

# Corneal Topography Pattern in Healthy Volunteers Coming to the Ophthalmology Department Hayatabad Medical Complex, Peshawar as Attendants

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**Purpose:** To determine the proportion of normal and abnormal topography patterns in attendants of patients coming to the Ophthalmology department Hayatabad Medical Complex, Peshawar.

**Material and Methods:** It was a descriptive cross sectional study conducted at Ophthalmology department, Hayatabad Medical Complex, Peshawar from August 2009 to Feb 2010. Sample size was 91 individuals using Epi info 6 (Expected frequency of abnormal patterns is 39% with precision of 1- and confidence interval 95%) while simple random sampling technique was used. All health volunteers coming to the institute, both males and females with age ranged from 18 to 60 years were included in this study while Contact lens wearer, previous ocular surgery, previous ocular trauma, ocular surface disorders and refractive errors five diopter of hyperopia, myopia or astigmatism patients were excluded. SPSS version10 was used for analysis of the data.

**Results:** We analyzed 182 eyes of 91 patients, 47 subjects were males and 44 were females. Abnormal patterns of corneal topography (asymmetric bow tie and irregular corneal topographic patterns) were seen in 77-79% of the people and normal patterns (oval, round and symmetric bow tie topographic patterns) were seen in 21-23% people.

**Conclusion:** Due to the variability in corneal topographic patterns developing a meaningful classification system for our local people is a challenge. This study which is the 1<sup>st</sup> of its nature to be conducted in this area will help in providing a possible standard for corneal topography patterns for Khyber Pukhtoonkhwa local people.

Corneal topography allows qualitative and quantitative measurement of corneal curvature. Databases of corneal topography patterns of normal human corneas are available in the United States and Europe<sup>1,2</sup>. They serve as a reference for detecting early corneal curvature abnormalities. Previous studies describe the variation in normal corneal topography patterns that exist in different populations<sup>1-3</sup>.

The spectrum of topography present in the general population of our country has not been reported so

far. The detection of early changes on the anterior corneal surface to classify it as a diseased state is difficult due to non availability of standardized data. Keratorefractive surgeries are gaining more popularity<sup>4,5</sup>. A corneal topography database of the local population is useful for planning such surgeries. Topography guided ablation for conditions such as keratoconus is based on this data<sup>6,7</sup>. Patterns of corneal topography are classified into five subgroups based on objective criteria<sup>8</sup>. The reported frequency of normal corneal patterns range from 61% to 71% (abnormal

patterns range from 29% to 39%) in studies conducted in Atlanta and Miami respectively<sup>1,8</sup>. These abnormal corneal topographic patterns could help in detection of early keratoconus<sup>2</sup>. The proportion of eyes in the local population that fall into each of these categories needs to be determined. As Khyber institute of Ophthalmic Medical Sciences is one of the centers of excellence and people from all cadres and socioeconomic strata and different districts come here so this will help establish normal variables for corneal topography in our people.

The purpose of the study was to make a corneal topography database of our local people to differentiate normal from abnormal corneas which will help us in the future for early detection of subclinical keratoconus and also in planning of keratorefractive surgeries and the response of cornea to such surgeries.

**MATERIAL AND METHODS**

The study was conducted at the Khyber Institute of Ophthalmic Medical Sciences, Hayatabad Medical Complex, Peshawar. This descriptive cross sectional study was carried out for six months August 2009 to February 2010. The sample size consisted of 91 Patients using Epi info 6 (Expected frequency of abnormal patterns is 39% with precision of 1- and confidence interval 95%). The sampling was simple random.

Health volunteers coming to the institute, both males and females with age range from 18 to 60 years were included in the study.

Contact lens wearer, previous ocular surgery, previous ocular trauma, ocular surface disorders and refractive errors five diopter of hyperopia, myopia or astigmatism were excluded from the study.

**RESULTS**

Gender distribution among 91 patients were analyzed as n=47(51.6%) patients were males and n=44(48.4%) patients were females.

Location was analyzed most of the patients n=24 (26.7%) were from Peshawar, n=11 (12.2%) patients were from Kohat, n=11 (12.2%) patients were from Mardan, n=9 (10%) patients were from Charsadda n=35 (40%) patients were from other districts.

Both eyes were examined of all the 91 volunteers. The corneal topography of the right eye showed abnormal patterns in 72 eyes {56 (61.5%) patients had

Asymmetric Bowtie, 16 (17.5%) patients had Irregular topographic patterns}. Normal patterns were observed in 19 eyes {9 (9.8%) patients had symmetric Bowtie, 4 (4.3%) patients had oval shape and 6 (6.5%) patients had round shape} (Table-2).

The corneal topography of the left eye showed that 70 eyes had abnormal topographic patterns {45(49.4%) patients had Asymmetric Bowtie, 25(27.4%) patients had Irregular patterns}. The left eye had normal topographic patterns in 21 eyes {15 (16.4%) patients had symmetric Bowtie, 4 (4.4%) patient had round shape and 2 (2.2%) patients had oval shape} (Table-3).

**Table 1:** Age Distribution (N=91)

Age	Frequency n (%)
18 - 30 Years	59 (65.6)
31-40 Years	19 (21.1)
41-50 Years	13 (13.3)
Total	91 (100)

**Table 2:** Right Eye Distributions (N=91)

Right eye topographic patterns		Frequency n (%)
Abnormal Patterns	Asymm Bowtie	56 (61.5)
	Irregular	16 (17.5)
Normal Patterns	Symm Bowtie	9 (10.0)
	Oval	4 (4.3)
	Round	6 (6.5)
Total		91 (100)

**Table 3:** Left Eye Location

Left eye topographic patterns		Frequency n (%)
Abnormal Patterns	Asymm Bowtie	45 (49.4)
	Irregular	25 (27.4)
Normal Patterns	Symm Bowtie	15 (16.4)
	Oval	2 (2.2)
	Round	4 (4.4)
Total		91 (100)

**Table 4:** Age Verses Right and Left Eye Location

Age in groups	Right Eye				Total	P Value
	Asymm Bowtie	Irregular	Symm Bowtie	Oval round		
18 - 30 Years	44	5	6	2 2	59	0.107
31-40 Years	5	8	3	2 3	19	
41-50 Years	7	3		1	13	
Total	56	16	9	4 6	91	
	Left Eye					
	Asymm Bowtie	Irregular	Symm Bowtie	Oval round		
18 - 30 Years	35	10	10	2 2	59	0.575
31-40 Years	7	8	2	2	19	
41-50 Years	3	7	3		13	
Total	45	25	15	2 4	91	

**Table 5:** Right eye verses Left Eye Location (N=91)

Right Eye Topographic patterns	Left eye topographic patterns				Total
	Asymm Bowtie	Irregular	Symm Bowtie	Oval	
Asymm Bowtie	22	20	9	0	51
Irregular	12	14	2	0	28
Symm Bowtie	3	2	3	1	9
Oval	0	1	0	1	2
Total	37	37	14	2	90

Gender distribution was compared with left Eye and right eye and the difference was found to be statistically insignificant. Most of the patients were between the ages of 18 to 30 years and there was no statistically significant difference between different age groups regarding the topography patterns as shown in (Table-4).

There was no statistically significant difference between right eye and left eye corneal topographic patterns shown in (Table-5).

## DISCUSSION

To our knowledge this is the 1<sup>st</sup> study to investigate the corneal topography patterns in our local people. The total number of volunteers in this study were

91. Many authors have studied variable number of volunteers ranging from 110-232 subjects<sup>2, 9-12</sup>.

Our study included people aged from 18-60 years which were almost similar to a Korean study<sup>10</sup>. A wide variety of age groups have been used in different studies ranging from 8 -79 yrs<sup>9,10</sup>. The refractive errors included in our study ranged from +5D to -5D, which were very different from the rest of the studies, Bogan<sup>2</sup> included +5.5D to -8.37D whereas both the Korean studies included up to -16D of myopia. Bogan and coworkers<sup>2</sup> studied both ametropic and emmetropic eyes by videokeratography. They derived a qualitative system for classifying normal corneal topography. Their study showed that asymmetric bow tie pattern was seen in 32% of normal corneas, round 22%, oval

21%, symmetric bow tie 18% and irregular patterns in 7% of people. Kim et al<sup>10</sup> also reported asymmetric bow tie pattern to be the most frequent pattern 42.7%, irregular 19%, symmetric bow tie 18.1%, oval 13.4% and round pattern was the most infrequent 6.9% in Korean adults. In our study asymmetric bow tie was found to be the most frequent pattern 56% followed by irregular 22.5%, symmetric bow tie 13.4%, round 5.5% and oval 3.2%.

There were no statistically significant differences between males and females. No statistically significant difference was found between both eyes as like all other studies conducted elsewhere<sup>2,9-11</sup>.

Overall our study showed abnormal topographic patterns ranging from 77-79% and normal patterns ranging from 21-23%.

These results are much different from the American studies (bogans<sup>2</sup> 61% normal patterns, Zuguos<sup>9</sup> study showing approximately 80% normal topography patterns).

Our study results are comparable to the two Korean studies<sup>10,11</sup> in which 38% normal, and about 61% abnormal patterns were seen. Irregular patterns were seen to be 22.5% in our study which was much more than the American studies (bogans 7.1%, Zingu 4.53%)<sup>2,9</sup>.

Korean<sup>10</sup> study showed comparable results to our study with 19% irregular patterns.

There were no statistically significant differences between males and females and no statistically significant difference was found between both eyes.

Overall our study showed abnormal topographic patterns ranging from 77-79% and normal patterns ranging from 21-23%. These results are much different from the American studies (bogans<sup>2</sup>, 61% normal patterns, Zuguos<sup>9</sup> study showing approximately 80% normal topography patterns). Our results are comparable to the two Korean studies 38% normal, and 61% abnormal topography patterns<sup>10,11</sup>. Possible explanations for high number of abnormal especially irregular patterns include tear film abnormalities (possibly dry eyes due to infrequent blinking during the topography). Bogan had a large number of normal results because they instilled artificial tears into every patient's eyes before the topography thus preventing drying of the corneas<sup>2</sup>.

Another study also proves that artificial tear instillation reduced the irregular patterns from 45.24% to %30.95<sup>12</sup>.

Other causes for abnormal patterns could be improper focusing of keratoscope, eccentric fixation or different location of corneal apex<sup>2</sup>. Although all patients were examined for tear film abnormalities but eccentric fixation cannot be ruled out.

Another explanation could be the presence of high percentage of abnormal patterns due to unequal distribution of age and sex<sup>2</sup>. Korean studies showed a tendency of more irregular topographic patterns than western adults<sup>10,11</sup>. Their might be some role of genetic make up and dietary habits which needs to be investigated in the future as well as increasing age. Different result scan also be attributed because of use of different topography machines. We used SHIN NIPPON2000. Another study used another machine Corneal Modeling System<sup>2</sup>, Zuguo used Orbscan<sup>9</sup> which is the most recent development and yields more information not only from the anterior corneal surface but also the posterior corneal surface.

Results differences can also be attributed to the different range of refractive errors included in different studies inclusion criteria<sup>2, 9-11</sup>.

So a number of factors are involved in the variability of corneal topographic patterns.

## CONCLUSION

Due to the variability in corneal topographic patterns developing a meaningful classification system for our local people is a challenge. This study which is the 1<sup>st</sup> of its nature to be conducted in this area will help in providing a possible standard of corneal topography patterns for Khyber Pukhtoonkhwas local people.

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