



Original Article

Analysis of Corneal Profile of Young Healthy Pakistani Population

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ABSTRACT:

BACKGROUND: This study was carried out to determine corneal parameters ((central corneal thickness, endothelial cell density, corneal diameter and K-reading) of young healthy population.

METHOD: This study was done on 320 emmetropes to determine corneal profile of young healthy subjects, which include, CCT, endothelial cell density, K-readings of both eyes and both horizontal and vertical corneal diameter was measured. Results were obtained by asking the patient to fill a structured Performa.

RESULTS: All parameters were in normal range in 90% young population of Pakistan. Only 10% subjects showed variations in normal range. Therefore, it is concluded that 90% subjects had normal range of parameters in young population of Pakistan.

CONCLUSION: The data suggested that 90% young population had normal values of corneal parameters .. Only 10% showed variations in results.

KEYWORDS: Central corneal thickness ((CCT), Endothelial cell density ((ECD), Horizontal visible diameter ((HVID), vertical visible iris diameter ((VVID), keratometry



INTRODUCTION:

Cornea is a thin transparent layer present in front of eye which covers the iris and pupil. Cornea It has five layers, which from anterior to posterior are the Epithelium, Bowman's layer, Stroma, Descemet's membrane and endothelium. As cornea is a transparent so two-thirds of refraction of eye occurs due to cornea.¹ With the help of corneal profile of normal population, many diseases could be defined like keratoconus, glaucoma and diabetes mellitus.² all these problems cause poor visual acuity. In this study, corneal parameters of healthy young Pakistani would be checked. In This corneal profile included corneal thickness, diameter, curvature and endothelial cell counting would be measured.

Corneal thickness plays a role in intraocular pressure. If cornea is thick IOP may be overestimated but if cornea is thin IOP would be underestimated.³ Normal central corneal thickness ((CCT) is 540 microns. CCT is usually measured with pachymeter but in this study CCT would be was measured with non-contact specular microscope. Limbus to limbus measurement is called corneal diameter ((CD). Both vertical and horizontal corneal diameters are important. Clinically importance of CD is that it ensures that a soft lens total diameter is sufficient to cover whole of cornea. Accurate measurement of CD is helpful in sizing and producing of intraocular lenses of anterior chamber.¹ Many diseases can be diagnosed on basis of CD e.g. microcornea, megalocornea, relative microphthalmos and corneal dystrophies.⁴ Corneal curvature is shape of cornea. A. Optical properties of cornea are identified with curvature of cornea. Corneal curvature would be measured with keratometer. For clarity of cornea, healthy endothelial cell count is important. Endothelia cell density decreases with age. For penetrating keratoplasty, endothelial cell densities are considered suitable corneal buttons.⁵ With help of corneal endothelial cell density, those populations are identified which have risk of corneal decomposition after cataract extraction by phacoemulsification. In this study endothelial cell counting would be done by non-contact specular microscope. In 2005 study was done white-to-white corneal diameter, normal values in healthy human obtained from Orbscan II topography system. In this study 148 females and 242 males were included. According to the study, average corneal diameter was 11.71 ± 0.42 mm. In the result of this study normal ranges were found to be 11.04 to 12.50 mm for males and 10.70 to 11.58mm for females.⁴ Study of corneal endothelial cell density and morphology was done in 2006 on normal Iranian population. 525 normal eyes of Iranian were examined with specular microscope and it was concluded that mean endothelial cell density was 1961 ± 457 cell/mm² and mean cell area was founded 537.0 ± 137.4 μ m. They also compared this data with that collected from Indian and American journals.⁶ Study of corneal endothelial cell density and morphology was

done on 2007 on healthy Chinese eyes. Specular microscopy was done on 700 healthy people. It was concluded that mean endothelial cell density was 2932 ± 363 cells/mm². They also found that endothelial cell density decreases with age.⁷ In 2009 data was collected on central corneal thickness of Pakistani adults. One hundred subjects were studied. According to this study mean CCT measurements were 531.08 ± 33.37 μ m for right eye and 531.29 ± 33.33 μ m for left eye, showing no significant difference in CCT values.⁸ In 2012 study was done on different factors like age, corneal diameter, CCT and on curvature of cornea with normal intraocular pressure on healthy Nigerians. 130 subjects were studied 77 males and 53 females. Mean values of these factors were CCT = 548.97 ± 34.28 μ m, IOP = 15.61 ± 2.69 mmHg, Average corneal curvature 42.98 ± 1.19 D, Horizontal corneal diameter 11.39 ± 0.69 mm and, vertical corneal diameter 10.51 ± 0.50 mm.⁹ In 2014 article was presented on changes of central corneal thickness with age in normal adults of Lithuanian. 11650 Caucasians of Lithuanian were studied on both genders. They concluded that mean CCT for both eyes was 544.6 ± 30.5 μ m.¹⁰ In 2015, a study was conducted on the measurement of White-to-white (WTW) corneal diameter in an adult population. 4787 citizens of Shahroud in northern Iran were examined. Mean WTW corneal diameter was found 11.80mm.¹¹

MATERIAL AND METHODS:

:This study was an institutional based study conducted on 300 patients having young age from 18 to 30 years and only emmetropes Pakistanis people were included. It explained the analysis of corneal profile in young Pakistani people. Students who don't want to get permission to perform these tests willingly were excluded in this study. Data was collected by a self-designed proforma. All the data was entered and analyzed using Statistical Software SPSS Version 22.00.

RESULTS:

Table 1: K1-Readings of RIGHT eye.

Diopters	Frequency	Percent
41-43	216	67.5
43-45	84	26.3
45-46	19	5.9
Total	320	100

K1 KERATOMETRY READING OF LEFT EYE

Table 2: K1-Readings of LEFT eye.

Diopters	Frequency	Percent
41-43	162	50.6
43-45	124	38.8
45-46	34	10.6
Total	320	100

This table shows that 50.6% shows K1 reading range of 41-

43 D, 38.8% shows range of 43-45 D and remaining 10.6% were from 45 to 46D.

This table shows K-1 reading of right eye. 67.5% are in range 41-43 D, 26.3% show range of 43-45 D and 5.9% show range of 45-46 D.

K2 READING S

Table 3: K2-Readings of RIGHT eye.

Diopters	Frequency	Percent
41-43	211	65.9
43-45	93	29.1
45-46	16	5
Total	320	100

Table 4: K2- Readings of LEFT eye

Diopters	Frequency	Percent
41-43	251	78.4
43-45	51	15.9
45-46	18	5.6
Total	320	100

CORNEAL DIAMETER

Table 5: Horizontal Corneal diameter RIGHT eye

Horizontal Corneal diam (mm)	Frequency	Percent
9 - 11	240	75
11 - 13	75	23.4
13 - 14	5	1.6
Total	320	100

Table 6: Horizontal Corneal diameter LEFT eye

	Frequency	Percent
9 - 11	238	74.4
11 - 13	50	15.6
13 - 14	32	10
Total	320	100

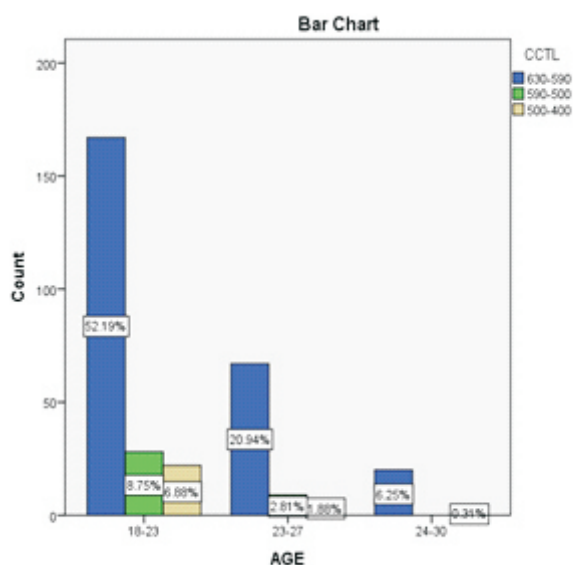
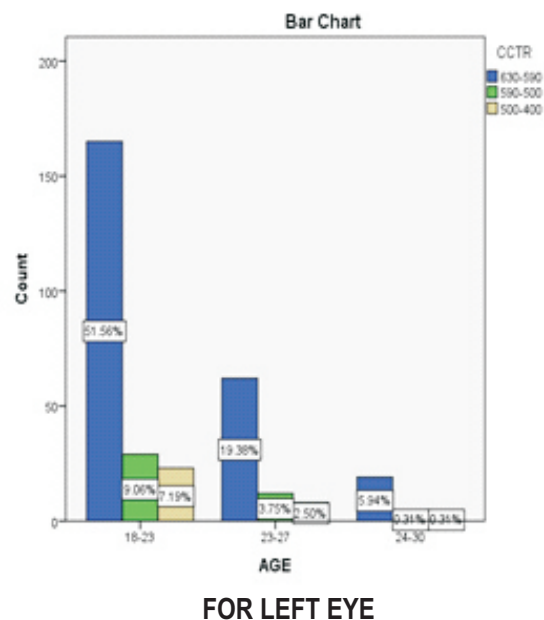
Table 7: Vertical Corneal diameter RIGHT eye

	Frequency	Percent
10 - 12	257	80.3
12 - 14	38	11.9
14 - 15	25	7.8
Total	320	100

Table 8: Horizontal Corneal diameter LEFT eye

Corneal Diameter (mm)	Frequency	Percent
10 - 12	236	73.8
12 - 14	46	14.4
14 - 15	37	11.6
21	1	0.30
Total	320	100

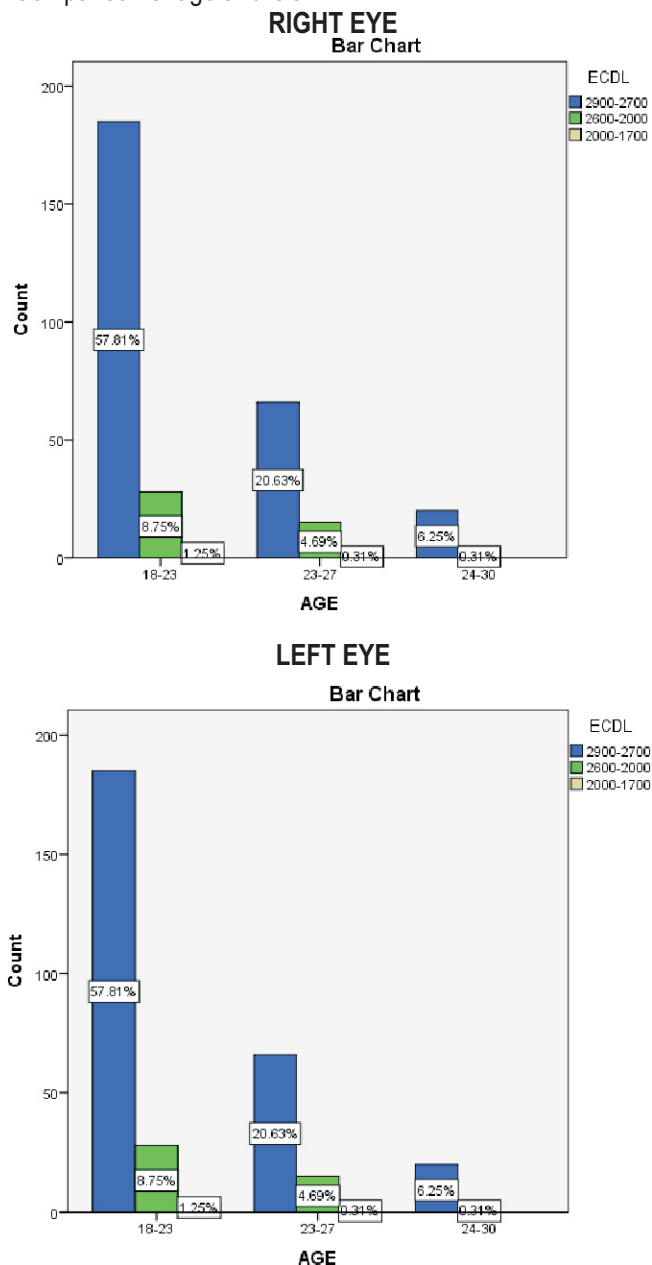
Fig 1 & 2: AGE AND CENTRAL CORNEAL THICKNESS FOR RIGHT EYE



These bar shows that 90% population shows range of 630-500µm, which is normal range of CCT.

Fig 3 & 4: AGE AND ENDOTHELIAL CELL COUNT

Comparison of age and CCT



These bar shows that 85% of participants have ECD of range 2000-3000 cells/mm² which is considered normal.

DISCUSSION:

Different studies have been done and different methods have been used to analyze corneal profile in different populations. In this study 90% of subjects show CCT of range 630-500µm which is quiet normal range but remaining 10% shows a minor variation from 500 to 400µm, but this range is not significant to label it in abnormal range because some studies shows normal range of CCT is from 630-42.¹² Some studies proved that there is no difference of CCT values between males and

females¹³ while others show that CCT has direct relation with gender. According to that study males have thicker corneas as compared to females.¹⁴ The current study, however, shows that men and women have no significant difference of CCT values. Some studies shows that CCT decrease with age.¹⁵ whereas others suggest that age has no effect on CCT.¹⁶ In this study as age of subjects is 18 - 30 years so a little variation is seen from normal range. Still, 85% of the subjects in current study have normal range of endothelial cell density because in healthy adults endothelial cells range is 2000 - 3000 cells / mm.¹⁷ Studies have been done to determine the endothelial cell density of males and female. Some shows that endothelial cells have no relationship with gender.¹⁸ while others show that females have higher endothelial cell density than males.¹⁹ According to the current study there is no relationship between gender sex and endothelial cell density. It is reported in literature that But endothelial cell starts declining after age of 40 years²⁰ but there is no notable decrease of endothelial cell density with age in my study have been noticed, as age of subjects is 18-30. almost.

Normal range of horizontal corneal diameter is 11.00 to 13.00 mm. In this study out of 320 people only 32 showed variation having corneal diameter 13.00 to -14.00 mm, while the remaining had horizontal corneal diameter between 11.00 -- 13.00 mm. Recently a study was done on Chinese to determine corneal diameter,²¹ where mean corneal diameter was 11.75 mm with standard deviation of ± 2..According to this study 80% normal subjects showed vertical corneal diameter ranging from 10.00 - 12.00 mm Remaining 20% showed a very little variation of corneal diameter. Age has no effect on vertical corneal diameter but horizontal diameter is affected by age because smaller corneal diameter has been seen in older age groups (70-79 years).⁹ Males have larger vertical corneal diameter than females, this may be due to the fact that women females are shorter than males.²² In this study out of 320 people 95% showed normal range of corneal curvature which was 41-45D. Average anterior corneal curvature was found to be 7.5mm (44.44D). It was found that anterior corneal curvature was 1.2mm larger than posterior corneal curvature.²³ Some studies shows that K reading has no relation with age.²⁴ As only young adults are examined in this study so no significant correlation was found between age and K readings.

CONCLUSION:

90% of young population shows normal values of corneal parameters. By analyzing corneal profile 85% subjects have normal endothelial cell counting. 90% shows normal central corneal thickness but 10% have some variations but that variations are close to normal range. Similarly, keratometry readings, K1 and K2 of both eyes and diameter, both horizontal and vertical are in normal range of about 95% subjects. Therefore in my this study it is concluded that in you-

-ng population corneal parameters are in normal range in 90% population. Only 10% percent of the subjects shows variation.

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