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Original Paper

Topographic and Clinical Characteristics of a Sample of Jordanian Students

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Abstract

Purpose: *To screen for keratoconus (KC) and potential associated risk factors in a sample of medical students.*

Methods: *This cross sectional study included 120 medical students studying at The University of Jordan. They were randomly selected from a total of 400 students. Participants responded by completing a self-administered questionnaire. Following initial clinical evaluation, corneal tomography images and indices were analyzed by an experienced ophthalmologist, after which the participants were classified into: normal, KC suspects and KC patients.*

Results: *A total of 120 participants (mean age, 23.1 ±0.5 years) were included in this study, 70 (58.3%) were females and 50 (41.7%) were males. Two subjects had KC, demonstrating a prevalence of 1.7% while five (4.2%) participants showed at least two abnormal indices and were considered as KC suspects.*

Conclusion: *the result of this study is similar to other studies conducted in the Middle East, which indicates a higher prevalence of KC than other western countries. Combined with the significantly impaired vision-related quality of life and the relatively young onset of disease, the burden of keratoconus represents a significant public health concern.*

Keywords

keratoconus, pentacam, prevalence, topographic indices

1. Introduction

Keratoconus (KC) is the most frequent axial corneal ectasia of non-inflammatory origin and it is

usually diagnosed in young people at puberty, in their late teens or early twenties (Krachmer et al., 1984) so considering it as an important cause of ocular morbidity with significant social and economic impact as the disease affects younger generations. It is a debilitating corneal disorder characterized by a progressive corneal thinning that results in corneal protrusion, irregular astigmatism, and decreased visual performance (Galvis et al., 2015).

Etiology is unknown and is most likely multi factorial. Several studies have reported a strong association between eye rubbing and the development of keratoconus. The hereditary pattern is not predictable although the strongest evidence of genetic involvement is a high concordance rate in monozygotic twins (Tuft et al., 2014). A positive family history has been reported in 6-8% of the cases and its prevalence in first-degree relatives is 15 times higher than the general population (Pearson et al., 2015).

Corneal topography/ tomography are valuable diagnostic tools for diagnosing subclinical keratoconus and for tracking the progression of the diseases. A recently introduced imaging devices provide accurate measurement of corneal power, elevation and pachymetry (Emre et al., 2007). Evolution in keratoconus detection has resulted in continued refinement of indices.

Our study aimed at screening for KC and potential associated risk factors in a sample of medical students.

2. Methods

2.1 Subject Population

A quantitative cross sectional study was conducted to determine the prevalence of KC among all senior medical students at The University of Jordan. The study was conducted between March 2016 and August 2016 at Jordan University Hospital (JUH) where the students spend their last three clinical years. Out of 400, one hundred twenty students were recruited to participate in the study. All students were of Arab origin. Exclusion criteria were subjects with history of contact lens wear, who had undergone refractive or corneal surgery, who had been diagnosed with a corneal pathology other than KC and traumatic corneal scar.

This research followed the tenets of the Declaration of Helsinki. Ethical approval to conduct this study was obtained from the Institutional Review Board (IRB) committee at JUH. Informed consent was obtained from all the participants.

2.2 Screening Protocol

Participants who responded to the research call underwent a self-administered questionnaire. . Following initial clinical evaluation by slit lamp, corneal tomography images were obtained for all participants using the OCULUS Pentacam HR rotating Scheimpflug camera. Corneal tomography images and indices were analyzed by an experienced ophthalmologist, after which the participants were classified into: normal, KC suspects and KC patients according to the criteria (Alhawari et al., 2018) shown in Table 1.

Table 1. Diagnostic Criteria of KC Based on Pentacam Tomography

1	K-max reading >48D
2	Superior-inferior difference on the 4.0mm circle on the sagittal map >2.5D
3	Inferior-superior difference on the 4.0mm circle on the sagittal map >1.5D
4	Superior-inferior corneal thickness difference on the 4.0mm circle >30 μm
5	Y-coordinate value of the thinnest location <−0.5mm
6	Values >15 μm within the central 4.0mm on theanterior elevation map (best-fit sphere)
7	Values >20 μm within the central 4.0mm on theposterior elevation map (best-fit sphere)
8	Thinnest corneal thickness on the pachymetrymap <470 μm

KC: if 4 or more of the above criteria. KC suspect: if 2-3 of the above criteria.

No KC (normal): if 0-1 of the above criteria.

Note. whenever the participants had bilateral findings, the patient was labeled according to the worse eye.

2.3 Data and Statistical Analysis

The Statistical Package of Social Sciences version 16.0 (SPSS Inc., Chicago, IL, USA) was utilized for data entry and statistical analysis. Only the participants who completed the study were included in data analysis. Chi-square test was used to compare the characteristics of each classification group. A multivariate analysis was used to evaluate the associations with KC. P-values ≤ 0.05 were considered statistically significant.

3. Results

126 participants responded to the research call of which 6 were excluded as they did not meet the inclusion criteria. The age of the participants ranged between 21 and 26 years (mean 23.1 $\pm$0.5). Of the total participants, 70 (58.3%) were females and 50 (41.6%) were males

3.1 Ocular and Medical Characteristics of the Participants

17.5 % of the participants were using spectacles to improve their visual acuity while the number of participants who were contact lens wearers was 6 (4.5%) and those were excluded from analysis.

15% participants reported daily significant eyerubbing, while about 9.2% reported having atopy and 8 (6.7%) participants reported having vernal keratoconjunctivitis (VKC). A positive family history of KC was reported by 5 (4.2%) participants. Furthermore, 24 (20 %) participants had parents who had a consanguineous marriage, of which, 11 (45.8%) parents were first cousins. None of the participants reported having any chronic diseases or genetic conditions associated with KC.

The presence of family history of KC was found to be significantly associated with a diagnosis of KC (p value = 0.02) and another significant association was with first-cousin consanguineous marriage (p value = 0.037). History of eye rubbing was also found to be significantly associated with KC diagnosis (p value = 0.04). However, neither atopy nor vernal keratoconjunctivitis demonstrated any statistical

association.

3.2 Keratomerty and Tomographic Indices

The following data were exported to Microsoft Excel (Microsoft Corp, Redmond, Washington): mean curvaturepower (Km), Kmax, corneal astigmatism, keratometric power difference (kpd), corneal thickness at the apex (Pachy Apex) and at the thinnest point of the cornea (Pachy Min), Rmin, index of surface variation (ISV), index of vertical asymmetry (IVA), keratoconus index (KI), central keratoconus index (CKI), index of height asymmetry (IHA) and index of height decentration (IHD).

Participants had a keratometry range between 38.0 to48.50 D, with a mean of 43.75 ± 1.50 D. eleven subjects (22 eyes) had keratometry values higher than 45(referral cutoff) in one or both eyes. Corneal astigmatism ranged between 0.00 to -5.75 D (mean 0.45 ± 0.44 D), with 6 subjects (12 eyes) having higher than 2.00 D (referral cutoff) astigmatism.

Average corneal thickness at the apex (Pachy Apex) is 549±26 and at the thinnest point of the cornea (Pachy Min) is 541 ± 23. The average of other indices were included in Table 2.

Table 2. Keratomertic and Tomographic Indices

Rmin	6.1 ± 0.5
ISV	79.6 ± 29
IVA	0.88 ± 0.3
KI	1.32 ±0.12
CKI	1.1 ± 0.05
IHA	22.7 ± 20.1
IHD	0.08 ± 0.04

Topographic patterns analysis showed that the majority (91%) of participants had a symmetrical pattern (symmetric bowtie, oval, and round), and the remaining 9% were divided among the other abnormal patterns.

Definite KC was found in 2 individuals, indicating a prevalence of 1.7%. One of them was previously diagnosed with KC, while the other was unaware of having KC before their participation in the study. Suspect KC was found in 5 individuals (4.2%).

4. Discussion

In this cross sectional study, the prevalence of KC was 1.7% .This prevalence is consistent with the results reported in other middle-eastern countries (Shehadeh et al., 2015; Brlin et al., 2012; Millodot et al., 2011; Waked et al., 2012) where a much higher prevalence of KC is demonstrated in comparison to other regions of the world (Nielsen et al., 2007; Owens et al., 2003; Tanabe et al., 1985).

The prevalence in our study was comparable to the study among Palestinian tertiary students (1.5%) (Shehadeh et al., 2015) where they used simplified nomenclature for describing keratoconus among

similar age group participants (Brlin et al., 2012) but lower among Arab students in Israel where the prevalence was 3.1% as they used a simplified criteria of four topographic indices to diagnose manifest KC (Millodot et al., 2011).

In addition the prevalence was also lower than the study conducted in Lebanon 3.3%. This may be attributed to the fact that the mean age of participants in the current study was less than the mean age of participants in Lebanon study (Waked et al., 2012). We can assume this from one other study for Topographic Keratoconus in an Iranian population in Tehran to determine the prevalence of KC based on topographic maps in a population with ages between 14-81 years. The prevalence of keratoconus was 3.3% (Hashemi et al., 2013). However, the prevalence of KC was 0.8% in the 14-29-year-old age group and 7.5% in those ≥ 60 years. The study showed that prevalence of keratoconus significantly increased with age (Hassan et al., 2013).

This study identified consanguineous marriage as a risk factor for KC. Gordon-Shaag et al. (2012) found similar results for Palestinian Arabs, while the studies in Iran and Lebanon didn't address the issue (Hashemi et al., 2013; Waked et al., 2012). Environmental influences leading to eye rubbing have been proposed as a cause of increased prevalence in our and other regions (Abu Ameerh et al., 2014) where the climate is characterized by dry conditions for most of the year and hot summer (Weed et al., 2008).

The sample size of this study was small to provide a good estimate of prevalence and the sample population is nonrandom group of individuals. This may contribute not to have a correlation in our study between atopy and VKC and development of KC which has been commonly mentioned in literature. The contact lenses wearers were excluded as we didn't apply measures to differentiate between corneal warpage attributable to contact lens wear that can resemble keratoconus and true keratoconus.

References

Abu Ameerh, M. A., Bussieres, N., Hamad, G. I., & Al Bdour, M. D. (2014). Topographic characteristics of keratoconus among a sample of Jordanian patients. *Int J Ophthalmol., 7*(4), 714-719.

Brlin, M. W., Kim, J. T., Zloty, P., Ambrosio, Jr. R., & Int, J. (2012). *Keratoco Ectatic corneal diseases*, *1*, 31-35. https://doi.org/10.5005/jp-journals-10025-1006

Emre, S., Doganay, S., & Yologlu, S. (2007). Evaluation of anterior segment parameters in keratoconic eyes measured with the Pentacam system. *Cataract Refract Surg*, *33*(10), 1708-1712. https://doi.org/10.1016/j.jcrs.2007.06.020

Galvis, V., Sherwin, T., Tello, A., Merayo, J., Barrera, R., & Acera, A. (2015). Keratoconus: An inflammatory disorder? *Eye (Lond)*, *29*(7), 843-859. https://doi.org/10.1038/eye.2015.63

Gordon-Shaag, A., Millodot, M., & Shneor, E. (2012). The epidemiology and etiology of keratoconus. *Int J Keratoconus Corn Ectatic Dis.*, *1*, 7-15. https://doi.org/10.5005/jp-journals-10025-1002

Hashemi, H., Beiranvand, A., Khabazkhoob, M., Asgari, S., & Emamian, M. H. (2013). Prevalence of keratoconus in a population-based study in Sharoud. *Cornea*, *32*(11), 1441-1445. https://doi.org/10.1097/ICO.0b013e3182a0d014

Hassan Hashemi, Mehdi Khabazkhoob, & Akbar Fotouhi. (2013). Topographic Keratoconus is not rare in an Iranian population: The Tehran Eye Study. *Ophthalmic Epidemiology*, *20*(6), 385-391. https://doi.org/10.3109/09286586.2013.848458

Hussam H. Alhawari, Muhannd S. El-Faouri, & Muawyah D. Al Bdour. (2018). Autoimmune Thyroid Disease and Keratoconus: Is There an Association? *International Journal of Endocrinology*. https://doi.org/10.1155/2018/7907512

Krachmer, J. H., Feder, R. S., & Belin, M. W. (1984). Keratoconus and related noninflammatory corneal thinning disorders. *Surv-ophthalmo*, *28*(4), 293-322. https://doi.org/10.1016/0039-6257(84)90094-8

Millodot, M., Shneor, E., Albou, S., Atlani, E., & Gordon-Shaag, A. (2011). Prevalence and associated factors of keratoconus in Jerusalem: A cross-sectional study. *Ophthalmic Epidemilogy*, *18*(2), 91-97. https://doi.org/10.3109/09286586.2011.560747

Nielsen, K., Hjortdal, J., Aagaard Nohr, E., & Ehlers, N. (2007). Incidence and prevalence of keratoconus in Denmark. *Acta Ophthalmol Scand*, *85*(8), 890-892. https://doi.org/10.1111/j.1600-0420.2007.00981.x

Owens, H., & Gamble, G. (2003). A profile of keratoconus in New Zealand. *Cornea*, *22*(2), 122-125. https://doi.org/10.1097/00003226-200303000-00008

Pearson, A. R., Soneji, B., Sarvananthan, N., & Sandford-Smith, J. H. (2015). *Does ethnic origin influence the incidence or severity of keratoconus*.

Shehadeh, M. M., Diakonis, V. F., Jalil, S. A., Younis, R., Qadoumi, J., & Al-Labadi, L. (2015). Prevalence of keratoconus among a Palestinian tertiary student population. *Open Ophthalmol J.*, *9*, 172-176. https://doi.org/10.2174/1874364101509010172

Tanabe, U., Fujiki, K., Ogawa, A., Ueda, S., & Kanai, A. (1985). Prevalence of keratoconus patients in Japan. *Nippon Ganka Gakkai Zasshi.*, *89*(3), 407-411.

Tuft, S. J., Moodaley, L. C., Gregory, W. M., Davison, C. R., & Buckley, R. J. (2014). *Prognostic factors for the progression of keratoconus*.

Waked, N., Fayad, A. M., Fadlallah, A., & El Rami, H. (2012). Keratoconus screening in a Lebanese students' population. *J Fr Ophthalmo.*, *35*(1), 23-29. https://doi.org/10.1016/j.jfo.2011.03.016

Weed, K., MacEwen, C., Giles, T., Low, J., & McGhee, C. (2008). The Dundee Scottish University Keratoconus study: Demographics, corneal signs, associated eye diseases and eye rubbing. *Eye*, *22*(4), 534-541. https://doi.org/10.1038/sj.eye.6702692