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Research Article

Central Corneal Thickness and Intraocular Pressure Changes in the Third Trimester of Pregnancy: A Comparative Study in a Cameroonian Population

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Abstract

Objective: To determine the variations in Central Corneal Thickness (CCT) and Intraocular Pressure (IOP) among third- trimester pregnant women compared to non-pregnant women in Douala, Cameroon.

Methods: A comparative study was conducted at the Douala General Hospital for 4 months. A total of 106 women (53 pregnant in their third trimester and 53 age-matched non-pregnant controls) were enrolled. CCT was measured using anterior segment optical coherence tomography (Topcon 3D OCT-1 Maestro) and IOP was measured using Goldmann applanation tonometry. Data were analyzed using SPSS version 26 and Student t-test with statistical significance set at $p<0.05$.

Results: The mean age of participants was 30 ± 5.5 years. The mean CCT was significantly greater in pregnant women (531.2 ± 35.2 µm) compared to non-pregnant women (514.3 ± 29.3 µm), representing a mean increase of 16.9 µm (3.2%, $p<0.01$). Concurrently, mean IOP was significantly lower in the pregnant group (11.5 ± 2.5 mmHg) than in the control group (13.6 ± 2.3 mmHg), a reduction of 2.1 mmHg (15.5%, $p=0.04$). A significant proportion of pregnant women (54.7%) exhibited a reduction in distance visual acuity. Awareness of ocular changes during pregnancy was very low (7.6%).

Conclusion: Third-trimester pregnancy is associated with a significant increase in CCT and a decrease in IOP among Cameroonian women, consistent with litterature findings in other racial groups. These physiological changes can lead to transient refractive errors and adjustment in anti-glaucomatous drugs during pregnancy. It also highlights the critical need to integrate patient education on these ocular changes into routine antenatal care in Cameroon.

Keywords: Central Corneal Thickness; Pregnancy; Intraocular Pressure; Cornea Changes; Douala; Cameroon

Introduction

Pregnancy is a dynamic physiological state characterized by profound hormonal and metabolic changes that affect nearly every organ system, including the eye [1,2]. Ocular changes range from benign, self-limiting physiological adaptations to sight-threatening pathological conditions [3,4]. Among the most documented physiological changes are increased Central Corneal Thickness (CCT), decreased corneal sensitivity, changes in corneal curvature and a reduction in Intraocular Pressure (IOP) [4,5].

The increase in CCT is primarily attributed to fluid retention and corneal subedema influenced by hormonal fluctuations, particularly estrogen and progesterone [3-5]. During pregnancy, estrogen-induced upregulation of the renin-aldosterone system resulting in systemic water retention, even in the cornea. This change can induce cornea subedema, a transient myopic shift and decreased visual acuity for distance, which typically resolves postpartum [5]. The decrease in IOP is thought to be due to increased uveoscleral outflow facilitated by hormonal changes and reduced scleral rigidity [5].

While these changes have been studied in Caucasian, Asian and some African populations data specific to Central African and particularly Cameroonian populations, are absent. This is a significant gap, as racial differences in baseline corneal parameters are well-established; individuals of African descent have been shown to have thinner corneas on average compared to Caucasians [5-12]. It is unknown if the degree of change during pregnancy is consistent across races.

This study aimed to bridge this knowledge gap by investigating the variations in CCT and IOP among third-trimester pregnant women compared to non-pregnant controls in Douala, Cameroon.

Methodology

Study Design

A cross-sectional comparative study was conducted at the Douala General Hospital for 4 months. This hospital is a major referral and teaching center with Ophthalmology, Gynecology and Obstetrics units.

Participants/Subjects

We recruited Pregnant and non-pregnant women consulting in our study site during the study duration. We included women with a confirmed pregnancy and in their third trimester. We excluded patients who refused to participate to the study, pregnancy gestational age below the third trimester, women with pre-existing ocular disease (glaucoma, keratoconus, corneal dystrophy, eg) and systemic comorbidities known to affect the eye (e.g., diabetes mellitus, hypertension). Groups were matched by age, occupation and from the same outpatient facility during the same study period.

Data Collection

After ethical clearance, administrative approvals and obtaining informed consent, participants underwent a structured one to one interview to collect socio-demographic (age, occupation ,level of education, marital status) , clinical history (gestational age obtained from the last menstrual period and verified using ultrasound, history of ocular disease, history of co-existing disease, family history of ocular disease) and clinical data (visual acuity, slit lamp examination, IOP, central corneal thickness assessment). Far visual acuity was measured with Snellen chart and graded with Logmar chart. We assessed near visual acuity with Parinaud test. Then we proceed to a comprehensive ophthalmology examination: visual acuity testing, a slit-lamp examination (to rule out anterior segment pathology), Intraocular Pressure (IOP) measurement with a Goldmann applanation tonometer between 9 am and 12 pm to avoid diurnal variation, eye fundus examination, Central Corneal Thickness (CCT) measurement using the pachymetry module of the Topcon 3D OCT- 1 Maestro spectral-domain Optical Coherence Tomography (OCT) machine. We performed radial scans and accepted only images with a signal strength >60.

Data Analysis

Data were analyzed using SPSS software (version 26.0). Continuous variables were expressed as means ± Standard Deviation (SD) and categorical variables as frequencies and percentages. The Student's t-test was used to compare means between groups. A p-value of less than 0.05 was considered statistically significant.

Results

We recruited a total of 106 women (53 pregnant and 53 non-pregnant). The mean age of the pregnant participants in our study was 30 ± 5,5 years with most of these participants been between 30-39 years (50,4%). The mean age of the nonpregnant participants in our study was 31 ± 6,3 years with the majority of these participants been between 30-39 years (37,74%). Multiparous women were the most represented in the 2 groups (50.9 % vs 54.7 %). Tertiary level of education were mostly represented (74.5%). All these data are described in Table 1 below.

		Non-Pregnant		Pregnant	
Characteristics		**Effective(n)**	**Percentage (%)**	**Effective(n)**	**Percentage (%)**
Age Group	15-20	7	13,2	2	3,8
	21-30	14	26,4	21	39,6
	31-40	20	37,7	27	50,9
	41-49	12	22,6	3	5,7
Marital Status	Married	27	50,9	27	50,9
	Single	19	35,9	26	49,1
	Divorced	3	5,7	0	0
	Widow	4	7,6	0	0
Employment	Student	14	26,4	7	13,2
	Employed	34	64.2	38	71.7
	Unemployed	5	9,4	8	15,1
Educational Level	Tertiary	32	60,3	43	81,1
	Secondary	18	33,9	10	18,9
	Primary	2	3,7	0	0
	Uneducated	1	1,8	0	0
Parity	Nulliparous	11	20,8	0	0
	Primiparous	15	28.3	24	45.3
	Multiparous	27	50.9	29	54.7

Table 1: Sociodemographic characteristics of participants.

Amongst the pregnant women, 5 complained of visual symptoms: blurred vision (n=4) and diplopia (n=1) Amongst pregnant participants, 29 (54.7%) had a reduction in far visual acuity compared to 12 (22.6%) amongst their non-pregnant counterparts. Far visual acuity amongst pregnant participants ranged from 1.58 to 0 LogMAR with median value been 0.05 LogMAR. Amongst non-pregnant participantit ranged from 1.58 to 0 LogMAR with median value been 0 LogMAR.

In our study, the values for CCT amongst pregnant women ranged between 427μm - 606μm. The mean CCT value for both eyes in our study was found to be 531,1 ± 32,4μm for the right eye and 530,2 ± 28.1μm for the left eye amongst pregnant women. The mean CCT amongst pregnant women for both eyes was 531,2 ± 35,2μm. CCT values amongst nonpregnant subjects ranged from 415 - 606μm, with mean CCT value been 514,6 ± 32,6μm for the right eye and 514,1 ± 26.4 for the left eye. The mean CCT amongst non-pregnant women for both eyes was 514.3 ± 29.3μm. There was therefore a 16,9μm difference amongst pregnant participants compared to non-pregnant participants. Hence, a 3,2% increase in CCT was observed during third trimester pregnancy. The mean CCT was significantly greater in pregnant women (531.2 ± 35.2 μm) compared to non-pregnant women (514.3 ± 29.3μm), a difference of 16.9 μm (3.2%, $p<0.01$). The mean IOP was significantly lower in the pregnant group (11.5 ± 2.5 mmHg) than in the control group (13.6 ± 2.3 mmHg), with a difference of 2.1 mmHg (15.5%, $p=0.04$) (Table 1). The Table 2 summarize the mean visual acuity, IOP and CCT for both eyes amongst the two groups of participants.

	Pregnant (n=53)	**Non-Pregnant (n=53)**	**P-value**
Far Visual acuity (LogMar)	1.58-0	1.58-0	0.34
Near Visual Acuity (LogMar)	0-0.1	0-0.4	0.45
IOP Range (mmHg)	9-17	9-21	0.04
IOP Mean value (mmHg)	11.5+/-2.5	13.6+/2.3	0.04
CCT Range (μm)	427-606	415-606	0.009
CCT Mean value (μm)	531.2+/-35	514.6+/-32	0.008
IOP: Intraocular Pressure; CCT: Central Corneal Thickness			

Table 2: Repartition of Far visual acuity, Intraocular pressure and Central corneal thickness amongst groups.

Awareness of ocular changes during pregnancy was very low among all participants. Only 8 out of 106 women (7.6%) were aware that such changes could occur. When asked which changes they were aware of, the most common responses were dry eyes (62,5%) and blurred vision (37,5%). The primary sources of information were the internet (75%) and healthcare providers (25%).

Discussion

In our study, participants were aged 15 to 46 years, which is comparable to the results reported in similar studies from Nigeria and Turkey [4-6]. This similarity can be attributed to the fact that these investigations, like ours, focused exclusively on women of reproductive age.

The mean Visual Acuity (VA) among third-trimester women was 0.1 LogMAR, compared to 0.05 LogMAR in non-pregnant women. This indicates a relative reduction in far visual acuity during pregnancy, whereas short-distance acuity showed only minimal variation between groups. Our findings are consistent with those of Nkiru, et al., who also reported no significant difference in near vision among pregnant women in the third trimester [4]. Blurred vision when viewing the smallest characters on the Snellen's chart was the most common symptom, reported by 29 of 53 pregnant participants (54.7%) compared with 12 of 53 (22.6%) non-pregnant participants. This prevalence closely reflects the 40% reported by Nkiru, et al. [4]. The mechanism is likely related to corneal thickening during pregnancy, leading to subtle refractive changes that predominantly affect distance vision. Notably, only 9.4% of pregnant participants self-reported visual problems, despite more than half demonstrating reduced distance VA on testing. This discrepancy suggests that many women adapt to mild visual blurring or misattribute it to general fatigue. Clinicians should therefore be proactive in assessing visual function during pregnancy and providing appropriate reassurance.

Central Corneal Thickness (CCT) was increased by 3.2% in pregnant women compared to non-pregnant controls, with mean values of 531.2 μm and 514.3 μm, respectively. This degree of change is strikingly consistent with reports from diverse populations: 3.19% in Nigeria, 3.1% in Turkey and 3.0% in the United States [5,11,13]. The reproducibility of this finding across different ethnic backgrounds indicates that CCT elevation in pregnancy is a robust physiological response rather than an ethnic or environmental variation. Importantly, our data confirm that pregnancy-induced CCT changes are systematic, predictable and clinically relevant [1,3,7].

We observed an IOP decrease of 2.1 mmHg in the third trimester of pregnancy. This change is clinically meaningful in pregnant patients with glaucoma or ocular hypertension, where choices of treatment protocols are often reduced [14]. Such a decrease may mask disease progression, lead clinicians to underestimate glaucomatous risk or prompt unnecessary alterations in therapy if the physiological basis of the IOP decline is unknown. Conversely, in patients with borderline pressures, this pregnancy-related decrease may delay the need for medical or surgical intervention. Elsewhere in glaucoma with normal IOP, it can motivates interruption of treatment in the third trimester until delivery to ensure the safety of the fetus. Careful longitudinal monitoring, ideally supplemented with structural and functional assessments, is therefore critical when managing pregnant patients with pre-existing glaucoma [15].

These findings have several key implications. First, the increase in CCT must be carefully considered in Intraocular Pressure measurement and interpretation. Thicker corneas tend to overestimate IOP readings on applanation tonometry [16,17]. However, in our study, IOP decreased by 15.5%, consistent with hormonal influences such as progesterone-mediated enhancement of aqueous outflow and reduced episcleral venous pressure [1,3]. Thus, failure to account for pregnancy-related CCT changes may lead to underestimation of the true IOP decrease or to misclassification of glaucoma severity in pregnant patients. Second, the consistent magnitude of CCT highlights the need to delay the prescription of corrective glasses after delivery. Third, its emphasizes the importance of adjusting corneal biomechanics in refractive surgery planning. Elective refractive procedures should ideally be postponed until after delivery, when CCT values normalize, to avoid inaccurate surgical planning and unpredictable outcomes. These findings highlight the need for clinicians to maintain vigilance in conditions where corneal thickness plays a role in risk assessment and management particularly in glaucoma, keratoconus and refractive errors. The mean CCT among non-pregnant participants in our study was lower than values previously reported in Cameroon by Eballe, et al. [11]. It may be explained by the methodological differences, as Eballe , et al., used ultrasound pachymetry-a technique that can yield slightly different measurements and a wider age range (5-75 years) than our study (15-49 years) [14].

Knowledge of pregnancy-related ocular changes was markedly low, with only 7.5% of participants aware of potential visual disturbances, compared to 27.5% in the study by Nwachukwu, et al. [5]. This profound lack of awareness points to a gap in antenatal education. Incorporating information on expected ocular changes into routine antenatal counselling could both reassure patients and prevent unnecessary ophthalmological consultations.

Limitations

The study was conducted in a single urban center. We didn't compare the intraocular pressure and central corneal thickness changes in other pregnancy trimesters and post-partum within the same individuals.

Conclusion

Our study confirms that third-trimester pregnancy in Cameroonian women is associated with a significant increase in central corneal thickness and a decrease in intraocular pressure, consistent with global findings. These are relevant datas that assess the importance of education about common ocular change into routine antenatal counselling and adjustment of anti-glaucomatous treatment for pregnant patients in their third trimester. Future longitudinal studies are needed to measure CCT and IOP changes across all trimesters and postpartum in African populations.

Conflict of Interest

The author declares no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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Informed Consent Statement

Informed consent was obtained from the participant involved in this study.

Authors' Contributions

All authors have contributed equally to this work and have reviewed and approved the final manuscript for publication.

Consent for Publication

Informed consent for publication was obtained from the patient involved in this case report, as documented in the manuscript.

Ethical Statement

This project was exempt from IRB review as it did not qualify as human subject research under federal regulations.

References

1. Agrawal N, Agarwal LT, Lavaju P, Chaudhary SK. Physiological ocular changes in the different trimesters of pregnancy. Nepal J Ophthalmol. 2018;10(1):16-22.
2. Soma-Pillay P, Catherine NP, Tolppanen H, Mebazaa A. Physiological changes in pregnancy. Cardiovasc J Afr. 2016;27(2):89-94.
3. Pei X, Li Z. Pregnancy and ocular health: physiological changes and pathological challenges. Curr Ophthalmol Rep. 2025;13(4).
4. Nkiru ZN, Obiekwe O, Lilian O, Daniel CN, Uchenna IN, Rich U. Visual acuity and ocular changes among pregnant women in Enugu, Southeast Nigeria. J Fam Med Prim Care. 2016;5(3):646-51.
5. Nwachukwu N, Okoye O, Okoye O, Eze C, Nwachukwu D, Nwagha U, et al. Relationship between intraocular pressure and corneal biomechanical properties among pregnant women in a tertiary hospital in Nigeria. Niger J Clin Pract. 2020;23(1):43-9.
6. Sen E, Onaran Y, Nalcacioglu-Yuksekkaya P, Elgin U, Ozturk F. Corneal biomechanical properties during pregnancy. Eur J

Ophthalmol. 2014;24(3):314-9.
7. Wang C, Li AL, Pang Y, Lei YQ, Yu L. Changes in intraocular pressure and central corneal thickness during pregnancy: A systematic review and meta-analysis. Int J Ophthalmol. 2017;10(10):1573-9.
8. Yang Y, Ye J, Ng TK. Changes in corneal biomechanics during pregnancy in Chinese healthy females. Eur J Ophthalmol. 2020;31(2):361-6.
9. Muthu Krishnan V, Jayalatha K, Vijayakumar C. Correlation of central corneal thickness and keratometry with refraction and axial length: A prospective analytic study. Cureus. 2019;11(12):e3917.
10. La Rosa FA, Girard LJ, Knighton RW. Central corneal thickness of Caucasians and African Americans in glaucomatous and nonglaucomatous populations. Arch Ophthalmol. 2001;119(1):23-7.
11. Eballe AO, Epee E, Koki G, Bella AL, Leundji H, Mvogo CE. Central corneal thickness and intraocular pressure in the Cameroonian nonglaucomatous population. Clin Ophthalmol. 2010;4:717-24.
12. Bonnemaijer PWM, Cook C, Nag A, Hammond CJ, van Duijn CM, Lemij HG, et al. Genetic African ancestry is associated with central corneal thickness and intraocular pressure in primary open-angle glaucoma. Invest Ophthalmol Vis Sci. 2017;58(7):3172-80.
13. Efe YK, Ugurbas SC, Alpay A, Ugurbas SH. The course of corneal and intraocular pressure changes during pregnancy. Can J Ophthalmol. 2012;47(2):150-4.
14. Shakha, Gupta S, Panigrahi A, Singh A, Gupta V. Outcomes of pregnancy after exposure to antiglaucoma drugs. Indian J Ophthalmol. 2024;72(4):599-601.
15. Salvetat ML, Toro MD, Pellegrini F, Scollo P, Malaguarnera R, Musa M, et al. Advancing glaucoma treatment during pregnancy and breastfeeding: Contemporary management strategies and prospective therapeutic developments. Biomedicines. 2024;12(12):2685.
16. Clement CI, Parker DG, Goldberg I. Intraocular pressure measurement in a patient with a thin, thick or abnormal cornea. Open Ophthalmol J. 2016;10:35-43.
17. Babbar S, Martel M, Martel J. Comparison of central corneal thickness by ultrasound pachymetry, optical coherence tomography and specular microscopy. New Front Ophthalmol. 2017;3(3).