International Journal of Clinical Obstetrics and Gynaecology

ISSN (P): 2522-6614
ISSN (E): 2522-6622

www.gynaecologyjournal.com
2021; 5(6): 339-341
Received: 04-11-2021
Accepted: 06-12-2021

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Maternal and fetal outcomes in pregnant women with pre-existing diabetic retinopathy

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DOI: https://doi.org/10.33545/gynae.2021.v5.i6e.1684

Abstract
Background and Objectives: Diabetic retinopathy (DR) is a prevalent microvascular consequence of diabetes that may exacerbate during pregnancy owing to metabolic and hemodynamic alterations. Pre-existing diabetic retinopathy jeopardizes maternal ocular health and fetal outcomes. The objective of this study was to assess maternal and fetal outcomes in pregnant women with pre-existing diabetic retinopathy and to identify characteristics linked to the progression of retinopathy and negative pregnancy outcomes.
Material and Methods: A prospective observational study was performed including 50 pregnant women with pre-existing diabetic retinopathy at the Department of Ophthalmology, Madha Medical College, Kundrathur Main Road, Kovur, Chennai, Tamil Nadu, India - 600128. The duration of the study was from July 2020 to June 2021. Fundus examination and retinal imaging were used to check participants' baseline systemic parameters and eye health.
Results: In the initial assessment, 30 individuals, or 60% of the total, had NPDR and 20 individuals, or 40% of the total, had PDR. In 18 out of 36 pregnant women, DR progressed; this was most common in women with preexisting DR. Twelve individuals (or 24%) experienced gestational hypertension, and eight women (16%) had preeclampsia. Twelve neonates (or 24%) were born with low birth weights and ten (20%) were born prematurely due to problems during pregnancy. A significant association between the advancement of retinopathy and worse maternal and fetal outcomes ($p < 0.05$) was shown to exist between prolonged duration of diabetes and poor glycemic management.
Conclusion: The advancement of retinopathy, hypertensive problems, preterm birth, and low birth weight are among the maternal and fetal issues that are more likely to occur in pregnant women who already have diabetic retinopathy. To enhance maternal and foetal outcomes, it is crucial to adhere to strict glycemic control, closely monitor the eyes, and receive treatment from a variety of medical professionals.

Keywords: Diabetic retinopathy, pregnancy, maternal outcomes, fetal outcomes, gestational complications, glycemic control

Introduction
Diabetic retinopathy (DR) is one of the most prevalent microvascular problems that can happen with diabetes mellitus. It is also one of the main reasons why adults of reproductive age lose their vision. Pregnancy brings about physiological changes such as elevated blood volume, hormonal variations, and modified glucose metabolism, which may expedite the advancement of pre-existing diabetic retinopathy. Women with pre-existing diabetes are especially vulnerable to ocular problems, potentially impairing maternal eyesight and affecting overall health [1-3].
Pre-existing diabetic retinopathy presents heightened hazards during pregnancy, affecting both maternal ocular health and fetal outcomes. Research indicates that maternal hyperglycemia and vascular dysfunction may lead to prenatal problems, including preeclampsia, gestational hypertension, premature labor, and fetal growth limitation. The advancement of diabetic retinopathy (DR) during pregnancy is affected by factors such as initial retinopathy severity, glycemic management, diabetes duration, and concurrent hypertension [4-6].
Even with improvements in diabetes treatment, the relationship between maternal DR and pregnancy outcomes is still important in the clinic. Early identification and vigilant monitoring of pregnant women with pre-existing diabetic retinopathy are crucial to avert the advancement of retinopathy, address maternal systemic problems, and enhance fetal health [7-9].
The objective of this study was to assess maternal and fetal outcomes in pregnant women with pre-existing diabetic retinopathy and to identify characteristics linked to the progression of retinopathy and negative pregnancy outcomes. The results may guide ideas for interdisciplinary management to enhance both maternal and new born outcomes.

Material and Methods

This prospective observational study involved 50 pregnant women with pre-existing diabetic retinopathy attending the Department of Ophthalmology at Madha Medical College, Kundrathur Main Road, Kovur, Chennai, Tamil Nadu, India - 600128. The study duration extended from July 2020 to June 2021. The Institutional Ethics Committee approved the study, and all subjects gave their informed consent. Participants underwent evaluation of their initial eye condition, systemic health indicators, and were monitored throughout pregnancy to evaluate maternal and fetal outcomes.

Inclusion Criteria

- Pregnant women aged 18-40 years.
- Pre-existing diagnosis of type 1 or type 2 diabetes mellitus.
- Evidence of diabetic retinopathy documented before or during early pregnancy.
- Singleton pregnancy.
- Willingness to participate and comply with follow-up assessments.

Exclusion Criteria

- Gestational diabetes without pre-existing diabetes.
- Pre-existing ocular conditions unrelated to diabetes.
- Multiple pregnancies.
- Chronic systemic illnesses other than diabetes that could affect maternal.
- History of ocular surgery within 6 months prior to pregnancy.
- Inability to cooperate with ophthalmic examinations or follow-up.

Statistical Analysis

The data were analyzed with SPSS version. Continuous variables (e.g., HbA1c, birth weight) were represented as mean ± standard deviation and analyzed using Student's t-test. We used percentages to show categorical factors (such the progression of DR or hypertensive problems) and Chi-square or Fisher's exact test to compare them. A multivariate analysis was conducted to ascertain parameters linked to the evolution of diabetic retinopathy (DR) and negative maternal and fetal outcomes. A p-value of less than 0.05 was deemed statistically significant.

Results

50 pregnant women who already had diabetic retinopathy were a part of the study. At baseline, 30 of these women had NPDR, or non-proliferative diabetic retinopathy, and 20 had PDR, or proliferative diabetic retinopathy. With an average age of 29.2 ± 4.1 years and an average duration of 8.3 ± 3.5 years, the participants had diabetes.

Table 1: Baseline Retinopathy Status

Retinopathy Type	Number of Patients	Percentage (%)
Non-Proliferative (NPDR)	30	60
Proliferative (PDR)	20	40
Total	50	100

In the beginning, 40% of patients had PDR and most had NPDR. Given this distribution, the risk of development in early and advanced diabetic retinopathy during pregnancy might be assessed.

Table 2: Progression of Diabetic Retinopathy during Pregnancy

Group	Progression of DR	No Progression	Total
NPDR	8	22	30
PDR	10	10	20
Total	18	32	50

Retinopathy progression transpired in 36% of patients, primarily among those with initial PDR (50%). Patients with NPDR exhibited a decreased advancement rate (26.7%), suggesting that baseline severity is a critical risk factor for the exacerbation of diabetic retinopathy during pregnancy.

Table 3: Maternal Complications

Maternal Complication	Number of Patients	Percentage (%)
Gestational hypertension	12	24
Preeclampsia	8	16
Cesarean delivery	22	44
Other obstetric complications	6	12

Among the significant maternal problems, 24% of patients experienced gestational hypertension, and 16% had preeclampsia. The majority of cesarean sections (44% of all deliveries) were necessitated by obstetric reasons or maternal systemic issues.

Table 4: Fetal Outcomes

Fetal Outcome	Number of Patients	Percentage (%)
Preterm birth (<37 weeks)	10	20
Low birth weight (<2.5 kg)	12	24
NICU admission	6	12
Normal outcome	32	64

Mothers whose DR progressed or who had poor glucose management were more likely to experience fetal problems. The effects of the mother's diabetes vascular condition on the health of her unborn child were highlighted by the fact that 20% of the neonates were born prematurely and 24% had a low birth weight.

Discussion

Pregnancy in women who already have diabetic retinopathy (DR) is extremely dangerous for the mother and the unborn child. We found that 36% of pregnant women with pre-existing DR went on to develop retinopathy throughout their pregnancy [10, 11]. The rates were greater for women with proliferative DR at baseline (50%) compared to non-proliferative DR (26.7%). These results are in accordance with previous studies that demonstrated that pregnancy can hasten the onset of DR, especially in women who have had diabetes for a longer period of time, had poor glycemic control, or have advanced retinopathy at baseline [12-14].

Significant difficulties for mothers were observed, with 16% developing preeclampsia and 24% experiencing prenatal hypertension. These hypertensive problems are in line with earlier research that found a correlation between microvascular damage in diabetes and an elevated risk of hypertension during pregnancy. The high rate of cesarean section (44% in our sample) highlights the necessity for interdisciplinary care and is a result of both obstetric reasons and maternal systemic concerns [15-17].

Additionally, fetal outcomes were impacted, leading to a 20% preterm neonate rate and a 24% low birth weight infant rate. Maternal diabetes, microvascular illness, and impaired placental

perfusion are recognized to be associated, and these negative effects are in line with that. Twelve percent of the infants had to be admitted to the neonatal intensive care unit, which shows that problems from maternal diabetes and DR can cause newborn morbidity [18-20].

The significance of maintaining tight control of blood sugar levels and conducting routine eye exams throughout pregnancy is highlighted by our findings. To avoid blindness for the mother and reduce hazards to the unborn child, it is important to detect the progression of retinopathy early on so that laser therapy or optimization of systemic treatment can be administered promptly [21]. To further improve pregnancy outcomes in this high-risk population, interdisciplinary care including ophthalmologists, endocrinologists, and obstetricians is essential. The study's single-center design and small sample size raise concerns about its generalizability. Validating these findings and developing uniform management methods for pregnant women with pre-existing DR requires further multicentric studies with larger cohorts [22, 23].

Conclusion

An increased risk of retinopathy progression and other poor maternal and fetal outcomes, such as gestational hypertension, preeclampsia, premature birth, and low birth weight, is associated with preexisting diabetic retinopathy in pregnant women. Complications are more likely to occur in patients with a history of severe baseline retinopathy, inadequate glycemic management, and longer duration of diabetes. It is crucial to improve maternal and newborn health in this high-risk population with close ocular monitoring, stringent glycemic management, and multidisciplinary treatment.

Funding

None

Conflict of Interest

None

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