Original Article

Screening For Keratoconus Using Tms Iv Corneal Topography Modelling System

Nehal Gandhi[1*], Dr. Chintan Gandhi[2]

[1*]Department Of Pharmaceutical Chemistry, Tathya Pharmacy College, Chikhli, Dist.: Navsari, Gujarat, India, E-Mail: ncgandhi82@gmail.com
[2]Ophthalmologist, Sun Eye Care Hospital, Bilimora, Dist.: Navsari.

***Corresponding Author:-** Mrs. Nehal C. Gandhi

*Department of Pharmaceutical Chemistry Tathya Pharmacy College, Thala, Chikhli Gujarat Technological University. Dist: Navsari-396521Gujarat, India. E-Mail: ncgandhi82@gmail.com
DOI: 10.47750/pnr.2023.14.02.425

Abstract

Keratoconus (KC) is a non-inflammatory progressive thinning (Ectactic) disorder of the cornea, which leads to progressive, mixed, myopic, and irregular astigmatism. Several devices are currently available for detecting early keratoconus by measuring anterior corneal topography. These range from simple inexpensive devices, such as handheld keratoscopes (Placido disks), to expensive sophisticated devices, such as computer-assisted video keratoscopes. The diagnosis of early or mild KC can be challenging. In such cases, it may be difficult to distinguish early KC from regular myopic astigmatism. However, recent advances in computerized corneal topography have made it much easier to establish diagnoses in questionable cases.

To detect topographic characteristics of keratoconus quantitatively, the use of multiple parameters, each of which represents distinctive characteristics of the map, is desirable. Keratoconus patterns in video keratoscopy can be characterized by an area of localized, abnormal steepening. Localized steepening is often observed in the inferior quadrant, but sometimes it is seen in the center or superior portion of the cornea. This results in asymmetry and a large refractive power difference across the corneal surface.

"SCREENING FOR KERATOCONUS USING TMS IV CORNEAL TOPOGRAPHY MODELLING SYSTEM –A prospective descriptive observational study" was conducted in "Sun eye care hospital, Bilimora, Dist: Navsari from June 2021 to December. 2022. 200 patients (100 cases & 100 control) were included in the study & both eyes of each patient were examined. To detect keratoconus as early as possible so that appropriate treatment options for preventing the progression of keratoconus and deterioration of vision, can be recommended timely.

Keyword: keratoconus, Screening, deep learning, keratoscopes, corneal topography.

INTRODUCTION:

Keratoconus (KC) is a non-inflammatory progressive thinning (Ectactic) disorder of the cornea, which leads to progressive, mixed, myopic and irregular astigmatism.[1]

In the early cases, where the cornea appears normal but keratoconus is suspected, measuring the anterior topography of the central and paracentral cornea is extremely useful to confirm the diagnosis.

The diagnosis of early or mild KC can be challenging. In such cases it may be difficult to distinguish early KC from regular myopic astigmatism. Several devices are currently available for detecting early keratoconus by measuring anterior corneal topography. These range from simple inexpensive devices, such as handheld keratoscopes (Placido disks), to expensive sophisticated devices, such as computer-assisted videokeratoscopes.[2] However, recent advances in computerized corneal topography have made it much easier to establish diagnosis in questionable cases.[3] The growing interest in refractive surgery is another reason for the early diagnosis of KC. There is a good deal of evidence to suggest that patients with KC are poor candidates for these procedures. [5-6]

Computer-assisted video keratography and the color-coded map provide an abundance of information about corneal surface characteristics. However, human visual interpretation is essentially subjective, whereas contour information is difficult to analyze quantitatively. An objective assessment of video keratography is essential for statistical studies of the progression of keratoconus, genetic studies, or screening procedures used for refractive surgery practice. Therefore, the thousands of data points in a color-coded map must be reduced in some fashion to a series of statistically manageable indices.[7]

Rabinowitz and McDonnell[8] reported the first numerical method to differentiate between keratoconus patterns and normals based on videokeratoscopy. They used central corneal power, the difference in central corneal power between fellow eyes, and the Inferior- Superior (I-S) value. These three parameters were significantly different in patients with keratoconus than in normal controls.

To detect topographic characteristics of keratoconus quantitatively, the use of multiple parameters, each of which represents distinctive characteristics of the map, is desirable. Keratoconus patterns in videokeratoscopy can be characterized by an area of localized, abnormal steepening. Localized steepening is often observed in the inferior quadrant, but sometimes it is seen in the center or superior portion of the cornea. This results in asymmetry and a large refractive power difference across the corneal surface.

KPI is able to differentiate keratoconus not only from normal corneas but also from keratoplasty, epikeratophakia, photorefractive keratectomy, radial keratotomy, and contact lens-induced warpage.

To prevent complications and patient's dissatisfaction after LASIK it is important to detect early keratoconus. As means are now available for treating and halting early keratoconus we must try to detect and manage them early. Corneal topography with special software is now available for detection of early keratoconus. Clinical parameters like myopia, myopic astigmatism, mixed astigmatism and failure to get satisfactory visual improvement with best correction can improve the chances of detecting more keratoconus early and reduce the cost of screening. Therefore, this study was undertaken to screen for keratoconus using corneal topography in myopia & myopic astigmatism of more than 3 D and in mixed astigmatism as against controls.

MATERIAL & METHODS:

This prospective, cross-sectional study was done at sun eye Care hospital, Bilimora Dist: Navsari, during the period of June 2021 to December 2022 to screen for keratoconus using TMS IV.

SAMPLE FRAME:

Patients aged 10 to 30 yrs, attending eye OPD in Sun eye care hospital, Bilimora, having myopic astigmatism of >= -3 D ; spherical equivalent >=-3 D which include myopia and compound myopic astigmatism Mixed astigmatism.
Age sex matched controls were selected from patients/ attendants with normal eye(s)/myopic astigmatism < 3 D/ spherical equivalent < -3 D attendants/ immediately following the case .

SAMPLE SIZE:-

CASES – 100
CONTROL – 100

SELECTION:-

Systemic random sampling from all those having myopic astigmatism of >= -3 D ; spherical equivalent >=-3 D which include myopia and compound myopic astigmatism ; Mixed astigmatism.

INCLUSION CRITERIA:-

- Patients in the10 - 30 yrs age group.
- Patients attending eye OPD or admitted in ward at Sankara eye hospital,Guntur.
- No other orbital,adnexial or anterior segment abnormality.
- Patients who give consent for complete examination.
- No history or evidence of eye injury.
- No history or evidence of eye surgery.
- Patients presenting with C/O gradually progressive diminution of vision for distance.

EXCLUSION CRITERIA:-

- Patients who do not give consent for complete examination.
- Patients who are not able to complete interview & examination.
- Ocular pathology, Orbit, Adnexa: & Anterior segment pathology..
- Glaucoma.
- Injury or trauma to the eye.

PROCEDURE :-

All cases will be selected as per the above mentioned criteria. After taking informed and written consent from the patients, they will undergo a detailed clinical interview and examination which includes:

- Systemic examination

- Ophthalmic and medical history
- DVA- with and without glasses, prescription of glasses in use
- Pin hole improvement.
- Auto-refraction
- Auto-keratometry
- Keratometry
- Retinoscopy & PMT
- BCVA (snellens charts)
- Complete ocular examination including Slit-lamp examination and fundus lens examination.
- Ophthalmoscopy
- IOP measurement (using NCT)
- Corneal Topography using TMS IV corneal topography modeling system using keratoconus screening protocol.

(corneal topography will be done after performing auto refraction and before any other examination which might preclude topography examination.)

Data will be analysed & interpreted by the inbuilt software based on which patients will be categorised into normal, keratoconus suspect & true keratoconus.

STATISTICAL METHOD:

Chi-square test, t-test & Anova test were used for calculations of statistical difference between various parameters from case & control group. Significance was calculated at 95% confidence level for all test applied.

RESULTS AND STATISTICAL ANALYSIS

This study was conducted at Sun Eye Care Hospital; Bilimora, Dist: Navsari.. The study was conducted from June 2021 to December 2022. A total number of 200 patients were examined.

Table 1 : Population Groups studied

GROUP	**No. of Patients**
CASES	100
CONTROL	100
TOTAL	**200**

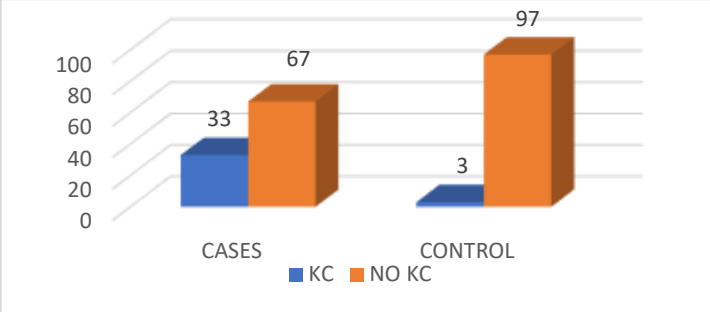
CASES include –
Myopic Astigmatism of >= -3 D
SE of >=-3D which include Myopia & Compound Myopic astigmatism -
Mixed astigmatism In either one eye or both eye of a patient.
CONTROL include –
Myopic Astigmatism of < -3 D
- Spherical Equivalent of < -3 D which include Myopia & Compound Myopic Astigmatism
- Normal persons

Table 2 : Total KC patients in cases & control

		BE	**RE**	**LE**	**TOTAL**
CASES	KC	27 (81.82%)	3 (9.09%)	3 (9.09%)	33 (33%)
	NO KC	-	-	-	67 (67%)
	TOTAL				**100 100%)**
CONTROL	KC	3 (100%)	00 (00.00%)	00 (00.00%)	3 (3.00%)
	NO KC	-	-	-	97 (97%)
	TOTAL				**100 (100%)**
TOTAL					**200**

BE: Both Eye, RE: Right Eye, LE: Left Eye

Chart 1



- A total of 33 patients are diagnosed as having KC (out of which 27 patients were found to have KC in both eyes ; 3 patients were found to have KC in RE & 3 in LE) out of 100 CASES & 3 patients of KC out of 100 CONTROL.
- So, from this we can conclude that there is more chance of getting KC patients on an OPD basis from all patients having Myopic astigmatism of >=-3 D; SE of >=-3 D which include myopia & compound myopic astigmatism & Mixed astigmatism than those having Myopic astigmatism of <-3 D; SE of <3 D which include myopia & compound myopic astigmatism and Normal persons.

Table 3 : History of Diminution of vision & Keratoconus identify (any eyes) with side diminished vision

		BE	**LE>RE**	**N**	**RE>LE**	**TOTAL**
CASES	KC	25 (75.75%)	6 (8.18%)	0 (0.00%)	2 (6.06%)	**33(33%)**
	NO KC	65 (97.01%)	2 (2.98%)	0 (0.00%)	0 (0.00%)	**67(67%)**
	TOTAL	**90 (90%)**	**8 (8.00%)**	**0 (0.00%)**	**2 (2.00%)**	**100 (100%)**
						P value 0.003
CONTROL	KC	1 (33.33%)	1 (33.33%)	0 (0.00%)	1 (33.33%)	**3(3.00%)**
	NO KC	32 (32.99%)	1 (1.03%)	64 (65.98%)	0 (0.00%)	**97 (97.00%)**
	TOTAL	**33 (33%)**	**2 (2.00%)**	**64 (64%)**	**1 (1.00%)**	**100(100%)**
TOTAL						**P value 0.0000**
		123 (61.5%)	**10 (5.00%)**	**64 (32%)**	**3 (1.5%)**	**200(100%)**

- Here most of the diagnosed patients (almost 76%) of keratoconus have DOV in BOTH EYES in CASES, which is also statistically significant (P value 0.003).
- While in CONTROL, 33.33% of diagnosed patients of KC have DOV in BOTH EYES, 33.33% have DOV in RE & 33.33% have DOV in LE.

Table 4 : Relation of KC with Visual Improvement with glasses

		RE			**LE**			**TOTAL**
VI >=2 lines		YES	NO	TOTAL	YES	NO	TOTAL	
CASES	KC	30 (30%)	0 (0.00%)	30 (30%)	29 (96.67%)	1 (3.33%)	30 (30%)	60 (30%)
	NO KC	65 (92.86%)	5 (7.4%)	70 (70%)	66 (94.29%)	4 (5.71%)	70 (70%)	140 (70%)
	TOTAL	**95 (95%)**	**5 (5.00%)**	**100 (100%)**	**95 (95%)**	**5 (5.00%)**	**100 (100%)**	**200**
				P value 0.16				**P value 0.61**
CONTROL	KC	3 (100%)	0 (0.00%)	3 (3.00%)	3 (100%)	0 (0.00%)	3 (3.00%)	6 (3.00%)
	NO KC	97 (100%)	0 (0.00%)	97 (97%)	97 (100%)	0 (0.00%)	97 (97%)	194 (97%)
	TOTAL	**100 (100%)**	**0 (0.00%)**	**100 (100%)**	**100 (100%)**	**0 (0.00%)**	**100(100%)**	**200**
TOTAL				**P value Not possible**				**P value Not possible**
				200			**200**	**400**

- In CASES, a total of 10 eyes out of 200 eyes were found to have VI of <2 lines out of which only 1 eye was found to have KC. Out of 190 eyes who were found to have VI >= 2 lines, 65 eyes were found to have KC. When this difference was compared, it is found that statistically, it is not significant.
- In CONTROL, it is not possible to calculate statistically as there is more of zero value in the table.

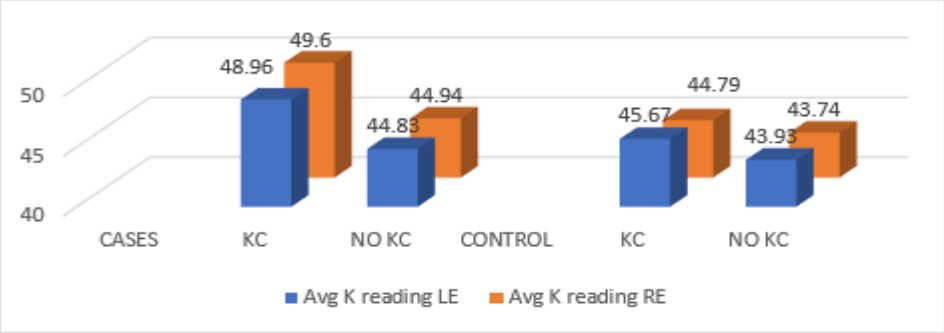
Table 5 : Comparision of K1 , K2 & CYL value of LE & RE between case & control

LE		**Mean ± SD**			
		K1	**K2**	**CYL**	**Avg K**
CASES	KC	46.07±3.23	50.39±4.48	4.32 × 180°	48.96±4.64
	NO KC	43.35±1.71	46.35±1.73	3.00 × 180°	44.83±1.60
	P value	**0.0000**	**0.0000**		**0.0000**
	KC	45.08±2.96	46.25±3.03	1.17 × 180°	45.67±2.99

CONTROL	NO KC	43.63±1.37	44.23±1.45	0.60 × 180°	43.93±1.39
	P value	**0.0851**	**0.0239**		**0.0428**

RE		**Mean ± SD**			
		K1	**K2**	**CYL**	**Avg K**
CASES	KC	46.78± 4.80	52.42 ±6.55	5.64×180°	49.60±5.56
	NO KC	43.20± 1.68	46.68 ± 1.70	3.48×180°	44.94±1.61
	P value	**0.0000**	**0.0000**		**0.0000**
CONTROL	KC	44.25±2.39	45.33±2.53	1.08×180°	44.79±2.45
	NO KC	43.44± 1.42	44.03± 1.45	0.59×180°	43.74±1.41
	P value	**0.3428**	**0.1370**		**0.2163**

Chart 2



- In CASES, significant difference is noted in Avg K value between KC & NO KC patients in BOTH EYES.
- In CONTROL, significant difference is noted in Avg K value between KC & NO KC patients in LE but not in RE.

Table 6 : Comparision of SimK1 , SimK2 & CYL value of LE & RE between case & control

LE		**Mean ± SD**		
		SimK1	**SimK2**	**CYL**
CASES	KC	52.13± 6.28	47.07± 5.19	5.05 ±2.64 × 90°
	NO KC	46.50± 1.66	43.28± 1.67	3.22 ±1.36 × 90°
	P value	**0.0000**	**0.0000**	**0.0000**
CONTROL	KC	46.39± 3.01	44.95± 2.76	1.43±0.34 × 90°
	NO KC	44.53± 1.45	43.85± 1.37	0.67±0.48 × 90°
	P value	**0.0365**	**0.1828**	**0.0083**

Chart 3

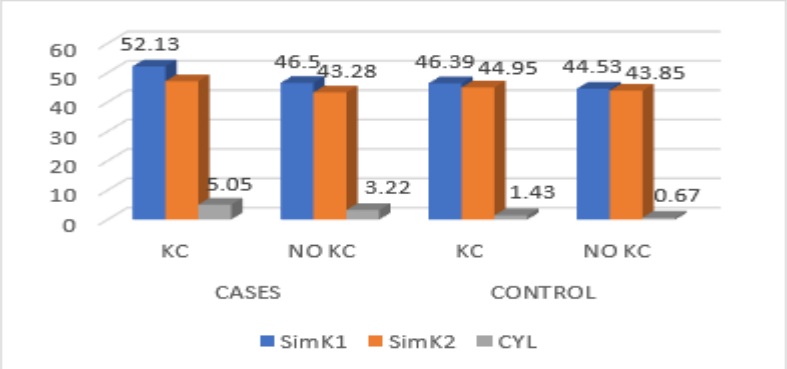
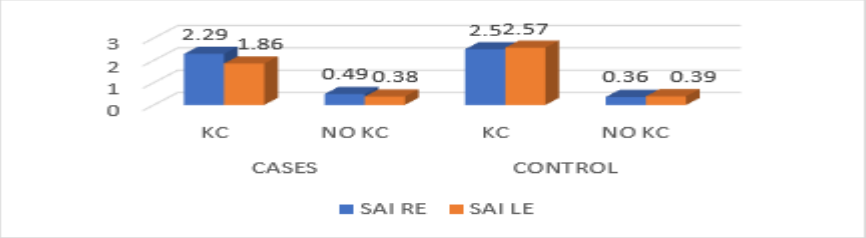


Table 7 : Comparision of SAI of LE & RE between case & control

SAI		**Mean ± SD**	
		RE	**LE**
CASES	KC	2.29 ± 1.83	1.86 ± 1.01
	NO KC	0.49 ± 0.32	0.38 ± 0.22

	P value	**0.0000**	**0.0000**
CONTROL	KC	2.50 ± 0.44	2.57 ± 0.18
	NO KC	0.36 ± 0.10	0.39 ± 0.13
	P value	**0.0000**	**0.0000**

Chart 4

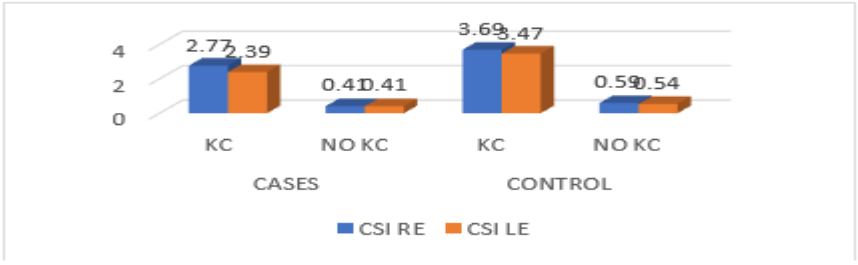


- Significant difference is noted in SAI values between KC & NO KC patients in both eyes in both CASES & CONTROL.

Table 8 : Comparision of CSI of LE & RE between case & control

CSI		**Mean ± SD**	
		RE	**LE**
CASES	KC	2.77 ± 2.52	2.39 ± 2.24
	NO KC	0.41 ± 0.24	0.41 ± 0.23
	P value	**0.0000**	**0.0000**
CONTROL	KC	3.69 ± 0.24	3.47 ± 0.30
	NO KC	0.59 ± 0.27	0.54 ± 0.29
	P value	**0.0000**	**0.0000**

Chart 5

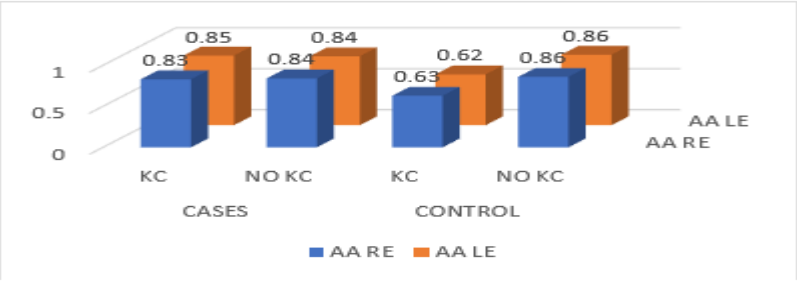


- Significant difference is noted in CSI values between KC & NO KC patients in both eyes in both CASES & CONTROL.

Table 9 : Comparision of AA of LE & RE between case & control

AA		**Mean ± SD**	
		RE	**LE**
CASES	KC	0.83 ± 0.13	0.85 ± 0.11
	NO KC	0.84 ± 0.08	0.84 ± 0.08
	P value	**0.4094**	**0.6399**
CONTROL	KC	0.63 ± 0.09	0.62 ± 0.11
	NO KC	0.86 ± 0.04	0.86 ± 0.04
	P value	**0.0000**	**0.0000**

Chart 6

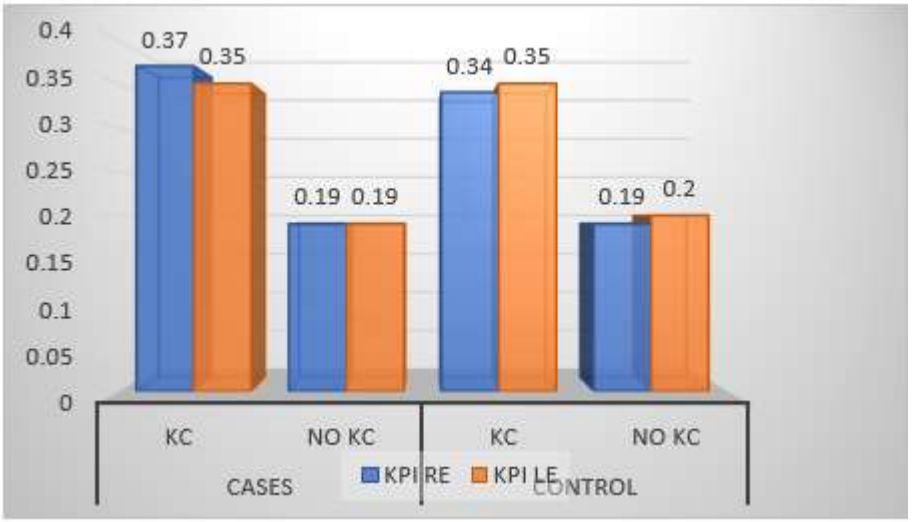


- In CASES, No significant difference is noted in AA values between KC & NO KC patients in both eyes.

Table 10 : Comparision of KPI of LE & RE between case & control

KPI		**Mean ± SD**	
		RE	**LE**
CASES	KC	0.37 ± 0.12	0.35 ± 0.12
	NO KC	0.19 ± 0.02	0.19 ± 0.02
	P value	**0.0000**	**0.0000**
CONTROL	KC	0.34 ± 0.06	0.35 ± 0.01
	NO KC	0.19 ± 0.01	0.20 ± 0.06
	P value	**0.0000**	**0.0001**

Chart 7



• Significant difference is noted in KPI values between KC & NO KC patients in both eyes in both CASES & CONTROL. Thus, From the above criteria of topography (Table 1 to Table 10), it is clear that there is a significant difference in all values between KC & NO KC patients in CASES except AA

DISCUSSION:

In our study, Significant difference is noted in DVA With Glass correction (DVAWG) between KC & NO KC patients in CASES in at least one eye (P value 0.001 in RE & 0.04 in LE). Almost 30% of KC patients have poor BSCVA. The study of Crews et al 1994[10] agrees with our results. He found that 21% (mild keratoconus) of keratoconic patients have no correction (no improvement) at all in at least one eye. But in control, no significant difference is noted in DVAWG between KC & NO KC patients. It might be due to less number of diagnosed patients of KC in CONTROL. (P value 0.15)

In our study, we got Average K reading of 49.60 ± 5.56 in RE & 48.96 ± 4.64 in LE in diagnosed patients of KC & significant difference was noted in Average K reading between KC & NO KC patients (P value 0.00) among CASES. We got average K reading of 44.79 ± 2.45 in RE & 44.67 ± 2.99 in LE in diagnosed patients of KC which might be because of mild KC & No significant difference was noted in KC & NO KC patients (P value 0.21 & 0.14 in RE & LE) among CONTROL . David P Pinero et al[11] reported KM (Mean Keratometry) value of 50.20 ± 5.75 in his study. He also reported KM value in all stages of KC i.e in Mild (45.97 ± 1.38) ; Moderate (49.95 ± 1.41) & Severe (58.32 ± 5.40) KC. Jonas JB et al[11] defined KC as corneal refractive power of > or = 48 D in rural regions of central India.

Keratoconus patterns in video keratoscopy can be characterized by an area of localized, abnormal steepening. Localized steepening is often observed in the inferior quadrant, but sometimes it is seen in the center or superior portion of the cornea. This results in asymmetry and a large refractive power difference across the corneal surface. So, according to Naoyuki Maeda et al study[7], we used 5 indices (Sim K, SAI, CSI, AA, KPI) to extract these characteristics.

In our study, we got Mean steepest SimK reading of 52.97 ± 6.54 in RE & 52.13 ± 6.28 in LE in diagnosed patients of KC & significant difference was noted in Mean steepest SimK reading between KC & NO KC patients (P value 0.00) among CASES. We got Mean steepest SimK reading of 46.09 ± 2.09 in RE & 46.39 ± 3.01 in LE in diagnosed patients of KC & significant difference was noted in Mean steepest SimK reading between KC & NO KC patients (P value 0.03) among CONTROL (Table 6). Burns et al[13] in his study 'KC – analysis of corneal asymmetry' studied the Asymmetry of KC between 2 eyes. He assessed videokeratographic data of 2 eyes separately using TMS I CTS. He found Avg K reading of 46.79 ± 4.54 in RE & 46.94 ± 4.96 in LE.

In our study, We got Average CYLINDER / Astigmatism of >5 D in diagnosed patients of KC & significant difference was noted in average cylinder value between KC & NO KC patients (P value 0.00) among CASES. We got average cylinder / astigmatism of > 1 D in diagnosed patients of KC & significant difference was noted in average cylinder value between KC & NO KC patients (P value 0.00) among CONTROL (Table 5). The difference in cylinder values among KC patients between cases & controls may be due to controls having early KC. Pinero et al[173] reported a CYLINDER value of **-4.03 ± 2.98** in KC patients in his study. B M Fontes et al[175] reported a Corneal astigmatism of **3.46 ± 2.20 in KC patients & 1.08 ± 0.81 in CONTROL** which consist of Healthy corneas. Ariela Gordon-Shaag et al[14] reported a CYL value of **-3.89 ± 2.99 in KC patients & -0.83 ± 0.78 in Normal eyes.**

In our study, We got Mean KPI values of 0.37 ± 0.12 in RE & 0.35 ± 0.12 in LE in diagnosed patients of KC & a significant difference was noted in mean KPI values between KC & NO KC patients (P value 0.00) among CASES. We got Mean KPI values of 0.34±0.06 in RE & 0.35±0.01 in LE in diagnosed patients of KC & a significant difference was noted in mean KPI values between KC & NO KC patients (P value 0.00) among CONTROLS. No significant difference was noted in mean KPI values in diagnosed patients of KC among CASES & CONTROLS (Table 10).

In our study, We got Mean SAI values of 2.29 ± 1.83 in RE & 1.86 ± 1.01 in LE in diagnosed patients of KC & a significant difference was noted in mean SAI values between KC & NO KC patients (P value 0.00) among CASES. We got Mean SAI values of 2.50 ± 0.44 in RE & 2.57 ± 0.18 in LE in diagnosed patients of KC & a significant difference was noted in mean SAI values between KC & NO KC patients (P value 0.00) among CONTROLS (Table 7).

In our study, We got Mean CSI values of 2.77 ± 2.52 in RE & 2.39 ± 2.24 in LE in diagnosed patients of KC & a significant difference was noted in mean CSI values between KC & NO KC patients (P value 0.00) among CASES. We got Mean CSI values of 3.69 ± 0.24 in RE & 3.47 ± 0.30 in LE in diagnosed patients of KC & a significant difference was noted in mean CSI values between KC & NO KC patients (P value 0.00) among CONTROLS (Table 8).

In our study, We got Mean AA values of 0.83 ± 0.13 in RE & 0.85 ± 0.11 in LE in diagnosed patients of KC & no significant difference was noted in mean AA values between KC & NO KC patients (P value 0.40 & 0.63 in RE & LE) among CASES. We got Mean AA values of 0.63 ± 0.09 in RE & 0.62 ± 0.11 in LE in diagnosed patients of KC & a significant difference was noted in mean AA values between KC & NO KC patients (P value 0.00) among CONTROLS (Table 9).

SUMMARY

"**SCREENING FOR KERATOCONUS USING TMS IV CORNEAL TOPOGRAPHY MODELLING SYSTEM** –A prospective descriptive observational study" was conducted in Sun eye care hospital, Bilimora, Dist: Navsari, from June 2021 to Dec 2022. 200 patients (100 cases & 100 control) were included in study & both eyes of each patient were examined. This Prospective study was conducted to screen all the patients of 10-30 years of age, who attend Sun eye care hospital, Bilimora, OPD, with Myopic astigmatism of >= -3 D; Spherical Equivalent of >= - 3 D which include myopia & compound myopic astigmatism; Mixed astigmatism, to find out Keratoconus by using 8 topographic indices according N. Meada et al study.[7] This is compared with age sex matched controls which consist of Myopia & Myopic astigmatism of < -3 D & Normal persons.

In our study, incidence of KC is found to be of 33% in all patients with Myopic astigmatism of >= -3D; Spherical Equivalent of >= - 3 D which include myopia & compound myopic astigmatism ; Mixed astigmatism. Among controls it was 3 %.

There is no impact of age groups & sex on the diagnosis of KC.Poor BSCVA is also noted in keratoconic eyes in comparison to non-keratoconus eyes.The results of this study confirm that all the topographic indices that were used in the study are significantly higher in keratoconus eyes than in non-keratoconic eyes except for AA in which no significant

difference is noted between keratoconic & non-keratoconus eyes. This is in agreement with several other studies.[7,11,12,13,14,15]

CONCLUSION

In our study, the incidence of KC is found to be 33% in all patients with Myopic astigmatism of >= -3 D; Spherical Equivalent of >= - 3 D which includes myopia & compound myopic astigmatism; Mixed astigmatism. It was 3 % in controls. There is no impact of age groups & sex on the diagnosis of KC.

As topography provides an objective assessment & there is a separate in-built parameter called 'Keratoconus screening' in the software which differentiates keratoconus cornea from others, there is no need for subjective interpretation. So, it can be used by ophthalmologists & non-ophthalmologist equally with ease.Screening for keratoconus among Myopic astigmatism of >= -3 D; Spherical Equivalent of >= - 3 D which include myopia & compound myopic astigmatism; Mixed astigmatism and in those who do not show satisfactory visual improvement with best correction with topography detects most of the keratoconus cases; hence it is recommended.

RECOMMENDATION

We can tell ophthalmologists & non-ophthalmologists or refraction-ists who are doing private practice but don't have a facility of topography to counsel & refer all their OPD patients who have myopic astigmatism or SE of > or = -3 D & mixed astigmatism for KC screening to hospitals where the topographic facility is available as they have a chance of having KC.

REFERENCES:

1. Smolin G: Dystrophies & Degenerations; The cornea scientific foundations & clinical practice, Boston, Little, Brown, 1987, Ed 2, pp:448-449.
2. Krachmer JH, Feder RS, Belin MW: Keratoconus and related noninflammatory corneal thinning
3. disorders. Surv Ophthalmol 28:293–322, 1984.
4. Maguire LJ, Bourne WM: corneal topography of early KC ; AJO 1989; 108(2) : 107-12
5. Maguire LJ, Lowry JC: Identifying progression of subclinical KC by serial topography analysis.,AJO 1991; 112(1): 41-5
6. Saragoussi JJ, Pouliquen YJ: Does the progressive increasing effect of Radial keratotomy (hyperopic shift) correlate with undetected early KC, J Refract Corneal Surg 1994; 10(1): 45
7. Ellis W: Radial keratotomy in a patient with KC. J Cataract Refract Surg. 1992; 18(4): 406-9 .
8. Naoyuki Maeda, Stephen D. Klyce, Michael K. Smolek, and Hilary W. Thompson; Automated Keratoconus Screening With Corneal Topography Analysis; Invest Ophthalmol Vis Sci. 1994; 35:2749-275.
9. Rabinowiiz YS, McDonnell PJ. Computer-assisted corneal topography in keratoconus. Refract Corneal Surg. 1989; 5:4*00-408.
10. 9) www.corneatransplant.net/images/ keratoconus _ problem _ no _ problem .pdf , Accessed on 9 th September, 2010.
11. 10) http://en.wikipedia.org/wiki/Keratoconus#History, Accessed on 9 th September 2010.
12. 11) Keratoconus with GP lenses by Louigiana sorbora ; Centre for contact lens research (CCLR) , school of optometry; pp 2
13. 12) Jonas JB, Nangia V, Matin A, Kulkarni M, Bhojwani K. Prevalence and associations of keratoconus in rural maharashtra in central India: the central India eye and medical study.Am J Ophthalmol. 2009 Nov;148(5):760-5. Epub 2009 Aug 11.
14. 13) Bruno Machado Fontes, R A junier, D Jardim, G C Vealrde, Walton Nose : Ability of corneal biomechanical matrics & anterior segment data in the differentiation of KC & Healthy corneas ; :Arq Bras Oftalmol. 2010 ; 73(4) : 333-7
15. 14) D M Burns, F M Johnston, D G Frazer, C Patterson, A J Jackson : KC – an analysis of corneal asymmetry ; BJO 2004 ; 88 :1252-1255
16. 15) Ariela Gordon-shaag, Michel Millodot, Reut Ifrah, Einet shneor : Aberrations & topography in Normal, Kc suspect & Keratoconic eyes Optometry & Vision Science , Vol 89, No. 4, April 2012, pp 1-8.

LIST OF ABBRAVIETIONS

KC– Keratoconus
HDOVPLP – History of Diminution of Vision Painless Progressive
HNB– History of Night Blindness
HA – History of Headache
SYSTEX – Systemic Examination
RE – Right Eye
LE – Left Eye
DVA– Distant Visual Acuity
VA – Visual Acuity
DVAWG – Distant Visual Acuity With Glasses
BSCVA– Best Spectacle Corrected Visual Acuity
DVAI - Distant Visual Acuity Improvement
SPH – Sphere
CYL – Cylinder
PGP – Present Glass Prescription
PHI– Pin Hole Improvement
AR – Automated Refraction
SE – Spherical Equivalent
K1 – Keratometry 1 (Horizontal keratometry)
K2 – Keratometry 2 (Vertical Keratometry)
CYL – Cylinder

BCVA – Best Corrected Visual Acuity
VKC – Vernal Keratoconjunctivitis
SL – Slit-lamp
IOP– Intra-ocular Pressure
DDO– Distant Direct Ophthalmoscopy
SimK1 – Simulated Keratometry (Steep meridian)
SimK2- Simulated Keratometry (Flat meridian)
CYL– Simulated Keratometric Cylinder (SimK1-SimK2)
SAI – Surface Asymmetry Index
DSI – Differential Sector Index
OSI – Opposite Sector Index
CSI – Central/Surround Index
IAI – Irregular Astigmatic Index
AA - Analysed Area
KPI – Keratoconus Prediction Index
DIAGN - Diagnosis