjunctivitis		4	2.7
Course influenced by environmental factors- Winter / Summer	**Summer**	39	26
	Winter	79	52.7
	No variation	32	21.3
Orbital darkening		133	88.7
Facial Pallor		95	63.3
Facial Erythema		56	37.3
Pityriasis alba		91	60.7
Anterior neck folds		72	48.0
Perifollicular accentuation		68	45.3
Itch when sweating		78	52.0
Intolerance to wool and lipid solvents		26	17.3
Food hypersensitivity		0	0.0
White dermographism		0	0.0
Eye symptoms		2	1.3
Serum IGE		85	56.7
High reading (keratoconous)	high reading with suspect keratoconous	3	2.0
	high reading	4	2.7
	Normal	143	95.3

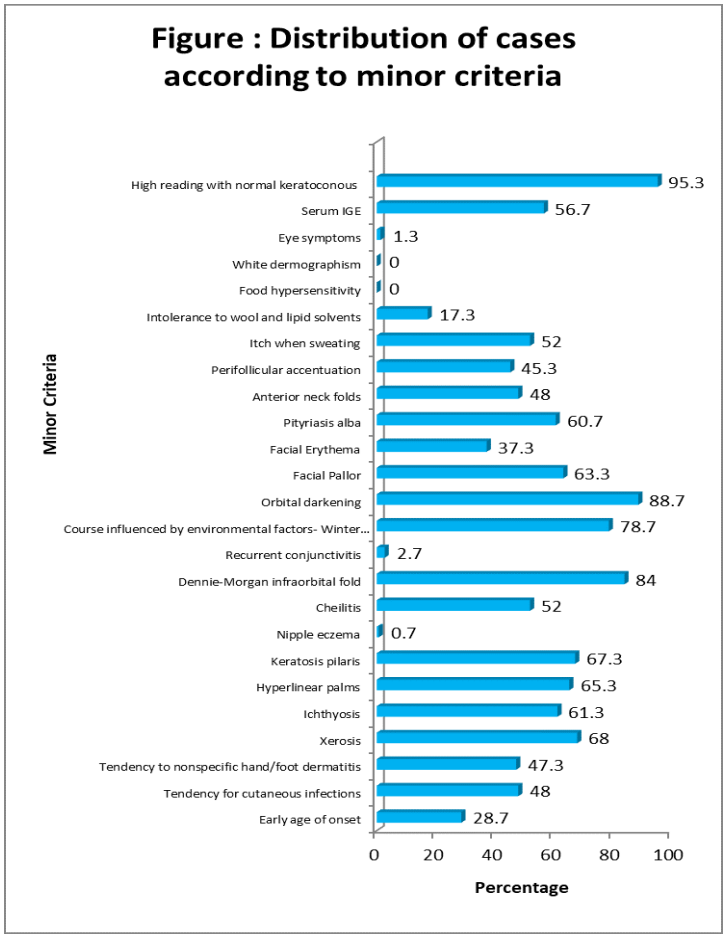

Fig. 1. *Percentage distribution of study of participants according to minor criteria.*

In our study, male children (88%) were more affected than female children as shown in Figure 2. Males presented predominantly with orbital darkening (90.9%), Dennie-Morgan fold (83%), xerosis (70.5%), ichthyosis (69.3%), keratosis pilaris (68.2%), facial pallor (65.9%), pityriasis alba (62.5%), winter exacerbation was observed in (60.2%) in comparison to summer (18.2%). Serum IgE was raised in 58% and 4 male children had high reading and 1 male child and 2 female children had high reading with suspect keratoconus. Photographs of numular dermatitis, facial dermatitis and pityriasis alba is shown below (Figures 3, 4, 5).

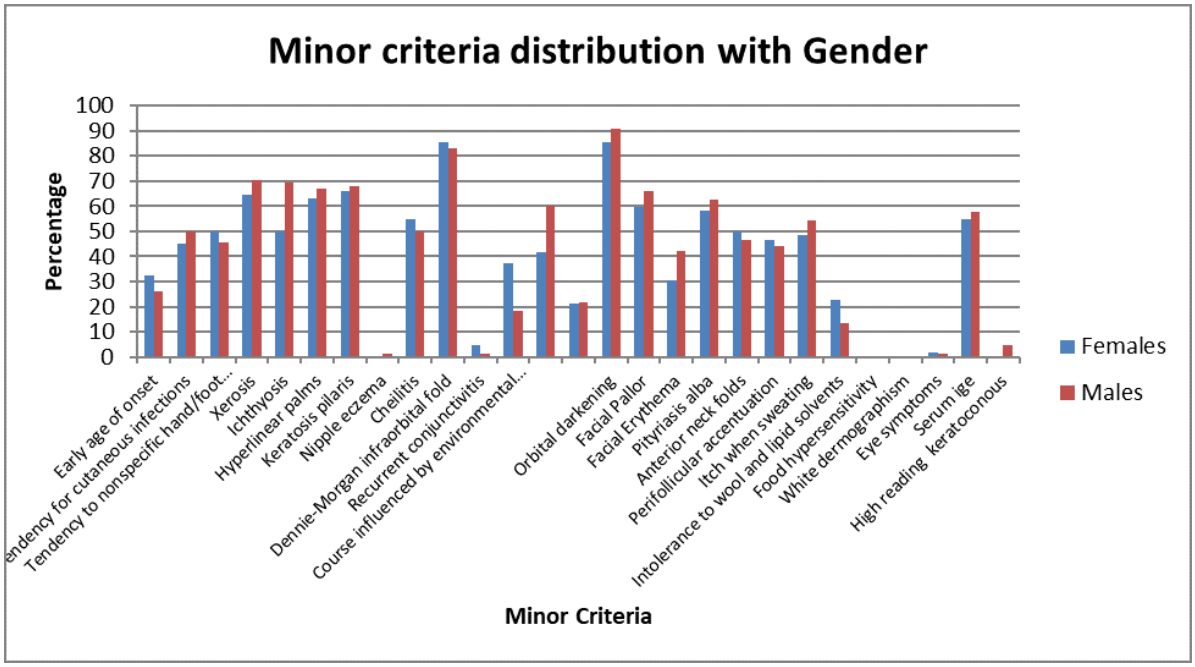

Fig. 2. *Gender-wise distribution of minor criteria.*

Fig. 3. *Photograph showing perifollicular accentuation and Nummular dermatitis.*

Fig. 4. *Photograph showing facial dermatitis.*

Fig. 5. *Photograph showing Keratosis Pilaris.*

One hundred forty-one children were > 1 year, as depicted in (Table III) and presented with orbital darkening (88.7%) and Dennie-Morgan fold (84.4%), keratosis pilaris (71.6%), xerosis (67.4%), hyperlinear palms (66%) and facial erythema (64.5%). Serum IgE was raised in 81 (57.4%) children. Ophthalmological examination revealed "high reading error" was seen in 4 children and "high reading error with suspect keratoconus" in 3 children.

Table III. Association of minor criteria with Age Group.

Minor criteria	**≤1 year n=9 (%)**	**>1 year n=141 (%)**	**P value**
Early age of onset	4(44.4)	39(27.7)	0.280
Tendency for cutaneous infections	2(22.2)	70(49.6)	0.110
Tendency to nonspecific hand/foot dermatitis	1(11.1)	70(49.6)	0.025
Xerosis	7(77.8)	95(67.4)	0.517
Ichthyosis	8(88.9)	84(59.6)	0.080

Hyperlinear palms		5(55.6)	93(66.0)	0.525
Keratosis pilaris		0(0.0)	101(71.6)	0.00*
Nipple eczema		0(0.0)	1(0.7)	0.800
Cheilitis		5(55.6)	73(51.8)	0.826
Dennie-Morgan infraorbital fold		7(77.8)	119(84.4)	0.599
Recurrent conjunctivitis		0(0.0)	4(2.8)	0.609
Course influenced by environmental factors- Winter / Summer	**Summer**	4(44.4)	35(24.8)	0.398
	Winter	4(44.4)	75(53.2)	
	No Variation	1(11.1)	31(22.0)	
Orbital darkening		8(88.9)	125(88.7)	0.983
Facial Pallor		4(44.4)	91(64.5)	0.225
Facial Erythema		7(77.8)	49(34.8)	0.010*
Pityriasis alba		5(55.6)	86(61.0)	0.746
Anterior neck folds		3(33.3)	69(48.9)	0.364
Perifollicular accentuation		2(22.2)	66(46.8)	0.151
Itch when sweating		4(44.4)	74(52.5)	0.640
Intolerance to wool and lipid solvents		2(22.2)	24(17.0)	0.689
Food hypersensitivity		0(0.0)	0(0.0)	-
White dermographism		0(0.0)	0(0.0)	-
Eye symptoms		0(0.0)	2(1.4)	0.719
Serum IgE		4(44.4)	81(57.4)	0.445
High reading (keratoconus)	**high reading with suspect keratoconus**	0(0.0)	3(2.1)	0.791
	high reading	0(0.0)	4(2.8)	
	normal	9(100.0)	134(95.0)	

6. Discussion

Atopic Dermatitis is one of the most common eczematous conditions presenting in the childhood age group because of rapid urbanization. The change in environment, food habits, lifestyle and hygiene contribute to its early onset. For the diagnosis of Atopic Dermatitis, a lot of criteria have been proposed like Hanifin and Rajka's criteria, U. K. diagnostic criteria (William et al., 1994), and ISAAC (International Study of Asthma and Allergies in Childhood) questionnaire (1995) but of all these Hanifin and Rajka's criteria have been validated the most (3). The mean age for the presentation of clinical features of AD children was 5.63(±3.21) years. A similar finding was observed in the studies conducted by Dhar et al. and Nagaraja et al., on children

aged 3 months to 12 years, in which it was 4.37 ± 3.42 years and 4.04 ± 3.42 years, respectively (5, 6, 7).

The most common finding in the minor criteria of AD was periorbital darkening (88.7%) and Dennie Morgan infraorbital fold (84%) analogous with other findings by Nagaraja et al and Kanwar AJ and Parthasarathy N et al. followed by xerosis 68% keratosis pilaris 67.3% and hyperlinear palms 65.3% as also observed by Kanwar et al. (7, 10, 11). Other findings of minor features like perifollicular accentuation (45.3%) and pityriasis alba (60.7%) were also observed comparable to the findings of the aforementioned authors.

Hand eczema was quite common in the childhood group; 47.3% of the childhood AD patients had hand eczema. The corresponding figures in Dhar and Kanwar's study were 13.64% and 4.29%, respectively (5, 10).

Out of 150 cases in our study, 79 of the cases gave a history of exacerbation of the lesions during the winter season, 39 gave a history of summer exacerbation and 32 had no seasonal variation. This is similar to other studies conducted in northern and eastern parts of India where winter and summer exacerbations are comparatively higher (6, 7, 11, 15).

Criteria such as nipple eczema, recurrent conjunctivitis, food hypersensitivity, and white dermographism were not observed in any of the 150 cases in our study. Nagaraja et al. and Sarkar et al. also noted similar findings. Kanwar et al. did not find any significance of nipple eczema, white dermographism, and recurrent conjunctivitis (10). Nipple eczema was found to be nonspecific in a study by Nagaraja et al. (7).

In our study, a history of intolerance to wool lipid solvents was present in 17.3% in contrast to Nagaraja et al. where it was observed in 41% and Kanwar et al reported in 28% This could be attributed to less exposure of woolens (5, 7, 10).

The serum IgE was raised in 68.7% which was consistent with the report by Nagaraja et al, Dhar et al., Kanwar Agarwal et al. (5,7,10,12).

In a study of 100 patients, 43% had findings in their eyes (17). Of these, 41.9% had involvement of the eyelids, 37.2% had conjunctival involvement, and the rest had involvement of both. Eye changes like isolated blepharitis, loss of the eyelashes, eczema of the eyelids, and conjunctival papillae were observed. In contrast to our study, eye symptoms were 1.1%, which can be explained by that, the cases in the previous studies resort to repeated rubbing leading to infections.

Anterior subcapsular cataract and keratoconus, the minor features for diagnosis of AD, in Hanifin and Rajka's criteria were not found in any patient. Features predisposing a patient for eye involvement are family history of atopy, palmar hyperlinearity, dryness of the skin and Dennie Morgan folds.

Ocular examination to diagnose keratoconus and anterior subcapsular cataract were performed by ophthalmologists, in our hospital. In 126 out of 150 cases, ophthalmological examination was done and 24 were non-compliant, being less than 2 years of age. Anterior subcapsular cataract was not observed among any of the children examined. "High reading but no obvious keratoconus" was noted in 4 cases, while 3 cases were labeled as "keratoconus suspect". The parents of these seven children were advised to follow up once in 6 months for an ophthalmological examination of their child. "Keratoconus suspect" is defined by the presence of asymmetric bowtie/skewed radial axes pattern on video keratography in the absence of slit-lamp findings or scissoring on retinoscopy (13). Nagaraja et al. in their study did not observe keratoconus or anterior subcapsular cataract in any of the patients (7). Keratoconus is postulated to arise due to chronic rubbing of the eyes in AD patients (14).

A higher prevalence was seen in males as compared to females (1.5:1). Similar results were observed in other Indian studies such as Nagaraja et al., (7) Kanwar et al. (10) and Dhar et al. (5) However, in Parthasarathy et al. [11] there was almost equal distribution among both genders (25%). The males presented predominantly with ichthyosis in 69.3% and females 50% (p=0.017).

The onset of symptoms of AD was seen in infant group 44.4%, is consistent with the finding of Shetty et al. (16). The children presented with a tendency to non-specific hand/foot dermatitis 49.6% in compari-

son to infants 11.1%(p=0.025), keratosis pilaris 71.6% children and no infants (p=0.0) and facial erythema infant 77.8% and 34.8% in children (p=0.010).

No correlation between facial eczematous lesions and eye changes was observed in contrast to earlier published studies. The authors explained this by the absence of habitual rubbing to relieve itching which is considered to be responsible for changes in and around the eyes (5).

7. Limitation

This was a single-centre study. In addition, the invasive minor criteria were not studied.

8. Conclusion

From the above discussion, it is evident that the prevalence and severity of AD are influenced by factors such as ethnic/racial factors, climate, geographical regions, food habits, and socioeconomic status. Therefore, dermatologists should know common clinical features of AD in a given population to diagnose the condition and thereby provide treatment to reduce morbidity along with appropriate counselling.

FUNDING

No funding was received.

DISCLOSURE

All authors report no conflict of interest.

INFORMED CONSENT

Informed consent was obtained from the parents of the children included in this case report.

References

1. Sinha PK. Clinical profile of infantile atopic eczema in Bihar. Indian J Dermatol Venereal Leprol. 1972; 38:179–84.

2. Karthikeyan K, Thappa DM, Jeevankumar B. Pattern of pediatric dermatoses in a referral center in South India. Indian Pediatr. 2004; 41:373–7.

3. Brenninkmeijer EE, Schram ME, Leeflang MM, Bos JD, Spuls PI. Diagnostic criteria for atopic dermatitis: A systematic review. Br J Dermatol 2008; 158:754-65.

4. Ardern-Jones MR, Flohr C, Reynolds NJ, Holden CA. Atopic eczema. In: Griffiths CE, Barker J, Bleiker T, Chalmers R, Creamer D, editors. Rook's Textbook of Dermatology. 9th ed Vol. 41. Oxford: Blackwell Publishing 2016. p. 1-41, 34.

5. Dhar S, Kanwar AJ. Epidemiology and clinical pattern of atopic dermatitis in North Indian pediatric population. Pediatr Dermatol. 1998; 15:347–51.

6. Dhar S, Mandal B, Ghosh A. Epidemiology and clinical pattern of atopic dermatitis in 100 children seen in city hospital. Indian J Dermatol. 2002; 47:202–4.

7. Nagaraja, Kanwar AJ, Dhar S, Singh S. Frequency and significance of minor clinical features in various age-related subgroups of atopic dermatitis in children. Pediatr Dermatol 1996; 13: 10-3.

8. Böhme M, Svensson A, Kull I, Wahlgren CF. Hanifin's and Rajka's minor criteria for atopic dermatitis: Which do 2-year-olds exhibit? J Am Acad Dermatol 2000; 43: 785-92.

9. Mevorah B, Frenk E, Wietlisbach V, Carrel CF. Minor clinical features of atopic dermatitis. Evaluation of their diagnostic significance. Dermatologica 1988; 177: 360-4.

10. Kanwar AJ, Dhar S, Kaur S. Evaluation of minor clinical features of atopic dermatitis. Pediatr Dermatol 1991; 8: 114-6.

11. Parthasarathy N, Palit A, Inamadar AC, Adya KA. A study to estimate the frequency of Hanifin and Rajka's minor criteria in children for diagnosis of atopic dermatitis in a tertiary care centre in South India. Indian J Paediatr Dermatol 2019; 21: 31-5.

12. Agrawal DP, Lavanya MS, Sathyanarayana BD, Swaroop MR, Jain M, Dukkipati M. Evaluation of clinical diagnostic criteria of atopic dermatitis and serum IgE levels in patients with chronic eczema. Int J Health Sci Res 2015; 5: 84-9.

13. Li X, Yang H, Rabinowitz YS. Keratoconus: Classification scheme based on videokeratography and clinical signs. J Cataract Refract Surg 2009; 35: 1597-603.

14. Leung DY, Eichenfield LF, Boguniewicz M. Atopic dermatitis (Atopic eczema). In: Goldsmith LA, Katz SI, Gilchrest BA, Paller AS, Leffell DJ, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 8th ed. The McGraw-Hill Companies; 2012. p. 165-82.

15. Sarkar R, Kanwar AJ. Clinico-epidemiological profile and factors affecting severity of atopic dermatitis in North Indian children. Indian J Dermatol 2004; 49: 117-22.

16. Shetty NS, Lunge S, Sardesai VR, Dalal AB. A Cross-Sectional Study Comparing Application of Hanifin and Rajka Criteria in Indian Pediatric Atopic Dermatitis Patients to that of Other Countries. Indian Dermatol Online J 2022 Dec 29; 14(1): 32-37.

17. Kaujalgi R, Handa S, Jain A, Kanwar AJ. Ocular abnormalities in atopic dermatitis in Indian patients. Indian J Dermatol Venereol Leprol. 2009; 75: 148–51.