International Journal of Research in Medical Sciences
Mahmud MU et al. Int J Res Med Sci. 2024 Jul;12(7):2266-2272
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012

DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20241870

Original Research Article

Correlation of axial length and corneal power with refractive status of patients with refractive error in Kano, North-Western Nigeria

Muhammad U. Mahmud[1], Umar F. Ibrahim[1], Mohammad Isyaku[1], Sadiq Hassan[2]*, Philips I. Ebisike[3], Rabi Y. Sani[2]

[1]Department of Ophthalmology, Aminu Kano Teaching Hospital, Kano, Nigeria
[2]Department of Ophthalmology, Faculty of Clinical Sciences, College of Health Sciences, Bayero University Kano/Aminu Kano Teaching Hospital, Kano, Nigeria
[3]Department of Optometry, Faculty of Allied Health Sciences, College of Health Sciences, Bayero University Kano/ Department of Ophthalmology, Aminu Kano Teaching Hospital, Kano, Nigeria

Received: 27 April 2024
Revised: 05 June 2024
Accepted: 14 June 2024

***Correspondence:**
Dr. Sadiq Hassan,
E-mail: abubakarsadiqh66@gmail.com

ABSTRACT

Background: Uncorrected refractive errors are a major cause of blindness and low vision. Determination of the etiology is essential in planning appropriate treatment modalities. Aim of this study was to determine the correlation between axial length and corneal power with refractive status of patients with refractive error in Kano, Nigeria.
Methods: Observational cross-sectional study in which 385 eligible patients were recruited. Relevant history was obtained from the patients and ocular examination was done. Objective and Subjective refraction were performed. Spherical equivalent was calculated for patients with astigmatism. Keratometric readings (k1 and k2) and measurement of axial length were taken. Data was analyzed using the statistical package for the social sciences (SPSS) version 22.
Results: Statistically significant inverse association ($r=-1.7$, $r^2=56.8\%$, $p<0.0001$) was found between Spherical equivalent objective refraction and axial length of right eye. Statistically significant inverse association ($r=-1.2$, $r^2=53.3\%$, $p<0.0001$) was found between Spherical equivalent subjective refraction and axial length of right eye. Statistically significant inverse association ($r=-0.5$, $r^2=8.5\%$, $p<0.0001$) was found between spherical equivalent objective refraction and corneal power of the right eye. Statistically significant inverse association ($r=-0.3$, $r^2=6.4\%$, $p<0.0001$) was found between spherical equivalent subjective refraction and Corneal power of right eye. Negative correlation existed between axial length and corneal power but was not statistically significant ($r=-0.0$, $p<0.4$).
Conclusions: The study established that axial length and corneal power are the determinants of refractive status and that axial length is a stronger determinant.

Keywords: Axial length, Corneal power, Refractive error, Kano, Nigeria

INTRODUCTION

The ocular refractive status can be defined as the locus within the eye conjugate with optical infinity during minimal accommodation. Under these conditions in an emmetropic eye, incident parallel rays of light are brought to a focus upon the retina. In a hypermetropic eye, incident parallel rays of light are brought to a focus behind the retina and in a myopic eye, incident parallel rays of light are brought to a focus in front of the retina.[1]

Ametropia can be defined as a condition in which the image of an object fails to focus upon the retina and can be classified by presumptive etiology as axial or refractive. In axial ametropia, the eye ball is either unusually long (myopia) or short (hypermetropia). In refractive ametropia, the length of the eye ball is statistically normal, but the refractive power of the eye (cornea and/or lens) is abnormal being either excessive (myopia) or deficient (hypermetropia). Ametropia can be corrected by either diverging (concave) or converging (convex) lenses to bring to focus the image of a distant object on the retina.[2]

Astigmatism is an optical condition of the eye in which light rays from an object do not focus to a single point, because of the differences in the curvature of the cornea or lens at different meridian. Instead, there is a set of two focal lines. Each astigmatic eye can be classified by the orientations and relative positions of these focal lines.[2]

The spherical equivalent of a refractive state can be defined as the algebraic sum of the spherical power and half of the cylinder power. Anisometropia is a condition when the two eyes have different refractive powers. The interplay between corneal power, lens power, anterior chamber depth and axial length determines an individual's refractive status. All four elements change continuously as the eye grows.[2]

The main cause of ametropia is the lack of balance between the various refractive components, rather than a single optical aberration but ocular refraction is mainly influenced by corneal refractive power and ocular axial length.[3]

Refractive errors (myopia, hypermetropia and astigmatism) affect a large proportion of the population worldwide irrespective of age, sex and ethnic group. Refractive errors can easily be assessed and corrected with either spectacles or other refractive corrections to restore normal vision. If not properly corrected, refractive errors can become a major cause of low vision and even blindness.[4] Globally, 153 million people over five years of age are visually impaired from uncorrected refractive errors, of whom 8 million are blind.[5] Uncorrected refractive errors were the leading cause of mild and moderate visual impairment (77.9% and 57.1% respectively) being the cause of visual impairment in 2.5 million adults in Nigeria.[6]

Study on 240 patients (480) eyes in India found that the eyeball (axial length) usually grows up to 16-18 years of age, and in myopia, it has longer axial length while in hypermetropia shorter axial length.[7]

A study in Egypt found no statistically significant correlation between average keratometry reading and spherical equivalent, keratometric astigmatism and age, but a statistically significant correlation was found between sex and average keratometric reading (with higher values in females).[8]

Study on the assessment of biometry and keratometry in myopic subjects found out that those with high myopia have longer axial length compared to those with simple myopia. No significant association was found between the two groups when front surface corneal power or type of corneal astigmatism were considered.[9]

Study carried out in Benin City Nigeria, found that the axial length of myopes was significantly longer than that of emmetropes and hyperopes by 0.8 mm and 0.9 mm respectively, and there was statistically significant inverse relationship between axial length and corneal radius of curvature. A statistically significant inverse relationship was also found between axial length and spherical refractive error. The mean corneal radius of curvature for all subjects was 7.8±0.2 mm. Across the refractive status groups, there was statistically significant difference in the mean corneal radius of curvature.[10]

Despite the fact that refractive errors have been found to be a major cause of visual impairment in the Nigeria national blindness and low vision survey, to the best of the authors' knowledge, there is paucity of data on the relationship between each of the major ocular refractive components (i.e. cornea, lens and axial length) and refractive errors in black Africans.[11] Therefore, a study like this will provide data on the pattern of refractive errors as well as the predominant pathogenesis in black Africans. This will aid in planning of optical services and appropriate patient counseling.[12]

The aim of the study was to determine the correlation of axial length and corneal power with refractive status of patients with refractive error in Kano, Nigeria.

METHODS

The study adhered to the Tenets of the Helsinki declaration. Ethical approval was obtained from the research ethics committee of Aminu Kano teaching hospital (AKTH), Kano, Nigeria.

It was an observational cross-sectional study carried out at the department of ophthalmology AKTH, Kano, Nigeria between April 2018 and May 2019. Sample size was calculated using the formula for estimating a single proportion at specified precision.[28] Formula is: $n=Z^2pq/d^2$

Where n=minimum sample size

Z=point on the normal distribution curve equivalent to 95% confidence interval=1.96

P=prevalence of refractive error in Nigeria=65%.[6]

q=complementary probability of p=1-p=(1-0.65)=0.35

d=degree of precision of margin of error=0.05

$n= (1.96)^2(0.65)(1-0.65)/(0.05)^2$

n=349.6~350

To compensate for losses due to attrition, the minimum sample size was inflated by 10% to 385.

Consecutive patients that fulfilled the inclusion criteria took part in the study. The study participants were patients aged 18 to 40 years diagnosed with refractive error who consented to participate. Patients with refractive error in the presence of ocular co-morbidities that could affect vision such as corneal opacity, cataract, glaucoma, previous history of ocular and or adnexal surgery, patients with manifest strabismus, systemic diseases such as diabetes mellitus and hypertension that could affect vision, elevated intraocular pressure, and those that did not consent to participate were excluded.

Relevant history (including demographics, visual symptoms, previous history of use of glasses, family history of use of corrective lenses, history of other eye disorders) was obtained from the participants. General, systemic and ocular examinations were done. Visual acuity (unaided, with pin hole and with available correction) was tested using a Snellen's chart. Examination of the anterior segment was done with a pen light and a slit lamp biomicroscope (Carl Zeiss Meditec AG Germany). That of the posterior segment was done using the direct ophthalmoscope (Heine, Germany). Intraocular pressure was measured with a Pulsair Tonometer (Keeler, UK). Objective refraction was performed using streak retinoscope (Heine, Germany) followed by subjective refraction. Spherical equivalent was calculated for each eye in patients with astigmatism. The average of three keratometric readings in 2 major meridians of corneal curvature (K1 and K2) determined for each eye using Von Helmholtz manual keratometre (bon 01-OM Model). Keratometre was used to view the step shaped and rectangular shaped mires of corneal image, the distance between the two was adjusted until the double images just touched. A reading was taken for that meridian and the arm rotated 90 degrees away for the second major meridian. An average of the two readings was calculated. This was done 3 times and average was calculated for each eye in dioptres. Three measurements of axial length were taken for each eye using an A-scan ultrasound machine (CAS 2000A model, China). Procedure was fully explained to each participant. One drop of topical anesthetic agent (amethocaine) was instilled in each eye and participants were asked to close both eyes for three minutes and to fixate on a distant target. A disinfected A scan probe was applied to the central cornea taking care not to indent central cornea by not exerting excessive pressure. Three readings were taken for each eye and average was calculated.

Statistical analysis

Data was analyzed using the statistical package for the social sciences (SPSS) version 22 (SPSS Inc., Chicago, IL, USA) and summarized as percentages, mean and standard deviation (SD). The correlation between axial lengths, corneal power with refractive status was determined using linear regression, while Pearson correlation was used to determine the correlation between axial length and corneal power. A p<0.05 was considered statistically significant.

RESULTS

Three hundred and 85 participants were included in the study. There were 120 males (31.2%) and 265 females (68.8%), (M:F =0.45:1). Mean age was 27.1 years±7.7 standard deviation, with a range of 18 to 40 years. 359 participants (93.2%) were Hausa (Table 1) gives the age, sex and tribe distribution of the participants.

Table 1: Age, sex and tribe distribution.

Variables	N	Percentage (%)
Age (in years)		
18-25	202	52.5
26-40	183	47.5
Total	385	100
Sex		
Male	120	31.2
Female	265	68.8
Total	385	100
Tribe		
Hausa	359	93.2
Yoruba	8	2.1
Igbo	12	3.1
Others	6	1.6
Total	385	100

The spherical equivalent objective refraction of the right eyes ranged from -18 to +10 diopters with a mean of -0.8 diopters, standard deviation±3.3, median was -1 diopter while that of the left eyes ranged from -18 to 12 Diopters with a mean of -0.5 diopter, standard deviation±3.1, median was 0 Diopter.

The ranges of spherical equivalent subjective refraction for the right and left eyes where -16 to +9 and-16 to +8 Diopters respectively. Mean spherical equivalent subjective refraction for the right and left eyes where -0.5 and -0.4 respectively, median of -1 for both right and left eyes, standard deviation of±2.6 for right eyes and±2.4 for left eyes.

The range of axial length for right eyes was 20-30 mm, mean of 23.4 mm, and median was 23 mm, standard deviation of ±1.5 mm. The range of axial length for left eyes was 19-30 mm, mean of 23.3 mm, and median was 23 mm, standard deviation of ±1.5 mm.

The range of corneal power for the right eyes was 37-61 diopters, mean of 43.6 diopters, median was 43 diopters, standard deviation of±2.1 The range of corneal power for the left eyes was 36-58 Diopters, mean of 43.5 diopters, median was 43 Diopters, standard deviation of±1.7 (Table 2).

Following subjective refraction of all participants, 197 (50.4%) were myopes (SE≤-0.5D), 120 (31.2%) were hypermetropes (≥+0.5D) and 68 (17.7%) were emmetropes (>-0.5 to < 0.5) (Table 3).

Only 61 participants were using spectacles and had their visual acuity improved to better than 6/12 with their spectacles (met need), while 250 participants had their visual acuity improved to better than 6/12 with pinhole but were not using spectacles (unmet need). Thus the spectacle coverage (met need/met need +unmet need ×100) was 19.6% (Figure 1).

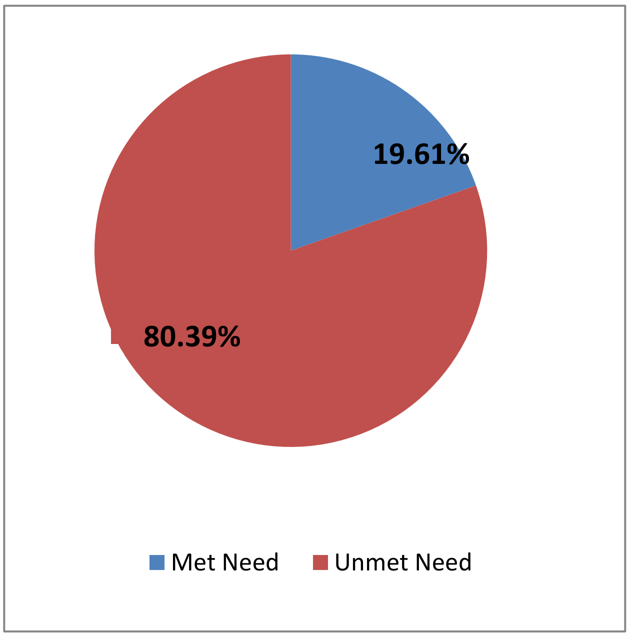

Figure 1: Spectacle coverage.

The ranges of mean and standard deviation of the refractive status, axial length and corneal power for right and left eyes were very similar, thus the correlation between these variables was checked using right eye values.

Linear regression between the spherical equivalent objective refraction as the dependent variable and axial length as the independent variable showed statistically significant inverse association (r=-1.7, r^2=56.8%, p<0.0001). This explained that axial length is the major determinant of objective refractive error in 56.8% of the participants. The plot showed 23.5mm as the average emmetropic axial length (Figure 2).

Linear regression between spherical equivalent subjective refraction as the dependent variable and axial length as the independent variable showed statistically significant inverse association (r=-1.2, r^2=53.3%, p<0.0001). This explained that axial length is the major determinant of subjective refractive error in 53.3 percenatges of the participants.

Linear regression between the spherical equivalent objective refraction as the dependent variable and corneal power as the independent variable showed statistically significant inverse association (r=-0.5, r^2=8.5%, p<0.0001). This explained that corneal power is the major determinant of objective refractive error in 8.5% of the participants, and the plot showed 43 Diopters as the emmetropic corneal power (Figure 3).

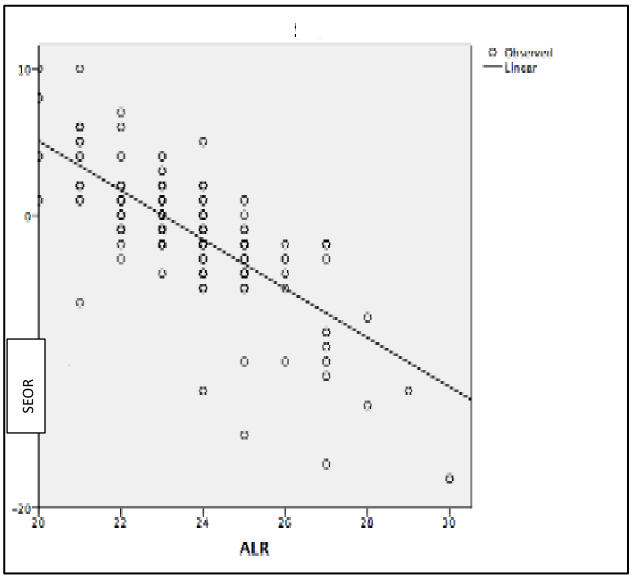

Figure 2: Correlation between spherical equivalent objective refraction and axial length.

SEOR: Spherical Equivalent objective refraction right eye, ALR: Axial length right eye.

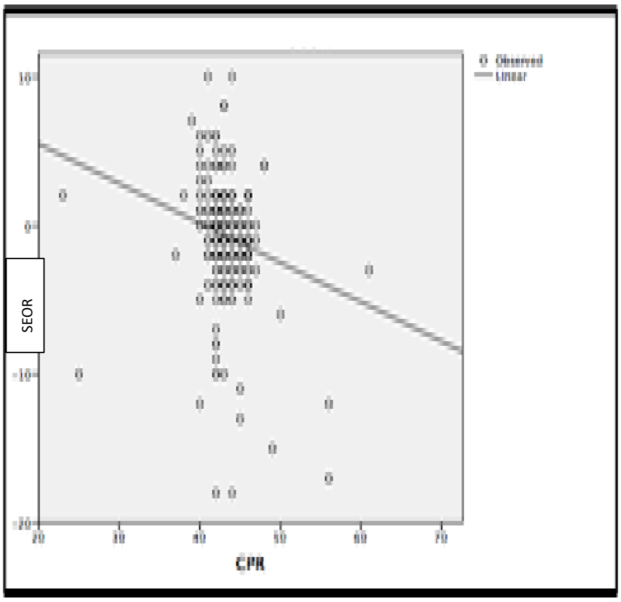

Figure 3: Correlation between spherical equivalent objective refraction and corneal power.

SEOR: Spherical equivalent objective refraction right eye, CPR: Corneal power right eye.

Linear regression between the spherical equivalent subjective refraction as the dependent variable and corneal power as the independent variable showed statistically significant inverse association (r=-0.3, r^2=6.4%, p<0.001).

This explained that corneal power is the major determinant of subjective refractive error in 6.4% of the participants (Figure 4).

Pearson correlation between axial length and corneal power showed a negative correlation which was not statistically significant (r=-0.040, p0.434).

Linear regression plots revealed that increasing axial length/corneal power is associated with increasing myopia and decreasing axial length/corneal power is associated with increasing hypermetropia shown in the Figures 2-4.

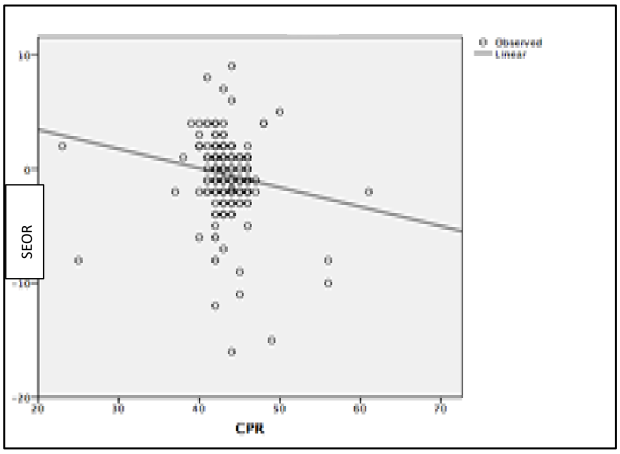

Figure 4: Correlation between spherical equivalent subjective refraction and corneal power.

SESR: Spherical equivalent subjective refraction right eye, CPR: Corneal power right eye.

Table 2: Spherical equivalent refraction and ocular biometrics.

Variables	Minimum	Maximum	Mean	Median	SD
Age (in years)	18	40	27.1	25	7.7
IOP/RE (mmHg)	7	21	13.9	14	2.7
IOP/LE (mmHg)	7	21	13.9	14	2.7
Objective refraction/RE (Diopters)	-18	10	-0.8	-1	3.3
Objective refraction/LE (Diopters)	-18	12	-0.5	0	3.1
Subjective refraction/RE (Diopters)	-16	9	-0.51	-1	2.6
Subjective refraction/LE (Diopters)	-16	8	-0.4	-1	2.4
Axial length/RE (mm)	20	30	23.5	23	1.5
Axial length/LE (mm)	19	30	23.3	23	1.5
Corneal power/RE (Diopters)	37	61	43.5	43	2.5
Corneal power/LE (Diopters)	37	58	43.4	43	2.4

IOP: Intraocular pressure, RE: Right eye, LE: Left eye.

Table 3: Distribution of refractive error.

Variables	N	Percentage (%)
Myopia	197	51.2
Emmetropia	68	17.7
Hypermetropia	120	31.2
Total	385	100

DISCUSSION

Refractive errors (myopia, hypermetropia and astigmatism) affect a large proportion of the population worldwide. These can easily be diagnosed, measured and corrected with spectacles or other refractive corrections to attain normal vision. However, if uncorrected or the correction is inadequate, refractive errors can become a major cause of low vision and even blindness.[5]

The ocular biometric variables are the determinants of final refractive status of the eye. Findings from this study showed that out of 385 participants examined, 265 (68.2%) were females, while 120 (31.2%) were males. This showed a higher prevalence of refractive errors in females, similar to findings of a study conducted in Southwestern Nigeria.[13] However as a hospital-based study this may signify more female hospital attendance.

The mean age and standard deviation of the participants in this study is similar to findings in a study in Benin, Nigeria.[10]

The mean spherical equivalent refractive error in this study is lower than that found in an observational study in Benin City, Nigeria.[12]

In this study, the mean axial length was higher than that found in a South African study, but similar to that found in Benin City. The mean keratometry reading in our study was higher than that found in a study on normal eyes in southern Nigeria.[10-12]

In this study, the refractive error with the highest prevalence was myopia followed by hypermetropia. This is in contrast to a study in India, but similar to the study in southwestern Nigeria.[13,14]

The spectacle coverage found in this study was higher than what was found in the National blindness and low vision survey (3.8%).[6] This might be due to the fact that the national blindness and low vision survey was a nationwide community-based survey while this was hospital-based.

The statistically significant inverse association found between spherical equivalent objective and subjective refraction with the axial length indicated that the variability of objective and subjective spherical equivalent refractive error is mainly determined by the axial length, this showed axial length to be a strong determinant of refractive status and is in keeping with findings of similar studies.[10-16]

The statistically significant but weaker inverse association found between spherical equivalent objective and subjective refraction with corneal power showed variability of objective and subjective refraction as determined by the corneal power to be 8.5% and 6.4% respectively which means corneal power is less powerful in determining refractive status as compared to axial length. This finding is similar to findings in a study by Eghosasere et al however the variable compared with the refractive status in the study was corneal radius of curvature in millimeters instead of corneal power in diopters as done in this study and thus the correlation they found was positive.[12]

Although not statistically significant, a negative correlation was found between axial length and corneal power which is in contrast to the findings by Eghosasere et al who found a statistically significant correlation, however both studies indicated that longer globes are associated with flatter cornea. In the same vein, longer globes are associated with lower corneal power. It seems there is an interplay between these variables, a mechanism in the relationship between these variables that tends to achieve emmetropia.[12]

The absolute values observed in this study however differed from values observed in earlier studies.[12,13,15] Hassan et al in Iran attributed 69.5% of the variation in spherical equivalent refraction to changes in these variables, perhaps, this may connote some racial variation which further studies may be required to confirm.[15]

The mean emmetropic axial length found to be 23.5mm was slightly higher than that found in a study in Durban South Africa which found 23.05 as the mean axial length of 600 patients.[11] Similarly our mean emmetropic axial length of 23.5 is higher than what was found in a descriptive multi Centre hospital based study in Khartoum and Omdorman Sudan which found 23.09 mm as the average ocular axial length.[17] However our emmetropic axial length was similar to that found in a study done in Port Harcourt, Nigeria on ocular axial length and keratometry readings of normal eyes with 23.57 mm as the average axial length, and similar to 23.74 mm found in a study in Benin City, Nigeria.[12,12]

The mean emmetropic corneal power found to be 43 Diopters was slightly higher than 42.4 diopters found in a study in Port Harcourt, Nigeria.[10]

Increasing axial length/corneal power found to be associated with more myopia and decreasing axial length/corneal power associated with more hypermetropia was similar to findings in other studies.[18-25]

Limitations

The study was conducted in a single hospital situated in urban area, so it is not a true reflection of the general population of Kano State, northwestern Nigeria. Multicenter research with a larger sample size should be conducted. Bulk of the patients in this study were under the age of 40 years. This may not give a true reflection of the study population. Additional research with a broader age range could improve findings on this study.

CONCLUSION

This study confirmed the correlation between axial length and corneal power with refractive status in a healthy Nigerian adult population. It has also confirmed that rather than being independent, ocular biometric variables are interdependent. This study also established that axial length is a stronger predictor of refractive status than corneal power. Although the relationship established between these ocular variables and refraction will hold for the majority, some selected individuals may have other ocular biometrics such as lens power, anterior chamber depth indices responsible for their final refractive outcome. This should be considered when determining the method of correcting refractive errors with spectacles, contact lenses or refractive surgery, as the nature of refractive error (Axial or Refractive) determines the best way of correction.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. William J Benjamin IMB. Clinical Refraction. In: Clinical refraction, 2nd edi, Butterworth-Heinemann Publication. 2006;3-15.
2. American Academy Of Ophthalmology. Refractive Status Of the Eye. In: Clinical Optics. 2024;113-20.
3. Hashemi H, Khabazkhoob M, Emamian M H, Shariati M, Abdolahi-nia T FA. All biometric components are important in anisometropia, not just axial length. Br J Ophthalmol. 2003;97(12):1586-91.
4. David A. Clinical Optics. In: Duke-Elder's Practice

of refraction, ed 10th. 2019;29-70.

5. Serge R, Donatella P, Silvio P, and Mariotti GPP. Global magnitude of visual impairment caused by uncorrected refractive errors in 2004. Bull world Heal Organ. 2008,86(1):63-70.
6. Christian E, Hessom R, Selvaraj S, Clare EG, Gudlavalleti V, Murthy S, et al. Refractive error in Nigerian Adults; Prevalence Type and Spectacle Coverage. Invest Ophthalmol VS Sci. 2011;52:5449-50.
7. Veena BJ, ghandni PR. Axial length,anterior chamber deapth. A study in different age group and refractive errors. J Clin Diagn Res. 2013;7(10):2211-2.
8. Afra A, Atif BMA. Assessment of biometry and keratometry in low and high degrees of myopia. Al-basar Int J ophthalomol. 2015;3(1):11-4.
9. Surabhi R,Poonam K,Vinita S. Correlation of refractive error with axial length andcorneal topography. Asian J Ophthalmol. 2016;15(1):25-33.
10. Adio AO and Onua DA. Ocular axial length and keratometry readings of normal eyes in southern Nigeria. Niger J Ophthalomol. 2010;18(1):12-4.
11. Khathutshelo P, Mashige OAO. Axial length, anterior chamber deapth and lens thickness, their intercorrelation in black south Africans. Africa Vis eye Heal. 2017;76(1):1-7.
12. Eghosasere I, Joy I and Christian ZO. The role of axial length-corneal radius of curvature ratio in refractive state categorization in Nigerian population. Isrn opththalmol. 2011;1(6):38941:1.
13. Badamus S.A, Ajaiyeoba AI, Adegbehingbe BO and Onakpoya OH. Axial length radius of curvature ratio and refractive status in an adult Nigerian population. Niger J Clin Pract. 2017;20:1328-34.
14. Venkata BM, Venkata SB. A study of the relationship between axial length, anterior chamber depths and corneal curvature in different refractive states. J Evid based Med Heal care. 2016;3(27):1253-6.
15. Hassan H, Mehdi K, Mohammed H E, Mohammed S, Abbasali Y, Hadi OAF. Association between refractive errors and ocular biometry in Iranian adults. J opthalmus Vis Res. 2015;10(3):214-20.
16. Thomas O, Arsaell A, Hiroshi S, kazuyuki S, Fridbert J. Reykjavak eye study on the ocular refracture components. Acta Ophthalmol. 2007;85(4):361-6.
17. Sahar IA, Mahgoub S. Normal range values of ocular axial length in adult Sudanese population. Albasar Int J Ophthalmol. 2015;3(2):31-8.
18. Tamer A R. Correlation between keratometric readings, corneal thickness and refractive error among patiens seeking for refractive surgery. J Appl Sci Res. 2011;7(12):2073-81.
19. Jyoti A, Prachi SA, Penkaj M, Baljeel k, Rhandhawa KDS, Avnish K, et al. Relation of refractive error with corneal curvature of the eye in adult subjects with refractive error. J Evol Med Dent Sci. 2015;8(57):8846-55.
20. Sayatan D, Nirmal K, Sasmal AD. A study to correlate the axial length of the eye ball and the curvature of the cornea with the age of onset of myopia. J Evid based Med Heal Care. 2017;4(42):2541-5.
21. Jin Z. Correlation of axial length and corneal curvature with dioptre in eyes of adults with anisometropia. Int J Clin Exp Med. 2015;8(8):13639-43.
22. Mei JC, Yin TL,Chia CT,Yen CC, Ching K, Chou SML. Relationship between Central Corneal Thickness, refractive error, corneal curvature, anterior chamber depth and axial length in normal Taiwanese Chinese adults. J Chinese Med Assoc. 2009;72(3):133-7.
23. Khathutshelo P, Mashige O, Alabi O. Corneal parameters and their correlations with refractive error, axial length, anterior chamber depth and lens thickness in black South Africans. Int eye Sci. 2017;17(4):597-603.
24. Araoye MO. Sample size for comparison groups in research methodology with statistics for health and social sciences, Ilorin, Nigeria. Nathadex Publications. 2003;117-20.
25. Tahra A, David P, Rejean M. Correlation between refractive error,corneal power,and thickness in a large population with a wide range of ametropia. Arvo J. 2011;52(3):1235-42.

Cite this article as: Mahmud MU, Ibrahim UF, Isyaku M, Hassan S, Ebisike PI, Sani RY. Correlation of axial length and corneal power with refractive status of patients with refractive error in Kano, North-Western Nigeria. Int J Res Med Sci 2024;12:2266-72.