

# A Prospective Study of Changes in the Refractive System of Eye during Pregnancy

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## Abstract

**Background:** Pregnancy affects every system of the body with the ocular structures bearing no exception. Ocular changes can be physiologic, pathologic or as a modification of pre-existing condition.

**Aim and Objectives:** The aim was to study the physiological variations in refractive status and keratometry of eye during the three trimesters of pregnancy.

**Methods:** 60 pregnant females with no ocular and systemic co-morbidities visiting the Obstetrics out-patient department at Thanjavur Medical College, Thanjavur were examined for visual acuity for distance and near, objective & subjective refraction and keratometry through the three trimesters from January 2016 – March 2017.

**Results:** In this study of 60 pregnant females, myopic shift was seen in 65% cases, near vision were unaffected, new or change in glass prescription needed in 16.67% and corneal steepening observed in 63.33%.

**Conclusion:** Physiological changes of pregnancy in the eye are mostly subtle, asymptomatic, transient, and harmless and expected to return to pre-pregnant state after delivery or cessation of breastfeeding. But they come to aid in a fraction of the symptomatic patients with asthenopia and blurred vision, to reassure the patients, identify and relieve them from non-specific, unexplained headaches, eye fatigue and in postponing refractive surgeries.

**Key words:** Females, Headache, Keratometry, Pregnancy, Refractive error

## INTRODUCTION

Pregnancy is a period of immense joy coupled with excitement as the feeling of carrying a little soul within the woman is magnificent. However, the physiological expenditures involuntarily occurring in women for the perpetuation of mankind are enormous.<sup>1,2</sup>

Ocular changes during pregnancy can be physiologic, pathologic, or as a modification of pre-existing condition.<sup>3,4</sup> Physiologic changes include anterior segment changes such as dry eye syndrome, fall in the intraocular pressure,

decreased corneal sensitivity, increased corneal thickness, steepening of corneal curvature, accommodative insufficiency altogether causing alterations in the refractive status of the eye, and contact lens intolerance.<sup>5,6</sup> Pregnancy is also found to cause asymptomatic visual field defects, formation of Krukenberg spindles, and adnexal changes such as chloasma, spider angiomas, and ptosis.<sup>7,8</sup> Most of the ocular changes are transient and harmless in majority, prominent during the third trimester and return to pre-pregnant state after delivery or after cessation of breastfeeding.

The estrogen and the aldosterone together cause excessive sodium reabsorption from renal tubules and produce fluid retention. The fluid retention in the ocular tissue manifests as corneal edema leading to steepening in the corneal curvature which in turn causes myopic shift in the refractive status of eye. These effects, in turn, affect the visual acuity, produce asthenopic symptoms, and need for new glass prescription and unpredictable refractive surgery

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outcomes. Hence, the prescription of contact lenses or planning of refractive surgeries should be postponed till the cessation of breastfeeding until the refractive status becomes stable.

### Aim of the Study

The aim of the study is to study the changes in the refractive system of eye during pregnancy in the study population.

### Objectives

To study the following parameters in pregnant females:

- To study the variations in refractive status during the three trimesters of pregnancy.
- To study the variations in keratometry during the three trimesters of pregnancy.

### Inclusion criteria

Pregnant mothers 20-35 years. First three viable pregnancies.

### Exclusion criteria

Pregnant mothers <20 and >35 years. Pregnancy terminated by abortion. Pregnancies with systemic comorbidities.

## MATERIALS AND METHODS

Patients with newly diagnosed pregnancy with no systemic and ocular comorbidities attending the Obstetrics Outpatient Department at Thanjavur Medical College from January 2016 to March 2017 were taken up for the study. A detailed history regarding defective vision, headache, pain, irritation, burning sensation, and redness of eyes were noted. Visual acuity for distance was checked using Snellen chart, near vision using Roman test charts, objective and subjective refraction, and automated keratometry to measure the K value was recorded during first, second, and third trimesters. The data were analyzed and the results were obtained.

## RESULTS

Majority of the patients were in the age group between 24 and 27 years (36.67%) (Table 1 and Figure 1).

In the first trimester, majority of the patients were emmetropes (71.67%), and the remaining were myopes (28.33%) (Table 2).

Of the 60 females, myopic shift was noted in 39 females (65%). Among 43 emmetropic patients, 27 patients (62.79%) showed myopic shift and 16 patients (37.21%) remained emmetropic during the second and third trimesters. Among the 17 myopes, 12 patients showed myopic shift and five patients retained the same refractive error (Table 3 and Figure 2).

Among the 39 patients with myopic shift, ten were given new glass prescriptions for defective vision and asthenopic symptoms. This accounts for 16.67% of the total 60 patients (Table 4). All the patients had N6 vision through the three trimesters.

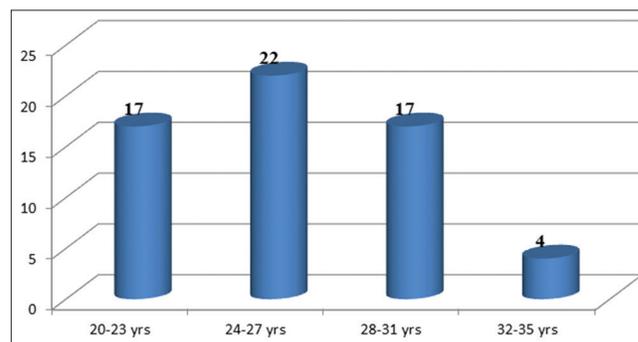
Totally, 60 females were subjected to keratometry measurements. A majority of 38 patients (63.33%)

**Table 1: Age distribution in the female study population**

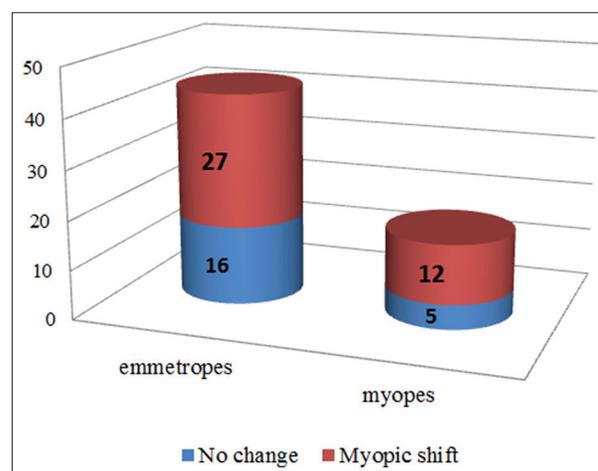
Age group	Number of patients (%)
20-23	17 (28.33)
24-27	22 (36.67)
28-31	17 (28.33)
32-35	4 (6.67)
Total (%)	60 (100)

**Table 2: Refractive status of the patients during first trimester in the study group**

Initial vision (I trimester)	Number of patients (%)
Emmetropes	43 (71.67)
Myopes	17 (28.33)
Total (%)	60 (100)



**Figure 1: Age distribution in the female study population**



**Figure 2: Refractive changes during second and third trimester pregnancy in the study group**

showed corneal steepening, 14 (23.33%) patients had the same curvature while a small proportion of eight patients (13.33%) showed flattening changes during the second and third trimesters (Table 5 and Figure 3).

## DISCUSSION

The second and third trimester results were compared with the first trimester results. Asthenopic symptoms were

**Table 3: Refractive changes during second and third trimester pregnancy in the study group**

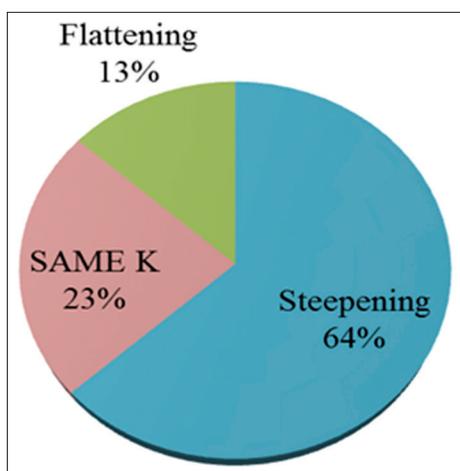
Refractive error	Number of patients	Myopic shift (%)	No change (%)
Emmetropes	43	27 (62.79)	16 (37.21)
Myopes	17	12 (70.58)	5 (29.41)
Total (%)	60 (100)	39 (65)	21 (35)

**Table 4: Number of patients that required glass prescription in the study group**

Glass prescription	Number of females (%)
Needed new glass prescription	5 (8.33)
Needed change in prescription	5 (8.33)
Did not need glass prescription	29 (48.33)
No change in refractive status	21 (35)
Total (%)	60 (100)

**Table 5: Keratometry value changes during second and third trimester pregnancy in the study group**

Change in K value	Number of patients (%)
Steepening	38 (63.33)
Same K	14 (23.33)
Flattening	8 (13.33)
Total (%)	60 (100)



**Figure 3: Keratometry value changes during second and third trimester pregnancy in the study group**

present in 12 patients (20%) including defective vision in two patients (3.33%) in our study.

Myopic shift was observed in 39 patients (65%) among the study group. Pizzarello *et al.* studied (2003) found that 14% of the pregnant females had changes in visual acuity, refractive error, and myopic shift.<sup>9</sup>

Total 10 patients (16.67%) needed new glass prescription in the study Group. Five cases of the pre-pregnant emmetropes needed new glass prescription and five of the pre-pregnant myopic patients required change in their glass prescription. Sharma *et al.* (2006) observed 14% of women needed new glass prescription.<sup>10</sup>

Our study did not demonstrate any near vision defect during and post-pregnancy. Study by Duke-Elder showed accommodative insufficiency and paralysis during lactation.<sup>11</sup> Pilas-Pomykalska *et al.* have reported transient changes in accommodation during pregnancy.<sup>12</sup>

In our study, 38 patients (63.33%) showed corneal steepening during pregnancy. The remaining patients consisted of 14 patients (23.33%) with same K values throughout pregnancy and eight patients (13.33%) with mild flattening during pregnancy. Park *et al.* found increase in corneal curvature during the second and third trimesters which resolved completely after delivery or cessation of breastfeeding.<sup>13</sup>

## CONCLUSION

In the study group comprising emmetropes in majority, myopic shift was observed, near vision were unaffected, and steepening in the corneal curvature were noted with advancement of pregnancy. Despite the changes in the refracting structures during pregnancy, a large proportion of the study group remained asymptomatic.

The knowledge of the physiological changes comes to aid in reassuring the patients of the transient nature of the new onset refractive errors, identifying, and relieving them from non-specific, unexplained headaches and eye fatigue, and importantly in postponing refractive surgeries.

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