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Original Article**Axial Length of Eyeball in Emmetropic Eye –A study in Rajshahi Medical College Hospital**Benzir M^{1*}, Zahan A², Mustafa R³, Khanom A⁴, Ferdous SS⁵

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Corresponding Author*Abstract**

Introduction: Axial length is one of the most important parameter for optometry and oculoplastic surgery. This variable is very crucial in biometry for the measurement of the power intraocular lens accurately in cataract surgery. Many studies were carried out in various populations to determine axial length in emmetropic eye. However, there is only one study on axial length measurement in emmetropic eye in Bangladesh. This study aimed to determine the axial length in emmetropic eye in Bangladesh. **Materials and Methods:** This descriptive cross sectional analytical study was conducted among 200 emmetropic eye of Bangladeshi people who were attend with the patient, in department of Ophthalmology in Rajshahi Medical college between from July 2017 to June 2018. Data was collected through face to face interview, checking visual activity by Snellen chart and axial length of eyeball by A scan ultrasonography. **Results:** The mean $\pm$ SD age of participants was 36.5($\pm$ 14.5) years. Participants are almost equal in sex distribution. The mean axial length of right and left eye was 23.07 $\pm$ 0.69 mm and 23.02 $\pm$ 0.66 mm respectively and significant ($p < 0.001$). **Conclusion:** Optical parametry is a non-invasive diagnostic and assessment tool. So axial length measurement is help in the actual measurement of intra ocular lens implantation of cataract surgery and it also provide supplementary information to researcher domain in the actual measurement of intraocular lens implantation in cararact surgery and may also provide supplementary information to researcher domain.

Key words: Axial length, Cataract, Emmetropic eye.

Introduction

Eye is the most important sense organ and organ of vision in human. Usually eye is so contracted that the parallel rays coming from distant object is focused at the level of retina when accommodation is at rest¹. This type of eye is known as emmetropic eye and its visual acuity is 6/6. To achieve 6/6 visual acuity, the axial length should be such that the light rays are accurately focus on retina being refracted through the cornea and lens.² Measurement of axial length is important in several clinical specialties including ophthalmology specially in oculoplastic surgery. The axial length measurement is one of the main component for calculating the accuracy of intraocular lens power. Axial length is an important biometric factor that affecting refractive status. The axial length is the distance between anterior surfaces of cornea to fovea or retinal Bruch's membrane.^{3,4} There is an only one study on axial length measurement in emmetropic

eye in Bangladesh². Other studies in different countries, it was observed that axial length varies in different population. So this study may help in studying orbito-cranial growth patterns, pathological diagnosis, and surgical managements of cataract surgery and manufacturing of spectacles.

As there was limited study on the context in our population, further study is need in larger population in Bangladesh need to be contemplated on axial length in emmetropic eye.

Materials and Methods

This is a cross sectional analytical study. Data was taken from department of Ophthalmology, Rajshahi Medical College Hospital with the collaboration of Department of Anatomy, Rajshahi Medical College. This study was done from July 2017 to June 2018.

Sample was collected from people who had 6/6 visual acuity came in Ophthalmology dept. at Rajshahi Medical College Hospital during the study period of one year. Sample size was determinate by this formula's= Z^2Sd^2/E^2 . Here: the minimum sample size of this study was 141. To enhance the validity of the findings 200 sample were taken. Purposive random sampling was used to select sample population. A survey questionnaire was prepared to collect data. Data was collected through face to face interview, checking visual acuity by Snellen chart and axial length measured by A Scan ultrasonography. Ethical permission was taken from the Institutional Review Committee of Rajshahi Medical College, Rajshahi. Data were expressed as mean $\pm$ SD and statistical significance of difference among the group was calculated by unpaired student's t test. After completion of data collection, they were checked, verified to reduce error. The data was analyzed with the help of a computer based on SPSS software program version 16.0 for windows. After entry into the computer results were analyzed according to objectives and variables of the study. P value <0.05 was considered as significant.

Results

The present study was intended to find out the axial length of eyeball in emmetropic eye on a total of 200 healthy adult people. This variable was measured by A Scan Ultrasonography. The findings obtained from the study were presented below

Table-I: Age distribution of the participants (n = 200)

Age distribution	Frequency(n)	Percent (%)
21-30	117	58.5
31-40	75	37.5
41-50	7	3.5
51-60	1	.5
Total	200	100

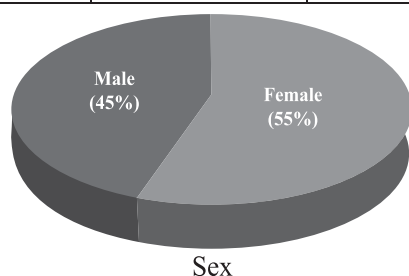


Fig 1: Distribution of participants by their sex (n = 200)

Table- I showed that of all participants, the majority 58.5 % (117) were in the age group 21 to 30 years and the minority participants 0.5 % (1) from 51 to 60 years. Among the participants female and male ratio was 11:9 where female 55% and male 45% (Figure-1).

Table-II: Frequency of right axial length

Right axial length in mm	Frequency(n)	Percent (%)
21-21.5	5	2.5
21.51-22	10	5.0
22.01-22.5	21	10.5
22.51-23	53	26.5
23.01-23.5	59	29.5
23.51-24	36	18.0
24.01-24.5	12	6.0
24.51-25	4	2.0
Total	200	100.0

Table-III: Study of right axial length.

Right axial length (mm)	n	Minimum	Maximum	Mean $\pm$ SD	S.E	Variance
	200	21.08	24.97	23.07 $\pm$ 0.69	.04940	.488

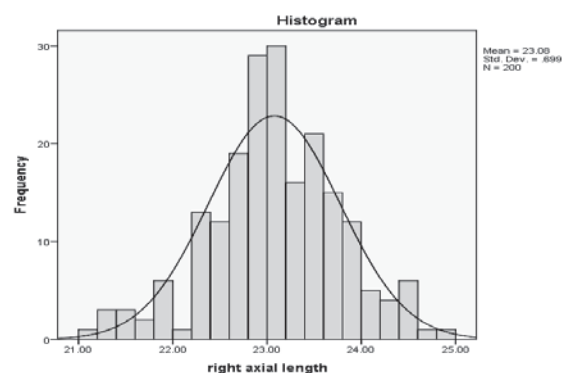


Figure-2: Histogram showing the normal distribution of right axial length

Table II delineated that majority of the sample population fall in the frequency of right axial length 22.51 to 23.50 mm. Table III also represent the study of right axial length in which, range was 21-25 mm, standard error, standard deviation and variance were 0.049, 0.69, and 0.48 respectively. The mean right axial length was 23.07 $\pm$ 0.69 mm. The histogram also shows that the normal distribution of right axial length. (Figure- 2).

Table-IV: Frequency of left axial length

Left axial length in mm	Frequency (n)	Percent (%)
21 -21.5	6	3.0
21.51-22	10	5.0
22.01-22.5	22	11.0
22.51-23	66	33.0
23.01-23.5	49	24.5
23.51-24	35	17.5
24.01-24.5	8	4.0
24.51-25	4	2.0
Total	200	100.0

Table-V: Distribution of left axial length

Left axial length(mm)	n	Minimum	Maximum	Mean±SD	S.E	Variance
	200	21.15	24.82	23.02±0.66	.04727	.447

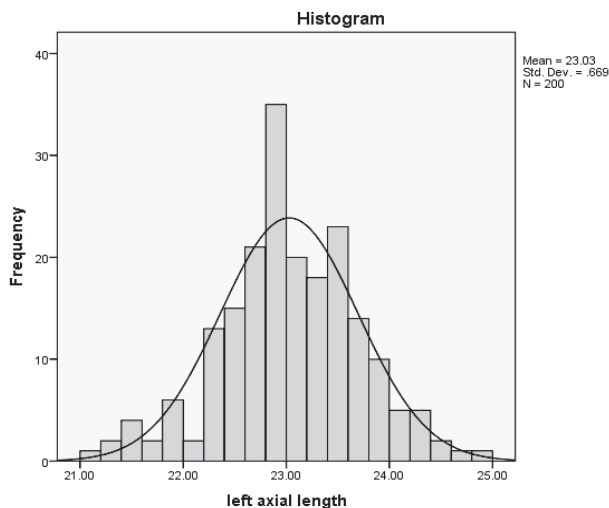
**Figure-3: Histogram showing the normal distribution of left axial length**

Table IV and V reported that the frequency of left axial length in which 22.51 to 23.5 mm carries majority portion of population. The standard deviation, standard error and variance were 0.047, 0.66, and 0.44 respectively. The mean left axial length was 23.02 ± 0.66 mm. Histogram showing the normal distribution of left axial length (Figure- 3)

Discussion

Measurement of axial length of eyeball and is a well-established diagnostic aid for different clinical condition in ophthalmology. This present study was based on optical parametric measurement, which included 200 adult individual who had 6/6 visual acuity without any aid in northern part of Bangladesh. The range of the age in this study was 21 to 52 years. The sample population was selected above 18 years to avoid the chance of primary refractive error. Majority of the participant's (58.5%) age range was 21 to 30 years as secondary refractive error usually absent in this age group. This study coincides with the study of Abdul *et al*,⁵ and Sudhan, M⁶, they observed that on 102 participant's age within 14 to 60 years of age where 46 % participants were 21 to 30 years of age. So the age range of the participants of that study was similar with the present study. The lowest age group was in 4th and 5th decade, which was only 4% because after that age incidence of secondary refractive error and various systemic diseases became more. So frequency of participants declined in that age group.

In the present study it was observed that the mean axial length of right and left eye was 23.07 ± 0.69 mm and 23.02 ± 0.66 mm respectively. The result was supported by other four studies in India, in which according to Abdul *et al*,⁵ the mean average of axial length was 23.52 ± 0.96 mm, according to Sudhan, M⁶ the mean axial length was right eye 23.52 ± 0.96 mm and left eye 23.52 ± 0.84 mm, according to Roy *et al*,⁷ the mean axial length was right eye 23.35 ± 0.87 mm and left eye was 23.23 ± 0.64 mm and according to Solu *et al*,⁸ the mean axial length was 22.37 ± 0.83 mm. The results of their study were similar with the present study ($p > 0.05$). A study also done on similar context in Nigeria, by Laymu *et al*,⁹ It was found that the mean axial length was 23.49 ± 0.44 mm which was coincides with this study.

The present study was well correlated with another study done by Hoque E,² in Bangladesh where the

axial length was 22.86 ± 0.73 mm which was similar and not significantly different ($p > 0.05$) with the present study. Because the study was also done in same population, almost same age group and using same instrument A scan ultrasonography.

Conclusion

Optical parametry is a noninvasive diagnostic and assessment tool. It is a promising method in studying in different ophthalmic measurement. This study revealed that axial length is an important factor to maintain 6/6 visual acuity for emmetropic eye. The axial length of eyes might be utilized in various applications in medical science including ophthalmology, specially in measuring the power of intraocular lens accurately in cataract surgery and other ocular surgery. The findings of the study might provide supplementary information to other researcher in this domain.

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