

Physiological Changes of Intraocular Pressure (IOP) in the Second and Third Trimesters of Normal Pregnancy

PITTA PARAMJYOTHI, A.N.R. LAKSHMI, D. SUREKHA

ABSTRACT

Background: Numerous physiological changes occur in the body during pregnancy and the eye is no exception. Pregnancy brings in an increase in hormones that may cause changes in the vision by altering the strength of refraction. The temporary changes in the vision will return to normal after the delivery.

Aim: To study the physiological IOP changes in the second and third trimesters of pregnancy, as pregnancy affects the pre-existing ocular conditions such as diabetic retinopathy, toxæmia of pregnancy, tumours and immunological disorders, but it can have beneficial effects on one such pre-existing condition such as glaucoma.

Settings and Designs: In the present study, the IOP in the right and left eyes was recorded by Schioltz tonometry in the second

and third trimester pregnant women of the age group 20-30 years, who were without any refractive error presently and previously.

Methods and Materials: The IOP changes of 30 pregnant women in the second trimester were compared to that of 30 pregnant women in the third trimester.

Statistical Analysis: The data which was obtained was analyzed by using the Student's t-test.

Results: During the second and third trimesters, the p values of the IOP in both the eyes are highly significant (<0.0001).

Conclusion: The physiological decrease in the IOP during pregnancy is due to an increase in the aqueous outflow because of the influence of increased progesterone and the beta subunit of the human chorionic gonadotrophin levels.

Key Words: Pregnant Women, IOP (Intra Ocular Pressure), Schioltz Tonometry, Second Trimester, Third Trimester

KEY MESSAGE

- The routine screening of IOP during an antenatal checkup may be useful in predicting the onset of pregnancy induced hypertension, gestational diabetes mellitus and the worsening of pre-existing ocular disorders.
- As the IOP is related to blood pressure (BP), a very high systemic blood pressure causes the development of hypertensive retinopathy with bleeding in the retina and retinal detachment which may progress to permanent visual impairment if untreated.
- The tendency of fluid retention affects refraction. As a result, the current spectacles or contact lenses may temporarily be either too weak or too strong, depending upon the specific refractive error.

INTRODUCTION

Pregnancy implies progressive anatomical and physiological changes that are not only confined to the reproductive organs, but also to all the systems of the body. The tendency of fluid retention affects refraction. As a result, the current spectacles (or) contact lenses may temporarily be either too weak or too strong, depending upon the specific refractive error.

Very few reports are available, which indicate the effect of pregnancy on the IOP changes. As compared to normo-tensive women, pre-eclampsia women have increased IOP in the peripartum period [9]. Ocular and systemic parasympathetic involvement appears earlier than the sympathetic involvement in diabetic patients [16].

A very high systemic BP causes the development of hypertensive retinopathy with bleeding in the retina and retinal detachment which may progress to permanent visual impairment [18] if untreated.

Pregnancy involves a number of endocrine interactions and so, in the present study, we tried to observe the physiological changes of IOP in the second and third trimesters of pregnancy to be aware of the vision changes and to know as to which symptoms indicated a serious problem.

MATERIALS AND METHODS

Subjects

A total of 60 subjects of the age-group of 20-30 years participated in this study. The inclusion criteria for the selection of the subjects was pregnant women with a known last menstrual period, regular ante-natal check-ups and with no history of previous abortion, without any refractive error or systemic disease presently and previously.

The subjects were selected from the Government Maternity Hospital, Hanamkonda and the Chandrakanthaiah Memorial Hospital,

Warangal. No financial burden was imposed on the subjects. Prior to the study, each subject was informed in detail about its objective, the aim of the research protocol and the method which had to be used and their consent was taken. Along with the routine lab investigations, ante-natal examinations and the local examination of both the eyes was performed.

The foot plate of the lower end of the plunger of the Schiottz tonometer was sterilized. After anaesthetising the cornea with 4% topical xylocaine, the subject was made to lie supine on a couch and was instructed to fix his/her eyes at a target on the ceiling. Then, by separating the eyelids with the left hand gently, the foot plate of the tonometer was rested vertically on the centre of the cornea. The reading on the scale was recorded as soon as the needle became steady. The tonometer was lifted and a drop of antibiotic was instilled. A conversion table was then used to derive the IOP in mm of Hg from the scale reading and the plunger weight.

Statistics

The data which was obtained was analyzed by using the unpaired Student’s t-test for the difference of the means with unequal variances for statistical analysis.

RESULTS

The mean and standard deviation of the IOPs of the right and left eyes have been compared in the Tables. The IOP measurement was done in 30 pregnant women in the second and third trimesters of pregnancy each. The IOP of the pregnant women in the second trimester was compared to that of the pregnant women in the third trimester. There was a significant decrease in the IOP in the third trimester of pregnancy ($p < 0.0001$) as compared to that in the second trimester of pregnancy.

DISCUSSION

The IOP decreases steadily from the second trimester to the third trimester due to hormonal and circulatory changes during pregnancy. The increased levels of oestrogen, progesterone and other placental hormones during pregnancy may play an important role in maintaining the IOP. The tendency of fluid retention affects refraction. The temporary changes in the vision will return to normal after the delivery.

Earlier studies have revealed the effects of pregnancy on the eyes, which in addition to new changes, and pre-existing ocular disorders,

may change their course owing to the widespread hormonal and other changes during pregnancy that may get either exacerbated or ameliorated [14]. The p-value of < 0.0001 in our study correlated with the findings of previous studies on both the eyes.

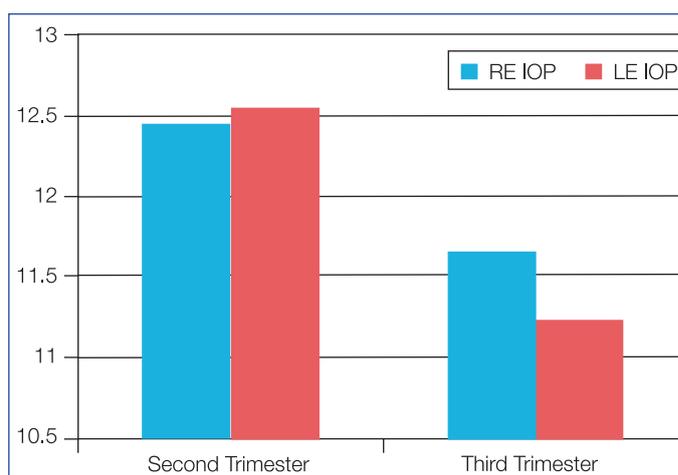
During pregnancy, the aqueous production is normal, but the facility of the aqueous out flow is increased because of the influence of increased progesterone and the beta subunit of the HCG levels and decreased episcleral venous pressure which is related to a generalized reduction in the peripheral vascular resistance. This results in a gradual, statistically significant fall of the IOP during pregnancy [15].

Progesterone has glucocorticoid antagonistic properties and this antagonistic action helps in the lowering of the IOP. The changes in the aqueous dynamics are consistent with the hypothesis that excess progesterone, during pregnancy, blocks the ocular hypertensive effect of endogenous corticosteroids [17].

Oestrogen’s protective activity in the vascular pathology influences the production and the effects of endothelial derived substances

IOP (Mean ± SD)	Second trimester (n = 30)	Third trimester (n = 30)	P value
RE	12.44 ± 0.996	11.6533 ± 0.9193	<0.0001
LE	12.533 ± 1.098	11.24 ± 0.8905	<0.0001

[Table/Fig-1]: Comparison of the IOP in the second and third trimesters of normal pregnancy



[Table/Fig-2]: Graph Showing IOP Changes in the Right and Left Eyes during the Second and Third Trimesters of Pregnancy

Author	Title	Conclusion
1. Pilas-Pomykalska M, Luczak M, Czajkowski J, Wozniak P, and Oszkowski. (2004)	Changes in IOP during pregnancy	Gradual, statistically significant fall of IOP during pregnancy.
2. Damji KF, Find all citations by this author (default). Muni RH, Find all citations by this author (default). Or filter your current search Munger RM . <i>Journal of Glaucoma</i> (2003)	Influence of corneal variables on accuracy of IOP measurement.	The IOP showed a consistent, statistically significant fall during pregnancy, returning to values seen in early pregnancy after delivery.
3. Giannina G, Belfort MA, Abadejos P, Dorman K. (1997)	Comparison of IOP between normotensive and pre-eclamptic women in the peripartum period.	IOP was higher in pre-eclamptic women in comparison to normotensive women.
4. Qureshi IA. (1997)	Measurements of IOP throughout the pregnancy in Pakistani women	Upto 8th week, IOP remained the same and at 12th week it became significantly lower.
5. Qureshi IA, Xi XR, Wu XD. (1996)	IOP trends in pregnancy and in the third trimester hypertensive patients.	The mean IOP of third trimester hypertensive pregnant women were significantly higher from that of third trimester non-hypertensives.
6. Ziai N, Org SJ, Khan A AR, Brubaker RF. (1994)	Beta-human Chorionic Gonadotrophin, progesterone and aqueous dynamics during pregnancy.	IOP decreases during pregnancy due to increase in aqueous outflow.

such as NO, endothelin-I and eicosonoids, thus introducing a final effect of vasodilatation and resistance reduction.

Oestradiol, in particular, increases the NO and prostacyclin activities, both with vasodilative action and it also appears to reduce the response capacity of the unstriated musculature to endothelin-I.

The decrease in the IOP could be advantageous to patients who suffer from glaucoma. Therefore, along with the routine antenatal investigations, it is important to be aware of the IOP changes during pregnancy, to focus on the early diagnosis and prevention of pre-eclampsia in pregnant women.

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