

## Prevalence of Keratoconus in Refractive Surgery Population in Sohag Governorate

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### Abstract

**Introduction** Keratoconus (KC) is a developmental anomaly in which the inferior or central portion of the cornea becomes thinner and bulges forward in a cone-shaped fashion as a result of non-inflammatory thinning of the corneal stroma<sup>[1,2]</sup>.

The disease has its usual onset at puberty and, in many cases, progresses until the third to fourth decade of life, when it usually arrests<sup>[1]</sup>. Although a large proportion of keratoconic patients can be managed with contact lenses, an average of about **20%** of all keratoconic corneas require keratoplasty; some authors report markedly different surgical indication rates of **6.5** and **12** to **45%**.<sup>[3-5]</sup>

**Aim of the work:** to study the prevalence of keratoconus in patients seeking refractive surgery to correct their refractive errors and to study common risk factors.

**Patients and Methods:** Two thousand eyes to **1202** patients (**623** males and **579** females) coming for investigations for refractive surgery were randomly chosen in the period from April to October **2015**. Screening –by Pentacam- was bilateral in **798** patients and unilateral in **404** patients.

**Results:** the resulting cases of keratoconus were **293** eyes (**14.65%**) of **210** patients. Of those patients, males were **117** (**165** eyes) (**56.25%**) and females were **93** (**128** eyes) (**43.75%**).

**Key words**

*Keratoconus- Pentacam -prevalence- pachymetry- Keratometry*

### Introduction

Keratoconus is a relatively common disorder with a reported prevalence ranging from **50** to **230** per **100,000**. Keratoconus affects all races and both sexes equally with an onset around puberty<sup>[1]</sup>.

The reported prevalence of keratoconus varies widely depending upon the geographic location, diagnostic criteria used, and the cohort of patients selected. The first population-based study was done by Hofstetter<sup>[6]</sup> using a Placido disc and he reported an incidence of **600** per **100,000**. The most commonly cited prevalence is **0.054%** in Minnesota, USA by Kennedy et al.<sup>[7]</sup> who used scissors movement on retinoscopy and keratometry for diagnosis.

Environmental factors may contribute to the wide variation in prevalence. Geographical locations with plenty of sunshine and hot weather such as India<sup>[8]</sup> and the Middle East<sup>[9]</sup> have higher prevalence than locations with cooler climates and less sunshine such as Denmark<sup>[10]</sup>, Japan<sup>[11]</sup>, and Russia<sup>[12]</sup>. Ultraviolet light induced oxidative stress,

which keratoconic corneas cannot handle well, may have a role to play.

The majority of recent papers<sup>[13,14]</sup> indicate a preponderance of men over women with KC. In a retrospective study conducted in Netherlands<sup>[15]</sup>, using data relating to over **100,000** contact lens wearers obtained from four university clinics and five contact lens centers between the years **1950** and **1986**, the ratio of men to women was **0.5**.

### Patients and Methods

A prospective randomized clinical Study that was held in the Future center for LASIK and refractive surgery in Sohag.

Two thousand eyes to **1202** patients (**623** males and **579** females) coming for investigations for refractive surgery were randomly chosen in the period from April to October **2015**. Screening was bilateral in **798** patients and unilateral in **404** patients.

The study was conducted on patients undergoing Pentacam, corneal topography as a routine screening before refractive surgery, thus confirmation or exclusion of keratoconus can be determined.

**Evaluation of the patient included:**

- History taking (data collected included sex, age, history of consanguinity, medical ophthalmic problem e.g.; eye rubbing, allergic conditions by counting the approximate attacks of eye allergy per year)

- Then Pentacam was done to all cases, and the following data were obtained:
  1. Pachymetry (thinnest corneal location)
  2. Keratometry (the steepest and flattest meridian of the cornea and the average Keratometry)
  3. The posterior surface elevation.

**Results**

**A) Sex:** The study was conducted on two thousand eyes of **1202** individuals (**623** males and **579** females), with the resulting cases of keratoconus were **293** eyes (**14.65%**) of **210** patients. Of those patients, males were **117 (165 eyes) (56.25%)** and females were **93 (128 eyes) (43.75%)**. (**Figure 1**)

**B) Consanguinity:** It was positive in **42%** and negative in **58%** cases (**Figure 2**)



**Fig. (1)** Sex distribution of keratoconus

**Fig. (2):** distribution of keratoconus patients in relation to their state of consanguinity.

**C) Eye Allergy:**

No. of attacks of eye allergy per year.				
	Number	Mean ± SD	Median	P value
Male	117	3.05±2.363	3	0.119
Female	93	2.42±1.853	2	

**Table (1):** Distribution of no. of attacks of eye allergy per year in relation to sex

**E) Pachymetry:**

	Mean ± SD	Median	95% Confidence Interval		P value
			lower bound	Upper bound	
Male	436.59±52.26	445	428.53	444.64	0.000
Female	468.67±51.07	463	459.77	477.56	

**Table (2):** Distribution of pachymetry in keratoconus patients in relation to sex

F) **Keratometry:**

	Mean±SD	Median	P value
Male	48.36±6.17	46.47	0.658
Female	48.08±4	47.22	

**Table (3):** Sex distribution related to Keratometry in keratoconus patients

G) **Posterior surface elevation:**

	Mean±SD	Median	Range	P value
Male	37.28±29.41	28	7-120	0.810
Female	36.50±24.5	30	9-115	

**Table (4):** Distribution of posterior surface elevation considering sex group

H) **Grade of keratoconus:**

	Total no. of eyes	Percentage
Subclinical	138	47.1%
Grade I	103	35.2%
Grade II	23	7.8%
Grade III	29	9.9%
Total	293	100%

**Table (5):** Distribution of grade of keratoconic eyes and their percentage.

## Discussion

The total prevalence of keratoconus entirely differed according to the geographical location; Gorskova EN<sup>[12]</sup> described that the prevalence was **0.3** per **100.000** in Russia. In this study, the prevalence of the disease, including subclinical grade, in patients seeking refractive surgery was **293** out of **2000** eyes (**14.65%**). This is considered unexpected high prevalence.

Concerning eye rubbing and its correlation with keratoconus, Boneham et al.<sup>[16]</sup> found a strong relationship of frequent eye rubbing to development of keratoconus.

In this study, it has been proved that increased number of attacks of eye allergy and subsequently eye rubbing has its direct effect on development of keratoconus. Also, it has been documented that attacks of eye allergy increases with younger age group.

Concerning grade of keratoconus, subclinical keratoconus had the highest prevalence among all patients (**138 eyes=47.1%**). Grade I came in the second ranking (**103 eyes=35.2%**). Then grade III, II had the least prevalence with **9.9%** and **7.8%** percentages respectively.

This manner of distribution clarified higher prevalence in lower grades of keratoconus, with minimal number in advanced degrees. Its explanation may be because all these patients came to do investigations for refractive surgery, so patients having clinical criteria of advanced stages especially corneal scarring and hydrops, were excluded from the start as it was obvious that refractive surgery would be contraindicated.

### Summary

Increased prevalence of keratoconus, nowadays is not an actual increase in number of cases, but it is due to increased liability of diagnosis of the disease by enhanced technologies including the Pentacam.

The prevalence of keratoconus was higher than expected (total prevalence was **(14.65%)**).

In the study, higher percentage of patients were males, in the middle age group (**25-35**) years in both genders. However, grade of keratoconus was higher in younger age groups (**15-25**) years, who had higher prevalence of attacks of eye allergy.

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