IBOM MEDICAL JOURNAL
Vol.19 No.2 | April - June 2026 | Pages 384-390
www.ibommedicaljournal.org

The Effect of Central Corneal Thickness on the Intraocular Pressure of Patients at a Rural Cataract Eye Camp in Nigeria

Ugochukwu A Eze[1,2,3], Ernest N Ogbedo[1], Susannah T Adepoju[4], Chukwudi C Uzozie[5], Chioma M Emelumadu[5], Ifeanyi O Orji[1], Thelma I Ndife[6], Adedeji O Akinyemi[1], Abiola A Salimonu[1], Benson A Victor[1], Samuel Ndiomu[1], Tochukwu C Malobi[1], Arinze A Onwuegbuna[5], Akunne I Apakama[5], Helen A Alen[7]

[1]*Depeartment of Ophthalmology, Federal Medical Centre, Asaba, Nigeria*
[2]*Cephas Research Initiative Inc, Ibadan, Nigeria*
[3]*Department of Research, University of Puthisastra, Phenon-Penh, Cambodia*
[4]*Department of Ophthalmology, Ladoke Akintola University of Technology, Ogbomosho, Nigeria*
[5]*Department of Ophthalmology, Nnamdi Azikiwe University Awka/Guiness Eye Centre, Onitsha, Nigeria*
[6]*Department of Ophthalmology, University of Uyo Teaching Hospital, Uyo, Nigeria*
[7]*Department of Ophthalmology, University College Hospital, Ibadan, Nigeria*

Abstract

Background: Understanding the effect of central corneal thickness (CCT) on intraocular pressure (IOP) is crucial for accurate measurement of IOP and glaucoma risk assessment.
Aim: To compare IOP values obtained before and after correction with central corneal thickness using the iCare tonometer among patients with cataract at a mobile eye outreach camp.
Methods: This was an institution-based cross-sectional study analysed consecutive records of baseline IOP, CCT values and corrected IOP from a mobile outreach register. Demographic data, such as age and sex were extracted. A Microsoft Excel sheet was created and data analysed with IBM SPSS version 25. Descriptive and inferential statistics were done, and a p-value less than 0.05 was considered significant.
Results: Records of 146 eyes of 73 patients were included of whom 64.4% were females and mean age of 53.2 years ± 13.72 SD. The mean baseline IOP, CCT and corrected IOP were 16.88mmHg ± 5.73 SD, 538.3µm ± 40.5 SD and 17.52mmHg ± 6.33 SD, respectively, on the right eye. While on the left, they were 16.08mmHg ± 6.06 SD, 537.1µm ± 52.7 SD and 16.61mmHg ± 6.29 SD, respectively. IOP increase with CCT correction was not significant.
Conclusion: The mean IOP increased following correction for CCT, but this was not statistically significant. However, the negative correlation between CCT and corrected IOP underscores the need to incorporate CCT adjustments in screening programs to improve the accuracy and guide public health interventions.

Keywords: Central Corneal Thickness; Intraocular Pressure; Rural Cataract Eye Camp; Nigeria

Introduction

Intraocular pressure (IOP) is the only modifiable factor in the management of glaucoma.[1] This makes intraocular pressure measurements very important in the diagnosis and monitoring of response to treatment and disease progression. The Goldmann Applanation Tonometer (GAT) is the gold standard for IOP measurement,[2] however, various modalities and instruments of IOP measurement have emerged over time.[2,3]

Corresponding Author:
Ugochukwu A Eze
Depeartment of Ophthalmology, Federal Medical Centre, Asaba, Nigeria
ugorexeze@gmail.com

DOI: 10.61386/imj.v19i2.1070

The iCare tonometer uses the rebound technique to measure IOP, and its accuracy has been shown to be comparable to that of GAT.[3] It is a handheld device that has a probe and a solenoid. The probe is held at a distance of ~4–8 mm from the cornea, using the forehead as a support. When the button is pressed, an electrical pulse generates a magnetic field in the

solenoid, which repels the magnet and the probe. The probe moves towards, then rebounds off the cornea; this is used in the calculation of IOP. The software is programmed to take six measurements: the average IOP is then automatically calculated, excluding the highest and the lowest readings. After the sixth measurement, the letter P appears on the display, followed by the mean IOP reading.[4] The mean of three consecutive IOP readings was recorded. The iCare tonometer is quick and simple to use. It does not require anaesthesia or a slit lamp. It can be used for screening due to its ease of use. The risk of transmission of infection is also very low. The central corneal thickness (CCT) has been shown to affect IOP measurements using various methods.[2,5-7] This study aims to compare the IOP measurements before and after central corneal thickness correction using the iCare tonometer among eye camp patients prepared for cataract surgery. This will provide verifiable local data on the effect of central corneal thickness on IOP using the iCare tonometer.

Methods

Study population/area: The outreach records of all patients whose IOPs and CCTs were measured as part of a preoperative assessment conducted during a free cataract surgery camp conducted in October 2023 at Mother and Child Specialist Hospital, Owa Alero, Ika-North East LGA, Delta State.

Study design: This was an institution-based cross-sectional study.

Sampling Method: Non-probability sampling was used as data included all the IOP and CCT records available in the outreach register.

Patient Examination: Patients were screened based on a history of poor vision and entry visual acuity. Those with VA worse than 6/12 were identified and subjected to pen torch examination of the anterior segment under dim room illumination and direct ophthalmoscopy (Heine™ Herrsching, Germany). Those with suspected glaucoma were counselled and referred appropriately, as glaucoma management was beyond the scope of the outreach camp. Suspected or confirmed cataract cases had tonometry and pachymetry as part of their basic evaluations. The CCT values obtained from pachymetry were used to electronically estimate the corrected IOP values. Pharmacological mydriasis was then achieved with a mydriatic agent composed of tropicamide and phenylephrine (Apamide™ by Apassamy Associate, India). The degree of mydriasis was noted, and they were further examined with a direct ophthalmoscope. The data obtained were recorded both electronically and manually in a register from which retrospective data for this study were obtained.

Data Collection: Using the outreach register, variables of interest such as patients' age, sex, average central corneal thickness (CCT), intraocular pressure (IOP) using iCare Tonometer and corrected IOP value after correcting for corneal thickness were obtained.

Ethical Consideration: Ethical clearance was obtained from the human research and ethics committee of Federal Medical Centre, Asaba (NHREC/TR/FMCASABA-HREC/31/7/24/95). The study adhered to all the tenets of the Helsinki declaration.

Data Management and Analysis: The data obtained was entered into an Excel sheet and exported to an IBM SPSS software version 25 for analysis. Data was summarised as averages, proportions and percentages. Descriptive statistics were done and reported using tables and charts. While Inferential statistics were done using the t-Test for the CCTs and IOP values, and comparisons of means was conducted. Analysis of variance (ANOVA) was done for the difference in IOP. A level of significance was set at a p-value less than 0.05.

Results

A total of 146 eyes of 73 participants were enrolled in this study, and the majority were females who constituted 64.4% of the study sample, while males accounted for 35.6%. The mean age of respondents was 53.2 ± 13.72 years. Participants aged 41–50 years and those aged 61 years and above each constituted 31.5% of the total number of study participants. They both formed the majority of the participants.

Table 1 illustrates the age range and the genders of the participants. The mean age of the study participants was 53.2 (±13.72), and the male-to-female ratio of the participants was 1:1.8.

Table 1: The Age and Sex Distribution of the Respondents

Variable	Frequency	Percentage
Age		
Mean (±SD) = 53.2 (±13.72)		
Age Group		
<40yrs	10	13.7
41 - 50yrs	23	31.5
51 - 60yrs	17	23.3
>61yrs	23	31.5
Sex		
Female	47	64.4
Male	26	35.6

Table 2: The mean IOP; Pre and Post CCT Correction

Eye	Mean IOP at Baseline (SD)	Mean IOP after correction (SD)	Mean paired IOP difference (SD)	Paired T-Test	P-value
Right Eye	16.88 (5.73)	17.52 (6.33)	-0.64 (3.09)	-1.771	0.081
Left Eye	16.08 (6.06)	16.61 (6.29)	-0.53 (2.74)	-1.633	0.107

SD = Standard Deviation

Table 3: A Summary of the Descriptive Statistics of the CCT Values

Parameter	Right Eye (OD)	Left Eye (OS)
Number of eyes (n)	73	73
Mean (µm)	538.3	537.1
Standard deviation (µm)	40.5	52.7
Median (µm)	537	539
Minimum (µm)	444	323
Maximum (µm)	642	645

Table 2 and Figure 3 summarize the comparison of mean intraocular pressure (IOP) before and after correction for central corneal thickness (CCT). The mean baseline IOP was 16.9 ± 5.73 mmHg (range :9.0–37.0) (right eye) and 16.1 ± 6.06 mmHg (range: 8.0–51.0) (left eye). After correction, the mean IOP increased slightly to 17.5 ± 6.33 mmHg (range: 9.0–36.8) and 16.6 ± 6.29 mmHg (range: 6.2–51.8), respectively.

Although there was a slight increase in mean IOP values after correction, the paired t-tests showed no statistically significant difference between pre- and post-correction readings (Right eye: t = –1.771, p = 0.081; Left eye: t = –1.633, p = 0.107).

Figure 1 (a & b) are histograms which show the distribution of CCT for the right and left eyes respectively. The distribution in the right eye (fig.1a) shows a near normal distribution with peak cluster around 520–550µm with a slight tilt to wart the thicker cornea (>600µm). In the left eye (fig.1b), most of the values clustered between 500–580µm, there was a slightly wider dispersion compared to the right. An extremely low CCT of 323 was noted.

Figure 2 (a & b) are box plots which also show distribution of CCT for the right and left eyes respectively. The right eye (fig.2a) showed a tightly

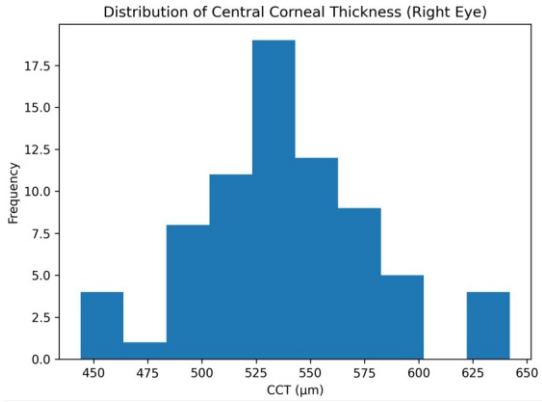

Figure 1a: The Distribution of Pachymetry Results in the Right Eye

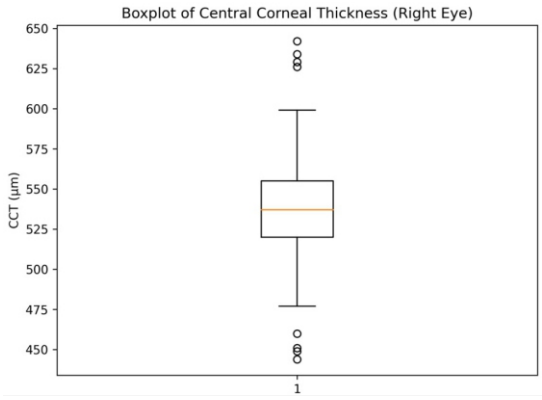

Figure 2a: A Boxplot of the CCT Results in the Right Eye

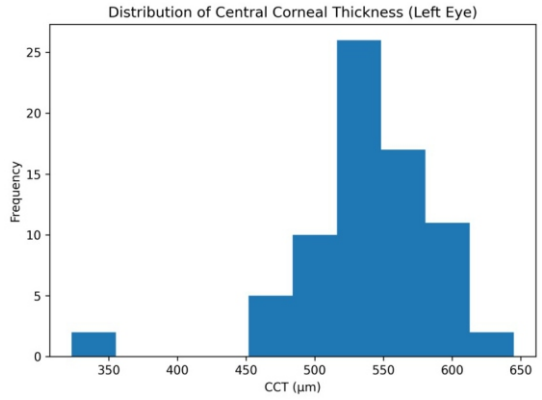

Figure 1b: The Distribution of Pachymetry Results in the Left Eye

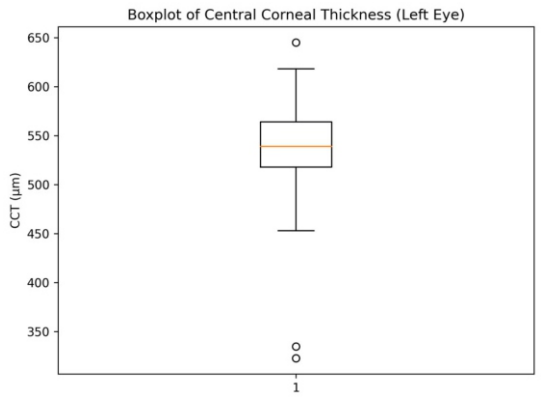

Figure 2b: A Boxplot of the CCT Results in the Right Eye

clustered interquartile range, a median CCT of 537µm showing that most values were within normal range with and few extreme values on both sides. The left eye (fig.2b) showed clear variability in the CCT value and clinical extremes. The median CCT was 539µm but there was a wider lower tail which corresponds to thinner corneas.

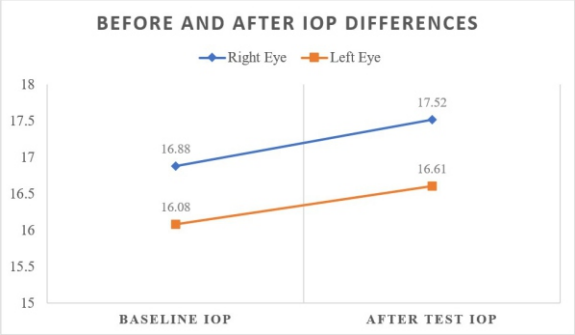

Figure 3: Mean IOP increase in both eyes

Table 3: Correlation between central corneal thickness (CCT) and change in IOP in both eyes

Variable	r (Correlation coefficient)	P-value	95% C.I.	
			Lower	Upper
Right Eye CCT x ΔIOP	-0.89	<0.001*	-0.98	-0.76
Left Eye CCT x ΔIOP	-0.69	<0.001*	-0.91	-0.52

*Significant

Table 3 shows a strong, statistically significant negative correlation between CCT and the change in IOP after correction for both eyes (Right eye: r = –0.89, p < 0.001; Left eye: r = –0.69, p < 0.001).

This finding implies that as CCT decreases, the corrected IOP tends to increase, and conversely, as CCT increases, the corrected IOP decreases. The stronger correlation in the right eye (r = –0.89) suggests a highly consistent relationship between corneal thickness and IOP change in that eye.

In Table 4, the effect of age and sex on IOP differences after CCT correction in the right and left eyes was examined using analysis of variance (ANOVA).

Age Group: There was a statistically significant difference in IOP change among the age groups (F = 4.156, p = 0.009). Respondents aged ≤40 years and 51–60 years recorded higher mean IOP differences (2.29 mmHg and 2.15 mmHg, respectively) compared to the 41–50 years and ≥61 years groups.

Sex: Although males had a slightly higher mean IOP

Table 4: The Analysis of Variance of the Effect of Age and Sex on the IOP Differences in Both Eyes after CCT Correction

Variable Right Eye	Mean	Standard Error	F-Test	P-Value
Age Group				
≤40yrs	2.29	0.90	4.156	0.009*
41 50yrs	-0.41	0.64		
51 – 60yrs	2.15	0.71		
≥61yrs	-0.18	0.59		
Sex				
Female	0.53	0.44	1.402	0.241
Male	1.39	0.57		
Variable Left Eye	**Mean IOP**	**Standard Error**	**F-Test**	**P-Value**
Age Group				
≤40yrs	1.78	0.81	3.554	0.019*
41 – 50yrs	-0.13	0.57		
51 60yrs	1.91	0.64		
≥61yrs	-0.28	0.54		
Sex				
Female	0.25	0.39	3.150	0.081
Male	1.39	0.51		

*Significant

difference (1.39 mmHg) compared to females in the right eye (0.53 mmHg), the difference was not statistically significant (F = 1.402, p = 0.241). Males again showed higher mean IOP diff erences (1.39 mmHg) compared to females in the left eye (0.25 mmHg), though this was not statistically significant (F = 3.150, p = 0.081).

Similar findings were presented for the left eye in table 4.

Age: The ANOVA revealed a significant age-related difference (F = 3.554, p = 0.019). Participants aged ≤40 years and 51–60 years had higher mean IOP differences (1.78 mmHg and 1.91 mmHg, respectively) than those in the 41–50 years and ≥61 years categories.

Discussion

There were more females than males in this study conducted in a rural free eye outreach program with a ratio of nearly 2:1 respectively (Table 1). Results from the reports of an earlier large mobile cataract camp in different parts of Delta state reflected a female preponderance to the ratio of 1.24:1.[11] This may have resulted from the known fact of better health-seeking behaviour of women, especially in communities where women are relatively free with equal opportunity to pursue their goals.[12,13] However, it may also suggest that men are more empowered economically and therefore are less likely to seek medical care from free eye healthcare camps than women. The results of this study also align with a similar study on CCT and IOP: Abah et al in Zaria,[14]

Nigeria, reported a F:M ratio of 3:1, while Lanza et al, and Eghosasere et al found the opposite.[9,15] The mean age of this study at 53.2years (SD+/-13.72) also correlated with a similar Nepalese community-based study, which reported 51.3years (SD+/-9.560.[16]

The mean baseline IOP recorded in this study was 16.9 ± 5.73 mmHg (right eye) and 16.1 ± 6.06 mmHg (left eye) (Table 2). After correction, the mean IOP increased to 17.5 ± 6.33 mmHg and 16.6 ± 6.29 mmHg, respectively (Figure 1). These values tally with findings from other studies in Nigeria: Mbatuegwu et al in Owerri reported 16.77 ± 4.37 mmHg and corrected mean IOP of 17.61 ± 4.57 mmHg,[17] Iyamu and Osuebeni, in Benin city posted 15.61 +/-2.69 mmHg;[18] while Abah et al in Zaria recorded mean IOP 16.8 ± 5.1mmHg.[14] The present study showed that when IOP was measured using the iCare tonometer, there was no statistically significant difference between the pre- and post-CCT corrected mean IOP values for both eyes, despite the minor increase. Several studies have corroborated this finding using various modalities of IOP measurement, including GAT, Perkins and Air puff tonometers.[8,19-21] However, some studies have concluded that iCare overestimated IOP when compared to applanation tonometers, with a mean of 2.90mmHg higher.[20] Although differences in the overall mean IOP values obtained by GAT and iCare were not statistically significant, Eletu and co-workers in their study, in which patients were classified into 3 IOP groups, found that iCare significantly underestimated IOP at high IOP levels compared with GAT.[21,22] Unfortunately, the extent of this could not be explored in this study as the IOP results were not compared with those of GAT.

The present study found a strong, statistically significant negative correlation between CCT and the change in IOP after correction for both eyes (Right eye: $r = -0.89$, $p < 0.001$; Left eye: $r = -0.69$, $p < 0.001$) (Table 3). This means that as CCT thins, the corrected IOP tends to increase, and conversely, as CCT thickens, the corrected IOP decreases. Several authors have published studies supporting this finding across different ethnicities.[17,23] This result cuts across 24 non-glaucomatous and glaucomatous eyes. Similarly, among myopic eyes, the same finding was established of a strong negative correlation between CCT and corrected-IOP as reported by Pandjaitan and Ariesti in Indonesia.25 Nonetheless, a very weak association between CCT and corrected-IOP was reported by Smedowski et al.[8]

The difference in mean IOP between the various age groups was found to be statistically significant in this study (Table 4). However, this was particularly true only for participants aged ≤40 years and 51–60 years who had higher mean IOP differences (1.78 mmHg and 1.91 mmHg, respectively) than those in the 41–50 years and ≥61 years categories. The reason for this was not well understood in this study. Conflicting results have been reported by different authors, whereby some found a positive correlation while others reported a negative association between age and IOP.[26,27] The effect of confounders (systemic blood pressure) in the Blue Mountains Eye Study possibly explains the lack of association between increasing IOP with increasing age,[27] however, this was not the case for the Tehran Eye Study which reported an association between increasing age and increasing IOP, irrespective of sex, the systolic blood pressure and the presence of diabetes.[26] This fluctuation of IOP in different age groups was corroborated by Ejimadu et al in Port Harcourt, where they reported a weak positive correlation between IOP and age.[28] In contrast, a population-based study in Turkey noted a negative correlation between IOP and age. However, the disparity may be explained by the use of baseline non-CCT-corrected IOP in the latter study.

Public health and policy implications: The results of this study have implications for glaucoma screening and eyecare delivery in rural and resource constrained settings like sub-Saharan Africa. There was no significant difference in the mean IOP before and after correction with CCT. However, the negative correlation between CCT and corrected IOP strongly suggests a possibility of under estimation or over estimation of IOP in people with thinner or thicker corneas, respectively. This is of particular importance in outreach camps such as this or mass screening programs in low resource settings, such as the National Blindness and Visual Impairment Survey. In the national survey, there was population-based glaucoma screening.[29] However, there was no data on CCT in the population that categorised glaucoma severity based on regions. This would have provided insight if the CCT was used to correct IOP values obtained, allowing for further analysis of CCT by zone and glaucoma severity. Though IOP is not the only criterion needed for glaucoma diagnosis, incorporating CCT measurements could improve the clinical interpretation of IOP results, thus enhance the likelihood of early identification of individuals at higher risk, and potentially reduce unnecessary

referrals or inappropriate risk categorisation.

Our results also have implications for policy development and planning of glaucoma screening and eye care programs at the community level. This emphasises the need to integrate pachymetry and tonometry using a portable instrument at outreach camps and screening programs. It behoves the eyecare policy makers, especially in Nigeria and sub-Saharan Africa, to find cost-effective ways to integrate pachymetry and tonometry into other community eye health programs as a more holistic intervention aimed at reducing avoidable glaucoma induced blindness.

Strengths and limitations of this study: In line with the objectives, the study highlighted baseline and corrected IOP for people who accessed eyecare at an outreach camp in a particular locality. Also, it clearly shows a negative correlation between CCT and IOP in the population. However, it is not without its own limitations, especially from a methodological standpoint. The biodata obtained did not include the ethnic backgrounds of the patients. This was actually collected in the general outreach data, but could not be linked with that of the subset who were considered for cataract surgery. The cross-sectional design of this study does not clearly establish a causal relationship between CCT and Change in IOP. A better design would have been that of a longitudinal study, which assesses temporal differences in clinical outcome. Also, the non-probability sampling technique used to extract data from the records of every patient who was being considered for a cataract surgery during the rural/mobile outreach camp limited the generalizability of our results in a country like Nigeria with a diverse population demography, such as urban dwellers and those without cataracts. Furthermore, the correction of the IOP for CCT did not consider other biomedical properties, such as corneal elasticity and hysteresis, which can influence the IOP values independently. Finally, there was no stratification of IOP based on severity and glaucoma status. This may have limited the ability to infer the effect of CCT on IOP values in the higher ranges, which may be needed for critical decision making under certain circumstances. The small sample size of the population is another potential limitation.

Conclusion

This study aimed to compare IOP measurements before and after central corneal thickness correction using the iCare tonometer among patients being prepared for cataract surgery in an outreach camp. There was no significant difference between the mean baseline IOP values and those obtained after correction for the CCT. However, there was a negative correlation between CCT and the corrected IOP values. Relying on IOP values alone has a high possibility of false IOP values, which may result in underestimation or overestimation of IOP, which may lead to missed cases of glaucoma or needless glaucoma referrals. This informs the need to integrate pachymetry and tonometry in ophthalmology clinics and glaucoma screening programs.

Conflict of Interest: Authors declare no conflict of interest

References

1. Almarzouki N. Impact of environmental factors on glaucoma progression: a systematic review. Clin Ophthalmol. 2024;18:2705–2720.
2. Lanza M, Rinaldi M, Carnevale UA, Di Staso S, Sconocchia MB, Costagliola C. Analysis of differences in intraocular pressure evaluation performed with contact and non-contact devices. BMC Ophthalmol. 2018;18:1–6.
3. Smedowski A, Weglarz B, Tarnawska D, Kaarniranta K, Wylegala E. Comparison of three intraocular pressure measurement methods including biomechanical properties of the cornea. Invest Ophthalmol Vis Sci. 2014;55(2):666–673.
4. Salvetat ML, Zeppieri M, Miani F, Tosoni C, Parisi L, Brusini P. Comparison of iCare tonometer and Goldmann applanation tonometry in normal corneas and in eyes with automated lamellar and penetrating keratoplasty. Eye (Lond). 2011;25(5):642–650.
5. Ko YC, Liu CJ, Hsu WM. Varying effects of corneal thickness on intraocular pressure measurements with different tonometers. Eye (Lond). 2005;19:327–332.
6. Ahmed MAA, Abdelhalim AS. Corrected intraocular pressure variability with central corneal thickness measurement. Clin Ophthalmol. 2020;14:4501–4506.
7. Doughty MJ, Zaman ML. Human corneal thickness and its impact on intraocular pressure measures: a review and meta-analysis approach. Surv Ophthalmol. 2000;44(5):367–408.
8. Smedowski A, Weglarz B, Tarnawska D, Kaarniranta K, Wylegala E. Comparison of three intraocular pressure measurement methods

including biomechanical properties of the cornea. Invest Ophthalmol Vis Sci. 2014;55(2):666–673.
9. Lanza M, Rinaldi M, Carnevale UA, Di Staso S, Sconocchia MB, Costagliola C. Analysis of differences in intraocular pressure evaluation performed with contact and non-contact devices. BMC Ophthalmol. 2018;18(1).
10. Salvetat ML, Zeppieri M, Miani F, Tosoni C, Parisi L, Brusini P. Comparison of iCare tonometer and Goldmann applanation tonometry in normal corneas and in eyes with automated lamellar and penetrating keratoplasty. Eye (Lond). 2011;25(5):642–650.
11. Ogbedo EN, Eze UA, Alen HA, Akinyemi AO, Salimonu AA. Ocular biometry parameters in mobile cataract surgery camp: a large-scale report from Nigeria. Med Hypotheses Discov Innov Optom. 2024;5(2):51–56.
12. Obilor NM. Gender and health-seeking behavior in rural Nigeria. UNIZIK J Gend Res. 2023:50–61.
13. Oluwasayo BO, Adesola AO. Relationship between health-seeking behaviour and health-related quality of life of female market traders in Ile-Ife, Southwest Nigeria. Saudi J Nurs Health Care. 2021;4(12):482–488.
14. Abah ER, Mahmud-Ajeigbe AF, Sharief S, Chinda D, Jiya PY, Bob-Egbe O. Central corneal thickness and intraocular pressure of adult Nigerians: an assessment of Zaria community. West Afr J Med. 2018;35(3):158–161.
15. Iyamu E, Kio F, Idu F, Osedeme B. Relationship between central corneal thickness and intraocular pressure in adult Nigerians without glaucoma. Sierra Leone J Biomed Res. 2010;2(2):95–102.
16. Thapa SS, Paudyal I, Khanal S, Paudel N, Mansberger SL, van Rens GH. Central corneal thickness and intraocular pressure in a Nepalese population: the Bhaktapur Glaucoma Study. J Glaucoma. 2012;21(7).
17. Mbatuegwu A, Achigbu EO, Mbatuegwu CU, Nkwogu FU, Omoti AE. Exploring the relationship between central corneal thickness and intraocular pressure among nonglaucoma patients in southeast Nigeria. Niger J Ophthalmol. 2021;29(1):17.
18. Iyamu E, Osuobeni E. Age, gender, corneal diameter, corneal curvature and central corneal thickness in Nigerians with normal intraocular pressure. J Optom. 2012;5(2):87–97.
19. Ademola-Popoola DS, Odi AF, Akande TM. Comparison of intraocular pressure readings using rebound iCare tonometer and Perkins applanation tonometer in an African population. J West Afr Coll Surg. 2014;4(1):17–30.
20. Siew LT, Lik TL, Chor YO, Md MR. Comparison of iCare rebound tonometer and Perkins applanation tonometer in community eye screening. Asia Pac J Ophthalmol. 2019;8(3):229–232.
21. Eletu SS, Balarabe AH, Monsudi KF, Lawal I, Gero RN. Is iCare rebound tonometry as accurate as Goldmann applanation tonometry in the measurement of intraocular pressure? Trans Ophthalmol Soc Niger. 2024;9(1).
22. Salvetat ML, Zeppieri M, Miani F, Tosoni C, Parisi L, Brusini P. Comparison of iCare tonometer and Goldmann applanation tonometry in normal corneas and in eyes with automated lamellar and penetrating keratoplasty. Eye (Lond). 2011;25(5):642-650.
23. Ahmed MAA, Abdelhalim AS. Corrected intraocular pressure variability with central corneal thickness measurement. Clin Ophthalmol. 2020;14:4501–4506.
24. Enesi I, Ndife TI, Kyari F, Odi A. Central corneal thickness and its association with the severity of primary open-angle glaucoma. J West Afr Coll Surg. 2025;15(2):146–156.
25. Pandjaitan HW, Ariesti A. Correlation of central corneal thickness to actual intraocular pressure in myopic patients. Ophthalmologica Indones. 2025;51(1).
26. Hashemi H, Kashi AH, Fotouhi A, Mohammad K. Distribution of intraocular pressure in healthy Iranians: the Tehran Eye Study. Br J Ophthalmol. 2005;89:652–657.
27. Rochtchina E, Mitchell P, Wang JJ. Relationship between age and intraocular pressure: the Blue Mountains Eye Study. Clin Exp Ophthalmol. 2002;30:173–175.
28. Ejimadu CS, Chinawa NE, Fiebai B. Age- and gender-related changes in intraocular pressure among patients attending a peripheral eye clinic in Port Harcourt, Nigeria. Austin J Clin Ophthalmol. 2018;5(2):1092.
29. Blindness and Visual Impairment Study Group. A population-based survey of the prevalence and types of glaucoma in Nigeria: results from the Nigeria National Blindness and Visual Impairment Survey. BMC Ophthalmol. 2015;15:176.