

## Refractive Changes and Visual Acuity among Pregnant Women of Southern Rajasthan Region

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### Abstract

**Introduction:** Changes in the eye have been linked to pregnancy; these changes may be natural, pathogenic, or an aggravation of pre-existing ocular diseases. Changes in refractive error (RE) and visual acuity (VA) are two examples of the physiological changes that might take place during pregnancy.

**Objective:** The goal of the current study was to examine changes in VA and RE in pregnant women of Udaipur region during the course of second and third trimesters and six weeks after giving birth.

**Materials and Methods:** Pregnant women in their second trimester who were attending an antenatal clinic were sequentially recruited for a longitudinal study. Information on their sociodemographic and clinical traits was gathered using a questionnaire. Measurements of visual acuity and refractive error were made during the second and third trimesters as well as six weeks following delivery.

**Result:** The average age of women were  $36.87 \pm 6.35$  years. In comparison to the second trimester, more women in the third trimester saw a worsening in Visual Acuity (VA) for distance. VA remained essentially changed during the course of the trial. Pregnant women experienced an increased myopic shift in the third trimester (40.83 % in left eye and 44.16 % in right eye) compared to the second trimester (35.83 % in left eye and 37.50 % in right eye). Simple myopia was the most prevalent refractive error among the women. Six weeks after delivery, these modifications disappeared.

**Conclusion:** Pregnancy worsened Visual acuity (VA) for distance, and simple myopia was the most prevalent Refractive Error among pregnant women. However, during the postpartum phase, these modifications disappeared.

**Keywords:** Visual acuity, Refractive error, pregnant women.

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### Introduction

Pregnancy puts an increased strain on the body's physical and metabolic processes, which includes the eye. [1] One of the ocular symptoms during pregnancy is blurry vision, which may be caused by increases in refractive error (RE) and visual acuity (VA). [2,3] These mostly physiological changes have been linked to the interaction of hormonal, metabolic, hemodynamic, vascular, and immunological variables that occur during pregnancy. [4,5,6] Their impact might only last for the duration of the pregnancy. [4,5] According to some studies, these changes could be pathogenic and the outcome of underlying systemic diseases including diabetes and preeclampsia. [7,8] Health

care professionals who provide services to these women should be able to distinguish between the physiological and pathological changes as they occur during pregnancy. This will allow them to know when to provide medical interventions and when to give them the right advice to reduce worry.

Data on VA and refractive changes during various stages of trimesters are scarce in our context. The need for the current investigation is justified by the likelihood that pregnant women experiencing typical physiological changes would be mistakenly prescribed spectacle adjustments. In order to give baseline information for better eye care for pregnant women in our environment, the study set out to

investigate the type and course of VA and refractive changes in pregnancy.

### Material and Method

120 Pregnant women who visited the antenatal clinic of tertiary care Hospital, Udaipur, were recruited for the study, which used a longitudinal design. This hospital offers tertiary care in all major subspecialties, including ophthalmology and obstetrics and gynecology. The pregnant women who had signed up for the study were assessed in the second and third trimesters and monitored up until six weeks after giving birth, when any physiological alterations should have returned to pre-pregnancy levels. As a result, they served as the control group.

Prior to the start of the study, ethical approval from Ethics Committee was taken. Prior to participating in the study, the subjects received enough information about it, including an informed consent form (attached), which detailed the risks and advantages of participating as well as the fact that it was optional. They were informed that they might voluntarily stop participating in the exercise at any point during the research without it negatively affecting their preferred therapy.

### Inclusion Criteria

The study included healthy pregnant women who gave their consent and had proven ultrasonographic proof of pregnancy, whether or not they had refractive problems.

### Exclusion Standards

Pregnant women who had systemic comorbidities like diabetes or hypertension. Women who had ocular illnesses like glaucoma or previous ocular procedures like corneal refractive surgery were excluded. People who declined to take part in the study were also not included.

Pretested structured questionnaires were used to record information about participants' sociodemographic, clinical, and ocular histories. A casual approach was used in the privacy of the exam room to promote complete participation without making the subjects feel uncomfortable.

### Definitions

#### Visual Acuity:

This is a measurement of the eye's ability to identify detail features and forms of objects at a given distance. [9] The Snellen's chart and the Log MAR near acuity charts were used to make this determination.

**Refractive Error:** As shown by one dip in line of the Snellen chart, refractive error was defined as VA of 6/9 or worse. [10]

#### Visual Acuity Assessment:

Distance Visual acuity: The patient was positioned 6 meters away from the chart in a well-lit area. Using the Snellen's chart and the tumbling E chart for patients who are illiterate, unaided VA was measured for the right eye first, followed by the left eye. A pinhole test was conducted in those with Visual Acuity less than 6/9.

#### Near-vision Acuity:

Each patient had their near visual acuity tested using the Log MAR near acuity chart from a distance of 40 cm. By ensuring that the room had adequate ambient lighting and a stand lamp, the testing environment was standardized. To measure monocular acuity, the examiner covered the subject's eye that was not being evaluated. The near acuity card was then placed 40 cm away from the nose's bridge during the test. Where appropriate, the patients' current refraction was used to retest the VA, and all collected data were documented. The line on the acuity chart that the patient read in its entirety was considered to be the true VA. Each of the three visits—during the second and third trimesters and six weeks after delivery—involved this procedure.

#### Refraction

Using an automatic auto refractor (Tomey RC-800 by Tomey Co., USA), an objective refraction was performed. Using the Jackson cross-cylinder and the duochrome chart, this was subjectively improved. It was noted what the best corrected visual acuity (BCVA) was.

#### Statistic Evaluation

Data were analyzed using Microsoft Excel displayed as mean standard deviation (SD). The variance was determined using a one-way analysis of variance (ANOVA). P values 0.05 and less than were regarded as significant.

#### Result

With a mean age of 30.81 (5.49) years, the participants ranged in age from 18 to 48. The majority of the women (Table 1) were college graduates. The majority of participants never had their eyes checked during prenatal visits. Most people who saw changes in their eyes did not associate them with pregnancy. Itching and blurred vision were the most common symptoms in people who experienced eye problems during their index pregnancy [Table 1].

Parameters	Number N=120	Percentage %	Mean
Age	36.87 ± 6.35		
1) 20-30 years	11	9.16	
2) 30-40 years	84	70	
3) > 40 years	25	20.8	
Education			
1) Primary	24	20.00	
2) Secondary	68	56.66	
3) Graduation	28	23.33	
Occupation			
1) Govt servants	41	34.16	
2) Private servants	56	46.66	
3) House wives	23	19.16	
Parity			
1) Primigravida	47	39.16	
2) Multigravida	73	60.83	
Had any eye check since induce pregnancy			
1) Yes	98	81.66	
2) No	22	18.33	
Ever had eye problem since index pregnancy			
1) Yes	21	17.5	
2) No	99	82.5	
Patients most disturbing symptoms			
1) Itching	8	6.66	
2) Blurring	5	4.16	
3) Redness	2	1.66	
4) Drooping of eye lids	1	0.83	
Primary Diagnosis			
Short sightedness	3	2.5	
Not know	15	12.5	
Main reason perceived to be the cause of the eye changes pregnancy			
1) Pregnancy	2	1.66	
2) Contact infected	1	0.83	
3) Not know	13	10.83	

The majority of patients experienced VA between 6/6 and 6/18. More women experienced a progressive worsening of VA for distance from the second to third trimesters, which improved after delivery. For nearly the entire duration of the trial, there was hardly any change in VA. More pregnant women in the third trimester than the second had changes in VA for distance [Table 2].

Parameters	Same		Improve		Worsen	
	Number	Percentage	Number	Percentage	Number	Percentage
VA for distance						
Left eye						
2 <sup>nd</sup> trimester	74	61.66	3	2.5	43	35.83
3 <sup>rd</sup> trimester	70	58.33	3	2.5	49	40.83
Right eye						
2 <sup>nd</sup> trimester	68	56.66	7	5.83	45	37.5
3 <sup>rd</sup> trimester	65	54.16	2	1.66	53	44.16
Both eye						
2 <sup>nd</sup> trimester	78	65	4	3.33	38	31.66
3 <sup>rd</sup> trimester	77	64.1	3	2.5	40	33.33
VA for near						
Left eye						
2 <sup>nd</sup> trimester	118	98.33	2	1.66	0	00
3 <sup>rd</sup> trimester	117	97.5	2	1.66	1	0.83
Right eye						
2 <sup>nd</sup> trimester	117	97.5	2	1.66	1	0.83
3 <sup>rd</sup> trimester	118	98.33	1	0.83	1	0.83
Both eye						
2 <sup>nd</sup> trimester	116	96.66	2	1.66	2	1.66
3 <sup>rd</sup> trimester	117	97.5	0	00	3	2.5

Simple myopia was the most prevalent refractive error among the individuals, followed by simple hypermetropia. From the second to the third trimester, more pregnant women showed an increased myopic shift [Table 3].

Refractive Error	LE						RE					
	2 <sup>nd</sup> trimester		3 <sup>rd</sup> Trimester		Postpartum		2 <sup>nd</sup> trimester		3 <sup>rd</sup> Trimester		Postpartum	
	N	%	N	%	N	%	N	%	N	%	N	%
Simple hypermetropia	15		14		13		14		14		17	
Simple Myopia	36		40		34		34		34		20	
Simple Myopic Astigmatism	12		13		11		12		12		10	
Compound Myopic Astigmatism	10		12		11		11		11		16	
Simple Hypermetropic Astigmatism	13		13		13		11		11		12	
Compound Hypermetropic Astigmatism	1		0		2		8		8		8	
Mixed Astigmatism	3		1		5		2		2		6	
Enmetropia	10		8		11		8		8		11	

## Discussion

The majority of our subjects never had their eyes checked during the index pregnancy because there is such a poor level of understanding in India about how pregnancy affects the eyes. The average age of the participants in this study was  $30.81 \pm 5.49$  years, which was older than the mean age of pregnant women in a study conducted in Northern Nigeria by Muhammad et al. [13] ( $23.67 \pm 6.11$  years) but similar to that reported in earlier studies conducted in Iran and Malaysia by Mehdizadehkashi et al. [11] and Sagili et al. [12]. In sharp contrast to our study location, where most girls want to marry after completing their university degree, Northern Nigeria has a sociocultural norm where girls marry at a young age.

## Visual acuity

Pregnancy has been shown to have an impact on refraction and VA [11,14] in studies conducted in other nations. [5] Significantly, more women in the third trimester showed decreased VA for distance, which was present in many of our subjects. Over the course of the study, there was no notable change in near VA. Few participants complained of blurring of vision at the time of recruitment in the second trimester, but this number rose in the third trimester. Vision fuzziness could be brought on by VA changes. In a prior study by Ebeigbe et al., reduced distance visual acuity was also noted. [14] They indicated a non-significant decline in both the near- and distant-VA. The clinical characteristics of the individuals, such as parity, may be responsible for the discrepancy in VA for distance between that reported by these employees and that of the current study. While they did not specify the parity of their

individuals, the majority of the pregnant women in the current study were multigravida.

In their research in Iran, Mehdizadehkashi et al. [11] showed significant changes in VA for both near and distance. However, there was no discernible changes in near VA in the current study; possible contributing variables include ethnic differences, the study technique, and exclusion criteria. Our study was longitudinal, whereas there was cross-sectional, and we did not include participants who had previously undergone ocular surgery while they were not specific about this. The rise in estrogen (a hormone that retains fluid) and aldosterone, which causes fluid to accumulate in ocular tissues including the cornea and cause corneal edema, may be responsible for the change in VA. [14,15]

This could be the cause of pregnant women's lower VA for distance, especially in the third trimester. This discrepancy may be explained by the limited sample size of the subjects in Park et al.'s investigation, which reported no change in refraction. Hormonal changes that result in corneal fluid retention during pregnancy may be the source of the change in the eyes' refractive index. [14,15,18] This discovery has also been linked by a prior study [19] to an increase in lens curvature, which inevitably causes a myopic shift. The lower VA and refractive alterations seen during pregnancy have been attributed by prior studies [11,15] to the presence of comorbidities including diabetes mellitus and hypertension; [20] This is not the case with the current investigation, either, as subjects with related co-morbidities were eliminated. There was no need for medical intervention during pregnancy because these alterations resolved postpartum. During patient counseling, it is

important to explain to patients why they might not need glasses during pregnancy because the symptoms may go away after delivery.

### Conclusion

The VA for distance decreased during pregnancy, and more women were impacted during the third trimester. The most prevalent refractive error was simple myopia, with the third trimester seeing the highest number of cases. The physiological alterations in the eye caused by pregnancy include VA and refractive changes. These changes are typically temporary and disappear during the postpartum period. It is crucial that obstetricians and family doctors who care for pregnant patients are aware of these changes and the possibility that pregnant patients might not need medical intervention in certain circumstances; instead, counseling to calm anxieties would be preferable.

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