Saudi Journal of Ophthalmology (2017) xxx, xxx–xxx

Original Article

Prevalence of keratoconus among patients seeking laser vision correction in Taif area of Saudi Arabia

Talal A. Althomali [a,b,*]; Ibraheem M. Al-Qurashi [a]; Saleh M. Al-Thagafi [a]; Afra Mohammed [b]; Mohammed Almalki [c]

Abstract

Purpose: To determine the prevalence of keratoconus among patients seeking laser vision correction (LVC).
Methods: Retrospective study of 1374 eyes of 687 patients (335 males, 352 females) who underwent keratoconus screening as a part of routine preoperative evaluation prior to LVC at the Tadawi surgical centre, Taif, Saudi Arabia from January 2014 to June 2015. The diagnosis of keratoconus was based on evaluation of Pentacam derived parameters.
Results: Manifest keratoconus was found in 59 subjects (out of 687 subjects) representing a prevalence rate of 8.59%. Of the 687 subjects, 45 subjects (6.55%) had bilateral manifest keratoconus (manifest keratoconus in both eyes or manifest keratoconus in one eyes and sub-clinical in contralateral eye) and remaining 14 patients (2.04%) had unilateral manifest keratoconus (with normal fellow eye). Sub-clinical keratoconus was diagnosed in 65 patients representing a prevalence rate of 9.46%. Of the 687 patients, 20 cases (2.91%) with subclinical keratoconus were bilateral and 45 (6.55%) were unilateral. Overall, 19.70% males (66/335) and 16.48% (58/352) females had either manifest or sub-clinical keratoconus, representing no statistically significant difference in the gender predisposition of the keratoconus disease process (Chi Square test; p = .277).
Conclusion: High prevalence of keratoconus was found among patients seeking LVC. Possible factors contributing to the high prevalence were recognized to be highly selective population (patients seeking LVC for myopia/hyperopia/astigmatism), ethnicity (high prevalence of consanguinity) and geographical location (high altitude) of the study subjects.

Keywords: Prevalence of keratoconus, Sub-clinical keratoconus, Saudi Arabia, Laser vision correction, Epidemiology

https://doi.org/10.1016/j.sjopt.2017.11.003

Introduction

Keratoconus is a chronic, idiopathic and non-inflammatory corneal disorder, which is characterized by thinning and protrusion of central or paracentral portion of the cornea[1] resulting in irregular astigmatism, myopia and corneal scarring[1,2] and reduction in visual acuity.[3–5] The onset of the keratoconus usually occurs at puberty with the progression until the third to fourth decade of the life in most of the cases.[4]

Several studies have evaluated the prevalence rate of the keratoconus. The prevalence rates reported in different studies range from 0.02 to 3333 cases per 100,000 population (0.00002 to 3.33%).[1,3–13] The wide variation in the prevalence

Received 9 January 2017; received in revised form 22 September 2017; accepted 12 November 2017; available online xxxx.

[a] Surgery Ophthalmology, Taif University, Taif, Saudi Arabia
[b] Tadawi Surgical Center, Taif, Saudi Arabia
[c] Surgery Ophthalmology, King Abdullah Medical City, Makkah, Saudi Arabia

* Corresponding author at: Taif University, PO Box 795, 21944, Saudi Arabia. Fax: +966 127443818.
e-mail address: tthomali@hotmail.com (T.A. Althomali).

Peer review under responsibility of Saudi Ophthalmological Society, King Saud University

Production and hosting by Elsevier

Access this article online: www.saudiophthaljournal.com www.sciencedirect.com

Please cite this article in press as: Althomali T.A., et al. Prevalence of keratoconus among patients seeking laser vision correction in Taif area of Saudi Arabia. *Saudi J Ophthalmol* (2017), https://doi.org/10.1016/j.sjopt.2017.11.003

rate among different studies can be attributed to the differences in geographical area, ethnicity, presence of concomitant diseases (atopy e.g. eczema, asthma, hay fever), dissimilarity in study population (hospital based, general population, student population, age group), criteria used for diagnosis of keratoconus etc.[4,12,14]

Geographical distribution and ethnicity are probably among the most important factors influencing the prevalence rate. Reports from different studies have indicated that the countries with warm climate such as Middle Eastern and Asian countries have high prevalence of keratoconus[3,4,8,12] as compared to the countries with cold climate such as Russia, USA, UK etc.[6,9,11] Genetic susceptibility in different ethnic groups, particularly the ones' with tradition of consanguinity, may also contribute to the high prevalence of keratoconus in some studies.[11,15]

Studies reporting the epidemiology of keratoconus are limited in Saudi Arabia. We found only one such study which was carried out in Asir province. The authors found high incidence of keratoconus in this region compared to the other regions of the world.[16] Thus, there is a need to carry out further studies evaluating the prevalence of keratoconus in Saudi Arabia. Moreover, with the increasing number of patients seeking laser vision correction (LVC), there is a need to determine prevalence rate of keratoconus among such patients as this will provide ophthalmologists with the direct estimation of the likelihood of finding keratoconus cases when screening the patients for LVC. In the current study, we examined the prevalence of keratoconus among patients seeking LVC at a refractive surgery centre in Saudi Arabia.

Material and methods

This observational case series included 1374 eyes of 687 patients who underwent keratoconus screening as a part of routine pre-operative evaluation prior to LVC at the Tadawi surgical centre, Taif, Saudi Arabia. Data were collected from January 2014 to June 2015. The exclusion criteria were age <18 years, corneal pathologies other than keratoconus and prior refractive or corneal surgery. The study followed the tenets of the Declaration of Helsinki and was approved by Taif University's institutional review board with waiver of consent.

The demographic data recorded were patient's age, sex and laterality of the eye. Out of 687 patients included in the study, 335 were males and 352 were females. The mean age of the patients was 27.6 ± 7.5 (range 18 to 65 years). The mean age of the male and female participants was 26.7 ± 7.5 (range 18 to 56 years) and 28.5 ± 7.5 years (range 18 to 65 years) respectively. All patients underwent complete ophthalmic examination, which included visual acuity measurement, refraction, pachymetry, keratometry, Pentacam evaluation, slit lamp biomicroscopy and fundus examination.

Visual acuity was tested in each eye with and without correction of refractive error using Snellen chart at a distance of 20 feet. The mean spherical equivalent (SE) of the included eyes was −3.11 ± 2.88 Dioptres (D). Of the total 1374 eyes, 91.85% (1262 eyes) were myopic (SE ≤ −0.50 D), 4.73% (65 eyes) were hyperopic (SE ≥ +0.50 D) and remaining 3.42% (47 eyes) had SE between +0.50 D and −0.50 D. Astigmatism (absolute cylinder ≥ 0.50 D) was present in 78.46% (1078/1374) eyes of which 38.9% (419/1078) eyes had high astigmatism of ≥1.50 D.

The diagnosis of the keratoconus was made using Pentacam (Pentacam; Oculus, Inc, Wetzlar, Germany) based on the Belin-Ambrósio enhanced ectasia display (BAD) which evaluates elevation data (anterior and posterior), pachymetric distribution and keratometry. The parameters evaluated by BAD software are described elsewhere.[17–21] The final D value is calculated performing a regression analysis against a standard database of normal and keratoconic corneas. The parameter is colour coded by the software based on the variation from the normal and classified as normal (<1.6 SD from the population mean, shown in white), suspicious (≥1.6 SD and <2.6 SD, shown in yellow), and pathologic (≥2.6 SD, shown in red).[17–21]

The prevalence rates of keratoconus in the study population were calculated as 'per patient' (i.e. based on the assessment of both the eyes). A patient was classified as having manifest keratoconus if he/she had bilateral manifest keratoconus or manifest keratoconus in one eye and sub-clinical/normal in the contralateral eye. To be classified as having subclinical keratoconus, patients should have either bilateral subclinical keratoconus or unilateral sub-clinical keratoconus with normal topography in fellow eye. The difference in the prevalence of keratoconus by gender was examined using Chi square test. The $p \leq 0.05$ was considered significant.

Results

Overall, the prevalence rate of the manifest keratoconus was 8.59% (59/687). Prevalence rate was 9.25% (31/335) in males and 7.95% in females (28/352). Of the 687 subjects, 45 subjects (6.55%) had bilateral manifest keratoconus (manifest keratoconus in both eyes or manifest keratoconus in one eyes and sub-clinical in contralateral eye) and remaining 14 subjects (2.04%) had unilateral manifest keratoconus (with normal fellow eye) (Fig. 1).

Sub-clinical keratoconus was diagnosed in 65 patients representing a prevalence rate of 9.46%. Prevalence rates of sub-clinical keratoconus in males and females were 10.45% (35/335) and 8.52% (30/352) respectively. Out of 687 subjects, 20 subjects (2.91%) had bilateral and 45 (6.55%) had unilateral sub-clinical keratoconus (Fig. 1).

Overall (manifest + subclinical keratoconus cases), 19.70% males (66/335) and 8.44% females (58/352) had either manifest or sub-clinical keratoconus. No statistically significant difference was found between male and female patients with respect to the prevalence rate of the keratoconus (Chi Square Test; p = .277).

Discussion

Studies carried out in different regions of the world have reported wide variation in the prevalence rates[1,3–13] and identified several factors that may contribute to these variations; e.g., geographical area, ethnicity, selected cohort of the patients (number of patients, age, sex, population type), methods and criteria for diagnosing keratoconus etc.[22,23]

Geographical distribution of the individuals in regions with differing weather conditions, UV exposure, altitude etc. may contribute to the variance in prevalence rates.[4] Review of literature shows high prevalence of keratoconus in India, Saudi

Please cite this article in press as: Althomali T.A., et al. Prevalence of keratoconus among patients seeking laser vision correction in Taif area of Saudi Arabia. *Saudi J Ophthalmol* (2017), https://doi.org/10.1016/j.sjopt.2017.11.003