



Original article

Biometric parameters and intra ocular lens power used for cataract eyes in Karnali, Nepal

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Abstract

Introduction: The biometric parameters of the eye are measured for the calculation of the intra ocular lens power to be used in cataract surgery. **Objective:** To report the keratometry reading, axial length and intra ocular lens power used for eyes operated for cataract in Karnali Zone, Nepal, and to compare these findings with those reported in other similar studies. **Subjects and methods:** The data for the study were retrospectively collected from the case files of patients who had undergone cataract surgery between January 2011 and July 2012 in Karnali Zone, Nepal. These surgeries were performed in an outreach surgical camp organized by the Himalaya Eye Hospital, Nepal, as a part of its annual program. The SPSS 16.0 and Microsoft Excel 2007 software were used for the data analysis. **Results:** The total number of patients taken for the study was 1055 and the total number of eyes was 1055. There were 530 (50.23%) males and 525 (49.77%) females, with the mean age of 64.34 ± 11.25 , ranging from 8 to 98 years. The mean keratometry reading for the total sample was 44.11 ± 1.6 (range, 34.00D to 49.00D). The mean axial length for the total sample was 22.68 ± 0.88 (range, 17.75 to 26.17). The mean IOL power for the total sample was 21.60 ± 1.74 (range, +15.00 to +30.00). **Conclusion:** The biometric eye parameters of keratometry, axial length and IOL power of this study required for cataract surgery in a Karnali population are similar to those presented in other similar studies from Nepal and abroad.

Keywords: keratometry readings, axial length, IOL power, cataract, Karnali

Introduction

The estimated number of people visually impaired in the world by 2010 was 285 million, with 39 million blind and 246 million having low vision; and 65% of people visually impaired and 82% of all blind are 50 years and older (Pascolini et al, 2011). In the south-east Asia region alone (India excluded), of the total population of 579.1 million (8.6% of

world population), 3.974 (10.1%) million are blind, 23.938 (9.7%) million have low vision and 27.913 (9.8%) have other visual impairments. Globally, cataract (33%) is the second common cause of visual impairment behind uncorrected refractive errors (42%). However, cataract (51%) is the most common cause of blindness in the world (Pascolini et al, 2011). Most of these blind people with cataract live in countries with a low socioeconomic status (Pascolini et al, 2011).

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In Nepal, Pokharel G P et al (1998) reported a higher prevalence of blindness in females than in males. They also reported that the burden of cataract was 74/1000 in females and 53/1000 in males. The different studies (Sapkota et al, 2005 and Serchan A et al, 2009) on the prevalence of blindness and cataract surgical coverage in different parts of Nepal show varying prevalence and cataract surgical coverage. In both of these studies, cataract was the most common cause of blindness in people over 45 years (Sapkota et al, 2005) in Gandaki Zone and in people over 50 years (Serchan A et al, 2009) in Lumbini Zone and Chitwan District combined. The cataract surgical coverage in this population was 59.5% in Gandaki and 66% in Lumbini and Chitwan combined. Although no national survey of blindness has been conducted in recent years, the data pooled from various sources indicate that the prevalence of blindness in Nepal has declined only marginally, from 0.84 % in 1981 to a still high of 0.74 % (Sapkota Y D, 2012). The number of blind persons in 1981 was 117,634, for the population of 14 million. It increased to 210,000 in 2008, for the population of 28 million (Upadhyay, 2010). The population-based Rapid Assessment of Avoidable Blindness (RAAB) survey of persons 50 years and older showed a very high prevalence of blindness in Karnali zone, and cataract is the major cause of avoidable blindness in this region (Sapkota Y D, 2012).

In this study, we have reported the keratometry readings, axial length and refractive power of the emmetropizing intra-ocular lens (IOL) of the eyes for the cataract surgeries performed in Karnali Zone during 2011 to 2012 AD. The objective of this study was to compare the ocular biometric parameters and IOL powers required for people in Karnali with those reported in other studies in Nepal and abroad and to observe the differences in different ethnicities, if any.

Subjects and methods

Study population

The study population includes people from Karnali zone. Karnali zone lies in the mid-

western development region of Nepal.

Data collection

Among the patients attending the Himalaya Eye Hospital's surgical eye camp in Karnali between January 2011 and June 2012, the case sheets of patients who had undergone cataract surgeries were retrospectively studied.

All cases for surgeries other than those for cataract were excluded for the study.

From the case sheets that could be included, the age, gender, eye operated, keratometry readings (both K1 and K2), axial lengths and IOL power used for the emmetropic post-operative refractive status were taken and recorded in an excel sheet. The keratometry readings and IOL power were recorded in dioptres (D) and the axial lengths in millimeters. A hand-held Nidek KM-500 was used for keratometry. The axial length was measured using the applanation technique with the ultrasound Sonomed 300A Pacscan. The IOL power was measured using the SRK-II formula of Power (D) = $A_1 - 0.9 (0.5K1 + 0.5K2) - 2.5$ (Axial length), fed in the equipment. The intraocular lens used was the Fred Hollow lens for which the A-constant is 118.3.

Statistical analyses

Statistical analyses were done using the SPSS version 16.0 software and Microsoft Excel 2007. The mean keratometric readings, axial length and the IOL power used were calculated with age and gender adjustments. The age was categorized as 40, 41-50, 51-60, 61-70 and >70 years. A nonparametric significance test, the Mann Whitney test was used to compare the values between the genders. ANOVA was used for the study of variance. A p-value of <0.05 was set for the statistical significance.

Results

The total number of patients taken for the study was 1055 and the total number of eyes was 1055. The surgeries were performed on one eye for each patient. There were 530 (50.23%) males and 525

(49.77%) females. The mean age of the subjects was 64.34 ± 11.25 , ranging from 8 to 98 years.

The mean keratometry reading was 43.76 ± 1.54 in males and 44.46 ± 1.57 in females. The mean keratometry reading for the total sample was 44.11 ± 1.6 (range, 34.00D to 49.00D). The mean axial length for the males was 22.85 ± 0.89 and that for females was 22.50 ± 0.84 . The mean axial length for the total sample was 22.68 ± 0.88 (range, 17.75 to 26.17). The mean IOL power for males was 21.46 ± 1.74 and that for females was 21.74 ± 1.74 . The mean IOL power (Fig) for the total sample was 21.60 ± 1.74 (range, +15.00 to +30.00).

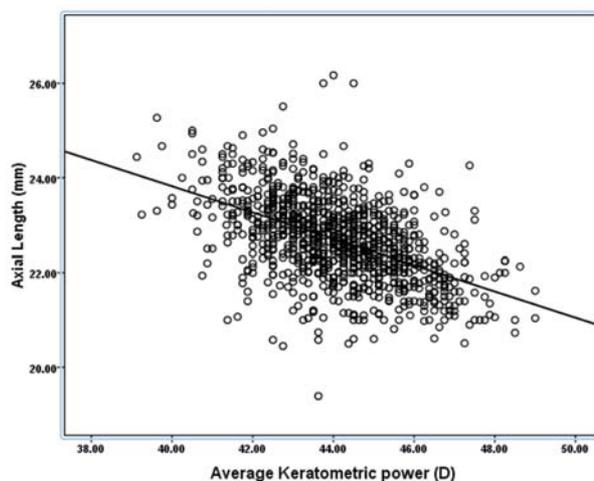


Figure: The mean IOL power of all the eyes

Table 1: Comparison of age and gender with study variables

Variables	n	Mean Keratometry reading (D)		Axial length (mm)		IOL power (D)		
		mean \pm SD	p value	mean \pm SD	p value	mean \pm SD	p value	
Gender								
Male	530	43.76 ± 1.54	<0.001	22.85 ± 0.89	<0.001	21.46 ± 1.74	0.009	Mann Whitney Test
Female	525	44.46 ± 1.57		22.50 ± 0.84		21.74 ± 1.74		
Age Groups								
≤ 40	32	43.76 ± 1.80	0.04	22.9 ± 1.21	0.86	21.75 ± 2.89	0.161	ANOVA
41-50	64	43.96 ± 1.69		22.59 ± 0.87		22.00 ± 1.97		
51-60	274	44.35 ± 1.58		22.57 ± 0.84		21.70 ± 1.68		
61-70	454	44.02 ± 1.54		22.72 ± 0.86		21.55 ± 1.67		
>70	231	44.06 ± 1.63		22.72 ± 0.90		21.46 ± 1.66		
subtotal	1055	44.11 ± 1.6		22.68 ± 0.88		21.60 ± 1.74		
SD Standard deviation								

Table 2: Pearson Correlation

	Mean Keratometric Reading	
	Correlation	p value
Axial Length	-0.507	<0.001

Table 3: Comparison of Age, mean keratometry readings, axial length and IOL power between the recent study and those of other studies.

S.N	Study	Sample Size	Age Range	Age Mean±SD	IOL calculation formula	K-Reading Mean±SD	AxialLength Mean ±SD	IOL Power Mean±SD
1	Karnali	1055	8 - 98	64.34±11.25	SRK II	44.11±1.6	22.68±0.88	21.60±1.74
2	Tilganga Eye Institute	5109	2 - 111	61.93±16.48	SRK II	43.69±1.8	23.08±1.26	21.37±3.04
3	Vietnam	346	19 - 87	64.11±13.58	SRK T	44.24±1.53	22.96±0.99	21.44±2.77
4	Auckland	488	34 - 94	74.9±NR	NR	43.7±1.6	23.14±1.03	NR
5	Eritrean	405 63	NR	56.1±10.8 64.1±7.85	SRK II	43.37±1.61 43.57±1.79	23.03±1.24 23.34±1.54	21.83±3.51
NR Not Reported								
SD Standard deviation								

Discussion

In this study, we have reported the keratometric readings, the axial length and the emmetropizing intraocular lens power of patients who had undergone cataract surgery in Karnali Zone of Nepal. Upadhyay MP (2010), stating other studies, reports that there is gender inequity in eye care in Nepal; we did not find this to be true in our study, where the number of males (50.23 %) and females (49.77) was practically the same.

The comparison of the different variables in our study with those in other similar studies is shown in Table 3.

The mean keratometric reading found in our study, 44.11±1.6, is similar to the mean keratometric reading of 44.24±1.53 in Vietnam, but a little higher than the mean keratometry reading found at the Tilganga Eye Institute, Nepal (43.69±1.8) (Murchison et al, 2004), in Auckland (43.7±1.6) (Andrew F Riley et al, 2001) and in Eritrean non-cataracts and cataract eyes (43.37±1.61 and 43.57±1.79) (Ben Connel et al, 1997). In our study, the mean keratometry reading of 44.46±1.57 in females was significantly higher than the mean keratometry reading of 43.76±1.54 in males, p<0.001.

In our study, the axial length of males (22.85±0.89) was found to be slightly greater than that in females (22.50±0.84), p<0.001. These findings correlate with the findings by Andrew F Riley et al (2001) and David A.

Atchison et al (2008). The mean axial length (22.68±0.88) found in our study is less than the mean axial length (23.08±1.26) found by Murchison et al (2004) at the Tilganga Eye Institute, Nepal. The reason for this is unknown. It is also less than the values found by Riley A F et al (2001) in Auckland and Connell B et al (1997) in Eritrean eyes, but is closely related to the mean axial length of 22.96±0.99 found by Nauze J L et al (1999) in Vietnam.

The mean IOL power for emmetropization found in our study is 21.60±1.74. This value is consistent with the mean IOL power of 21.37±3.04 found for Nepali people by Murchison et al (2004), the mean IOL power of 21.44±2.77 found by James La Nauze et al (1999) for a Vietnamese population and the mean IOL power of 21.83±3.51 found by Ben Connell et al (1997) in an Eritrean population.

The ANOVA test showed no significant difference in the axial length and IOL power with varying age while the Pearson correlation showed a negative relation of -0.507, p<0.001 between the axial length and the mean keratometry readings for an individual (Table 2 and 3). Comparing the findings of our study with those of other studies - Murchison et al (2004), Riley A F et al (2001), Connel B et al (1997) and Nauze J L et al (1999), we can conclude that axial lengths may differ by ethnicity. But from the consistent IOL power of our study and of these studies and from the



comparison of keratometry readings with axial lengths, it can be suggested that there could be some correlation of keratometry readings with axial lengths in different ethnic groups. Further studies need to be done to see if this is true. We have not reported the presenting visual acuity (VA) of the eyes before cataract surgery and the unaided or best-corrected visual acuity after cataract surgery in the study. Due to the lack of follow-up from both sides, the patients and the hospital, we only had the data of the presenting VA and the VA on the first post-operative day. As the VA on the first post-operative day could be misleading for the exact outcome of surgery, it was not reported.

Conclusion

The values for the keratometry readings, axial lengths and IOL power of our study in a Karnali population are similar to that of other similar studies from Nepal and from abroad. To know more about the relation between keratometry readings and axial lengths, further studies in different ethnic groups need to be conducted.

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