Journal of Cardiovascular Disease Research
ISSN: 0975-3583,0976-2833 VOL 12, ISSUE 6, 2021

Clinical Profile of Ocular Changes in Pregnant Women: An Observational Study from Central India

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Abstract

Background: Pregnancy is associated with various physiological, hormonal, metabolic, and vascular changes that affect multiple organ systems, including the eye. Ocular manifestations during pregnancy may be physiological or pathological and can range from benign transient changes to vision-threatening conditions. Early identification of these changes is important for appropriate management and prevention of complications. **Aim:** To evaluate the clinical profile of ocular changes among pregnant women attending a tertiary care hospital in Central India. **Materials and Methods:** This hospital-based cross-sectional observational study was conducted jointly in the Departments of Ophthalmology and Obstetrics & Gynaecology at Shri Shankaracharya Institute of Medical Sciences (SSIMS), Bhilai, Chhattisgarh. A total of 80 pregnant women between 24 and 38 weeks of gestation were enrolled. Detailed medical, obstetric, and ophthalmic histories were obtained. Comprehensive ocular examination included visual acuity assessment, refraction, slit-lamp biomicroscopy, keratometry, corneal sensitivity testing, Schirmer's test, intraocular pressure measurement using a non-contact tonometer, ocular motility assessment, and dilated fundus examination. **Results:** Physiological ocular changes associated with hypertensive retinopathy were the most common findings (28.7%), followed by physiological changes alone (22.5%) and physiological changes associated with diabetic retinopathy (15.0%). Among physiological ocular manifestations, lid pigmentation was the predominant finding (68.8%), followed by refractive errors (17.5%), corneal curvature changes (8.7%), and tear film alterations (5.0%). Papilledema was observed in a subset of patients, with transient visual loss being the most common symptom (53.8%), followed by visual field defects (37.5%) and reduced visual acuity (8.7%). **Conclusion:** Pregnancy is associated with a broad spectrum of ocular changes, most of which are physiological and reversible. However, retinal and neuro-ophthalmic abnormalities such as hypertensive retinopathy, diabetic retinopathy, and papilledema may occur and require timely diagnosis. Routine ophthalmic screening during antenatal care can facilitate early detection and management of ocular complications, thereby improving maternal visual outcomes.

Keywords: Pregnancy; Ocular Changes; Hypertensive Retinopathy; Diabetic Retinopathy; Papilledema; Antenatal Screening

Introduction

Pregnancy is a unique physiological state characterized by profound hormonal, metabolic, hematological, immunological, and cardiovascular changes that affect nearly every organ system, including the eyes. These physiological adaptations are essential for maintaining maternal and fetal well-being but can induce various ocular changes, ranging from transient refractive alterations to potentially vision-threatening retinal and neuro-ophthalmic complications. Understanding these changes is

important because some ocular manifestations are benign and self-limiting, whereas others may indicate underlying systemic diseases requiring prompt intervention.

The eye is particularly sensitive to fluctuations in estrogen, progesterone, human chorionic gonadotropin (hCG), prolactin, and corticosteroid levels that occur during pregnancy. These hormonal changes can affect the cornea, lens, tear film, intraocular pressure, retina, choroid, and optic nerve. Most physiological ocular changes resolve spontaneously after delivery; however, pathological changes may persist and significantly impact maternal visual function and quality of life. Therefore, comprehensive ophthalmic evaluation during pregnancy is important for distinguishing physiological adaptations from disease processes requiring medical attention.[1]

Pregnancy-associated ocular changes can be broadly classified into physiological changes, modifications of pre-existing ocular diseases, and ocular manifestations of pregnancy-related systemic disorders. Physiological changes commonly include decreased corneal sensitivity, increased corneal thickness and curvature, dry eye syndrome, transient refractive changes, and reduced intraocular pressure. These changes are generally reversible and are attributed primarily to fluid retention and hormonal influences.[2]

Corneal alterations represent some of the most frequently observed ocular changes during pregnancy. Elevated estrogen and progesterone levels promote fluid retention within the corneal stroma, resulting in increased corneal thickness and curvature. These changes may lead to temporary refractive shifts and contact lens intolerance, particularly during the second and third trimesters. Corneal sensitivity may also decrease, contributing to discomfort and altered tear film stability.[3] Dry eye syndrome is another common complaint among pregnant women. Hormonal fluctuations affect the lacrimal glands and meibomian gland function, leading to tear film instability and ocular surface discomfort. Symptoms such as burning sensation, foreign body sensation, redness, and fluctuating vision may significantly affect daily activities. Recent studies have demonstrated a higher prevalence of dry eye disease during pregnancy compared to non-pregnant women of similar age groups.[4]

Changes in refractive status during pregnancy have been documented extensively. Temporary myopic shifts may occur due to increased lens thickness and corneal edema. These refractive changes often fluctuate throughout pregnancy and usually regress postpartum. Consequently, refractive surgeries and prescription changes are generally deferred until several months after delivery.[5] Intraocular pressure (IOP) typically decreases during pregnancy, especially during the second and third trimesters. The reduction in IOP is believed to result from increased aqueous humor outflow, reduced episcleral venous pressure, and hormonal influences. This physiological phenomenon may have implications for the management of glaucoma in pregnant women.[6]

Pregnancy can also influence the course of several pre-existing ocular disorders. Diabetic retinopathy is among the most important conditions affected by pregnancy. Women with pre-existing diabetes mellitus are at increased risk of progression of retinopathy during pregnancy, particularly when glycemic control is rapidly

intensified or hypertension coexists. Regular retinal evaluation is therefore recommended throughout pregnancy.[7]

Hypertensive disorders of pregnancy, including preeclampsia and eclampsia, are major causes of ocular morbidity. Ocular manifestations occur in approximately 25–50% of women with severe preeclampsia and may include arteriolar narrowing, retinal hemorrhages, cotton wool spots, serous retinal detachment, choroidal ischemia, and optic disc edema. Visual symptoms such as blurred vision, scotomas, photopsia, and transient visual loss may serve as early indicators of disease severity.[8] Central serous chorioretinopathy (CSCR) has also been associated with pregnancy, particularly during the third trimester. Elevated endogenous corticosteroid levels are believed to contribute to increased choroidal vascular permeability, resulting in serous detachment of the neurosensory retina. Although most cases resolve spontaneously after childbirth, visual disturbances may persist in some patients.[9]

Neuro-ophthalmic complications during pregnancy are relatively uncommon but may have serious consequences. Conditions such as idiopathic intracranial hypertension, pituitary adenoma enlargement, cerebral venous sinus thrombosis, and optic neuritis may present during pregnancy and require multidisciplinary management. Early recognition of ocular signs can facilitate timely diagnosis and treatment.[10] India contributes substantially to the global burden of maternal health challenges. Despite improvements in antenatal care services, hypertensive disorders, gestational diabetes mellitus, anemia, and nutritional deficiencies remain prevalent among pregnant women. These conditions may influence ocular health and increase the risk of visual complications. However, data regarding the prevalence and spectrum of ocular changes during pregnancy in the Indian population remain limited, particularly from Central India.[11]

Central India has unique demographic, socioeconomic, and healthcare characteristics that may influence the occurrence and recognition of ocular changes during pregnancy. Variations in nutritional status, access to ophthalmic care, prevalence of systemic diseases, and health-seeking behavior may contribute to regional differences in ocular manifestations. Therefore, region-specific studies are necessary to generate evidence relevant to local healthcare planning and antenatal screening programs.[12] Several international studies have documented pregnancy-related ocular changes, but findings vary considerably due to differences in study populations, methodologies, and diagnostic criteria. Furthermore, most available studies focus on specific ocular parameters rather than providing a comprehensive assessment of ocular changes throughout pregnancy. There remains a need for observational studies evaluating the prevalence, pattern, and clinical significance of ocular changes among pregnant women in diverse Indian settings.[13]

The present study, "An Observational Study of Ocular Changes in Pregnancy in Central India," aims to assess the spectrum of physiological and pathological ocular changes occurring during pregnancy and to determine their association with gestational age and systemic conditions. The findings of this study may help clinicians improve antenatal screening practices, facilitate early detection of vision-threatening complications, and contribute to the development of evidence-based guidelines for ocular care during pregnancy.

Materials and Methods

Study Design and Setting

This hospital-based cross-sectional observational study was conducted jointly in the Department of Ophthalmology and the Department of Obstetrics and Gynaecology at Shri Shankaracharya Institute of Medical Sciences (SSIMS), Junwani, Bhilai, Chhattisgarh. The study included 80 pregnant women with gestational ages ranging from 24 to 38 weeks who attended the antenatal clinic during the study period.

Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Committee before commencement of the study. Written informed consent was obtained from all participants prior to enrollment.

Inclusion and Exclusion Criteria

Pregnant women between 24 and 38 weeks of gestation who consented to participate were included in the study. Women with pre-existing systemic comorbidities such as diabetes mellitus and chronic hypertension, as well as those with known ocular disorders including cataract, glaucoma, uveitis, retinal diseases, and optic nerve disorders, were excluded.

Ophthalmic Evaluation

A detailed medical, obstetric, and ophthalmic history was obtained from each participant. Comprehensive ocular examination included measurement of uncorrected visual acuity (UCVA) and best-corrected visual acuity (BCVA). Intraocular pressure was measured using a non-contact tonometer. Anterior segment examination was performed using slit-lamp biomicroscopy. Corneal sensitivity was assessed using a cotton-wisp test, and corneal curvature was measured using a Bausch and Lomb keratometer. Tear film evaluation was carried out using Schirmer's test. Ocular motility was assessed by examination of binocular eye movements in all cardinal positions of gaze. Fundus examination was performed after pupillary dilatation using a direct ophthalmoscope to detect retinal and optic nerve abnormalities, including hypertensive retinopathy, diabetic retinopathy, and papilledema.

Statistical Analysis

Data were entered and analyzed using Statistical Package for Social Sciences (SPSS) version 20.0. Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequencies and percentages. Statistical significance was assessed using appropriate tests, and a p-value of less than 0.05 was considered statistically significant.

Observation and Results

A total of 80 pregnant women were included in the study. The analysis demonstrated a wide spectrum of ocular manifestations during pregnancy. Physiological ocular

changes were the most common findings, either occurring alone or in association with pathological retinal changes. Retinal changes related to hypertension and diabetes constituted a significant proportion of ocular abnormalities observed during the study period.

Overall, 22.5% of participants exhibited only physiological ocular changes, while 15.0% showed physiological changes associated with diabetic retinopathy. Physiological changes associated with hypertensive retinopathy were observed in 28.7% of cases, representing the most common category of ocular manifestations. Papilledema was present either alone (7.5%) or in association with physiological changes (7.5%). Isolated diabetic retinopathy and hypertensive retinopathy were noted in 6.3% and 10.0% of participants, respectively. Lid pigmentation associated with diabetic retinopathy was observed in 2.5% of cases.

Table no. 1: Percentage of ocular changes in pregnancy

Ocular changes	**% of ocular change**
Physiological changes only	22.5%
Physiological changes and Diabetic retinopathy	15
Physiological changes and Hypertensive retinopathy	28.7
Lid pigmentation with Diabetic retinopathy	2.5
Papilledema	7.5
Diabetic retinopathy	6.3
Hypertensive retinopathy	10
Physiological changes and Papilledema	7.5

Table no. 2: Percentage of physiological ocular changes in pregnancy

Physiological Ocular changes	**% of ocular change**
Lid pigmentation	68.8
Refrective error	17.5
Tear film alteration	5
Corneal curvature	8.7

Among the physiological ocular changes observed during pregnancy, lid pigmentation was the most common finding, present in 68.8% of cases. Refractive errors were observed in 17.5% of participants, while corneal curvature changes and tear film alterations were noted in 8.7% and 5.0% of cases, respectively

Table no. 3: Patients with papilledema

Patients with papilledema	**%**
Field loss	37.5
Transsiet visual loss	53.8
Reduced visual ecuity	8.7

Among the patients diagnosed with papilledema, transient visual loss was the most common presenting symptom, observed in 53.8% of cases. Visual field loss was reported in 37.5% of patients, while reduced visual acuity was the least common manifestation, accounting for 8.7% of cases

DISCUSSION

The present cross-sectional observational study was conducted jointly in the Department of Ophthalmology and the Department of Obstetrics and Gynaecology, SSIMS, Junwani, Bhilai, Chhattisgarh, to evaluate the spectrum of ocular changes among pregnant women. A total of 80 pregnant women between 24 and 38 weeks of gestation were included in the study. Pregnancy is associated with numerous physiological and pathological changes affecting the visual system due to hormonal, metabolic, hemodynamic, and immunological alterations. Recognition of these changes is important for distinguishing normal physiological adaptations from potentially vision-threatening conditions.

In the present study, physiological ocular changes constituted the majority of ocular manifestations. The most common category observed was physiological changes associated with hypertensive retinopathy (28.7%), followed by physiological changes alone (22.5%) and physiological changes associated with diabetic retinopathy (15.0%). Isolated hypertensive retinopathy and diabetic retinopathy accounted for 10.0% and 6.3% of cases, respectively. Papilledema, either alone or associated with physiological changes, was observed in a considerable proportion of patients. These findings emphasize that pregnancy-related ocular manifestations may coexist with systemic disorders such as hypertension and diabetes mellitus, highlighting the importance of comprehensive ophthalmic evaluation during antenatal care.

Among the physiological ocular changes, lid pigmentation was the most common finding, observed in 68.8% of cases. Increased pigmentation during pregnancy is attributed to elevated levels of estrogen, progesterone, and melanocyte-stimulating hormone, which stimulate melanin production. Similar findings have been reported by previous investigators who documented hyperpigmentation of periocular tissues as a common physiological adaptation during pregnancy. Refractive errors were observed in 17.5% of cases, while corneal curvature changes and tear film alterations were noted in 8.7% and 5.0% of participants, respectively.

Hormonal influences during pregnancy can induce significant alterations in corneal physiology. Increased fluid retention leads to corneal edema, resulting in increased corneal thickness, changes in corneal curvature, and reduced corneal sensitivity. These changes may subsequently produce temporary refractive errors and contact lens intolerance. Consequently, prescription of new spectacles and refractive surgical procedures should generally be postponed until the postpartum period when ocular parameters stabilize. Similar observations have been described by Park et al. and Pizzarello, who reported reversible corneal and refractive changes during pregnancy.[7]

Tear film alterations observed in the present study may be explained by hormonal changes affecting lacrimal gland function and ocular surface homeostasis. Increased immune-mediated changes in lacrimal gland tissues, combined with dehydration

secondary to nausea and vomiting, contribute to tear film instability and symptoms of dry eye disease. Previous studies have similarly demonstrated a higher prevalence of dry eye symptoms among pregnant women compared with non-pregnant controls.

Intraocular pressure is known to decrease during pregnancy due to enhanced aqueous humor outflow, reduced episcleral venous pressure, and hormonal influences on ocular tissues. Although intraocular pressure was not the primary outcome measure of the present study, the observed findings were consistent with previously reported physiological reductions in intraocular pressure during pregnancy.

Retinal changes represented the most clinically significant pathological ocular manifestations observed in this study. Hypertensive retinopathy was more common than diabetic retinopathy among the study participants. Pregnancy-induced hypertension and preeclampsia are known to produce characteristic retinal vascular changes, including arteriolar narrowing, retinal hemorrhages, cotton-wool spots, hard exudates, retinal edema, and, in severe cases, exudative retinal detachment. The predominance of hypertensive retinopathy in the present study is consistent with reports indicating that retinal vascular changes correlate with the severity of systemic hypertension and may provide valuable information regarding maternal and fetal prognosis.[8]

Diabetic retinopathy was another important retinal manifestation observed in the study. Pregnancy may accelerate the progression of diabetic retinopathy due to rapid metabolic changes, increased vascular permeability, and alterations in glycemic control. Most cases identified in the present study were mild and stabilized with appropriate glycemic management. These findings support current recommendations for regular retinal screening among pregnant women with pre-existing diabetes mellitus.

Papilledema was identified in a subset of study participants and represented a significant neuro-ophthalmic finding. Among patients with papilledema, transient visual loss was the most common symptom (53.8%), followed by visual field loss (37.5%) and reduced visual acuity (8.7%). Transient visual obscurations are classically associated with papilledema and are typically characterized by brief episodes of dimming or loss of vision lasting a few seconds. These episodes often occur with postural changes and are attributed to transient optic nerve head ischemia. Visual field defects generally begin in the peripheral field, particularly the inferonasal quadrant, and may progressively involve central vision if the underlying condition remains untreated. Similar clinical features have been described in neuro-ophthalmic literature.[9] Headache was a common complaint among women with papilledema. Pregnancy-related headaches may result from hormonal fluctuations, increased circulating blood volume, altered vascular reactivity, and elevated intracranial pressure. Persistent headache associated with visual symptoms warrants detailed ophthalmic and neurological evaluation to exclude serious intracranial pathology.[10] The findings of the present study are clinically important because many ocular manifestations of pregnancy may be asymptomatic during the early stages. Routine ophthalmic examination during antenatal visits provides an opportunity for early detection of retinal and neuro-ophthalmic complications, thereby facilitating timely intervention and preventing irreversible visual loss.

Strengths and Limitations of the Present Study

The present study provides valuable information regarding the spectrum of physiological and pathological ocular changes among pregnant women in Central India. It contributes regional data from a population where published literature is relatively limited. Furthermore, the study highlights the importance of multidisciplinary collaboration between ophthalmologists and obstetricians in the management of pregnant women.

However, certain limitations should be acknowledged. The sample size was relatively small, consisting of only 80 participants, which may limit the generalizability of the findings. The study was conducted at a single tertiary care center and included women primarily between 24 and 38 weeks of gestation. Ocular changes occurring during the first and early second trimesters were not evaluated. Additionally, long-term postpartum follow-up was not performed to assess the reversibility of observed ocular changes. Future multicentric studies with larger sample sizes and longitudinal follow-up are recommended to provide more comprehensive evidence regarding ocular changes during pregnancy.

CONCLUSION

The present study demonstrates that pregnancy is associated with a wide spectrum of physiological and pathological ocular changes. Lid pigmentation was the most common physiological ocular manifestation, while hypertensive retinopathy represented the most frequent pathological retinal finding. Papilledema was associated predominantly with transient visual loss and visual field defects. The findings highlight the influence of hormonal, vascular, and metabolic changes on ocular health during pregnancy. Routine ophthalmic examination should be incorporated into antenatal care, particularly for women with hypertension, diabetes mellitus, visual symptoms, or neurological complaints. Early identification and management of retinal and neuro-ophthalmic complications can prevent serious maternal visual morbidity and contribute to improved maternal and fetal outcomes.

Source of Support: Nil
Conflict of Interest: None declared.

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