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Research Article

Prevalence, Clinical Features and Associated Factors of Keratoconus Patients Attending Ophthalmology Department, King Khalid Hospital, Hail City, Saudi Arabia

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Abstract

Introduction: Keratoconus is a non-inflammatory, progressive and usually bilateral corneal disorder that leads to considerable alterations in the shape, thickness and biomechanical properties of the cornea. The incidence varies globally depending upon the geographic location, the ethnic groups and diagnostic criteria used.

Methods: Retrospective study, review the prevalence, demographic features and associated factors of the outpatients who have been diagnosed as keratoconus through the years 2010 - 2014.

Results: Forty-Four eyes reviewed, the prevalence of keratoconus among ophthalmology department was 5-6 per 12,000 patients each year. The greatest age group affected was 20 - 29 years old (60.8%), slightly common in female compared to male (52.2%) with majority affected in both eyes (78.3%). The commonest presenting symptom was painless progressive decrease of vision (95.65%), itching (56.21%) and intolerance lenses (39.13%). Clinical profile started by visual acuity the greatest had 6/30 meter (29.3%) then count finger (14.9%), for K-reading mostly they had severe K-reading > 52 (56%), intraocular pressure was within normal (95.2%); high myopia > 6.00 for around half of the patients (41.7%) with absolute astigmatism in all patients. Slit Lamb examination the commonest found cunning (61%) then scaring of cornea (24.4%) and one case with acute bilateral hydro-drop.

Discussion: To our knowledge, the current study is the first study of keratoconus in northern region of Saudi Arabia. Demographic features were parallel to the pervious published studies of keratoconus. Moreover, in this study was found a significant relationship between increasing in the age and the severity of the presenting features of keratoconus.

Keywords: *Keratoconus; Auto Keratometry; Auto refraction; Intraocular; Ophthalmology; KC*

Introduction

Keratoconus (KC) is a non-inflammatory, progressive and usually bilateral (even thought asymmetrical [1]) corneal disorder that leads to considerable alterations in the shape, thickness and biomechanical properties of the cornea [2], which could produce irregular myopic astigmatism, thinning of the cornea, protrusion and scaring of cornea in advanced cases [3]. The onset of KC it is classically at puberty and is progressive until the third to fourth decade of life, when it usually arrests. It may, however, commence later in life and progress or arrest at any age [4].

The presentation symptoms are highly variable and it depends on the stage of the progression of the disorder. Early presentation it can be misdiagnosed as the progression of the disease there is significant distortion of vision accompanied by profound visual loss. Patients with KC fortunately never become totally blind so as presentation the patients could complain of PPDV, legal blindness and unpleasant

frequent changes of glasses [4,5]. Although the natural description of the disease has been well described, the aetiology and underlying biochemical pathology remain invalid. Family histories as well as environmental factors have been involved [6]. The cause of this condition is still largely unidentified. A positive association between KC and many conditions has been suggested, including atopy, eye rubbing, contact lens wear, ocular trauma, collagen vascular disorders, pigmentary retinopathy, Marfan's syndrome, and Down's syndrome [4,7].

Incidence ranges from 1.4 to 600 cases per year per 100 000 in the general population [8,9] and it is varies worldwide depending upon the geographic location [10,11], the ethnic groups reflection [12-14] and diagnostic criteria used [15].

Recently, there were different modalities of treatment for KC discovered, so it is recommended that the Kingdom should establish a system for early diagnosis, which will help in the control of future problems and unlikable symptoms as it can arrest the progression of the disease.

The studies of KC in SA unfortunately are very limited [10,16-17]. Hopefully this document may demonstrate the clinical features of KC patients and to evaluate the risk factor of KC Patients attending ophthalmology department, KKH, Hail city, SA by way of increasing of this disease worldwide.

Aim of the study

Aim of the present study is to know the prevalence of KC patients among the patients who attending the Ophthalmology Department, KKH, through the years of 1432- 1435 Hijri, Hail city, SA. And to identify the most affected gender, age group and to assess the presenting clinical features of keratoconus patients as also to determine the association factor and its complication. Conclusively to provide the knowledge of the clinical features outcome of KC among Ophthalmology Department, KKH, Hail city, SA.

Patients and Methods

1. Our study is retrospective study including the outpatients who have been already diagnosed as KC in the Ophthalmology Department, KKH, through the years of 1432- 1435 Hijri, Hail city, SA

2. All the studied patients were diagnosed based on history and physical finding and mainly by classical stages of KC using the AutoKeratometry beside SLE, standard Snellen chart, Air puff and Autorefraction (dry), which were collected from the files of the patients.

3. Due to insufficient data on the files about risk factor and complication, we had done questionnaire for our patients that we communicate with them through the contact information on their files, so around the third of patients they answered the questionnaire.

4. The questionnaire included questions related to risk factors such as family history, contact lenses wear, frequent changes of glasses, allergic keratoconjunctivitis, eye rubbing and who had been diagnosed with an eye diseases other than KC. To determine whether this factors were significantly associated.

5. After receiving administrative approval from local authorities, at the College of Medicine Hail University as well as KKH, we performed this study and the oral consents already taken from who answered the questionnaire.

Results

The results of Forty-One eyes of 23 patients (18 of patients with both eyes and the remaining 5 with one affective eyes) of KC were studied during the years of 1432 until 1435 attended in Ophthalmology Department, KKH Demographic profile of these 23 patients showed the greatest age group presentation was 20-29 (60.8%) (Entirely range from 14- 48) Table 1 with 12 females (52,2%) and 11 males (47,8%) slightly more in female compared to male Table 2. The majority ware present with both eyes affected (78.3%) Table.3 and it is more in age group range from 20-24 (60.9%) with completely present of both affective eyes on elderly patient (30-49 years) and vari-

ation with youngest patients (10-29 years) Table 4. The presenting symptom was the majority of patients had PPDV (95.6%) then itching (65.2%) and the other presenting were varying between frequent changes of glasses, non fitting contact lances and allergic keratoconjunctivitis in addition there were 6 patients had allergic keratoconjunctivitis 3 of them specifically had vernal keratoconjunctivitis (VKC).

Age Group	10 - 19	20 - 29	30 - 39	40 - 49	*Totally
No. of Patients	5	14	2	2	23
Percentage	21.7%	60.8%	8.6%	8.6%	

Table 1: *Age of diagnosis as a relating factor of keratoconus patients attending ophthalmology department, Hail city, Saudi Arabia through the years of 1432- 1435 Hijri.*

***Total number of attending ophthalmology department, Hail city, Saudi Arabia, through the years of 1432- 1435 Hijri.*

Sex	Males	Females
No. of Patients	11	12
*Percentage	47.8%	52.2%

Table 2: *Sex distribution as a relating factor of keratoconus patients attending ophthalmology department, Hail city, Saudi Arabia through the years of 1432- 1435 Hijri.*

**Percentage of total number of attending ophthalmology department, Hail city, Saudi Arabia, through the years of 1432- 1435 Hijri.*

Affective Eye	Right (OD)	Left (OS)	Both Eyes (OU)
No. of Patients	3	2	18
*Percentage	13	8.7	78.3

Table 3: *The affective eye as presenting symptoms during the diagnosing of keratoconus patients attending ophthalmology department, Hail city, Saudi Arabia through the years of 1432- 1435 Hijri.*

**Percentage of total number of attending ophthalmology department, Hail city, Saudi Arabia, through the years of 1432- 1435 Hijri.*

Age at the presentation	19 - 20	20 - 29	30 - 39	40 - 49
Both Eyes	3	11	2	2
One Eye	2	3	0	0
*Percentage	21.7	60.9	8.7	8.7

Table 4: *Affective eye depend on the age of the presentation among ophthalmology department, Hail city, Saudi Arabia through the years of 1432- 1435 Hijri.*

**Percentage of total number of attending ophthalmology department, Hail city, Saudi Arabia, through the years of 1432- 1435 Hijri.*

Presenting symptoms	PPDV	Itching	Frequent change of glasses	Intolerance lenses	No-fitting lenses	Others presenting
No. of Patients	22	15	6	9	6	1
Percentage	95.65%	56.21 %	26.08 %	39.13%	26.08%	4.34%

Table 5: *Presenting symptoms of keratoconus patients attending ophthalmology department, Hail city, Saudi Arabia through the years of 1432- 1435 Hijri.*

**Percentage of total number of attending ophthalmology department, Hail city, Saudi Arabia, through the years of 1432- 1435 Hijri.*

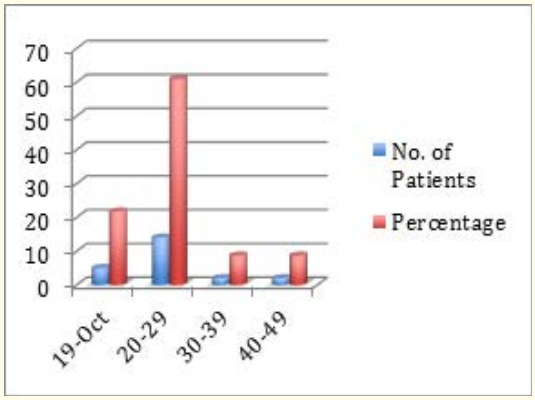

Figure 1: *Age of diagnosis as a relating factor of keratoconus patients attending ophthalmology department, Hail city, Saudi Arabia. Through the years of 1432- 1435 Hijri.*

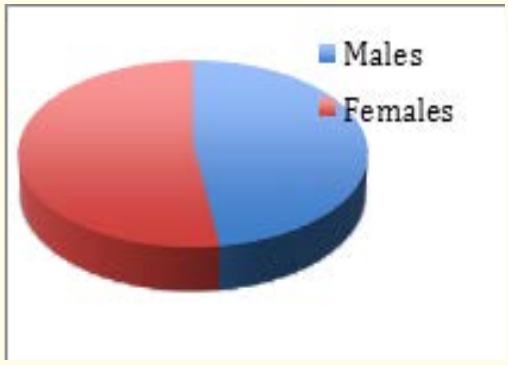

Figure 2: *Sex distribution as a relating factor of keratoconus patients attending ophthalmology department, Hail city, Saudi Arabia Through the years of 1432- 1435 Hijri.*

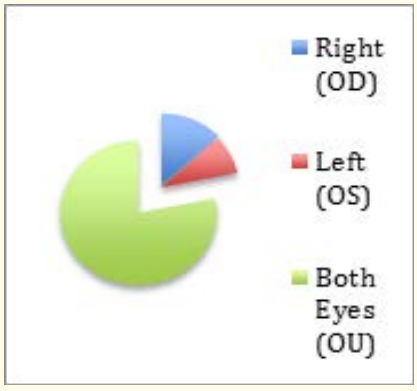

Figure 3: *The affective eye as presenting symptoms during the diagnosing of keratoconus patients attending ophthalmology department, Hail city, Saudi Arabia through the years of 1432- 1435 Hijri.*

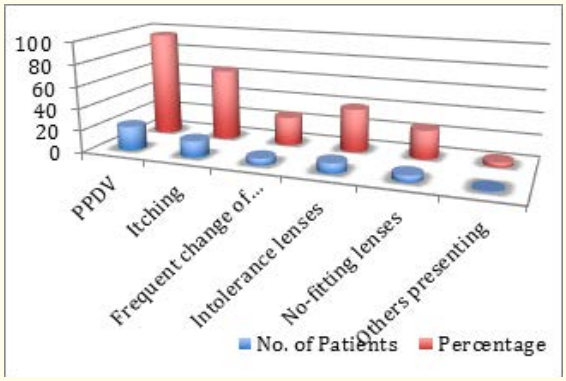

Figure 4: *Presenting symptoms of keratoconus patients attending ophthalmology department, Hail city, Saudi Arabia through the years of 1432- 1435 Hijri.*

The clinical features it specified into the whole affected eyes to detect any distinction between the right and left eye (Totally 41 eyes). So, starting by the VA the majority were 20/100 (29.3 %) then count finger (19.5%) with varies range from VA (20/400-20/24) Table 6, then the K-reading was according to the age group, a twenty-three eyes (56.1%) was sever K-reading (>52) in the age group 20-29 following it in the same age group but with moderate K-reading (45-52) was thirty-six percent (36.6%), as also there was completely presentation of sever K reading for age group 40.49 and absent of mild CK and moderate for the third and fourth decades. Then the intraocular pressure the common was with normal IOP (12-22 mmHg) with thirty-nine eyes (95.2%) Table 8. For Refraction -there is missing on this particular data in 9 files - according to the degree myopia there was high myopia > 6.00 (41.7%) for the around the half of the patients then it varies between low myopia (33.3%) and moderate (25%) and the total patient had astigmatism with eighteen eyes (75%) had more the 4.00-cylinder astigmatism Table 9. Finally, for the Finding on (SLE) the majority was with cunning of the cornea 61% and there was scaring 24.4% and one patient with hydrodrop.

Visual Acuity	OD	OS	Percentage
CF	4	2	14.6%
20/25	0	1	2.4%
20/30	3	1	9.8
20/40	2	2	9.8%
20/50	0	1	2.4%
20/70	1	2	7.3%
20/100	5	7	29.3%
20/120	1	2	7.3%
20/200	2	0	4.9%
20/400	3	2	12.2%

Table 6: *Visual acuity of keratoconus patients attending ophthalmology department, Hail city, Saudi Arabia through the years of 1432- 1435 Hijri.*

Percentage of total number of the affective eyes diagnosed on ophthalmology department, Hail city, Saudi Arabia, through the years of 1432- 1435 Hijri.

K reading	Mild < 45				Moderate 45-52				Sever > 52			
Age	10-19	20-29	30-39	40-49	10-19	20-29	30-39	40-49	10-29	20-29	30-39	40-49
OD					3	4	1		4	7	1	1
OS	2	1			3	3	1		2	5	1	2
*Percentage	7.3%				36.6%				56.1%			

Table 7: *Clinical features keratometry of keratoconus patients attending ophthalmology department, Hail city, Saudi Arabia through the years of 1432- 1435 Hijri.*

**Percentage of total number of the affective eyes diagnosed on ophthalmology department, Hail city, Saudi Arabia, through the years of 1432- 1435 Hijri*

IOP	Normal (12-22 mmHg)	High	Low
OD	**20**	**0**	1
OS	**19**	**1**	0
*Percentage	95.2%	2.4%	2.4%

Table 8: *Intraocular Pressure of keratoconus patients attending ophthalmology department, Hail city, Saudi Arabia through the years of 1432- 1435 Hijri.*

**Percentage of total number of the affective eyes diagnosed on ophthalmology department, Hail city, Saudi Arabia, through the years of 1432- 1435 Hijri*

Reffraction	OD			OS	
	Myopia Diopter		astgimatsm (clynder)	Myopia Diopter	astgimatsm (clynder)
- 0.50	LOW < -3.00 D			1	
-1					1
-1.25		1			
-1.50				1	
-1.75				1	
-2				1	1
-2.25			1	1	1
-2.20		1		1	

-3	Moderate -3.00 to -6.00 D	1	1		
-3.25		1	1		
-3.50		1			
-3.75		1			
-4			2		
-4.50			1		
-4.75			1	1	
-5			2		2
-5.50			1	1	
-5.75					1
-6.50	High >-6.00.00		1		
-6.75		1	1		1
-7		1			1
-7.50		1			
-7.75					1
-8			1		
-9					1
-10.75					1
-12		1			
-14		2			
-15		1			
-15.75				1	
-17.25				1	
-18				1	

Table 9: Distribution of Refraction degree of keratoconus patients attending ophthalmology department, Hail city, Saudi Arabia through the years of 1432- 1435 Hijri.

**Percentage of total number of the affective eyes diagnosed on ophthalmology department, Hail city, Saudi Arabia, through the years of 1432- 1435 Hijri*

Finding	OD	OS	Percentage
Conning of Cornea	13	12	61%
Central scaring	4	4	19.5%
Apical scaring	1	1	4.9%
Vogt's striae	2	2	9.7%
Corneal hydrops	1	1	4.9%

Table 10: *Finding on slit-lamb Examination of keratoconus patients attending ophthalmology department, Hail city, Saudi Arabia through the years of 1432- 1435 Hijri.*

**Percentage of total number of the affective eyes diagnosed on ophthalmology department, Hail city, Saudi Arabia, through the years of 1432- 1435 Hijri.*

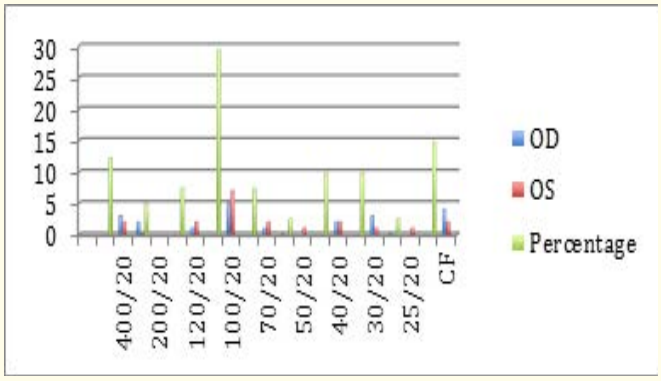

Figure 5: Visual acuity of keratoconus patients attending ophthalmology department, Hail city, Saudi Arabia through the years of 1432- 1435 Hijri.

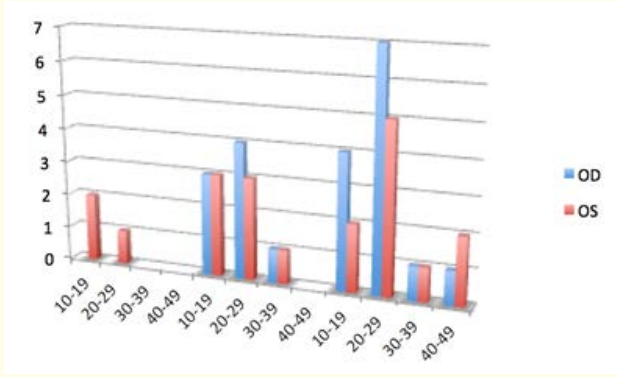

Figure 6: *Clinical features keratometry of keratoconus patients attending ophthalmology department, Hail city, Saudi Arabia through the years of 1432- 1435 Hijri.*

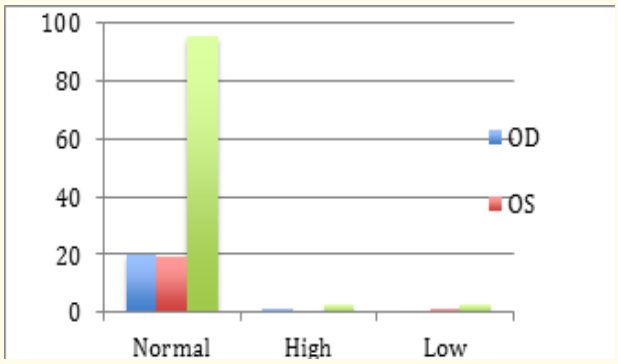

Figure 7: *Intraocular Pressure of keratoconus patients attending ophthalmology department, Hail city, Saudi Arabia through the years of 1432- 1435 Hijri.*

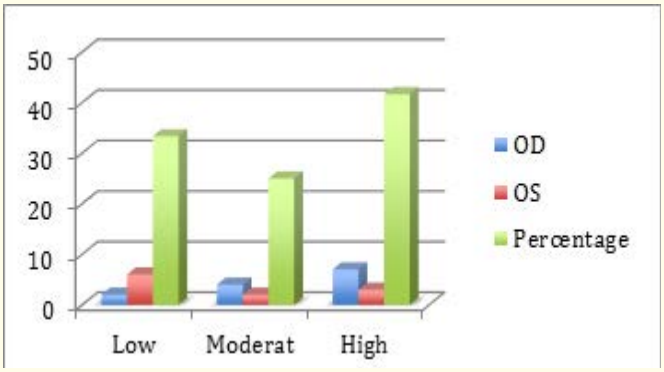

Figure 8: *Distribution of Refraction degree of keratoconus patients attending ophthalmology department, Hail city, Saudi Arabia through the years of 1432- 1435 Hijri.*

The Questionnaire result was 7 patients out of 23 patients we were contact with them, there was a significant association found between KC disease and eye rubbing were 7 patients (100%) had this bad habit, 5 patients (71,4%) with chronic history of allergic keratoconjunctivitis, contact lenses wear and glasses wear also have (57,1%) of patients diagnosed with KC and the hereditary factor is supported by KC patients report a positive family history by 42,8% of the disease. No relation between KC and genetic diseases (e.g. Trisomy 21) in our study was reported.

Risk factor	No. of Patients	*Percentage
Family history	3	42.9%
Glasses use	4	57.1%
Contact lens use	4	57.1%
Eye rubbing	7	100%
Allergic conjunctivitis	5	71.4 %
Decrees vision	4	57.1%

Table 11: *Associated factors with Keratoconus disease.*

**Percentage of total number (7) of patients had the diagnosed of keratoconus, answered the questionnaire.*

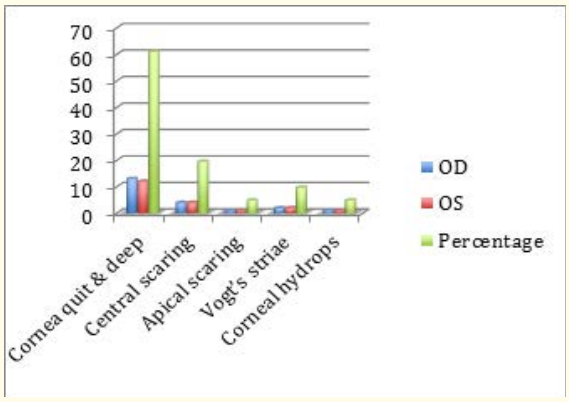

Figure 9: *Finding on slit-lamb Examination of keratoconus patients attending ophthalmology department, Hail city, Saudi Arabia through the years of 1432- 1435 Hijri.*

Discussion

In our study a number of 23 patients who had been already diagnosed of KC attending Ophthalmology Department, KKH, through the years of 1432- 1435 Hijri, Hail city, SA and the general population of Hail count to be 527,000 [18]. The prevalence of KC patients among general population of Hail was 4 patients per 100,000 in which the prevalence found to be lower than Asir [10], which may be due to hereditary or associated environmental factors.

The literatures review, it was doubtful significance between the differences of males and female's ratio. In this study prevalence of keratoconus in Hail shows slightly increase in female gender (52,2%), which was smellier to result that obtained from Asir and other studies [3,10] while some studies found KC higher in males [13,19].

Age distribution among our patients reveal an average age of 22 years like city of Asir (age average 18) also like Haifa, Israel (average age 18) and Iran [10,20-21] regarding the age groups the keratoconus diagnosis, were found to be more in 20-29 year (60,8%) were in this age group. The finding of these advanced age group to have the most complication may be associated to increase in the prevalence of misdiagnosis and poor awareness about the disease, associated diseases and environmental factors.

Although the majority ware present with both eyes affected (78.3%) the remaining patients had unilateral (21.7%) KC comparable to 14.3% eyes had unilateral diagnosed of KC [22], however we found complete presenting of both affective eyes on elderly patient (30-49 years) with complete absent of unilateral KC, which demonstrating by correlation of the progression of the disease and growing up with the age.

In this study the concerning of the history of patient were collected from files which there was limited previous study regarded about it, the main cause the patients seeking the medical help was PPDV (95%) by way of 22 out of 23 they had it as chief complaining resemble to the one study were they discovered the majority of patients reported a decrease in vision, frequent change of glasses [23] comparable to our finding the frequent change of glasses was (26.08)% equally to the presenting of non-fitting lenses and intolerance of contact lenses (39.1%) furthermore 15 patients were complaining of itching (65.2%), while there were 6 patients had a history of allergic keratoconjunctivitis, 3 of them had VKC on behalf of previous diagnosed disease that agree with this study which found 13% of VCK can lead to CK [24], beside the founded of VKC was seen in five patients (22.7%) [1].

The current study conducted third of patients to have increased prevalence of these associated factors with keratoconus disease. The most prevalent of them are eye rubbing where (100%), allergy where (71,4%) Contact lenses wear (57,1%), glasses wear (57,1%) and positive family history by 42,8% of the disease, which are correlated with result found in Asir and Cardiff [10,16]. Which may lead us to believe that associated factors are a risk factor for Keratoconus disease [10].

VA was measured with the standard Snellen chart, founded that 12 eyes was 20/100 (29.3%), 6 eyes count fingers CF (14.4%) and 5 eyes with 20/400 (12.2%) comparable to Fifty-eight percent of the eyes of patients had >=40/40 visual acuity [25] and majority of patients had 6/24 - 6/60 of VA [10].

K-reading it was measured by AtuoKeratometry in this study found 23 eye (56.1%) with sever k-reding (>52 D) affect all age group but mostly in 20-29 age group. Similarly, to some published studies were the mean age in the severe keratoconus group was 18.3 ± 5.9 years [1], the mean age at presentation was reported to be 25 years [26] and 27.3 ± 8.7 years [27].

The same age group also were had the main of moderate k-reading (36.6%), comparable to mild k-reading (7.3%) was totally for young patient (10-29 years old) while the 3rd and 4th decade was limited to the moderate and sever KC that could explain the coloration between the older of the presenting the KC the severity of k-reading, which can prevent this consequence by early diagnosis.

IOP measured using the Air puff, the founding is 59.2% with the normal (12-22 mmHg) IOP, there wasn't much significant outcome of IOP like other studies [28,29].

Myopia there was high myopia > 6.00 (41.7%) for the around the half of the patients parallel to the Indian study were found Higher myopic refractive error of KC [8], with manifest refraction [25] then it varies between low myopia (33.3%) and moderate (25%) and the total patient had astigmatism with eighteen eyes (75%) had more the 4.00 cylinder astigmatism the cause of sever myopia and high astigmatism at first presentation of our thought to be due to the early misdiagnose of KC by optometrists and opticians and low of facilities of diagnoses outside the KKK as it is the primary place the patient would ask the help.

Outcome on SLE were found 25 eyes (61%) cunning cornea then the corneal scaring was affect 23.9% of eyes which was unlike from the Fifty-three percent had corneal scarring in one or both eyes in the Collaborative Longitudinal Evaluation of Keratoconus (CLEK) Study [19]. Moreover, the scarring being as result of defects on the extracellular matrix and basement membrane components [30]. The Vogt's striae (9.7%) dissimilar the study of (Ira Chopra MS, Arun K Jain MD [1]), they found 65.9% Vogt's striae and Vogt's striae were present in 43 (63.2%) eyes on SLE [31], the reason may be that some doctors they didn't document the finding in the files and rely on measurement of the devises used as the core of the diagnoses.

Finally, on SLE, there was one patient who had come with bilaterally acute hydrodrop with deep cupping, papillary conjunctivitis, and central scaring and over cylinder k-reading.

Conclusion

To our knowledge, the current study is the first study of KC in Northern region of SA that emphasized the prevalence of KC and the presenting clinical features with concerning to some associated factors for patients who attending ophthalmology department, KKH.

Females were found to be slightly more affected than males and their ages were mainly 20-29 with majority of patient had Bilateral KC. The commonest complaining symptoms were PPDV and itching, for the clinical finding the common VA was 20/100 with predominance of sever k-reading, normal IOP and high myopia with full astigmatism in all patients, therefore the main finding on SLE was cunning of the cornea then scarring of the cornea with one case of acute bilateral Hydro drop.

Limitation of the study

It Though to be this study as a highlight the prevalence of KC and the presenting clinical features with concerning to associated factors but it can't be broad study for entire Hail region beside some missing data already mentioned above in some files, which can't give us an absolute picture of the pattern of KC in Hail region.

Recommendation

1. The results of this study signal a need for public health outreach, screening program for this age group to improve early detection, treatment and intervention for KC by full treatment in the northern region without needs to referral for higher institutions. Moreover,

flashlight the needs of countrywide program to early diagnoses of CK due to misdiagnosed patients since the majority of population seek the help of the optometrists and opticians other than the ophthalmologist and to establish a program for family awareness about the common risk of CK, others associated factors

2. More studies of KC in Middle East and SA exclusively because of geographic proprieties to our place and the risk of increasing in the KC while it is curative disease and it can arrest with more than one modern modalities of treatments of KC.

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