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Original Research

The level of keratoconus awareness among general population in Northern Border Region of Saudi Arabia

Keratoconus awareness

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Abstract

Aim: The study aims to evaluate the level of awareness regarding keratoconus (KCN) among residents of the Northern Border Region in Saudi Arabia.

Material and Methods: This cross-sectional study, conducted in the Northern Border Region of Saudi Arabia, utilized an electronically distributed questionnaire. Participants aged 18 to 65 provided informed consent. Data analysis was performed using STATA/SE 11.2 and MS Excel, employing descriptive statistics and the Chi-square test. Stepwise multiple logistic regression identified significant predictors of good KCN awareness (P<0.05).

Results: Among 511 participants, predominantly female (76.52%) and young adults (18-29 years) with at least a bachelor's or diploma degree, only 19% demonstrated good awareness. Significant differences in awareness were observed by gender, education level, and family history of KCN. The internet/ social media was the primary information source (53.62%). Over half recognized eye rubbing and allergies as risk factors, and most acknowledged the need for treatment. Awareness of specific treatments was low, with only 23.09% and 24.07% knowing about contact lenses and corneal collagen cross-linking, respectively. Notably, 27% incorrectly believed KCN could be treated with eye drops. Awareness of KCN complications varied, with 56.16% recognizing its impact on quality of life.

Discussion: Keratoconus awareness among participants was poor, with misconceptions about treatment modalities. Proper awareness campaigns and education programs are needed to enhance this awareness and improve the quality of life for affected individuals.

Keywords

Awareness, Cornea, Keratoconus, Northern Border Region, Saudi Arabia

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Introduction

Keratoconus (KCN) is an idiopathic, chronic, non-inflammatory, ectatic eye condition in which the normally dome shaped cornea bulges outward, leading to a conical shape. This alteration results in irregular myopic astigmatism, diminishing both far and near visual acuity, and increased sensitivity to glare and light [1]. While the exact etiology remains elusive, various risk factors have been identified, including genetic predisposition, habitual eye rubbing, and certain medical conditions such as asthma, allergies, Ehlers-Danlos syndrome, and Down syndrome [2-5]. Typically, keratoconus manifests during adolescence or early adulthood, with a protracted progression over the subsequent one to two decades. As the condition advances, the cornea becomes more pronouncedly distorted, exacerbating visual impairment [6].

Timely diagnosis by an ophthalmologist is essential for initiating appropriate management strategies aimed at stabilizing corneal morphology and impeding disease progression. Treatments may encompass the use of rigid contact lenses and corneal cross-linking surgery, with the latter proving effective in retarding keratoconus progression [7]. In severe cases, where corneal integrity is compromised, a corneal transplant may be necessitated to restore visual function.

Research underscores the significant impact of keratoconus on individuals' vision related quality of life, underscoring the importance of heightened awareness and early intervention [8-9]. Studies conducted around the world have reported prevalence and incidence rates of keratoconus based on 100,000 persons and 100,000 years, respectively [10]. Incidence of keratoconus most commonly occurs between the ages of 20 and 30 years, with progression occurring until the age of 35. Some studies report higher rates of keratoconus in men, while others report higher rates in women. Moreover, the interplay of genetic predisposition, environmental factors such as ultraviolet (UV) radiation exposure, and lifestyle variables including ethnic background and dietary habits further modulate the disease trajectory. Notably, syndromic conditions such as Down syndrome have been implicated in keratoconus pathogenesis, emphasizing the multifactorial nature of its etiology. and diabetes mellitus. Conversely diabetes may act as a preventative measure against keratoconus [11].

Contemporary therapeutic modalities encompass a spectrum of interventions, ranging from conventional approaches like contact lenses to advanced surgical techniques including intrastromal corneal ring segments and various forms of keratoplasty. Corneal cross-linking, heralded as a cornerstone in keratoconus management, offers promise in halting disease progression and preserving visual function [12-13].

Currently, ongoing research aims to improve current therapeutic methods and investigate new approaches to enhance the effectiveness and safety of treatment for keratoconus. However, prioritizing preventive measures and early detection is crucial in mitigating the harmful effects of the condition. Despite studies on keratoconus awareness in some areas, comprehensive data from regions like the Northern Border Region of Saudi Arabia are still lacking [14-15].

Against this backdrop, our study endeavors to delineate the level of keratoconus awareness among the general population in the Northern Border Region via a predesigned questionnaire. Furthermore, we sought to assess the influence of demographic variables on the dissemination of knowledge regarding this sight-threatening condition, thereby facilitating targeted educational initiatives and bolstering public health interventions.

Material and Methods

Study setting and design

A population-based cross-sectional study was conducted in Arar, Turaif, Al Uwayqilah, and Rafha, major cities in the Northern Border Region of Saudi Arabia, from June 15, 2023, to April 15, 2024.

Research tool

The level of KCN awareness was assessed using a pre-designed questionnaire validated by the Ophthalmology Department at NBU. The questionnaire was distributed electronically via a Google form through various social media platforms. The introductory part of the questionnaire outlined the study's objectives, and respondents provided written informed consent before participating.

Inclusion and exclusion Criteria

Both genders aged 18 to 65 residing in the Northern Border Region were included. Individuals living outside the study area and those with mental challenges were excluded.

Sample size and sampling method

Random sampling was employed, with a minimum sample size of 376 calculated using the formula:

$n = (Z1-\alpha/2)^2 * P * (1-P) / d^2$

Where: n = sample size $Z1-\alpha/2$ = standard normal variate at 5% type 1 error (1.96) P = expected awareness (43.0%) d = absolute error (0.05)

Data analysis

Statistical analysis utilized STATA/SE version 11.2 for Windows (STATA Corporation, College Station, Texas), and MS Excel. Descriptive statistics were employed, presenting data in terms of frequency and percentage. Knowledge about keratoconus on risk factors, treatment options and complications among different study groups was compared using the Chi-square test (x^2). Each correct response in the knowledge questions was scored as one, while incorrect one was scored as zero. Scores of 11 or lower indicated 'poor awareness,' while scores above 11 'good awareness'. Stepwise multiple logistic regression analysis identified significant predictors for good awareness about keratoconus among participants, with statistical significance set at $P<0.05$.

Ethical approval

This study was approved by the Ethics Committee of Northern Border University (Date: 2023-06-11, No: 45/44/H).

Results

A total of 511 individuals consented to participate in the study, comprising 391 (76.52%) females. Among them, 249 fell within the age group of 16 to 29 years. More than half of the participants (50.49%) hailed from families with three or more members, while the majority (68.88%) had attained either a bachelor's or diploma degree. The comprehensive socio-demographic profile of the study participants is detailed in

Table 1. Sociodemographic characteristics of the study participants

Character (n.=511)		N.	%
Age (years)	18-29	249	48.73
	30-39	102	19.96
	40-49	116	22.70
	50-65	44	8.61
Gender	Female	391	76.52
	Male	120	23.48
Number of family members	Less than 3	253	49.51
	3 or more	258	50.49
Education level	Below secondary	30	5.87
	Secondary	88	17.22
	Bachelor or diploma	352	68.88
	Master or Ph.D.	41	8.02
Job status	Student	188	36.79
	Employee	182	35.62
	Non-employee	141	27.59
To which region do you belong?	Arar	280	54.79
	Turaif	58	11.35
	Al-Uwayqilah	32	6.26
	Rafha	141	27.59
History of allergy (eye or general)	Yes	161	31.51
	No	350	68.49
Personal History of Keratoconus	Yes	44	8.61
	No	467	91.39
Family history of Keratoconus	Yes	34	6.65
	No	477	93.35

Table 1. The participants' KCN awareness is displayed in Table 2. More than half of the participants identified eye rubbing and ocular or systemic allergy (51.86% and 50.29%, respectively) as potential risk factors for KCN. Regarding the treatment, although most participants (74.17%) recognized the necessity of treatment for KCN, only a small percentage were familiar with treatment options like hard contact lenses and corneal collagen cross-linking (23.09% and 24.07%, respectively). Unfortunately, 27% of participants mistakenly believed that KC could be treated solely with eye drops. Concerning KCN-related complications, 41.1% of participants believed that KC impacts far vision exclusively, while 29.75% thought it affects both far and near vision. A significant majority (56.16%) acknowledged that KCN results in a diminished quality of life.

The overall demonstrated good awareness was demonstrated by only 97 (19%) study participants, while the majority, 414 (81%), exhibited poor awareness. Table 3 outlines the relationships between the KCN awareness level and different sociodemographic characteristics.

Significantly varied awareness levels were observed among genders, education levels, and individuals with a family history of KCN (p-values of 0.03, 0.008, and 0.001, respectively). Conversely, no significant difference was noted concerning ages and geographical locations. Multiple logistic regression of good KCN awareness conditioned on significant predictors revealed that the good awareness was mainly associated with family history of KCN, reliable source of information (seminar/ lecture/ workshop) and the participants' level of education.

Figure 1 illustrates the frequency distribution of the sources of

Table 2. Participants' awareness about keratoconus

Variable (n=511)	Yes		No		I do not know	
	N.	%	N.	%	N.	%
I. What conditions do you think can increase the risk of Keratoconus?						
1. Hereditary	241	47.16	59	11.55	211	41.29
2. Family history	246	48.14	94	18.40	171	33.46
3. Eye rubbing	265	51.86	94	18.40	152	29.75
4. History of allergy (ocular or systemic)	257	50.29	79	15.46	175	34.25
5. Syndromes like Down's Syndrome	106	20.74	147	28.77	258	50.49
6. Contact lens wearing	199	38.94	125	24.46	187	36.59
7. Dry eyes	119	23.29	140	27.40	252	49.32
II. What do you think about the treatment options for Keratoconus?						
1. Is treatment required?	379	74.17	21	4.11	111	21.72
2. Eye drops	139	27.20	137	26.81	235	45.99
3. Glasses.	152	29.75	117	22.90	242	47.36
4. Hard Contact lens.	118	23.9	161	31.51	232	45.40
5. Soft Contact lens	274	53.62	30	5.87	207	40.51
6. Corneal collagen cross linking.	123	24.7	103	20.16	285	55.77
7. Corneal transplantation	105	20.55	136	26.61	270	52.84
III. What complications do you think Keratoconus can cause?						
1. Decreased vision for far.	210	41.10	83	16.24	218	42.66
2. Decreased vision for near.	147	28.77	117	22.90	247	48.34
3. Decreased vision for both far and near.	152	29.75	84	16.44	275	53.82
4. Blindness	110	21.53	133	26.3	268	52.45
5. Occupational.	228	44.62	107	20.94	176	34.44
6. Psychological.	299	58.51	53	10.37	159	31.12
7. Impaired general quality of life.	287	56.16	69	13.50	155	30.33

Table 3. Relationships between the KCN awareness level and participants' sociodemographic characteristics

Characteristics		Poor awareness (n.=414)		Good awareness (n.=97)		x²	P
		N.	%	N.	%		
Age (years)	18-29	205	49.52	44	45.36	0.85	0.84
	30-39	81	19.57	21	21.65		
	40-49	94	22.71	22	22.68		
	50-65	34	8.21	10	10.31		
Gender	Female	325	78.50	66	68.04	4.79	0.03
	Male	89	21.50	31	31.96		
Number of family members	Less than 3	195	47.10	58	59.79	5.06	0.02
	3 or more	219	52.90	39	40.21		
Education level	Below secondary	24	5.80	6	6.19	11.84	0.008
	Secondary	80	19.32	8	8.25		
	Bachelor or diploma	283	68.36	69	71.13		
	Master or Ph.D.	27	6.52	14	14.43		
Job status	Student	152	36.71	36	37.11	7.59	0.02
	Employee	138	33.33	44	45.36		
	Non-employee	124	29.95	17	17.53		
To which region do you belong?	Arar	221	53.38	59	60.82	2.33	0.51
	Turaif	47	11.35	11	11.34		
	Al-Uwayqilah	26	6.28	6	6.19		
	Rafha	120	28.99	21	21.65		
History of allergy (eye or general)	Yes	128	30.92	33	34.02	0.35	0.55
	No	286	69.08	64	65.98		
Personal History of Keratoconus	Yes	31	7.49	13	13.40	3.49	0.06
	No	383	92.51	84	86.60		
Family history of Keratoconus	Yes	20	4.83	14	14.43	11.67	0.001
	No	394	95.17	83	85.57		
Source of information about keratoconus	A seminar/ lecture/ workshop	103	24.88	48	49.48	22.85	<0.001
	A visit to the doctor	74	17.87	26	26.80	3.98	0.05
	Friends/ relatives.	143	34.54	29	29.90	0.76	0.38
	Internet. /social media	224	54.11	50	51.55	0.21	0.65
	Personal experience with keratoconus	45	10.87	10	10.31	0.02	0.87

x2: The Chi-square test; P: Probability (statistical significance is considered at p<0.05)

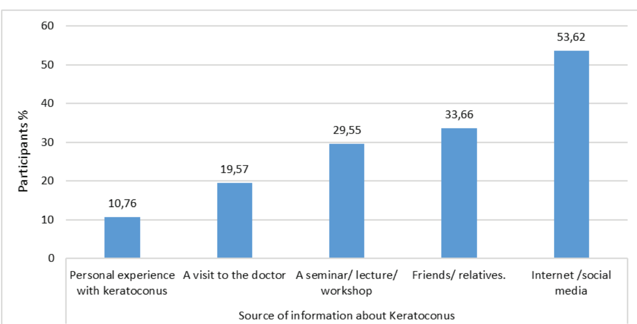

Figure 1. Sources of KCN information among the study participants

information about keratoconus among the study participants. The primary source of information about KCN was the internet/ social media, reported by 53.62% of participants, followed by friends/relatives, mentioned by 33.66% of the participants.

Discussion

This is the first study to evaluate the level of keratoconus (KCN) awareness among residents of the Northern Border Region in Saudi Arabia and to assess the influence of demographic variables on this awareness. Out of 511 total study participants, 391 (76.52%) were female. Among them, 249 were aged 16 to 29. Over half (50.49%) came from families with three or more members, and the majority (68.88%) had a bachelor's or diploma degree.

The current study revealed that overall KCN awareness was very poor, with only 19% demonstrating good awareness. This aligns with findings from the Aseer region of Southern Saudi Arabia, where good awareness was reported in 18.7% of participants [14]. However, KCN awareness was higher (38.4%) in Riyadh, possibly due to more participants having personal experience with the disease, as over 50% were diagnosed with KCN [16].

Eye rubbing and ocular or systemic allergy were identified by 51.86% and 50.29% of surveyed participants respectively as risk factors for KCN. Similarly, a study in the Eastern Province of Saudi Arabia reported these factors in 45.9% and 42.3% of participants, respectively [17].

However, these findings are in contradiction to another study conducted in Medina, Saudi Arabia where only 28.9% participants believed that eye rubbing could be a KCN risk factor and 27.8% thought that there is a relation between KCN and allergy [18]. This could be because of the difference in geographical location as in their study the overall good KCN awareness was also only 5.9%.

Regarding the treatment options, only 24.07% of study participants were familiar with corneal collagen cross-linking, while 27% had misconception that KCN could be treated by eye drops. Comparable results were found in Hail, Saudi Arabia, where 26.5% knew about cross-linking and 21.8% had misconceptions about eye drops [19]. However, in Abha, Saudi Arabia this misconception was higher (32.5%), likely due to their sample being exclusively non-medical students [20].

Concerning KCN-related complications, a significant majority (56.16%) acknowledged that KCN results in a diminished quality of life. Numerous studies both within Saudi Arabia and internationally endorse that KCN adversely affects both general and vision-related quality of life [21-22].

Limitation

The current study's dependence on self-reported data and the potential biases typical of survey-based research should be recognized as significant limitations. Additionally, future research could investigate other factors like the status of healthcare facilities affecting KCN awareness.

Conclusion

The keratoconus awareness level among study participants was very poor. Misconceptions regarding treatment modalities existed. The primary source of information was the internet and social media, likely contributing to misinformation and poor awareness. To improve general and vision-related quality of life for those affected by KCN, awareness should be enhanced through awareness campaigns and education programs involving ophthalmology professionals.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and Human Rights Statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or compareable ethical standards.

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Conflict of Interest

The authors declare that there is no conflict of interest.

References

1. Althomali TA, Al-Qurashi IM, Al-Thagafi SM, Mohammed A, Almalki M. Prevalence of keratoconus among patients seeking laser vision correction in Taif area of Saudi Arabia. Saudi J Ophthalmol. 2018;32(2):114-118.

2. Khor WB, Wei RH, Lim L, Chan CM, Tan DT. Keratoconus in Asians: Demographics, Clinical characteristics and visual function in a hospital-based population. Clin Exp Ophthalmol. 2011;39(4):299-307.

3. Naderan M, Shoar S, Rezagholizadeh F, Zolfaghari M, Naderan M. Characteristics and associations of keratoconus patients. Cont. Lens Anterior Eye. 2015;38(3):199-205.

4. Gordon-Shaag A, Millodot M, Shneor E, Liu Y. The genetic and environmental factors for keratoconus. Biomed Res Int. 2015;(2015):1-19.

5. Lindsay RG, Bruce AS, Gutteridge IF. Keratoconus associated with continual eye rubbing due to punctal agenesis. Cornea. 2000;19(4):567-569.

6. Flockerzi E, Xanthopoulou K, Goebels SC, Zemova E, Razafimino S, Hamon L, et al. Keratoconus staging by decades: a baseline ABCD classification of 1000 patients in the Homburg Keratoconus Center. Br J Ophthalmol. 2021;105(8):1069-1075.

7. Shi Y. Strategies for improving the early diagnosis of keratoconus. Clin Optom (Auckl). 2016;(8):13-21.

8. Pinto RDP, Abe RY, Gomes FC, Barbisan PRT, Martini AF, de Almeida Borges D, et al. Quality of life in keratoconus: evaluation with Keratoconus Outcomes Research Questionnaire (KORQ). Sci Rep. 2021;11(1):1-9.

9. Gothwal VK, Reddy SP, Fathima A, Bharani S, Sumalini R, Bagga DK, et al. Assessment of the impact of keratoconus on vision-related quality of life. Invest Ophthalmol Vis Sci. 2013;54(4):2902-2910.

10. Santodomingo-Rubido J, Carracedo G, Suzaki A, Villa-Collar C, Vincent SJ, Wolffsohn JS. Keratoconus: An updated review. Cont Lens Anterior Eye. 2022;45(3):1-26.

11. Gomes JAP, Rodrigues PF, Lamazales LL. Keratoconus epidemiology: A review. Saudi J Ophthalmol. 2022;36(1):3-6.

12. Bui AD, Truong A, Pasricha ND, Indaram M. Keratoconus diagnosis and treatment: Recent advances and future directions. Clin Ophthalmol. 20231;17:2705-18.

13. Andreanos KD, Hashemi K, Petrelli M, Droutsas K, Georgalas I, Kymionis GD. Keratoconus Treatment Algorithm. Ophthalmol Ther. 2017;6(2):245-262.

14. Al-Amri A, Alshamrani AS, Abo Tamraa AA, Alqahtani SA, Alotaibi KML, Almutairi KH. Awareness level of general population regarding keratoconus in Aseer region, Southern of Saudi Arabia. J Family Med Prim Care. 2020;9(12):6153-57.

15. Alruwaili R, Alharbi A, Alghamdi O, Alyahya Y, Albalawi N, Alostaz S, et al. The Awareness of Keratoconus among General Population in Saudi Arabia. Open Journal of Ophthalmology. 2021;11:49-59.

16. Alkadi T, Alruwaili S, Mahfud SA. and Alomair F. The Level of Keratoconus Awareness among the Saudi Population in Riyadh. J Pharm. Res Int. 2021;33(30A):47–53.

17. AlSomali A, Almithn D, Alamer A, Al-Omair A, Almuhaysin F, Almulhim N. Awareness of keratoconus and its relationship with eye rubbing among the population of the Eastern Province of Saudi Arabia. Cureus. 2024;16(1):1-11.

18. Kordi ES, Almokhtar AM, Alshareef EK, Alkayyal AA, Alharbi JO, Alharbi AH. Awareness about keratoconus and its relation with eye rubbing: A cross-sectional study in Medina. Cureus. 2022;14(11):1-12.

19. Alshammari ZA, Ali A, Alshammari LK, Alassaf OM, Alshehri AYA, AlSarhan R, et al. The level of awareness of keratoconus among the general population in Hail region, Saudi Arabia. Cureus. 2023;15(12):1-10.

20. Al-Amri AM, Al-Ghamdi AS, Al-Khabbaz FI, Al-Qallaf AZ, Siddiqui JJ, Al-Sadiq FA, et al. Level of awareness among non-medical students toward keratoconus, Abha, Saudi Arabia. Saudi j health sci. 2020;9(1):7-11.

21. Al-Mehdawi Z, Elzarug H. Keratoconus awareness and disease effect on life of keratoconus Libyan patients. International Journal of Progressive Sciences and Technologies. 2024; 43(1):427-440.

22. Al-Dairi W, Al Sowayigh OM, Al Saeed AA, Alsaad A. Depression among keratoconus patients in Saudi Arabia. Cureus. 2020;12(12):1-9.

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