

Study the Epidemiology of Paediatric Keratoconus and its Association with Vernal Keratoconjunctivitis



Medical Science

KEYWORDS : Paediatric Keratoconus, VKC, associated with progression

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ABSTRACT

INTRODUCTION:

- Keratoconus is a disorder that produce marked thinning and conical shape of the cornea.

• When keratoconus manifest in childhood i.e. less than 18 years of age, it is known as paediatric keratoconus or Adolescence keratoconus (between 10 to 19 years of age)

• Paediatric keratoconus have unique characteristics by which it differs from adult keratoconus – its presentation, progress, biomechanical rigidity of the cornea and its association with allergy and eye rubbing.

AIMS AND OBJECTIVES :

- To study the difference between adult and paediatric keratoconus
- Severity of keratoconus at the time of presentation in paediatric patients.
- Progression of disease
- Association with ocular allergy (VKC)

MATERIAL AND METHOD : 80 eyes of 40 pt. With confirm diagnosis of keratoconus where study for stage of keratoconus at the time of diagnosis, its progress at 3 months and 6 months and its association with allergy (Vernal Keratoconjunctivitis VKC). Diagnosis and progression were confirmed by clinical examination, refraction, topography and Pentacam

RESULTS :

- Out of 40 pt. 28 pt were below 19 years of age (70%)
- 24 male: 16 female pt.
- 30 bilateral: 10 unilateral
- From 28 paediatric pts. 8 pt.(28.5%) present at stage 3 KC (PentacamKK-stage 3) 15 pt. at stage 2 KC (53.5%) and 5 pt at stage 1 KC (17.85%)
- 7 adult pt present at stage 2 (58.3%) and 5 pt. at stage 1 (41.6%)
- 90% paediatric pt (25 pt.) show progression while only 6 adult pt. (50%) show progression of disease at 6 month.
- 20 paediatric pt. Associated with ocular allergy (71.4%)
- 6 adult pt. (50%) associated with ocular allergy

CONCLUSION :

- In children Keratoconus was significantly more severe at diagnosis as compare to adult
- Paediatric keratoconus have higher rate and speed of progression
- Children with keratoconus have more co-existing Vernal Keratoconjunctivitis (VKC), children with keratoconus require early intervention to halt the progression and prevent visual disability.

Introduction-

— There are few corneal disorders that produce marked thinning without significant ocular inflammation like, Keratoconus (KC), Posterior keratoconus, pellucid marginal degeneration and keratoglobus. keratoconus is the most important condition that affect the young individual and if severe, result in crushing disability and psychological effects, due to polyopia and eyestrain. Keratoconus is a progressive, frequently asymmetric, non-inflammatory corneal thinning disorder characterized by changes in the structure and organization of corneal collagen.

The cornea assumes an increasingly conical shape owing to its biomechanical instability. This leads to irregular astigmatism and subsequent decrease in visual acuity. The unknown course and uncertain prognosis also make management to keratoconus extremely challenging

It is managed by spectacles, contact lenses and intra corneal ring segments (INTACs) in mild to moderate keratoconus. In case of progression, collagen cross linking is an effective modality to arrest the disease progression or to slow down the progression. In severe cases, deep anterior lamellar keratoplasty and full thickness keratoplasty is indicated to restore the vision.

Criteria for progression of keratoconus includes following: change in refraction (including astigmatism), decrease uncorrected visual acuity & best corrected visual acuity, change in corneal shape (topography and tomography).

In our country keratoconus seen in relatively young patient the course of the disease is different in paediatric patients than in adult patients. Some time it may be so severe that leads to visual disability. Internationally accepted terminology is Paediatric keratoconus, when keratoconus manifest in childhood i.e. less than 18 years of age or Adolescence keratoconus when it manifest between 10 to 19 years of age. It has some unique characteristics which differ them from adult patients.

- **Unique characteristics :**
- Severity at the time of diagnosis
- Rate of progression
- Biomechanical rigidity of the cornea
- Association with allergy (VKC)
- Frequent eye rubbing

Therefore, in our study we have made an attempt to understand the characteristic of disease in paediatric patients and its association with various factors which determine its cause and progression.

Method —

Study was done at western regional institute, tertiary care centre year March 2014-February 2015.

It included 80 eyes of 40 patients with confirm diagnosis of keratoconus.

Complete ocular examination was done:

- **Visual acuity** - both corrected and uncorrected
- **Refraction**- cycloplegic refraction
- **Slitlamp examination** to see signs of keratoconus like-corneal thinning , Vogt's striae , Fleischer's ring, stromal scarring, Hydrops , Munson's sign . Also look for sign of ocular allergy mainly Vernal KeratoConjunctivitis (VKC).

Keratometry- with Bausch and Laumb keratometer was done to measure the radius of curvature of the central cornea and dioptric refracting power of the cornea.

- **Distant Direct Ophthalmoscopy**- show the dark area within the illuminated field ("oil droplet sign") .

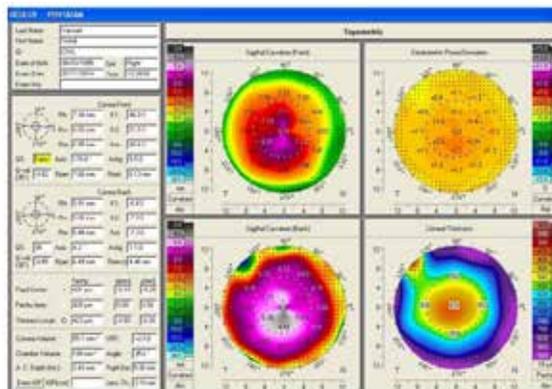
Fig:1 Vernal Kerato Conjunctivitis



Fig:2 "oil droplet sign"



- **Fundus examination** – with indirect ophthalmoscopy
- **Topography** – Topography is a placido disk based method to measure anterior corneal curvature. However, it doesn't measure posterior curvature. So it is less reliable then pentacam for documenting progression and detection of forme fruste keratoconus.
- **Pentacam** – Pentacam was done in each patient to confirm the diagnosis of keratoconus , confirm its stage ,astigmatism ,corneal thickness at various points and find out the thinnest point



- **Inclusion criteria**- All patients of keratoconus at various stages of keratoconus were included in this study.

- **Exclusion criteria**-
 - Patients with any associated ocular anomalies
 - Patient with any other systemic disease.
 - Patient with any syndromes or connective tissue disorders.
 - Patient who had received some intervention for this condition.
- **Follow up**- every 3 months and 6 months after first diagnosis. All the above test were done to see any progression of disease

Stages of Keratoconus

Stage	Characteristics
Stage 1	<ul style="list-style-type: none"> • Eccentric steepening Induced myopia and/or astigmatism of ≤ 5.0 D • K-reading ≤ 48.00 D • Vogt's lines, typical topography
Stage 2	<ul style="list-style-type: none"> • Induced myopia and/or astigmatism > 5.00 to ≤ 8.00 D • K-reading ≤ 53.00 D • Pachymetry ≥ 400 μm
Stage 3	<ul style="list-style-type: none"> • Induced myopia and/or astigmatism > 8.00 to ≤ 10.00 D • K-reading > 53.00 D • Pachymetry 200 to 400 μm
Stage 4	<ul style="list-style-type: none"> • Refraction not measurable • K-reading > 55.00 D • Central scars • Pachymetry ≤ 200 μm

Stage is determined if one of the characteristics applies. Corneal thickness is the thinnest measured spot of the cornea.

Results

Age of pt. at the time of diagnosis

Age	No. Of pt.	Percentage
< 19 years	28	70%
>19 years	12	30%
Total	40	100%

Gender of pt.

	No. Of pt.	Percentage
Male	24	60%
Female	16	40%
Total	40	100%

Stage of presentation at the time of diagnosis in pediatric pt.

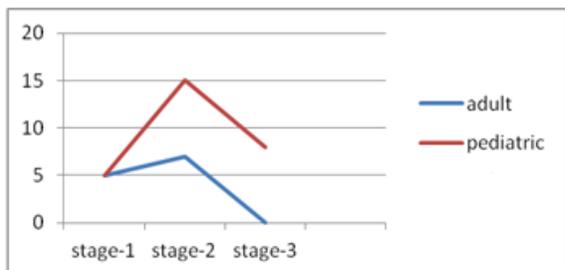
Stage of KC on Pentacam	No.of pt.	Percentage
Stage-1	5	17.85%
Stage-2	15	53.5%
Stage-3	8	28.5%
Total	28	100%

Stage of KC at the time of presentation

Comparison between Paediatric pt. & adult pt.

Stage of KC	Adult	%	Paediatric	%	total
Stage-1	5	41.6	5	17.85	10
Stage-2	7	58.4	15	53.57	22
Stage-3	0	0	8	28.57	8
Total	12	100	28	100	40

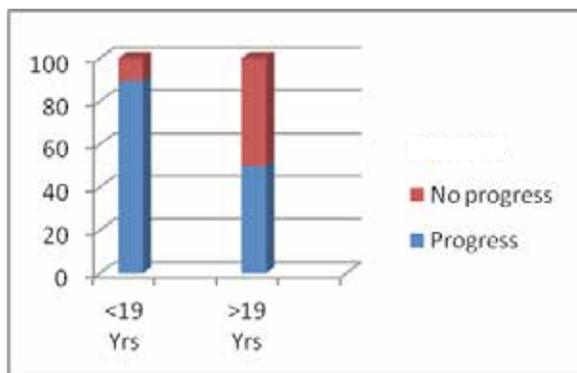
P value-0.11(> 0.05) chi square 2.54



Progression of Kertoconus

Age	Total no.	Progression +	%	No progression	%
<19 years	28	25	89.28%	3	10.71%
>19 years	12	6	50%	6	50%
total	40	31	77.5%	9	22.5%

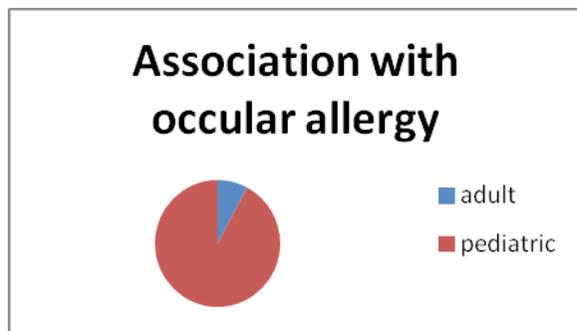
P VALUE - 0.02(<0.05)chi square with Yates correction 5.35



Association with ocular allergy

	Total no.	Pt. With ocular allergy	Percentage
<19 years	28	20	71.4%
>19years	12	6	50%
Total	40	26	65%

P value- 0.19(>0.05)



Discussion-Keratoconus is a condition where the cornea assumes a conical shape as a result of non-inflammatory thinning of stroma, leading to irregular astigmatism, myopia and pro-

trusion of central or paracentral region. It was first described in 1854 and treatment was first given in 1869 by chemical cauterization of corneal cone. Since the start of the 20th century, research on keratoconus has improved understanding of disease and expanded the range of treatment options.

Epidemiology is the study of the patterns, causes, and effect of disease condition in defined population. It is the cornerstone of public health and informs policy decision and evidence-based medicine by identifying risk factor for disease and targets for preventive medicine.

Paediatric keratoconus is different in many aspect from adult KC, particularly in its time of presentation , speed of progress, rate of complications ,its association with allergic diseases and that is why its management.

In our study we try to find out the difference between adult and paediatric keratoconus, epidemiology of paediatric KC and its association with vernal keratoconjunctivitis.

We also discuss results of other study and compare our results with other study.

1) Age of presentation :

A study on KC was conducted in the from July 2003 to July 2006. 50 eyes were studied. The majority of patients 41 (82%) presented between 13 and 28 years of age.

Another study of incidence and severity of showed an early age of onset (18.5 years) with approximately three quarters of the patients (74.4%) presenting before the age of 20 years. In our study patients presented in the age group of 7-25 years suggesting KC is predominantly a disease of young adults.

2) Gender:

Earlier studies done by Amsler showed higher incidence of keratoconus in females (59.2%) . But in recent studies of past 30 years it has been more often seen in males. In Buxton series by Kennedy 62% of 140 cases were males. It's unknown whether this reflects a true shift in the gender incidence of keratoconus.

A study on KC was conducted in the Department of Ophthalmology,

Gomal Medical College, DHQ Teaching Hospital, Dera Ismail Khan (NHWP) from July 2003 to June 2006. Male to female ratio was found to be 7:1.

Another study on Influence of ethnic origin on the incidence of KC and associated atopic disease in Asians and white patients T Georgiou, CL Funnell, A Cassels-Brown and R O'Conor also showed that KC was found to be significantly more common in males, 53 (72%) than in female patients, 21(28%).

In our study also KC was more common in males. Out of 40 patients of KC 24 were males (60%) and 16 were female (40%)

3) Severity at the time of presentation

Leoni-Mesplie conducted retrospective study to assess the severity of keratoconus in children at diagnosis. In children Keratoconus was significantly more severe at diagnosis as compare to adult.

According to this study , 27.8% children presented with stage 4 and only 7.8% adults presented with stage 4.

In our study, 28.5% children presented with advanced KC (stage 3), 53.5 % children presented with moderate KC (stage 2). While 17.5% children presented with mild KC (stage 1).

Among adults, none presented with advanced KC (stage 3). 58.4% adults presented with moderate KC (stage 2). While, 41.6% presented with mild KC (stage1)

4) Progression of KC

According to Li X, Yang H, Rabinowitz YS. Longitudinal study of keratoconus progression.(*Exp Eye Res* 2007;85:502-7)and Chatzis N, Hafezi of Study of Progression of keratoconus and efficacy of pediatric [corrected] corneal collagen cross-linking in children and adolescents. (*J Refract Surg* 2012;28:753-8), Paediatric keratoconus have higher rate and speed of progression (88 % eye progress) and disease may not halt on its own.

In our study, 89.28% paediatric patients progressed within 6 months while only 50 % adults progressed within 6 months.

5) Co-existing ocular allergy:

According to Léoni-Mesplé S, Mortemousque B, Touboul D, Malet F, Praud D, Mesplé N, et al. Scalability and severity of keratoconus in children. *Am J Ophthalmol* 2012;154:56-62 study, 67.3% paediatric patients had co-existing ocular allergy , while 47.3% adults had co-existing ocular allergy.

In our study, 71.4% paediatric patients had co-existing ocular allergy, while 50 % adults had co-existing ocular allergy.

Conclusion:

- 1) Keratoconus is predominantly a disease of young population.
- 2) Both KC and VKC are more common in males.
- 3) In paediatric patients, severity at the time of presentation is more as compared to adults.
- 4) Progression is very fast in paediatric patients as compared to adults.
- 5) Incidence of co-existing ocular allergy is more in paediatric patients as compared to adults

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