# ABSTRACT

**INTRODUCTION:**

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

**Method:**

- Complete ocular examination was done:
  - Out of 40 pt. 28 pt were below 19 years of age (70%)
  - 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

**Results:**

- 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.

**Conclusion:**

- 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 paediatrics 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:**

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**Keywords:** Paediatric Keratoconus,VKC,associated with progression

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**Research Paper**

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- 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 diopteric refraacting power of the cornea.

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

- 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

<table>
<thead>
<tr>
<th>Stage</th>
<th>Characteristics</th>
</tr>
</thead>
</table>
| Stage 1 | Eccentric steepening Induced myopia and/or astigmatism of <= 5.0 D  
  · K-reading <= 48.00 D  
  · Vogt’s lines, typical topography |
| Stage 2 | Induced myopia and/or astigmatism > 5.00 to <= 8.00 D  
  · K-reading <= 53.00 D  
  · Pachymetry >= 400 µm |
| Stage 3 | Induced myopia and/or astigmatism > 8.00 to <= 10.00 D  
  · K-reading > 53.00 D  
  · Pachymetry 200 to 400 µm |
| Stage 4 | 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

<table>
<thead>
<tr>
<th>Age</th>
<th>No. Of pt.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 19 years</td>
<td>28</td>
<td>70%</td>
</tr>
<tr>
<td>&gt;19 years</td>
<td>12</td>
<td>30%</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>100%</td>
</tr>
</tbody>
</table>

Gender of pt.

<table>
<thead>
<tr>
<th>Gender</th>
<th>No. Of pt.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>24</td>
<td>60%</td>
</tr>
<tr>
<td>Female</td>
<td>16</td>
<td>40%</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>100%</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Stage of KC on Pentacam</th>
<th>No.of pt.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage-1</td>
<td>5</td>
<td>17.83%</td>
</tr>
<tr>
<td>Stage-2</td>
<td>15</td>
<td>53.5%</td>
</tr>
<tr>
<td>Stage-3</td>
<td>8</td>
<td>28.5%</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
<td>100%</td>
</tr>
</tbody>
</table>

Stage of KC at the time of presentation

Comparison between Paediatric pt. & adult pt.
Stage of KC

<table>
<thead>
<tr>
<th>Stage</th>
<th>Adult</th>
<th>Paediatric</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage-1</td>
<td>5</td>
<td>41.6</td>
<td>5</td>
</tr>
<tr>
<td>Stage-2</td>
<td>7</td>
<td>58.4</td>
<td>15</td>
</tr>
<tr>
<td>Stage-3</td>
<td>0</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td>100</td>
<td>28</td>
</tr>
</tbody>
</table>

P value-0.11(> 0.05) chi square 2.54

Progression of Keratoconus

<table>
<thead>
<tr>
<th>Age</th>
<th>Total no.</th>
<th>Progression +</th>
<th>%</th>
<th>No Progression</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;19 years</td>
<td>28</td>
<td>25</td>
<td>89.28%</td>
<td>3</td>
<td>10.71%</td>
</tr>
<tr>
<td>&gt;19 years</td>
<td>12</td>
<td>6</td>
<td>50%</td>
<td>6</td>
<td>50%</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>31</td>
<td>77.5%</td>
<td>9</td>
<td>22.5%</td>
</tr>
</tbody>
</table>

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

Association with ocular allergy

<table>
<thead>
<tr>
<th>Age</th>
<th>Total no.</th>
<th>Ocular allergy</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;19 years</td>
<td>28</td>
<td>30</td>
<td>71.4%</td>
</tr>
<tr>
<td>&gt;19 years</td>
<td>12</td>
<td>6</td>
<td>50%</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>26</td>
<td>65%</td>
</tr>
</tbody>
</table>

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 protrusion of central or paracentral region. It was first described in 1854 and treatment was first given in 1869 by chemical cautery 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 (stage 1).

4) Progression of KC


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-Mesplié S, Mortemousque B, Touboal D, Malet F, Praud D, Mesplié 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.

Acknowledgement: We are very thankful to our patients, colleagues and paramedical staff.