

ORIGINAL ARTICLE**STUDY OF OCULAR CHANGES IN PREGNANCY****O K Radhakrishnan¹, Debapriya Datta², Jyoti Yadav³, Priti Kumari², Vasundhara Phillips², Nimrita Nagdev²****Author's Affiliations:** ¹Professor; ²PG Resident; ³Senior Resident, Department of Ophthalmology, Dr D. Y. Patil Medical College, Pimpri, Pune**Correspondence:** Dr Debapriya Datta Email: debapriya87@gmail.com**ABSTRACT**

Introduction: In pregnancy, women undergo a tremendous number of systemic and ocular changes. Physiological changes occur in the cardiovascular, hormonal, metabolic, hematologic and immunologic systems. Hormonal changes are among the most prominent systemic changes in pregnant women with the placenta, maternal endocrine glands and the fetal adrenal glands combining their productivity to make a high-powered hormone factory.

Aims: To evaluate the various ocular changes taking place in pregnancy in women with no other co-morbid ocular or systemic diseases and to compare ocular changes in three trimesters of pregnancy with controls of non pregnant women.

Materials and Methods: The ocular changes occurring in varying stages of pregnancy in 225 pregnant women were studied and compared with 75 healthy non pregnant women.

Results: Age was similar in the pregnant and non pregnant women studied. Headache was significantly more common among pregnant women when compared to non pregnant women. Diplopia was not significantly different between pregnant and non pregnant women. Intraocular pressure was significantly less among the pregnant women as compared to non pregnant women. Occurrence of conjunctival pigmentation was significantly more in pregnant women when compared to non pregnant women. There was no difference in corneal thickness when pregnant and non pregnant women were compared. Krukenberg's spindles were seen more commonly among pregnant women when compared to non pregnant women.

Conclusion: Various ocular changes occur during a normal pregnancy. Knowledge of these changes can help to differentiate the physiological changes occurring in a normal pregnancy from ocular manifestation of systemic diseases.

Keywords: Pregnancy, Diplopia, Krukenberg's spindle

INTRODUCTION

Pregnancy is a physiological situation which places abnormal stress and demands on a pregnant woman's body.¹ The physiological, hematological, hormonal, immunological and metabolic changes in the body of a pregnant woman merit special consideration, as also the eye. The maternal endocrine system and the placenta (the hormone factory) cause ocular abnormalities which are reversible and rarely permanent.²

The ocular effects of pregnancy may be physiological or pathological or may be modifications of pre-existing conditions.³ Physiological changes include increased pigmentation of the lids, ptosis, changes in cornea and refractive status and decreased intraocular pressure. ⁴These usually resolve post partum. Pre-existing diseases such as Graves' disease, Retinitis

pigmentosa and Optic neuritis should be monitored due to their relapses in pregnancy. There may be worsening of Diabetic retinopathy and Central serous chorio-retinopathy with increased risk of retinal detachment. Conditions like glaucoma and non infectious uveal inflammatory disorders may even improve transiently. Pre-eclampsia and eclampsia could result in hypertensive retinopathy, exudative retinal detachment and cortical blindness. Neuro-ophthalmological disorders such as venous sinus thrombosis, benign intracranial hypertension, pituitary adenoma, meningioma and optic neuritis should be kept in mind as differential diagnosis in pregnant women presenting with visual acuity loss, visual field loss, persistent headaches or oculomotor palsies.⁵ Use of ophthalmic drugs can affect foetal health during pregnancy.

Knowledge of ocular changes in pregnancy can help to differentiate the physiological changes from ocular manifestation of systemic disease and diseases pertaining to the eye in a pregnant woman.⁴

AIMS: The aim of the study was to evaluate the various ocular changes taking place in pregnancy in women with no other co-morbid ocular or systemic diseases and to compare ocular changes in three trimesters of pregnancy with controls of non pregnant women.

MATERIALS AND METHODS

It was a cross sectional observational study carried out jointly in the Department of Ophthalmology and Department of Obstetrics and Gynaecology of a tertiary care centre in Western Maharashtra from July 2012 to September 2014. The study included 225 pregnant women and 75 non pregnant women. Ethics Committee Clearance was obtained before starting the study.

Written and informed consent was obtained from all women participating in the study.

Inclusion Criteria: Pregnant women between the age of 19-40 years in the 1st, 2nd and 3rd trimester of pregnancy and non pregnant women with no ocular or systemic co-morbidity were included in the study.

Exclusion Criteria: Pregnant women with any pre-existing co-morbidity like Diabetes and Hypertension; and Pregnant women with any pre-existing ocular morbidity like Cataract, Uveitis, Glaucoma, Retinal and Optic nerve disorders were excluded from the study..

The selected patients were divided into 4 groups:

- **Group A:** 75 pregnant women in 1st trimester with no other ocular and systemic co-morbidity.
- **Group B:** 75 pregnant women in 2nd trimester with no other ocular and systemic co-morbidity.

- **Group C:** 75 pregnant women in 3rd trimester with no other ocular and systemic co-morbidity
- **Group D:** 75 non pregnant women with no other ocular and systemic co- morbidity.

Evaluation of the patient included the following in each case:

Demographic factors like age, sex, occupation and address were recorded. Complete ophthalmic history and medical history was taken. The measurement of the uncorrected visual acuity (UCVA) and best corrected visual acuity (BCVA) was done. Intraocular pressures were recorded using Goldmann appplanation tonometer. Anterior segment of both eyes were examined under the slit lamp biomicroscope. Corneal thickness was measured using Pachymeter. Fundus evaluation of both eyes was done through dilated pupils using direct ophthalmoscope, slit lamp biomicroscopy with a 90D lens and indirect ophthalmoscopy. Keratometry was done using Bausch and Lomb Keratometer. Perimetry was done using Humphrey's visual field analyzer.

RESULTS

In all group 75 women included in each. Thus total 225 women participated. The mean age was analyzed quantitatively within groups as shown in table 1. The P value was >0.05, which was statistically not significant.

Table 1: Comparison of Age in Study Groups

Group	Women	Mean Age (yrs)	p-Value
Group A	75	24.75	>0.05
Group B	75	25.03	
Group C	75	24.96	
Group D	75	24.64	

Group A: Pregnant in 1st trimester; Group B: Pregnant in 2nd Trimester; Group 3: Pregnant in 3rd Trimester; and Group 4: Non pregnant

Table 2: Comparison of Ocular Problems in Study Groups and its Statistical Significance

Ocular problems	Group A (%)	Group B (%)	Group C (%)	Group D (%)	p-Value
Headache	30 (40.0)	34 (45.33)	28 (37.33)	5 (6.67)	<0.0001
Diplopia	0	2 (2.67)	0	0	>0.05
IOP Mean (mm Hg)	15.03	13.05	11.07	15.33	<0.0001
Conjunctival pigmentation	20 (26.67)	19 (25.33)	16 (21.33)	1 (1.33)	<0.001
Corneal thickness Mean(microns)	548.89	551.96	553.48	547.77	>0.05
Krukenberg's spindles	10 (13.33)	14 (18.67)	6 (8.0)	0	<0.05

Group A: Pregnant in 1st trimester; Group B: Pregnant in 2nd Trimester; Group 3: Pregnant in 3rd Trimester; and Group 4: Non pregnant

Table 3: Comparison of ocular changes between pregnant and non pregnant women and its statistical significance

Ocular Problem	Groups	Present	Absent	Odds Ratio (CI)	P value
Headache	Pregnant	92	133	9.68 (3.76 - 24.92)	<0.0001
	Non Pregnant	5	70		
Diplopia	Pregnant	2	223	1.69 (0.08 - 35.58)	>0.05
	Non Pregnant	0	75		
Conjunctival Pigmentation	Pregnant	55	170	23.94 (3.25 - 176.28)	<0.001
	Non Pregnant	1	74		
Krukenberg's spindle	Pregnant	30	195	23.56 (1.42 - 390.14)	<0.05
	Non Pregnant	0	75		

DISCUSSION

Pregnancy is a natural state of physiological stress for the body. Each organ system of the body in a pregnant woman behaves differently from that of a body in a non-pregnant state. The present study was conducted to evaluate the various ocular changes taking place in pregnancy in women with no other comorbid ocular or systemic diseases. Headache was more commonly seen among pregnant women as compared to non pregnant women in the study. Within group comparison showed that all cases in 1st, 2nd and 3rd trimester had significantly more headache as compared to non pregnant women. Increase in headaches is caused by surge of hormones in pregnancy along with an increased volume of blood circulating throughout the body.⁶

Diplopia was not seen to be a significant problem among the pregnant women studied. In a study of 240 normal pregnant women, it was found that 12 pregnant women developed Idiopathic Intracranial Hypertension during their pregnancies. Ten were found to have headaches, five were found to have transient visual obscuration, four were found to have visual field loss, four were found to have reduced visual acuity and three had diplopia. Bilateral papilledema of varying severity was seen in all 12 women.^{7,8} Intraocular pressure was found to be significantly less among pregnant women as compared to non pregnant women in this study. Within group comparison showed that intraocular pressure in 2nd and 3rd trimester pregnant women was significantly less as compared to non pregnant women. Similar finding was also observed in a study conducted by Ebeigbe JA, Ebeigbe PN and Ighoroje ADA (2012) who found that there was a fall in intraocular pressure across the trimesters and this was very significant ($P < 0.0001$).^{9,10}

The prevalence of Conjunctival pigmentation was more commonly seen among the pregnant women as compared to non pregnant women in the study. Within group comparison also showed that in 1st 2nd and 3rd trimester of pregnancy, conjunctival pigmentation was more commonly seen as compared

to non pregnant women ($P < 0.0001$). A study conducted by Gaikin AV and Vavilis D et al reported similar findings where conjunctival pigmentation was found to be more common in pregnant women. Authors felt that an increase in conjunctival pigmentation is due to elevated estrogen levels associated with normal pregnancy which resolves post partum.¹¹

Corneal thickness was not significantly different between pregnant and non pregnant women in our study. Weinreb RN, Lu A, Beeson C. (1988) measured central corneal thickness in 89 pregnant women. They found that there was no significant difference ($P = .79$) in corneal thickness between the nonpregnant and postpartum women. A study by Huna Baron R et al done in 2002 found that corneal thickness increased by 16 micron ($P = .01$) in the pregnant women when compared to the control eyes of 18 non gravid and 17 postpartum women. Authors mentioned that in pregnancy, there is a measurable increase in corneal thickness due to edema.¹² Krukenberg's spindles on the cornea was more common among the pregnant women as compared to non pregnant women in our study ($P < 0.0001$). Study by Riss B, Riss P showed similar results of increase in Krukenberg's spindles in pregnant women in comparison with non pregnant women. Newly developed Krukenberg's spindles on the cornea have been observed early in pregnancy and they tend to decrease in size during the third trimester and during the postpartum period.¹³ The mechanism presumably is related to hormonal changes such as low progesterone levels. However, by the third trimester, an increase in progesterone and aqueous outflow often result in decreased or absence of Krukenberg's spindles.¹⁴

CONCLUSIONS

Pregnancy produces numerous changes in the organ systems of a pregnant woman's body. Headache was a common symptom reported by pregnant women. Decreased intra ocular pressure and conjunctival pigmentation were seen during pregnancy. Krukenberg's spindles were more common among pregnant

women when compared to non pregnant women. The occurrence of diplopia and a change in corneal thickness was not different between pregnant and non-pregnant women.

REFERENCES

1. Garg P et al. Ocular changes in pregnancy. *Nepal J Ophthalmol.* 2012;4(7):150- 61.
2. Sunness J.S. The pregnant woman's eye. *Surv Ophthalmol.* 1988;32:219–238.
3. Gary F, Kenneth J, Steven L, et al. *Williams Obstetrics* Twenty-third Ed 2010;8:195.
4. Sushil C, Tarun C, Jairam Y, et al. Ophthalmic considerations in pregnancy. *Med J Armed Forces India.* Jul 2013;69(3):278– 84.
5. Erkkila H, Raitta C, Iivanainen M, et al. Optic neuritis during lactation. *Graefes Arch Clin Exp Ophthalmol* 1985; 222:134.
6. Carlin A, Alfirevic Z. Physiological changes of pregnancy and monitoring. *Best Pract Res Clin Obstet Gynaecol.* 2008;22:801–23.
7. Tang RA, Dorotheo EU, Schiffman JS, et al. Medical and surgical management of idiopathic intracranial hypertension in pregnancy. *Curr Neurol Neurosci Rep* 2004; 4:398.
8. Huna-Baron R, Kupersmith MJ. Idiopathic intracranial hypertension in pregnancy. *J Neurol* 2002;249:1078.
9. Ebeigbe JA, Ebeigbe PN and Ighoroje ADA. Intraocular Pressure in Pregnant and Non-Pregnant Nigerian Women. *African Journal of Reproductive Health* December 2011; 15(4):20.
10. Pitta Paramjyothi, Lakshmi A.N.R, Surekha D. Physiological Changes of Intraocular Pressure (IOP) in the Second and Third Trimesters of Normal Pregnancy. *Journal of Clinical and Diagnostic Research.* 2011 October ; 5(5):1043-45.
11. Gaïkin AV. Condition of the microcirculatory bed of the bulbar conjunctiva in physiological and pathological pregnancies. *Arkh Anat Gistol Embriol* 1985;89:36.
12. Weinreb RN, Lu A, Beeson C. Maternal corneal thickness during pregnancy. *Am J Ophthalmol* 1988;105:258.
13. Riss B, Riss P. Corneal sensitivity in pregnancy. *Ophthalmologica* 1981;183:57-62.
14. Duncan TE: Krukenberg spindles in pregnancy. *Arch Ophthalmol* 1974; 91:355.