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Agreement of Kisa% and $Kmax^2$/Tp in the Diagnosis of Keratoconus

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Abstract:-

- ***Background:***

Keratoconus is a progressive degenerative disorder of cornea in which structural changes in the cornea cause it to become thin and conical in shape. There are no gold standard criteria for diagnosing Keratoconus. KISA% is one of the popular criteria for diagnosing Keratoconus. The new criteria were reported in the year 2015, using K_{max}^2 and TP[4] to diagnose Keratoconus. The sensitivity and specificity of this $Kmax^2$/TP were 99.5% and 95.7% respectively.

- ***Materials and Methods:***

In this retrospective study, we collected information of 418 eyes (209 Keratoconus +209 ages matched controls). The necessary data was collected from the Visante AS OCT and Zeiss atlas topography in a tertiary eye hospital, Udupi. The demographic data of the patients was drawn from the system. . Further details on visual acuity, refractive error, slit lamp findings and fundus examinations were obtained from the MRD. All parameters included in the study were taken from the last 3 year data available in the instruments. Keratoconus diagnosis had been confirmed based on clinical and topographical findings.

- ***Results:***

The parameters were entered in the IBM SPSS statistics version 24 for the analysis. KISA %[(K*I-S*AST*SRAX*)*100/300] and K_{max}^2 /T were calculated and values are obtained. With these values, kappa analysis was done to find the agreement between the two criteria for diagnosing Keratoconus. It is found that the r= 0.807 ($p<0.001$). This showed that the two criteria have good agreement for Keratoconus diagnosis.

All eyes were categorized under Amsler Krumeich and CLEK's classification systems. Interclass Correlation statistics was used to find the level of agreement between Amsler Krumeich and CLEK classification system in diagnosing Keratoconus

- ***Conclusion:***

KISA% and Kmax2 /TP showed good agreement between them in diagnosing Keratoconus. Hence both criteria can be used interchangeably for the diagnosis of Keratoconus. Amsler Krumeich and CLEK classification system showed a good level of agreement for Keratoconus diagnosis.

I. INTRODUCTION

Keratoconus is a non-inflammatory disorder of the cornea, the etiology of keratoconus is unknown. The main characteristics of keratoconus is progressive thinning and cone-shaped protrusion of the cornea that cause visual impairment. Patients may complain blurring of vision or a sudden decrease in visual acuity. Due to frequent progression in myopia and irregular astigmatism its very difficult to fit corrective lenses or it can change frequently. Some time correction may require surgical correction as the disease progresses. The onset of Keratoconus includes at puberty or early adulthood. The prevalence of keratoconus reported widely , ranging from 50 to 230 in 100,000 population.[1] However, this study found that blacks and Latinos have approximately 50 percent higher odds of having Keratoconus when compared with whites[2].

There are different classification systems and different diagnosing criteria used in Keratoconus. Also there are different diagnostic tools used to detect Keratoconus.

1. The KISA% index quantifies the topographic features seen in patients with clinical Keratoconus. To calculating the algorithm for the KISA% index was initially derived as follows: KISA% (K) * (I–S) * (AST) * (SRAX) * 100 /300. This KISA% index demonstrated sensitivity and specificity of 96% and 100%, respectively, in terms of Keratoconus diagnosis. The with a cut-off value of 100%, KISA% determined the correct diagnosis in 99.6% of cases [3].
2. The $Kmax^2$ /TP index was reported to have diagnostic ability in detecting Keratoconus eyes from normal eyes. Where Kmax is the maximum keratometric value and TP indicates the thinnest pachymetry. This proportional analysis has given the cut off as $\geq$ 4.1. The sensitivity and specificity of this $Kmax^2$/TP are 99.5% and 95.7% respectively[4]

Classification of KC is the first step in approaching the disease because the severity of the disease and the stage at which the patient is diagnosed and treated affect treatment results.

1. AMSLER KRUMEICH CLASSIFICATION helps to find the Severity of KC and it was classified by Krumeich. This classification is depends on mean K-readings on the anterior curvature sagittal map, thickness at the thinnest location, and the refractive

error of the patient[5]

2. CLEK'S CLASSIFICATION: CLEK study is an eight-year, multi-center, natural history study of 1,209 patients with Keratoconus who were examined annually for eight years. Its goals are to prospectively characterize changes in vision, corneal curvature, corneal status, and vision-specific quality of life[6] they defined a new method for grading severity of Keratoconus[7]

Corneal topography, also known as photokeratoscopy or videokeratography, is a non-invasive medical imaging technique for mapping the surface curvature of the cornea

1. CARL ZEISS ATLAS TOPOGRAPHY**:** The Zeiss Atlas 9000 Corneal Topography System is a diagnostic instrument that measures the curvature of the cornea and produces topographical images. The Smart Capture technology analyzes and automatically selects the best image during alignment. Pathfinder II software evaluates images to identify abnormal topographies, and Master Fit II software is helpful for contact lens fitting of rigid gas permeable lenses, particularly in challenging cases. The Zeiss Atlas 9000 also features non-visible Placido's ring illumination is comfortable for even the most light-sensitive patients
2. VISANTE AS OCT: Optical coherence tomography (OCT) has proven to be a useful tool in diagnosing and managing retinal and optic nerve disease. Recent technology has progressed to include examining the anterior segment. Visante AS OCT was the first commercially available OCT with sufficient speed to map the cornea. Visante AS OCT provides high-resolution corneal images and documentation for the anterior segment specialist to support the evaluation of ocular health. The Visante AS OCT software automatically processes the OCT image and calculate the Pachymetric map. The entire scan takes up to o.5 sec.

II. NEED OF THIS STUDY

There are no gold standard criteria, classification systems and imaging tools in diagnosing keratoconus. Hence the current study is aimed at checking the validity of topographic and pachymetric indices using different imaging system with KISA% and Kmax/TP criteria and using Amsler Krumeich and CLEK's grading systems. There is need to find agreement between different criteria used in keratoconus diagnosis with the increasing severity of the condition.

- *Aim:*

To determine the agreement of keratoconus between two criteria in the diagnosis of Keratoconus.

- *Objectives:*

1. To find out the agreement of keratoconus diagnosis with 2 different criteria (KISA% and K^2max/TP)
2. To determine the level of agreement between 2 classification systems (Amsler Krumeich and CLEK)systems in grading keratoconus.

III. REVIEW OF LITERATURE

A study by **Rabinowitz et al[8]** on a computer assisted digital videokeratoscopy to map the corneas of 28 family members of 5 patients with Keratoconus. Abnormalities observed in those family members included central steepening, greater steepening of the cornea inferior to the apex, and substantial asymmetry in the central dioptric power between the two eyes of the same individual. These findings may represent the variable expression of a gene contributing to the development of Keratoconus. Pedigree analysis in these families suggests an autosomal dominant inheritance.

N Maeda[9] developed an automated system to differentiate Keratoconus patterns from other conditions using computer-assisted videokeratoscopy. In this system they combined a classification tree with a linear discriminant function derived from discriminant analysis of eight indices obtained from TMS-1 videokeratoscopy data. For that, 100 corneas with a variety of diagnoses (Keratoconus, normal, keratoplasty, epikeratophakia, excimer laser photorefractive keratectomy, radical keratotomy, contact lens-induced warpage, and others) were used for training, and a validation set of 100 additional corneas was used to evaluate the results. In that training set, all 22 cases of clinically diagnosed Keratoconus were detected with three-false-positive cases (sensitivity 100%, specificity 96%). With the validation set, 25 out of 28 Keratoconus cases were detected with one false-positive case, which was a transplanted cornea (sensitivity 89%, specificity 99%, and accuracy 96%). So they concluded that this system can be used as a screening procedure to distinguish clinical Keratoconus from other corneal topographies. Also this can be used as an aid in refining the clinical interpretation of topographic maps.

Mukesh kumar[10] in his study aimed to compare and determine the repeatability of central corneal thickness (CCT) measurements using four noncontact pachymetry instruments in eyes with Keratoconus. In that he found that Mean ± standard deviation CCT measured by HHSD-OCT, Orbscan IIz, SS-OCT, and Pentacam was 462 ± 41 mm, 458 ± 41 mm, 454 ± 40 mm, and 447 ± 42 mm, respectively. With this he concluded that, though the measurements by different devices correlated well, the numerical agreement may be inadequate for their interchangeable use in clinical practice.

Himanshu Matalia [11] did a study in imaging modalities in Keratoconus. He used different topographies like corneal topographers based on placido disc, elevation based topographers and also optical coherence tomography (OCT). He concluded that the topographic indices can help us to detect and classify early and borderline cases of Keratoconus. He also states that the placido disc based devices are very useful tool to diagnose Keratoconus; however they do not show any changes on the posterior surface of the cornea. Newer, diagnostic devices like elevation based topographers and OCT can help us to visualize the posterior surface of cornea and can also give an accurate idea about the pachymetry of entire cornea also these newer modalities can help us to diagnose Keratoconus in preclinical stage, thus allowing an early treatment.

Mohammad Reza Sedghipour[3] (2012) did a study in the corneal topography for the diagnosis of Keratoconus. He compared the sensitivity and specificity of the KISA% index with the keratometric (K) value, inferior-superior (I-S) value, relative skewing of the steepest radial axes (SRAX), and keratometric astigmatism (AST) indices in 25 patients with bilateral Keratoconus. Then he found that KISA% was significantly more sensitive and specific than the other indices examined. And Furthermore, he found that it was significantly better at predicting positive and negative results than the other indices included in the study.

Jack T. Holladay[12] did a study on Keratoconus detection using corneal topography. He reviewed the topographic patterns associated with Keratoconus suspect and provided criteria for Keratoconus screening. He found five criteria for the detection of Keratoconus. They are 1) apex of the cone is not centered at the 6-o'clock semi-meridian, 2) cone should appear round on the tangential map, 3) keratometry 45.00 diopters, 4) corneal thickness at the apex of the cone is approximately 30 µm thinner than the corresponding distance above the pupil center, and 5) topographic patterns are not symmetric.

Xiaohui li[13] conducted a study for classification scheme based on videokeratography and clinical signs in Keratoconus. He did a longitudinal study whether there is correlation between these two and stated that these might be useful to predicting clinicians. These were significant differences at baseline between the normal, Keratoconus and early Keratoconus groups in all indices. He found that the respective means were central K: 44.17 D, 45.13 D, and 45.97 D; I–S: 0.57, 1.20, and 4.44; log (KISA): 2.49, 2.94, and 5.71 (all P<.001 after adjusting for covariates). Over a median follow-up of 4.1 years, approximately 28% in the Keratoconus-suspect group progressed to early Keratoconus or Keratoconus and 75% in the early Keratoconus group progressed to Keratoconus. Using all 3 indices and age, 86.9% in the normal group, 75.3% in the early Keratoconus group, and 44.6% in the Keratoconus-suspect group could be classified, yielding a total classification rate of 68.9%.

Reddy JC[14] had done a retrospective study on the Comparative evaluation of dual Scheimpflug imaging parameters in Keratoconus, early Keratoconus, and normal eyes. In this study he determined the efficacy of various parameters measured by dual Scheimpflug imaging technology in differentiating eyes with Keratoconus or early Keratoconus from normal eyes. It showed many parameters were statistically significantly different between Keratoconus and normal eyes compared with early Keratoconus eyes. He finally concluded that the total corneal power, anterior curvature, posterior curvature, pachymetry, and corneal aberration data generated from the dual Scheimpflug analyzer showed promising results in differentiating Keratoconus and early Keratoconus eyes from normal eyes.

Rabinowitz[8] did a work in designing a computer software program with quantitative indices to aid in videokeratograph screening for Keratoconus. The results showed that central K greater than 47.20 diopters (D) and I-S value greater than 1.20 D detected 39 of 40 (98%) Keratoconus patients, with 10 of 195 (5%) normal identified as Keratoconus. And also by adding the SRAX (steepest radial axes) index of greater than 21° to these indices, 39 of 40 (98%) Keratoconus patients were identified, but only 1 of 195 (0.5%) normal was identified as Keratoconus. Finally he concluded that the new index which quantifies irregular astigmatism in Keratoconus increases the specificity of previously reported quantitative descriptors of Keratoconus without decreasing their sensitivity.

Beutel[15] compared the central and peripheral Pachymetric measurements determined with Sirius system and Visante OCT and evaluate the agreement between them at different stages of Keratoconus. But the measurements were not significantly different in all patients and subgroups and showed high correlation for the corneal thicknesses of the entire cornea in different stages of Keratoconus. The study was dropped due to some lack of interest within authors.

Sedghipour et al[3] conducted a study on 25 patients with bilateral Keratoconus and reported sensitivity and specificity of 96% and 100% suggesting that KISA% could be used to detect/diagnose Keratoconus in place of other topographical indices such as the K value, I-S value, SRAX, and AST, used alone or in combination. The authors emphasized the need of further studies are required to confirm the specificity and sensitivity of KISA% for the detection of early-stage disease and Keratoconus suspects as some earlier studies reported a total classification rate of 68.9%.

Toprak et al[4] reported that maximum keratometry and thinnest Pachymetric showed high diagnostic ability to detect Keratoconus using Scheimpflug system (Oculus Pentacam) using Amsler-Krumeich classification system. The validity of the indices based on other grading systems has to be checked according to the authors especially forme fruste keratoconus.

IV. RESEARCH GAP

Many studies were done on concentrating the different grading systems that can be used for diagnosis of keratoconus. Few studies are aimed to construct newer classification systems with different parameters for grading the severity of keratoconus. A study was done on the topographic and Pachymetric parameters of Scheimpflug system in Turkey populations.

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But there is lack of such on diagnosis criteria and classification system that can be used widely for detecting keratoconus in the early stage. There are no gold standard criteria, classification systems and imaging tools in diagnosing keratoconus. Hence the current study is aimed at checking the validity of topographic and Pachymetric indices using different imaging system with KISA% and Kmax/TP criteria and using Amsler Krumeich and CLEK's grading systems. There is need to find agreement between different criteria used in keratoconus diagnosis with the increasing severity of the condition.

➢ *Methodology*

- *Subjects*

✓ Study design: Retrospective case control Study
✓ Sampling technique: Purposive sampling
✓ Study setting: Prasad Nethralaya, Udupi
✓ Study participants: Patients diagnosed with Keratoconus and their age matched controls
✓ Study duration: February 2016 – March 2017
✓ Sample size calculation: last 3 years data available in the instruments.
✓ Inclusion criteria: Data of Subjects with keratoconus and subjects with normal cornea
✓ Exclusion criteria: Data of Subjects with history of any other corneal pathologies or infections, recent contact lens use, past corneal surgeries.

➢ *Materials*

1. Data from Corneal topography (Atlas, Carl Zeiss Meditec) and Pachymetry (Visante AS OCT, Zeiss)
2. Details of comprehensive examination which includes vision assessment, refractive error measurement, slit lamp biomicroscopy and fundus examination was retrieved from the files of Medical Records Department, Prasad Nethralaya, Udupi.

- *Procedure*

Permission from IRB and ethics committee was obtained for conducting the study. And also letter from Prasad Nethralaya stating the consent to procure the data needed for the study was obtained prior to the commencement of data collection. In this retrospective study, we collected information of 418 eyes (209 Keratoconus +209 ages matched controls). The demographic data of patients was drawn from the system. The corneal topographic and Pachymetric parameters was obtained from the Atlas corneal topography and AS OCT respectively from patients diagnosed with keratoconus and their age matched controls. All the topographic and Pachymetric maps of the patients enrolled were also been retrieved and was saved in a thumb drive for further reference. Using these values, KISA% with cut off of 4.1 and $Kmax^2$/TP with cut off of 100 was calculated [Figure 1&2]. Further details of vision, refractive error, slit lamp findings and fundus examinations and the clinical diagnosis were obtained from the MRD. Each topographic map was analyzed for patterns. Using all parameters (topography patterns, parameters, and refractive status), each Keratoconic eyes was graded using both classifications. Keratoconus diagnosis had been confirmed based on clinical and topographical findings [figure3].

V. STATISTICAL ANALYSIS

"Apple Numbers" and IBM SPSS statistics version 24 was used to tabulate and analyze the data... Mean ±SD was used to report the average values of topographic and Pachymetric indices. Normality of data was checked with SPSS statistics. Kappa statistics have been used to determine the agreement between different criteria and Interclass correlation was used to find the level of agreement between the two classifications systems used in diagnosing keratoconus.

➢ *Results*

In patients of 418 eyes, 209 eyes were diagnosed as Keratoconus and 209 were age matched controls. The mean age of the patients was 32.38 years ± 14.75(range 17 to 47) in both the eyes. 228 (54.5%) male and 190 (45.5%) female eyes were taken for our study. The mean spherical equivalent of the normal was 0.75D ±0.35D, and keratoconus was 6.14D ±2.70D. The arithmetic mode of astigmatism in normal patients was -1.37D and in keratoconus patients was -3.24D. The mean and standard deviation of sim K, Axial I-S, thinnest Pachymetry of both keratoconus and controls are given in the (table 3). In 209 Keratoconic patients, around 83(39%) eyes had isolated central steepening, 90(43%) eyes had inferior steepening pattern and 6(13%) eyes had typical bow tie pattern, and rest had consistent pattern of keratoconus in the topography maps.

In slit lamp findings of 209 Keratoconic eyes [table 4], 164 eyes had adnexa change. The adnexa changes seen includes, 63(87%) eyes had Munson's sign, 54(32%) had Vogt's sign, 17(10%) eyes had few hydrops seen in the cornea, 27(16%) eyes showed Fleischer's ring and only 3 eyes showed corneal scars. The lens abnormalities were seen in 77 eyes. The lens changes seen include, PCIOL in 67(87%) eyes, aphakia in 8(10%) eyes and opacity in 2(2.5%) eyes. The slit lamp finding of 209 eyes in controls [table 4] were with in normal limits (WNL). But 34 eyes had lens changes. The lens changes seen in controls include, 31 eyes had PCIOL and 2 had opacities. The fundus in both cases and controls were WNL.

In K^2max/TP is calculated as shown in the figure2. Based on the calculated values keeping 4.1 as cut off, all subjects were categorized as grade 0 for patients having the value of <4.1(indicates that eyes not having Keratoconus), 1 for patients having the value of 4.1(indicates that eyes having Keratoconus suspect) and 2 for patients having the value of >4.1(indicates that eyes having Keratoconus). KISA% was calculated as shown in the figure 1. Based on the calculated value, keeping 100 as cut off, all subjects all subjects were categorized as grade as 0 for patients having the value of <100((indicates that eyes not having Keratoconus), 1 for patients having the value of 100(indicates that eyes having Keratoconus suspect) and 2 for patients having the value of >100(indicates that eyes

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having Keratoconus).

Kappa analysis was done to find the agreement between the two criteria. The measurement of agreement was found to be r = 0.807, which is a good amount of agreement. In K^2max/TP criteria, 201(48%) had 0, 46(11%) had 1 and 171(40%) had 2. In KISA% criteria, 213(48%) eyes had 0, 55(13%) eyes had 1, and 150(35%) eyes had 2. The result showed that, only 192 eyes falls below the cut off, 29 eyes falls on the cut off, and 149 falls above the cut off (4.1) values for both KISA% and $Kmax^2$/TP. Distributions of values in both KISA% and $Kmax^2$/TP are shown in the figure 3 and 4 respectively.

All eyes were graded based on both Amsler Krumeich and CLEK classification system. Intraclass correlation was done to determine the level of agreement between these two classification systems. It was found that ICC was 0.746, for 95% CI (-0.184, +921), p<0.001. This showed that both classifications had a good level of agreement for Keratoconus diagnosis.

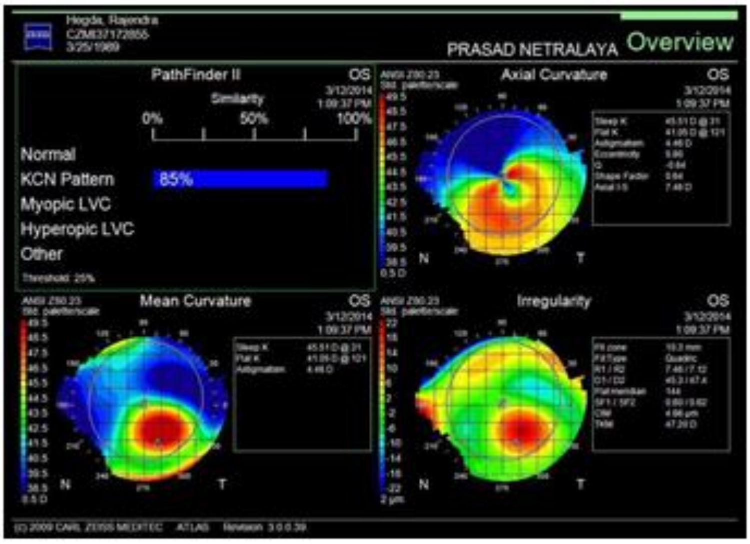
According to Amsler Krumeich classification, among 209 Keratoconic eyes, 184(88%) eyes fall under grade 1,15(7%) eyes fall under grade 2, 8(4%) eyes fall under grade 3 and only 2 eyes fall under grade 4. According to CLEK's among 209 Keratoconic eyes, 176(84%) eyes fall under grade 0, 6(3%) eyes fall under grade 1, 10(4.7%) eyes fall under grade 2, 5(2%) eyes fall under grade 3, 3(1%) eyes fall under grade 4 and only 9(4%) eyes fall under grade 5. Distributions of values in Amsler Krumeich and CLEK's classification are shown in the fig. 6 and 7 respectively.

➢ *Discussion*

Corneal topography is effective in the early diagnosis of keratoconus, irrespective of clinical symptoms, and when compared to clinical examinations[16] had been reported to have a sensitivity 87% and specificity of 92% in the terms of diagnosing the disorder[17]. However still now there were no gold standard criteria for diagnosing Keratoconus. KISA% was been used widely across the world for diagnosing Keratoconus. However $Kmax^2$/TP is a criterion which was introduced in the year 2015. Our current study used these two different clinical criteria $Kmax^2$/TP and KISA % for diagnosing keratoconus. These two was found to have a good agreement between each other. Studies have been focused more on KISA%, but only one study was done on $Kmax^2$/TP. still both have the good ability in diagnosing Keratoconus

Apart from diagnosing, classification of Keratoconus is the first step in approaching the disease and the stage at which the patient is diagnosed and has to be treated. In other classifications, the shape of the cone (nipple, oval, globes) has been used to classify keratoconus. Although this classification didn't found the severity of the disease. A work on Keratoconus classification [18] came up with a four stages of severity; in which stage 1 having early disease and stage 4 has corneal steepening and Munson's sign. One study [19] presented a severity rating scale based on clinical sign and easily obtained topographic indices. But still these classifications require a skilled observer to detect the topographic patterns. Our study uses Amsler Krumeich classification and recently formulated CLEK's classification which uses topographic patterns, topographic parameters and Pachymetric values. Our study focuses on these two different classification systems (Amsler Krumeich and CLEK found the level of agreement between two classifications. We found that that there is a good level of agreement between two classifications.

TABLES AND FIGURES



MEAN K: 43.28(K, 47.2 is taken as 1)

AST: 4.46

I-S: 7.46

SRAX: 90

KISA%=K*AST*I-S*SRAX*100/300

=1*4.46*7.46*90*100/300

=998.14

KERATOCONUS CONFORMED

Fig 1:- calculation of KISA%

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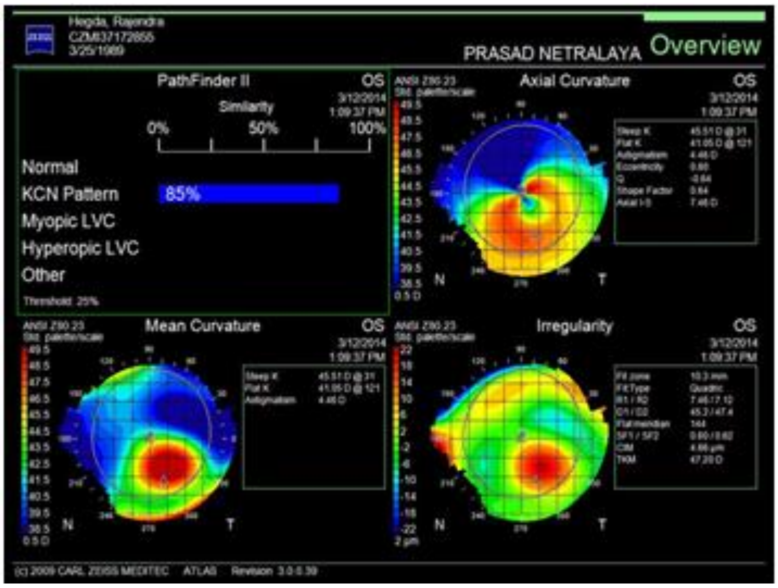

Kmax=45.51

TP=375

Kmac2/TP= 5.52

Keratoconus Confirmed

Fig 2:- calculation of Kmax2/Tp

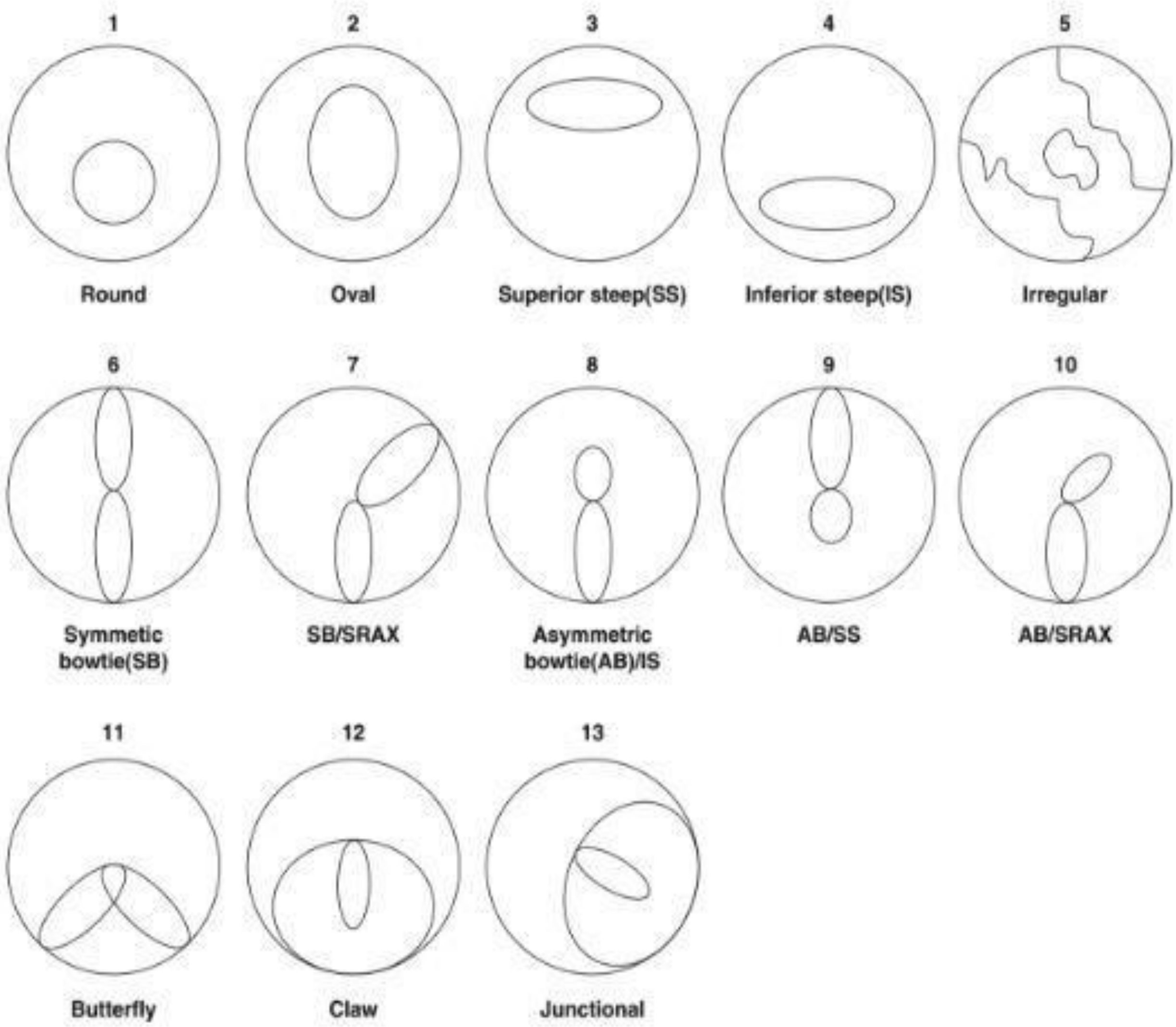

Fig 3:- Corneal Topographic Patterns.

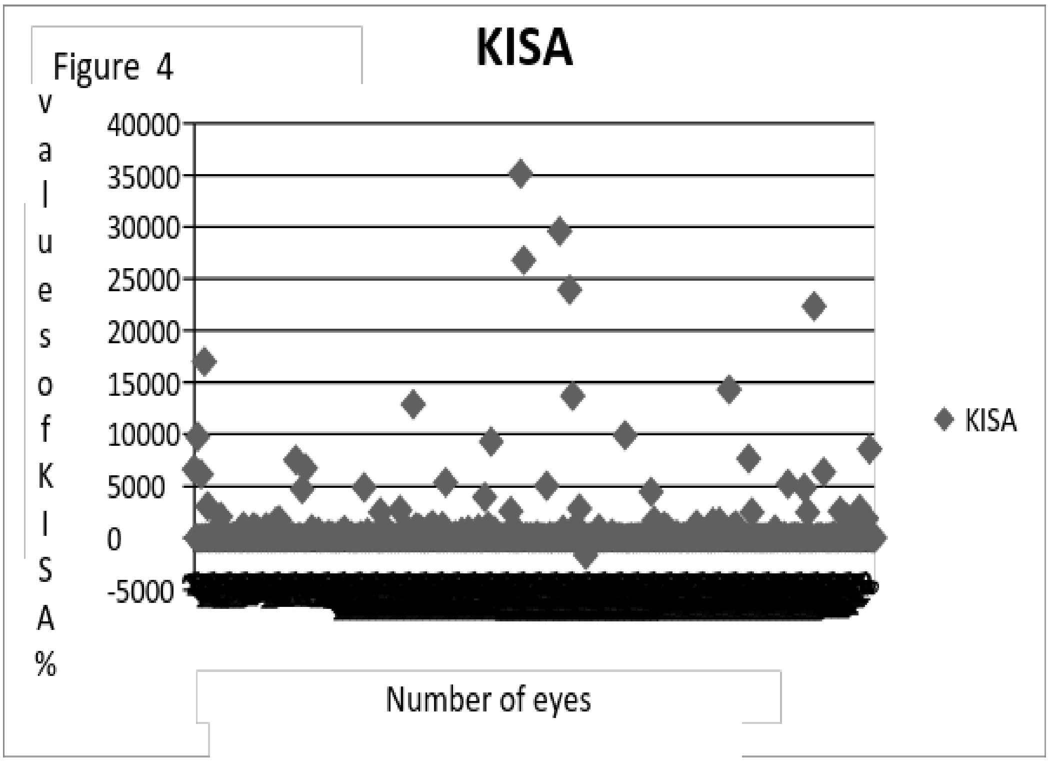

Fig 4: Distribution of Data in KISA%

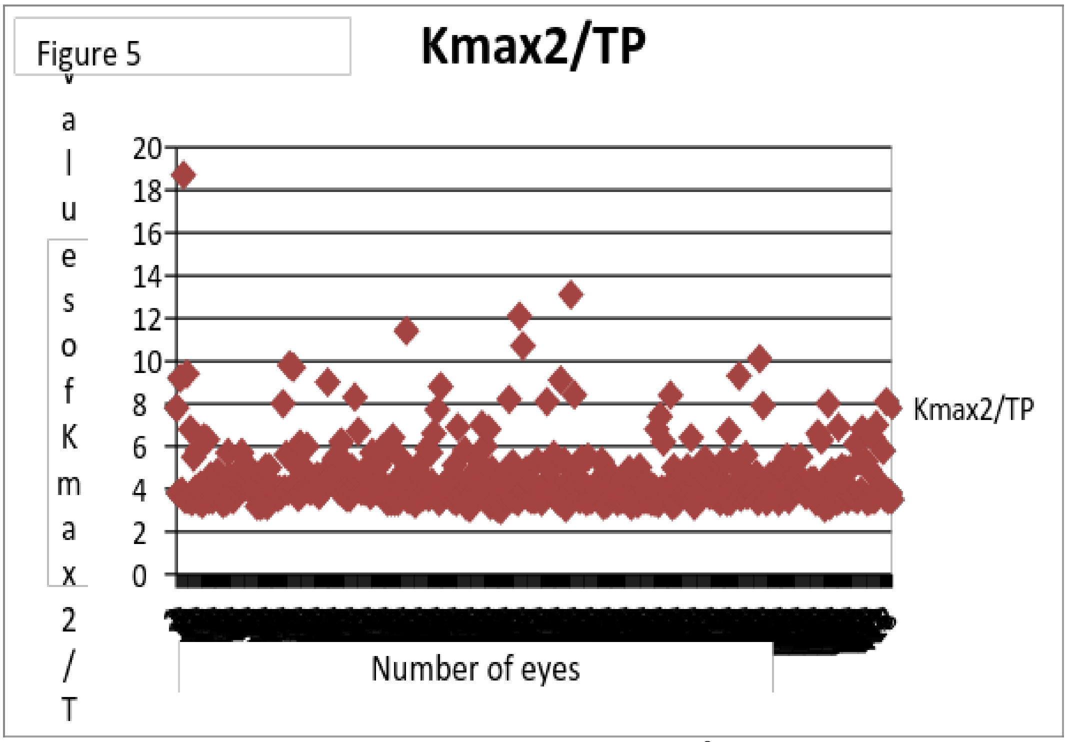

Fig 5:- Distribution of data in $Kmax^2/TP$

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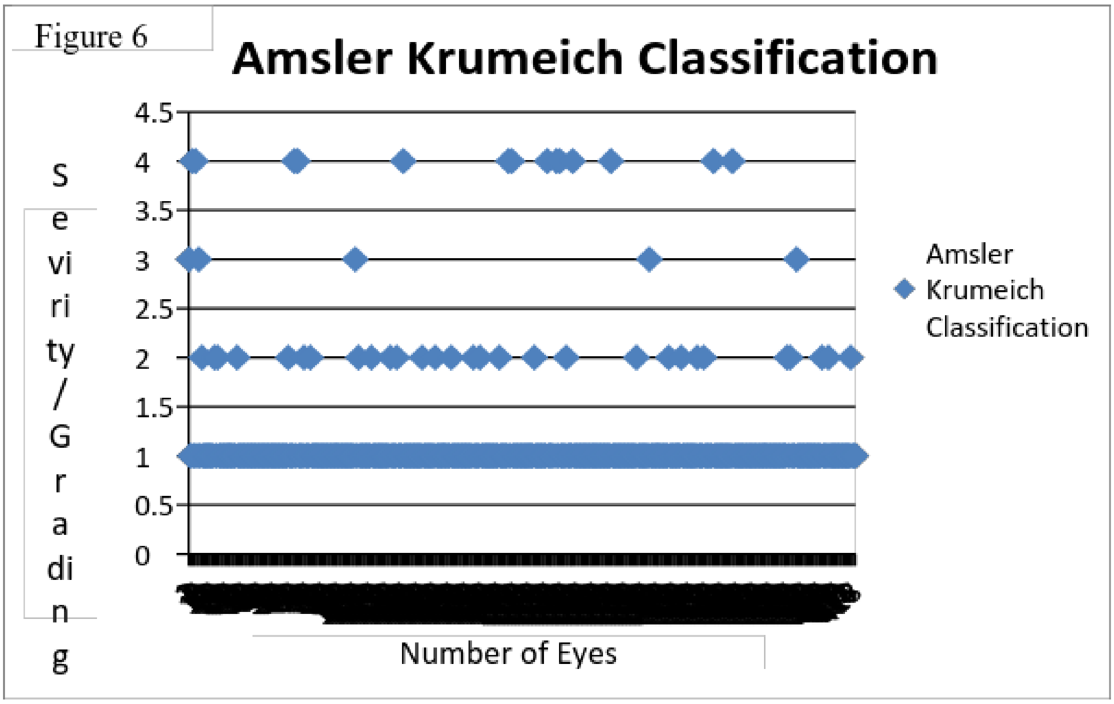

Fig 6:- Distribution of data in Amsler Krumeich Classification

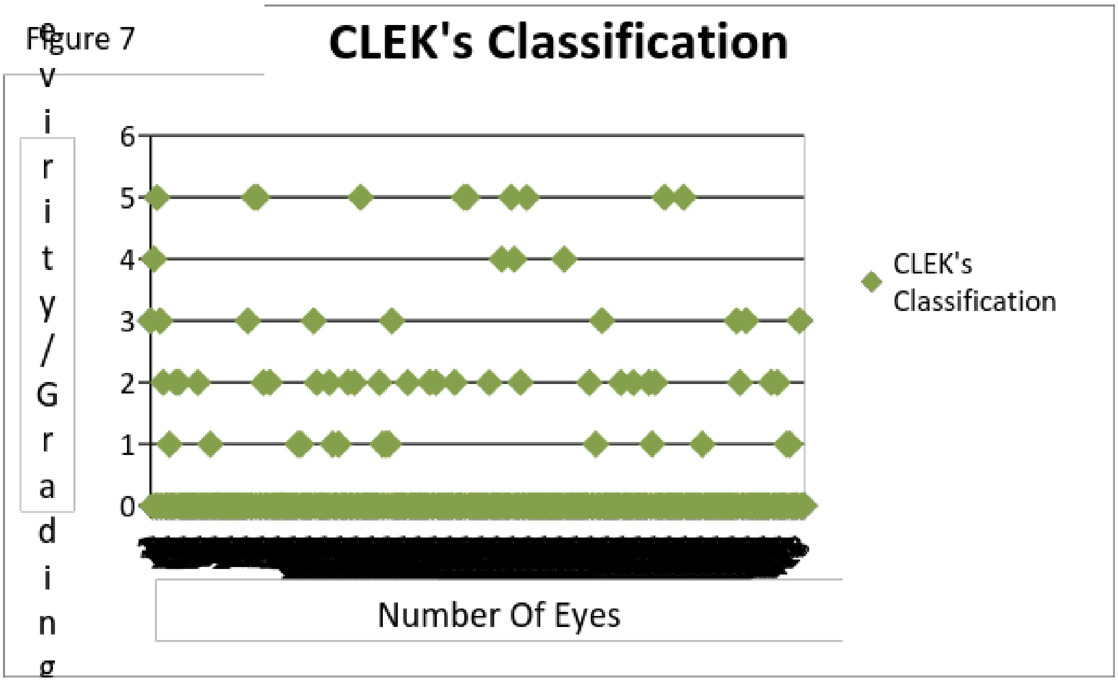

Fig 7:- Distribution of data in CLEK's Classification

Severity	Sim K	Thickness (μ)	Spherical equivalent	Cornea
4	>55	<200	Not measurable	Corneal scars
3	54 to 55	200 to 400	>-8D	No Corneal scars
2	48 to 53	400 to 500	[-5 to -8] D	No Corneal scars
1	<48	>500	<-5D	No Corneal scars

Table 1:- Amsler Krumeich classification

Grade	Stage	Corneal scarring	Slit-lamp signs*	Axial Pattern	Other Features
0	Normal topography	None	None	Typical	Average corneal power (ACP) ≤ 47.75 D, Higher-order RMS error** ≤ 0.65
1	Atypical Topography	None	None	Atypical: - Irregular -Sup. Bowie -Inf. bowie -Inf. or Sup. area of steepening no more than 3.00 D steeper than ACP	ACP ≤ 48.00 D, Higher-order RMS error ≤ 1.00
2	Suspect Topography	None	None	Isolated area of steepening: -Inferior -Superior -Central steep	Additional features: ACP ≤ 49.00 D or Higher-order RMS error > 1.00, ≤ 1.50
3	Mild disease	None	Possible	Consistent with KCN	Additional features: ACP ≤ 52.00 D or Higher-order RMS error > 1.50, ≤ 3.50
4	Moderate disease	Add features: Corneal scarring and overall CLEK grade up to 3.0	Possible	Consistent with KCN	Additional features: ACP > 52.00 D, ≤ 56.00 D or Higher-order RMS error > 3.50, ≤ 5.75
5	Severe disease	Add features: Corneal scarring CLEK grade 3.5 or greater	Must have	Consistent with KCN	Additional features: ACP > 56.00 D or Higher-order RMS error > 5.75"

Table 2: CLEK's Classification

PARAMETERS	**CASES** (n=209)	**CONTROLS** (n=209)
SimK(D)	47.49+5.35	43.98+1.45
Axial I-S(D)	4.19+29	0.50+0.4
Thinnest Pachymetry(mm)	458+54	533+36

Table 3:- The Mean And Standard Deviation Of Cases And Normal Patients.

	CASES		**CONTROLS**	
	NORMAL	**ABNORMAL**	**NORMAL**	**ABNORMAL**
ADENEXIA	45	164	209	0
ANTERIOR SEGMENT	209	0	209	0
LENS	132	77	175	34
PUPIL	209	0	209	0

Table 4:- Slit Lamp Findings of cases and controls

VI. CONCLUSION

KISA% and Kmax2 /TP showed good agreement between them .Hence both criteria can be used interchangeably for the diagnosis of Keratoconus. Amsler Krumeich and CLEK classification system showed a good level of agreement for Keratoconus diagnosis.

LIMITATIONS

Criteria and classifications used in this study needs imaging systems like topography and pachymetry, which is difficult in a primary eye care set up.

Parameters used in these criteria and classification can be analyzed accurately only by the skilled persons.

FUTURE SCOPE

Criteria and classifications can be correlated with the clinical signs that are easily obtained in the primary eye care set up.

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