

Original Article

Pregnancy's Invisible Impact on Vision: Tracking Acuity and Refractive Alterations

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Abstract

Objective: To find the impact of pregnancy on visual acuity and refractive changes.

Study design: It was a Descriptive Hospital based study.

Place and duration of study: The study was conducted at Holy Family Hospital in Rawalpindi from July to December 2023.

Material and Methods: The study started on 1st July 2023. All the patients were referred to the refraction room of eye OPD of Holy Family Hospital Rawalpindi for vision. The data was collected on a specifically designed Performa. Visual impairment was calculated on the basis of auto refractometer, and subjective refraction.

Results: Results were drawn based on selected variables i.e. gender, age and pregnant women. During the observation period, 65 patients were enrolled in the study, with 60 providing positive responses and 5 opting out. Ten patients had incomplete records and did not complete the required follow-up tests. The study focused on 50 pregnant women, aged between 18 and 47, with the majority in the 28–37 age range. Vision loss was reported across various pregnancies, with a higher frequency in later pregnancies. 27 were already using glasses, and 43 exhibited a myopic shift in refractive status.

Conclusion: The results indicate a diverse pattern of visual changes and refractive errors across various age groups and pregnancy trimesters. The higher prevalence of myopia (43 cases) compared to hypermetropia (6 cases) highlights the importance of vigilant monitoring of visual health during pregnancy. The study emphasizes the necessity of thorough eye examinations throughout pregnancy, particularly during the second and third trimesters, to identify and address potential refractive errors. Timely intervention and corrective measures can help maintain the visual health of pregnant women and may reduce the risk of visual complications during and after pregnancy.

1. Introduction

Refractive errors are common vision problems caused by the eye's inability to focus light accurately on the retina. These errors affect millions globally. They occur when the eye's focusing mechanism is either too strong or too weak to direct light onto the retina. For clear vision, the cornea and crystalline lens must refract light precisely to focus it on the retina. In contrast, emmetropia is a condition where the eye achieves optimal focus, enabling clear vision without any distortion. ⁽¹⁾ Any disruption in the process of refraction can result in a refractive error, leading to a condition known as ametropia. Ametropia refers to the inability to achieve optimal visual clarity due to improper focusing of light on the retina. ⁽²⁾ Refractive errors are categorized into four types: myopia (nearsightedness), hypermetropia (farsightedness), astigmatism, and presbyopia. In these conditions, the eye's refractive

surfaces fail to focus light accurately on the retina. Myopia occurs when the eye's refractive system is too strong, causing light rays to focus in front of the retina. In contrast, hypermetropia occurs when light rays focus behind the retina, often due to a smaller eyeball, a weaker lens system with a lower refractive index, or a flatter curvature of the refractive surfaces. ⁽³⁾ Hypermetropia can sometimes result from the dislocation or complete absence of the lens in the eye. Astigmatism, another refractive error, occurs when light rays focus on multiple points on the retina instead of a single point, creating a line focus rather than a precise point focus. Pregnancy introduces widespread physiological changes across various body systems, including the visual system, due to hormonal, immunological, metabolic, hematologic, and cardiovascular shifts.

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Lasting approximately 39–40 weeks, pregnancy triggers notable adaptations in the musculoskeletal, endocrine, reproductive, cardiovascular, respiratory, nervous, urinary, gastrointestinal, and immune systems, along with changes in the skin and breasts.

During pregnancy, the cardiovascular system undergoes remarkable adjustments to support the growing fetus. One of the most significant changes is an increase in blood volume, which rises by approximately 30% to 50% compared to pre-pregnancy levels.⁽⁴⁾ This increase is essential for meeting the demands of the growing uterus, placenta, and fetus, leading to an elevated cardiac output primarily driven by an increase in stroke volume. The expanding uterus also applies pressure to the diaphragm, the main respiratory muscle, contributing to physical changes in the respiratory system. Additionally, pregnancy induces complex adjustments in the nervous system, largely influenced by hormonal shifts. These changes can affect neurotransmitter levels, resulting in symptoms such as mood fluctuations and changes in cognitive function.⁽⁵⁾

One often overlooked physiological change during pregnancy involves the visual system. Pregnancy affects multiple aspects of a woman's body, including the eyes, where noticeable changes may occur. Although these changes are generally temporary, it is important for pregnant women to recognize them and consult a healthcare professional if they experience significant vision-related concerns.

The hormonal shifts during pregnancy, particularly increased levels of estrogen and progesterone, contribute to various physiological adjustments, including those affecting the eyes. These hormonal changes can influence eye health and vision in different ways.⁽⁶⁾ Hormonal changes during pregnancy can impact the cornea's thickness and curvature, the transparent front surface of the eye. These alterations may cause temporary vision changes and can potentially lead to refractive errors.⁽⁷⁾ The cornea is essential for directing light onto the retina to ensure clear vision. During pregnancy, hormonal shifts can cause the cornea to swell or temporarily change shape,

resulting in vision changes. Additionally, some women may experience dry eyes due to these hormonal fluctuations, which can further impact visual clarity.⁽⁸⁾

Fluid retention is a common occurrence during pregnancy, affecting various parts of the body, including the eyes. This increased retention can alter the thickness of the crystalline lens, located behind the cornea, potentially impairing the eye's focusing ability and causing temporary refractive errors. Additionally, some women may develop gestational diabetes during pregnancy, a condition that impacts blood sugar levels and can also influence vision.⁽⁹⁾

Uncontrolled diabetes can affect the eye's refractive characteristics. High blood sugar levels may cause vision fluctuations and worsen pre-existing refractive errors. Additionally, pregnancy can sometimes aggravate existing eye conditions. Women with pre-existing myopia (nearsightedness), hyperopia (farsightedness), or astigmatism may experience changes in their vision during pregnancy.⁽¹⁰⁾

Visual acuity impairment during pregnancy is considered rare, but a range of ocular changes can occur, encompassing both physiological and pathological conditions. These changes can manifest with various symptoms and may require different forms of treatment. Ocular alterations during pregnancy are primarily due to the body's physiological adjustments to support the developing fetus. While most of these pregnancy-related changes are harmless, some pathological conditions may affect the eyes. Additionally, the severity of these changes is often influenced by the overall health of the pregnant woman, such as in cases of diabetes or hypertension during pregnancy.⁽¹¹⁾ The increased blood volume and circulation during pregnancy can also affect intraocular pressure and impact the optic nerve, potentially causing issues such as blurred or double vision. In some cases, pregnancy may trigger or exacerbate conditions like glaucoma or lead to retinal changes, such as hypertensive retinopathy or choroidopathy, particularly in women with pre-eclampsia.⁽¹²⁾

A thorough diagnostic process begins with a detailed understanding of the patient's medical and family history. The patient form used in this study carefully records essential information, including medical and family histories, as well as previous use of eyeglasses. Understanding genetic factors and pre-existing medical conditions that may influence visual acuity and refractive changes during pregnancy is crucial. By taking an in-depth history, healthcare providers can gather vital information to better interpret the ocular changes observed in pregnant women.

Managing refractive errors in pregnant women requires a flexible and comprehensive approach, considering the temporary nature of visual changes during pregnancy. Given the hormonal fluctuations, individualized optical corrections are essential. For minor refractive changes, lifestyle adjustments and regular prescription updates may be sufficient.

For more significant changes, temporary solutions like updating glasses or contact lenses may be needed. The health of both the mother and the developing fetus should be prioritized, with unnecessary interventions avoided. Regular monitoring of ocular health, including visual acuity assessments with Snellen charts and subjective refraction through phoropters, is key to ensuring timely interventions status.

The study titled "Visual Acuity and Refractive Changes Among Pregnant Women in Enugu, Southeast Nigeria" by Z. Nwachukwu Nkiru et al. (2018) examined ocular changes during pregnancy and found a notable decline in distance visual acuity (VA) and a myopic shift, predominantly simple myopia, in the third trimester. This longitudinal research highlighted that these changes were temporary, resolving after childbirth. Similar patterns have been observed worldwide, with studies linking pregnancy-induced hypertension to changes in the eye's fundus. The Enugu study also revealed low awareness of ocular changes during pregnancy and a lack of eye check-ups, particularly among women with higher education.

The study "Refractive Status During Pregnancy in the United States: Results from NHANES 2005–2008," published on December 10, 2019, by Frances Wu, Julie M. Schallhorn, and Eugene A. Lowry, focused on refractive status in a nationally representative sample of pregnant women in the U.S. aged 20–44 years. The study found no significant difference in refractive error between pregnant women and non-pregnant controls. However, pregnant women who wore glasses showed a noticeable increase in refractive changes by trimester, though no significant shift towards myopia or hyperopia was observed. The study concluded that pregnant women experienced greater differences in their refractive status from their previous spectacle prescription later in pregnancy, though the changes were variable and did not reach statistical significance. The findings highlight the need for further longitudinal studies to better understand the impact of pregnancy on refractive status.

2. Materials & Methods

The study started on 1st July 2023. All the patients were referred to the refraction room of eye OPD of Holy Family Hospital Rawalpindi for vision assessment. The patients having above mentioned anomalies were exposed to diagnostic criteria. The data is collected on a specifically designed Performa. Detailed examination was done of the patient starting from assessment of visual acuity, objective and subjective refraction.

3. Results

During the observation period, 65 patients were enrolled in the study, with 60 showing a positive response and 5 declining participation. Additionally, 10 patients had incomplete records and did not complete necessary follow-up procedures, such as fundoscopy and other required tests.

The age distribution of participants revealed 19 women in the 18–27 age group, 23 in the 28–37 range, and 8 in the 38–47 range, providing insight into how refractive errors and visual acuity may vary across different stages of reproductive age.

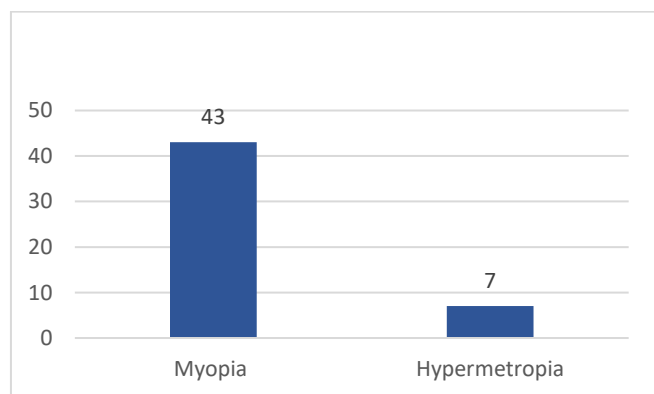
The trimester breakdown showed that 6 women were in the first trimester, 19 in the second, and 25 in the third, offering a detailed view of how visual changes occur during different pregnancy stages.

Regarding vision loss, 9 women experienced it during their first pregnancy, 11 during their second, 14 during their third, 9 during their fourth, 4 during their fifth, and 3 during their sixth pregnancy. These findings provide valuable information on potential trends and correlations between multiple pregnancies and visual changes

Table No. 1: Pre-existing Use of Glasses

Prior use of glasses	No of patients	Percentage
Yes	27	54%
No	23	46%
Total	50	100%

Graphical representation of distribution of patients on the basis of types of refractive error



4. Discussion

The present study investigated the correlation between pregnancy and refractive changes in visual acuity among a cohort of women in their 2nd and 3rd trimesters. The findings revealed a noteworthy trend,

with 86% of participants experiencing myopia and 14% hyperopia during this period. Furthermore, the majority of these women fell within the age range of 28 to 37 years, with a considerable proportion requiring either an update in their prescription glasses or a new pair altogether. The study's results underscore a significant association between pregnancy and altered visual acuity, particularly in the 2nd and 3rd trimesters. Myopic shifts were observed in the majority of cases, suggesting a potential physiological basis for refractive changes during this specific period. Additionally, a subset of the participants already using glasses necessitated an adjustment to their prescriptions, emphasizing the dynamic nature of visual changes in pregnant women. To delve deeper into the observed myopic shifts, further research could explore potential physiological mechanisms underlying these refractive changes. Hormonal fluctuations, fluid retention, and changes in corneal thickness are among the factors that merit investigation, as they may contribute to the observed alterations in visual acuity. Understanding the temporal pattern of refractive changes during pregnancy holds clinical significance, especially for eye care practitioners. The prevalence of myopia in the 2nd and 3rd trimesters suggests that regular eye examinations during pregnancy are crucial, not only for prescription updates but also for the timely detection of vision-related issues that may arise during this period. The concentration of participants within the 28 to 37 years age range prompts consideration of age-related factors in conjunction with pregnancy-induced refractive changes. Future studies may explore whether age plays a synergistic role in the observed alterations or if it acts independently, providing a more nuanced understanding of the interplay between age and pregnancy on visual acuity

Conclusion:

The results indicated a diverse pattern of visual changes and refractive errors across various age groups and pregnancy trimesters. The higher prevalence of myopia (43 cases) compared to hypermetropia (7 cases) highlights the importance of vigilant monitoring of visual health during pregnancy. The study emphasized

the necessity of thorough eye examinations throughout pregnancy, particularly during the second and third trimesters, to identify and address potential refractive errors. Timely intervention and corrective measures can help maintain the visual health of pregnant women and may reduce the risk of visual complications during and after pregnancy.

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