Original Article

Visual acuity and refractive changes among pregnant women in Enugu, Southeast Nigeria

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Abstract

Introduction: Pregnancy has been associated with changes in the eye which could be physiological, pathological, or exacerbation of pre-existing ocular conditions. Visual acuity (VA) and refractive error (RE) changes are part of the physiological changes that may occur during pregnancy. **Objective:** The objective of the present study was to investigate changes in VA and RE across two different trimesters and six weeks postpartum among pregnant women in Enugu, southeast, Nigeria. **Materials and Methods:** A longitudinal study was adopted and pregnant women in their second trimester attending antenatal clinic at University of Nigeria Teaching Hospital, Ituku-Ozalla, Enugu were consecutively recruited. A questionnaire was used to obtain information on their sociodemographic and clinical characteristics. Visual acuity was measured and refractive error monitored in second and third trimesters and 6 weeks after delivery. **Results:** The mean age of women was 30.81 (±5.49) years and a majority of them were civil servants. There was a worsening of VA for distance in more women in the third trimesters compared to the second trimester. There was no significant change in VA for near throughout the study period. There was an increased myopic shift in more pregnant women during the third trimester (40; 40.0%) compared to second trimester (36; 36.0%). The most common refractive error found among the women was simple myopia. These changes resolved six weeks postpartum. **Conclusion:** Pregnancy worsened VA for distance and the most common RE in pregnant women was simple myopia. However, these changes resolved during the postpartum period.

Keywords: Longitudinal study, pregnancy, refractive errors, visual acuity

Introduction

The increased physical and metabolic demands of pregnancy can cause changes in many systems of the body including the eye.[1] Blurring of vision is one of the ocular complaints during pregnancy; this could result from visual acuity (VA) and refractive error (RE) changes.[2,3] The interplay between hormonal, metabolic, hemodynamic, vascular, and immunological factors that occur during pregnancy has been reported to cause these changes which are mainly physiological.[4-6] Their effect could be transient lasting only through the stages of pregnancy.[4,5]

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Other studies have suggested the possibility of these changes being pathological resulting from underlying systemic conditions such as diabetes and Pre-eclampsia.[7,8] As these changes manifest during pregnancy, health care providers who provide services to these women should be able to differentiate between the physiological and pathological changes, and therefore, know when to offer medical interventions and when to advise them appropriately to allay anxiety.

There is paucity of data on VA and refractive changes across different trimesters of pregnancy in our environment. The possibility that pregnant women with normal physiological changes could erroneously be given spectacle corrections justifies

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the need for this present study. The study sought to determine the nature and course of VA and refractive changes in pregnancy to provide baseline data for better eye care for pregnant women in our environment.

Materials and Methods

Background information

The study adopted a longitudinal design; pregnant women attending the antenatal clinic of University of Nigeria Teaching Hospital (UNTH), Enugu, southeast, Nigeria, were recruited. This hospital is one of the first-generation tertiary health facilities in Nigeria; it provides tertiary health care services in all major subspecialties including ophthalmology and obstetrics and gynecology. The obstetrics and gynecology department is staffed by consultants, trainee residents, and nurses. It provides inpatient and outpatient services. The enrolled pregnant women were evaluated in their second and third trimester and followed up to 6 weeks postpartum when physiological changes must have reverted to their pre-pregnancy level, thus, they acted as their control.

Ethics and informed consent

Prior to study commencement, ethical clearance compliant with 1964 Helsinki Declaration on human studies (revised in 2008) was obtained from the Health and Medical Research Ethics Committee of the University of Nigeria Teaching Hospital, Ituku Ozalla, Enugu, Nigeria. The subjects were adequately briefed about the study and given an informed consent form (attached) which consisted of a brief introduction of the study, voluntary nature of participation, study procedure, confidentiality, risks/benefits, and feedback before participating in the study. They were made to understand that voluntary withdrawal from the exercise was permissible at any stage of the study and attracted no prejudice on their desired management.

Inclusion criteria

Normal pregnant women with or without refractive errors with a confirmed ultrasonographic evidence of pregnancy who gave their consent were included in the study.

Exclusion criteria

Pregnant women with systemic comorbidities such as diabetes and hypertension were excluded. Pregnant women with ocular pathologies such as glaucoma, previous ocular surgeries such as cornea refractive surgeries were also excluded. Those who refused to participate in the study were excluded.

Questionnaire administration

Information about sociodemographic, clinical characteristics, and ocular history of participants was obtained using pretested structured questionnaires prepared *de novo* by the principal investigator and validated by the two most senior members of the research team after a pilot study at another public health care facility in Enugu metropolis. Informal approach within the privacy of an examination room was adopted to encourage full participation without embarrassing the subjects.

Study definitions

Visual acuity

This is defined as a measure of the ability of the eye to distinguish shapes and the details of objects at a given distance.[9] This was determined using the Snellen's chart and the LogMAR near acuity charts.

Refractive error

Refractive error was defined as VA of 6/9 or worse as evidenced by one drop in line of the Snellen's chart.[10]

Visual acuity assessment

Distance visual acuity

In a well illuminated room, the patient was positioned at a distance of 6 m from the chart. Unaided VA was measured for the right eye and then the left eye in that order using the Snellen's chart and tumbling E chart for illiterate patients. This was followed with a pinhole test in those with VA less than 6/9.

Near visual acuity

The near visual acuity was carried out on each patient using LogMAR near acuity chart at a distance of 40 cm. Testing condition was standardized by assuring that the room had enough ambient lighting and a stand lamp. The examiner occluded the subjects' eye that was not being tested first to assess monocular acuity. The near acuity card was then positioned at 40 cm test distance from the bridge of the nose. The VA was retested with the patients' existing refraction where applicable and all obtained data recorded. If the patient read all the letters in a row of the acuity chart, that line was taken as the actual VA. This procedure was carried out at each of the three visits: second and third trimesters and 6 weeks postpartum.

Refraction

An objective refraction was conducted using an automated autorefractor (Tomey RC-800 by Tomey Co-operation, USA). This was subjectively refined with the duochrome chart and Jackson cross-cylinder. The best corrected visual acuity (BCVA) was recorded.

Statistical analysis

Data were presented as mean ± standard deviation (SD) and analyzed using SPSS version 20 by IBM Corp., USA. One-way analysis of variance (ANOVA) was used to determine the difference between means. P values <0.05 were considered significant.

Results

The participants were aged 18–48 years with a mean age of 30.81 (±5.49) years. Majority of the women had tertiary

education [Table 1]. Majority of the participants never had an eye check as part of the antenatal examinations. For those who noticed eye changes, majority could not relate it to pregnancy. The most frequent symptoms in those that had eye problem during their index pregnancy were itching and blurring of vision [Table 1].

Majority of the participants had VA between 6/6 and 6/18. There was a progressive worsening of VA for distance in more women from second to third trimesters which improved during the postpartum period. There was only a slight change in VA for near throughout the study period. Changes in VA for distance occurred among more pregnant women in the third trimester than second trimester [Table 2].

Table 1: Distribution of the pregnant women according to their socio-demographic, clinical characteristics and past ocular history (*n*=100)

Variables	Frequency	Percentage (%)	Mean
Age (years)			30.81±5.49
18-35	82	82.0	
>35	18	18.0	
Educational level completed			
Primary	1	1.0	
Secondary	28	28.0	
Tertiary	71	71.0	
Occupation			
Civil servants	33	33.0	
Housewives	30	30.0	
Traders	21	21.0	
Artisans	5	5.0	
Students	11	11.0	
Parity			
Primigravida	32	32	
Multigravida	68	68	
Had any eye check since index pregnancy (*n*=100)			
No	96	96.0	
Yes	4	4.0	
Ever had eye problems since index pregnancy (*n*=100)			
No	81	81.0	
Yes	19	19.0	
Patients most disturbing symptoms (*n*=19)			
Itching	9	47.0	
Blurring of vision	6	32.0	
Redness	3	16.0	
Drooping of eyelids	1	5.0	
Primary diagnosis			
Short sightedness	3	16.0	
Do not know	16	84.0	
Main reason perceived to be the cause of the eye changes			
Pregnancy	2	12.0	
Contact with infected persons	1	5.0	
Don't know	16	83.0	

The most common refractive error among the participants was simple myopia, followed by simple hypermetropia. There was an increased myopic shift in more pregnant women from second to third trimester [Table 3].

Discussion

The awareness that pregnancy affects the eye is very low in Nigeria; majority of our participants never underwent eye check during the index pregnancy. The mean age (30.81 ± 5. 49 years) of the participants in this study was similar to that reported in previous studies done in Iran and Malaysia by Mehdizadehkashi *et al.*[11] and Sagili *et al.*,[12] respectively, but differed from a study done in Northern Nigeria by Muhammad *et al.*,[13] where the mean age of the pregnant women was 23.67 ± 6.11 years. This difference could be attributed to socio-cultural factors; girls marry at early age in Northern Nigeria in stark contrast to our study area where most girls prefer to marry after their university education.

Visual acuity

Studies done in other countries have reported that pregnancy affects VA[11,14] and refraction.[5] Many of our participants had decreased VA for distance which was significant and found in more women in the third trimester. There was no significant change in near VA throughout the study period. At the point of recruitment in second trimester, few of the participants had blurring of vision as a complaint but the number increased in the third trimester. Blurring of vision could be due to changes in VA. Decreased visual acuity for distance was also observed in a previous study by Ebeigbe *et al.*[14] who reported non-significant decrease in VA for both distant and near. The difference in VA for distance reported by these workers and that of the present study could be attributed to clinical characteristics of the subjects such as parity. Most pregnant women in the present study were multigravida while they were not specific on the parity of their subjects.

Mehdizadehkashi *et al.*[11] in their study in Iran also reported significant changes in VA for both distance and near. However, there was no significant change in near VA in the present study; racial difference, study protocol, and exclusion criteria may be contributory factors. These workers conducted a cross-sectional study, while ours was a longitudinal study, we excluded those with past ocular surgeries while they were not specific on this. The change in VA could be attributed to the increased level of estrogen (a fluid retaining hormone) and aldosterone which leads to retention of fluid in ocular tissues such as the cornea, thereby leading to corneal edema.[14,15] The nonsignificant change in near VA in the present study also contradicts reports from a previous study,[16] where a significant change in VA for near was observed with consequent loss of accommodation.

Refractive changes

Simple myopia was the most common refractive error observed among our participants; other refractive changes observed

Table 2: Distribution of pregnant women according to changes in their VA levels in the second or third trimesters in comparison to VA 6 weeks postpartum

	Same		Improve		Worsen	
	Freq.	Percentage	Freq.	Percentage	Freq.	Percentage
VA for distance						
Left eye						
2nd trimester	64	64.0	3	3.0	33	33.0
3rd trimester	60	60.0	1	1.0	39	39.0
Right eye						
2nd trimester	58	58.0	7	7.0	35	35.0
3rd trimester	55	55.0	2	2.0	43	43.0
Both eyes						
2nd trimester	68	68.0	4	4.0	28	28.0
3rd Trimester	67	67.0	3	3.0	30	30.0
VA for Near						
Left eye						
2nd trimester	98	98.0	2	2.0	0	0.0
3rd trimester	97	97.0	2	2.0	1	1.0
Right eye						
2nd trimester	97	97.0	2	2.0	1	1.0
3rd trimester	98	98.0	1	1.0	1	1.0
Both eyes						
2nd trimester	96	96.0	2	2.0	3	2.0
3rd Trimester	97	97.0	0	0	3	3.0

Improvement represents gain in at least one line in VA Worsening is loss of at least one line in VA Same means no change in VA level

Table 3: Distribution of the pregnant women according to their refractive errors

Refractive Error	LE						RE					
	2nd Trimester		3rd Trimester		Postpartum		2nd Trimester		3rd Trimester		Postpartum	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Simple hypermetropia	15	15.0	14	14.0	13	13.0	15	15.0	14	14.0	17	17.0
Simple myopia	36	36.0	40	40.0	34	34.0	31	31.0	34	34.0	20	20
Simple myopic astigmatism	12	12.0	13	13.0	11	11.0	14	14.0	12	12.0	10	10.0
Compound myopic astigmatism	10	10	12	12.0	11	11.0	15	15.0	11	11.0	16	16.0
Simple hypertmetropic astigmatism	13	13.0	13	13.0	13	13.0	13	13.0	11	11.0	12	12.0
Compound hypermetropic astigmatism	1	1.0	0	0.0	2	2.0	3	3.0	8	8.0	8	8.0
Mixed astigmatism	3	3	1	1.0	5	5.0	2	2.0	2	2.0	6	6.0
Emmetropia	10	10.0	8	8.0	11	11.0	7	7.0	8	8.0	11	11.0

include simple hypertmetropia, simple myopic astigmatism, compound myopic astigmatism, and simple hypermetropic astigmatism. The greatest change in refraction occurred in the third trimester and may be due to myopic shift observed in some of the participants, which improved in the postpartum period. A greater myopic shift was observed in those who were myopic before pregnancy in this study. Myopic shift during pregnancy was reported in other previous studies.[11,14,16] This could be responsible for the reduced VA for distance found in pregnant women, especially during the third trimester. A contradicting study by Park *et al.*[17] found no change in refraction, this disparity could be attributed to the small sample size of the participants in their study. The change in the eyes refractive index during pregnancy could be due to hormonal changes which cause fluid retention in the cornea.[14,15,18] A previous study[19] has also related this discovery to increase in the lens curvature which invariably lead to a myopic shift. Previous studies[11,15] have suggested that the presence of comorbidities such as diabetes mellitus and hypertension to be responsible for the reduced VA and refractive changes observed during pregnancy;[20] however, this is not true of the present study because participants with associated co-morbidities were excluded. These changes resolved postpartum and did not warrant any medical intervention during pregnancy. Patient counseling includes making them understand that spectacle prescription may not be required during pregnancy as symptoms will resolve postpartum.

Conclusion

Pregnancy caused a reduction in VA for distance and more women were affected in the third trimester. Simple myopia was the most common refractive error observed with the highest number occurring in the third trimester. VA and refractive changes are part of the physiological changes in the eye associated with pregnancy; they are mostly transient and resolve during the postpartum period. It is important that family physicians

and obstetricians who manage pregnant women are aware of these changes and the fact that medical intervention may not be required in such cases; rather counseling of pregnant women to allay fears may be preferred.

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Conflicts of interest

There are no conflicts of interest.

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