

## Frequency of keratoconus in paediatric population of rural Jaipur

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### Abstract

Keratoconus (KC) is a ectatic corneal disorder with marked progression during childhood and puberty that may lead to severe visual loss. Prevalence of keratoconus is variable in different parts of the world. Environmental and ethnic factors and the cohort of patients selected for such studies may explain the wide variation in the reported rates. Family history, gender differences, asymmetry in the two eyes, association with ocular rubbing, and natural history of disease are discussed.

Epidemiology of Keratoconus has been classically described as a noninflammatory pathology, characterized by a conical shape of the cornea, as a result of thinning and protrusion. The etiopathogenesis is still under research and it may be the final manifestation of diverse pathologic processes. With better understanding of the disease and new imaging modalities as well as the advent of refractive surgery, it is being diagnosed much more often and much earlier than in the past.

### Methods:

It is a cross sectional study, conducted in our institute National Institute of Medical Sciences, Jaipur from January 2022 to June 2023 for a duration of 18 months ,a total of 384 patients attending schools in Jaipur who were selected based on inclusion and exclusion criteria who underwent complete history taking and examination. These patients were subjected to corneal topography.

### Results:

Out of 384 patients,19 had keratoconus ,46 had VKC (Vernal keratoconjunctivitis),40 had myopic astigmatism.

### Conclusion:

The incidence of pediatric keratoconus in relation to number of pediatric patient assessed at our hospital was 0.26% and was noted to be higher in our study as compared to other published literature. This can attributed to higher incidence of VKC in the region.

**Keywords:** Keratoconus, prevalence, Vernal Keratoconjunctivitis

## I. INTRODUCTION

Keratoconus (KC) is a progressive ectatic corneal disorder characterised by corneal thinning, irregular astigmatism and protrusion of the cornea that may lead to severe visual loss. Both eyes are usually affected, frequently in an asymmetric manner. It is a common bilateral, noninflammatory,

degenerative axial ectatic condition of the cornea in which the cornea assumes an irregular conical shape[1]. These changes may result in visual impairment due to irregular astigmatism, progressive myopia, or corneal scarring. The disease most often occurs at puberty[2] and progresses until the age of about 30 to 40 years before stabilizing. Keratoconus is a rare cause of amblyopia and visual impairment in children, as the development of visual function generally continues until the age of 8 to 11 years[3]. Studies have reported figures varying between 0.08% and 12% according to the study and country of origin. Young age appears to be associated with more severe forms of keratoconus and faster disease progression, with an inverse correlation between age and severity[4,5]. In addition, young age at diagnosis is linked to a greater risk of developing corneal opacity and requiring a corneal transplant. In 1854, a British physician, John Nottingham described it in further details and differentiated it from other ectatic disorders[6,7]. Finally in 1869, a Swiss ophthalmologist Johann Horner entitled the disorder as keratoconus and conducted a thesis 'On the treatment of keratoconus'[9]. Since then, much has been discovered and studied regarding the etiopathogenesis of the disease and newer treatment modalities are still being developed[8]. Studies reporting the prevalence of keratoconus have shown a wide range of results (between 0.3 per 100,000 in Russia<sup>4</sup> and 2,300 per 100,000 in Central India<sup>12</sup>). This difference is believed to be due to ethnic, genetic, and environmental factors and to the diagnostic criteria used.[13,14,15]. In children, keratoconus is a rare disease. However, keratoconus may affect younger children, with some studies finding the average age at diagnosis to be less than 20 years.[9] Pediatric keratoconus seems to progress faster and to be more advanced at the time of diagnosis than keratoconus in adults[10]. Due to its advanced stage at diagnosis, pediatric keratoconus bears a higher risk of severe visual impairment due to irregular astigmatism, progressive myopia, or corneal scarring, thus resulting in a greater need for penetrating keratoplasty. In India, the ectasia progresses at a more rapid rate in pediatric patients with several studies having implicated eye rubbing as an important etiologic factor in the development of keratoconus. The microtrauma associated with eye rubbing may be the etiologic link between conical cornea and associated systemic (atopy) and ocular diseases (VKC). Vigorous eye rubbing has frequently been observed in patients with Down's syndrome and may explain the high incidence of corneal hydrops (edema caused by rupture of the Descemet's membrane) in these patients. Contact lens wear is another form of ocular microtrauma that seems to be associated with keratoconus.

## II. Materials and Methods

Study design: Cross sectional study.

Study area: Ophthalmology OPD at National Institute of Medical Sciences, Jaipur.

Study period: 18 months from date of clearance from institutional Research Committee and Ethics Committee.

Sample size :=384

Time frame: 18 months from date of clearance from College Research Committee and Ethics Committee. 1st January,2022 to 30th June,2023

### Selection criteria of patients

Inclusion criteria:

1. All school going children of either gender within age group 5-18 years attending OPD at NIMS.

2. Patients who are willing to take part in study.
3. Patients whose guardians are willing to give written informed consent.

Exclusion criteria:

1. Patients with corneal scarring.
2. Patient with history of ocular surgery and refractive surgery.
3. Patient with any opacity in ocular media.
4. Patients with other corneal pathologies (like pellucid marginal degeneration, corneal dystrophies etc)
5. Uncooperative patients.

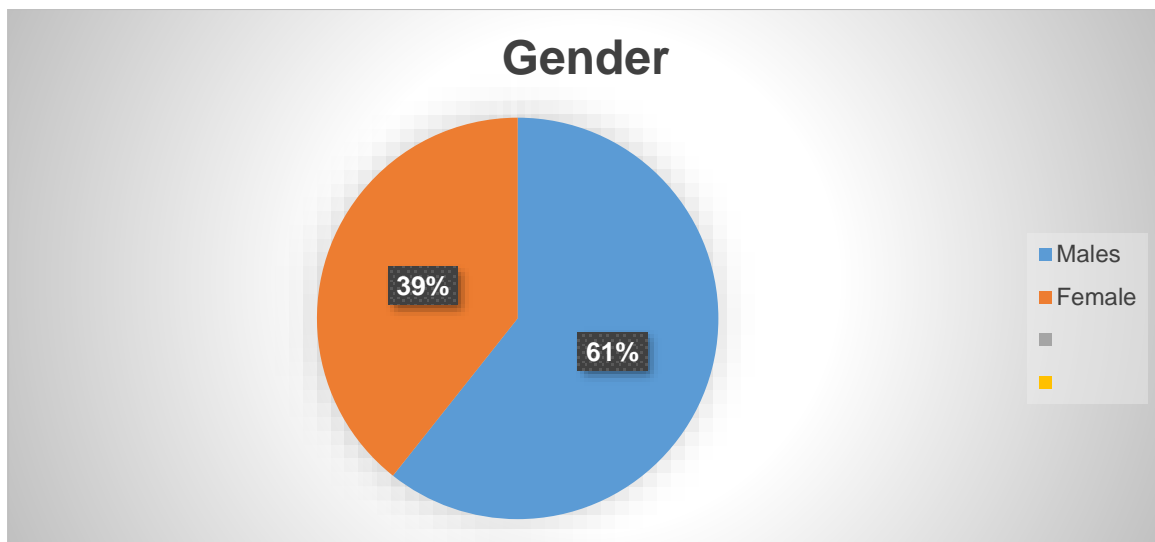
### III. Methodology:

- School going children coming to Ophthalmology OPD at NIMS for various complaints or referrals were screened for distant visual acuity with snellen's chart.
- Detailed history was taken for symptoms of vernal keratoconjunctivitis/itching/constant eye rubbing.
- Slit lamp examination, fundus examination and retinoscopy of these patients was performed.
- Patients fulfilling inclusion and exclusion criteria were recruited for the study.
- Corneal topography (Oculus pentacam ) of patients suspected of keratoconus was performed to detect keratoconus by assessment of the KISA INDEX9)

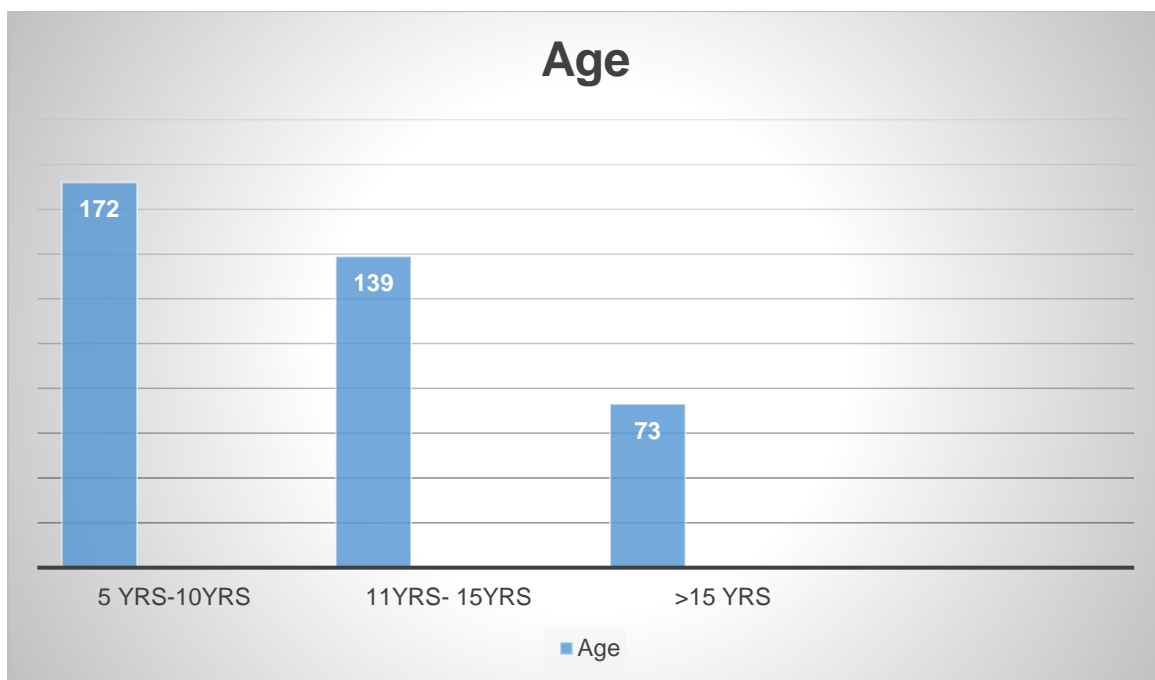
### IV. Results:

**TABLE 1-**In this study, out of 384 patients, there are 233 male and 151 female patients.

	MALE	FEMALE
TOTAL (IN NUMBER)	233	151
PERCENTAGE	61 %	39%



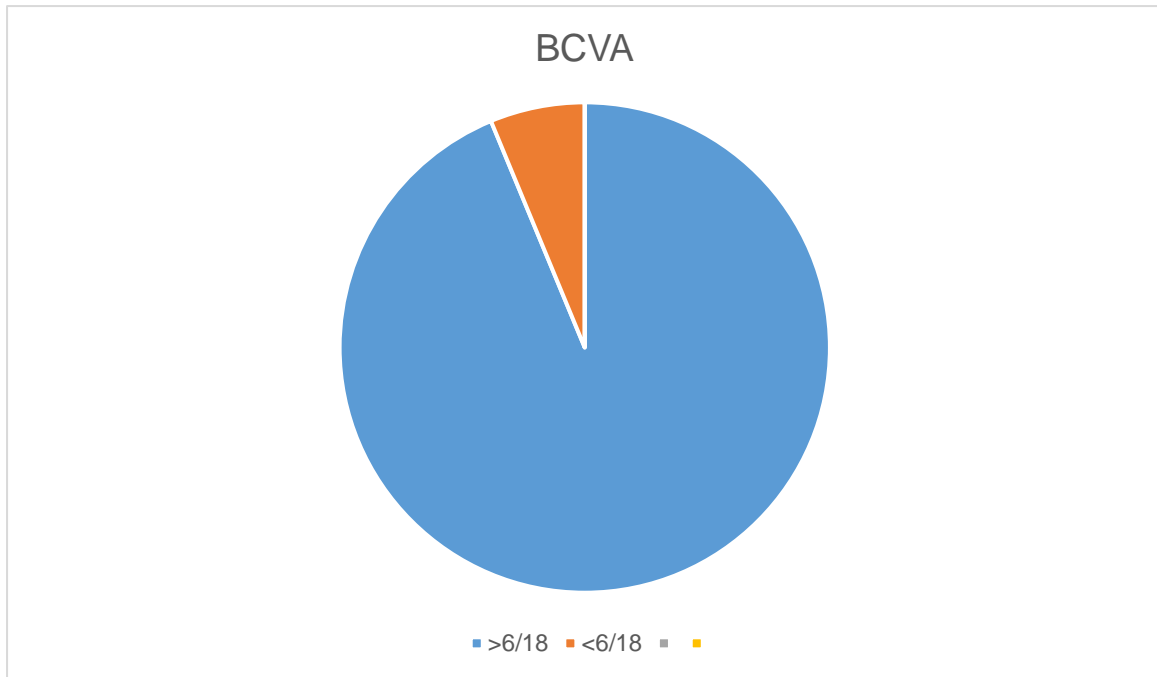
In our study, out of 384 patients, 174 patients were in the age group of 5-10 years, 139 patients were in the age group of 11-15 years and 73 patients were in the age group of more than 15 years



**TABLE 3- BCVA AMONG PATIENTS IN THE STUDY**

In our study among 384 patients 360 had BCVA >6/18 and 24 had BCVA values <6/18

BCVA	>6/18	<6/18
TOTAL (IN NUMBER)	360	24
PERCENTAGE	93.75	6.25



**TABLE 4- MYOPIC ASTIGMATISM AMONG VARIOUS PATIENTS**

Among 384 patients 40 had myopic astigmatism while 344 did not have myopic astigmatism

MYOPIC ASTIGMATISM	PRESENT	ABSENT
TOTAL PATIENTS (IN NUMBERS)	40	344
PERCENTAGE	10.41%	89.59%

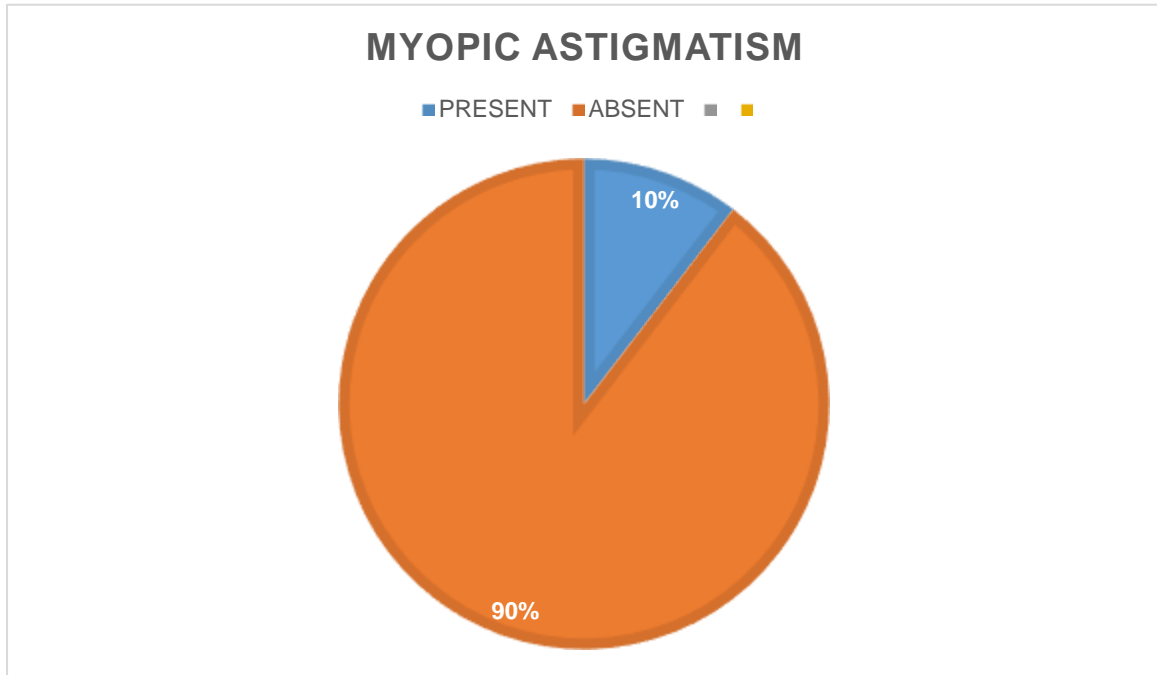


FIGURE 4-MYOPIC ASTIGMATISM AMONG VARIOUS PATIENTS

**TABLE 5-** PATIENTS WITH MYOPIC ASTIGMATISM WITH AND WITHOUT KERATOCONUS

Among 40 patients with myopic astigmatism 19 had keratoconus while 21 did not have keratoconus

KERATOCONUS	PRESENT	ABSENT
TOTAL (IN NUMBER)	19	21
PERCENTAGE	47.5	52.5

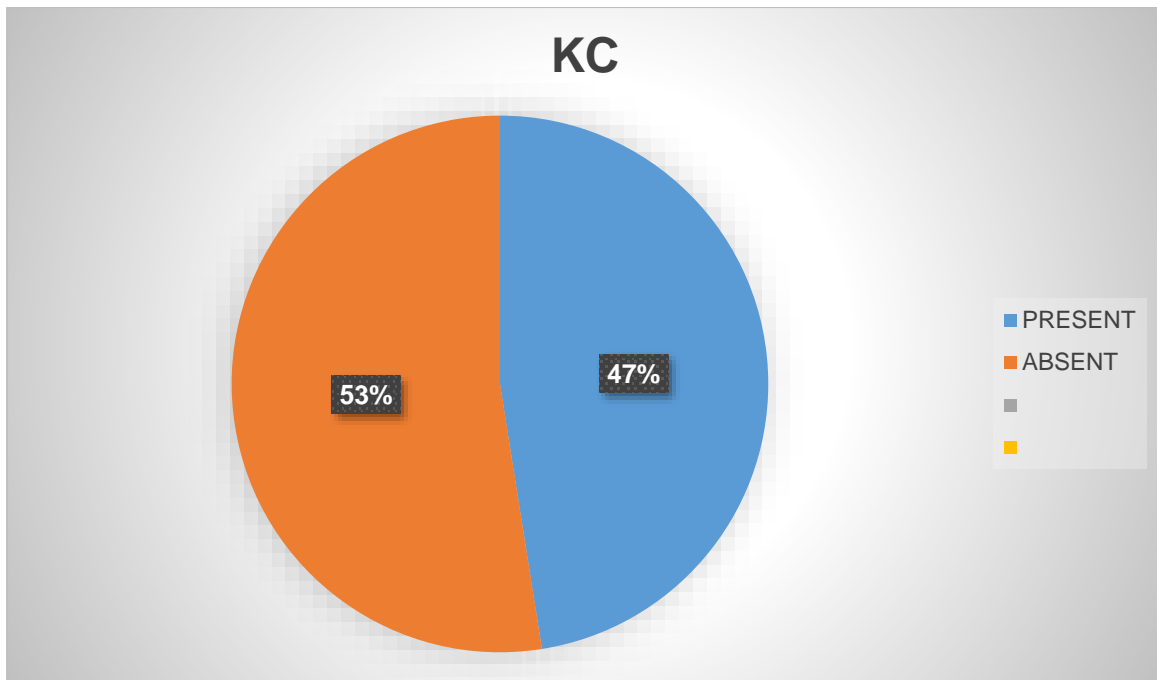


FIGURE5-PATIENTS WITH MYOPIC ASTIGMATISM WITH AND WITHOUT KERATOCONUS

**TABLE-6** RELATIONSHIP BETWEEN VENERAL KERATOCONJUCTIVITIS(VKC) AND KERATOCONUS(KC)

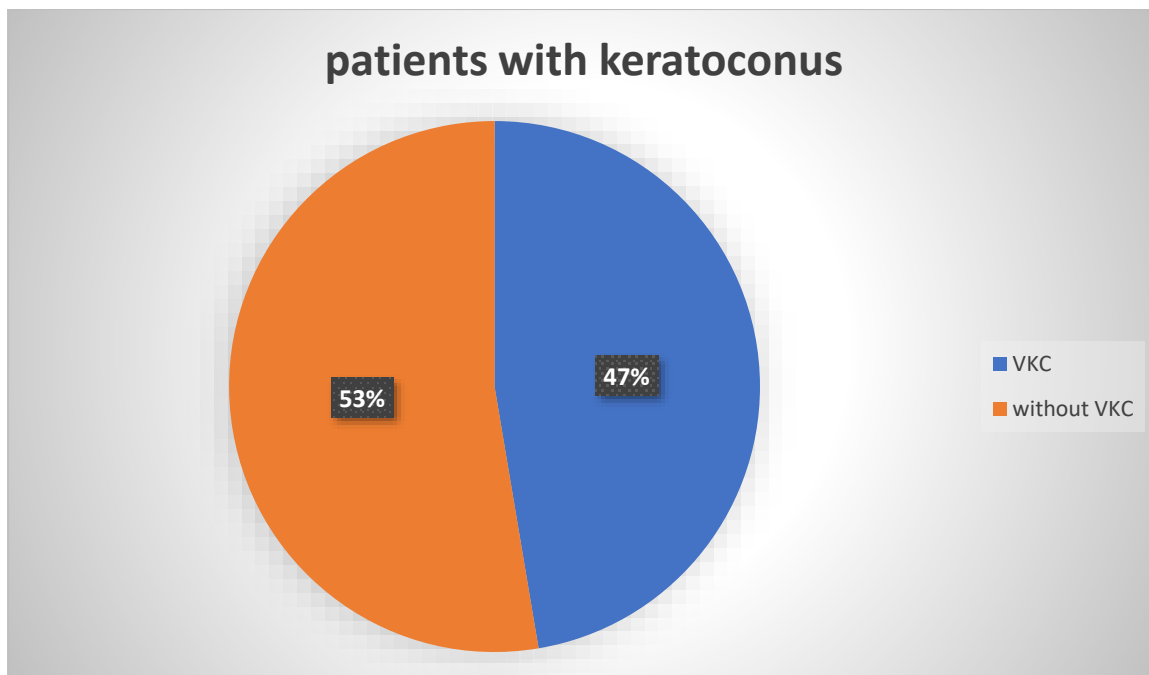
Among 384 patients 46 had Veneral keratoconjunctivitis while 338 were not found to have veneral keratoconjunctivitis

	VKC	Without VKC
Number of cases (out of 384)	46	338

Among the 19 patients found to have keratoconus, 9 had symptoms and signs of vernal keratoconjunctivitis. While rest of 10 patients did not have vernal keratoconjunctivitis.

**TABLE-7:** prevalence of VKC in patients with keratoconus

	VKC	Without VKC
Patients with keratoconus (19)	9 (47%)	10 (53%)



#### V. Discussion

Keratoconus in children can be missed in its early stages and progression could be rapid and relentless. This could lead to failure of visual maturation and failure to reach developmental and social milestones. Early detection of KC in children is therefore vital, and more tools are becoming available to allow for this. The study evaluated the incidence, associated clinical profile, & surgical outcomes of paediatric keratoconus (age group 5 to 18 years) in Jaipur, Rajasthan, India. 768 eyes of 384 patients were included. The incidence of paediatric keratoconus in relation to number of paediatric patients presenting to the hospital was 0.26% and the incidence in relation to number of patients with keratoconus of all ages was 21.93%. A similar study by El-Khoury et al<sup>26</sup> in their 4-year retrospective study, documented the incidence to be 0.53% in relation to number of paediatric patients presenting to the hospital and 2.96% in relation to number of patients with keratoconus with all ages. Our data was significantly high as compared to results published by various other studies. The number of male patients in our study was 233(61%) as compared to 151(39 %)female patients. The age group of 5-10 years had 174 patients, while 11-15 years had 139 patients and >15 years were 73 in number. The BCVA score <6/18 was in 24 (6.25%)patients while 360 (93.75%)patients had BCVA >6/18. Out of 384 patients, 40(10.41%) patients had myopic astigmatism and 344(89.59%) had no myopic astigmatism. Out of 40 patients with myopic astigmatism 19(47.5%) had keratoconus while 21 (52.5%)did not have keratoconus. Out of 384 patients 46(12%) had VKC while 338(88%) had no VKC associated with KC. The most common presenting complaints were found be diminution of vision followed by eye rubbing. El-Khoury et al<sup>26</sup> reported similar results with reduced visual acuity as the most common complaint (62.5%) whereas Sharma et al<sup>29</sup> reported eye rubbing to be the most common complaint (55.8%). The classical clinical findings of keratoconus were not noted in all eyes. Scissoring was seen in 71.1% eyes. Other findings such as vogtstraie, fleischer's ring were seen in 38% & 58 % of eyes respectively.

#### VI. Conclusion

Our cross-sectional single center study evaluated the incidence of paediatric keratoconus in school going children of 5-18 years. The incidence of paediatric keratoconus was noted to be high in



our study as compared to other published literature. The clinical features of the disease were noted in 50% of eyes only. Our study concluded that there was no significant difference in topographical parameters in KC eyes with or without VKC. Mixed type of VKC was found to be a significant risk factor for development & progression of KC, with significant influence on the topographical parameters. Incidence of KC is high in children. It is more aggressive and tends to be more advanced at presentation.

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