COMPARISON OF CENTRAL CORNEAL THICKNESS AND INTRAOCULAR PRESSURE IN THIRD PREGNANT FEMALES WITH AND WITHOUT GESTATIONAL DIABETES MELLITUS

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ABSTRACT

Background: In pregnancy, like other body changes, changes also occur in eyes. During third trimester of pregnancy, central corneal thickness (CCT) increases and intraocular pressure (IOP) decreases as compared to other trimesters. There were only few studies which publish the data regarding CCT and IOP in gestational diabetes mellitus during third trimester. **Objective:** To compare the central corneal thickness and intraocular pressure in third trimester pregnant females with and without gestational diabetes mellitus. **Methodology:** A case-control study was done in this research. Total 90 pregnant females having third trimester were included in this study, in which 45 were cases and 45 were controls. Age group of 18-45 is included in this study. HbA1c less than 6% was taken. Complete eye examination was done in all females. CCT was measured by corneal topography method and IOP was measured by air-puff tonometer without using any local anesthesia. Both eyes were included in this study. **Results:** Results showed that third trimester pregnant females had major affects on eyes, as central corneal thickness increase and intraocular pressure decrease in third trimester, but gestational diabetes mellitus changed the whole scenerio. Sociodemographic data also played an important role in this context. Independent sample was applied. Significant difference was present between the values of both study groups. **Conclusion:** It was concluded that pregnancy had affect the values of central corneal thickness and intraocular pressure especially in third trimester. Pregnant females with gestational diabetes mellitus showed tremendous increase in values as compared to non-gestational diabetes mellitus pregnant females.

Keywords: Gestational and non-gestational diabetes mellitus, central corneal thickness, intraocular pressure and pregnant females.

INTRODUCTION

A large population especially pregnant females were affected by gestational diabetes mellitus, during their gestational period. GDM exert influence about 7% pregnancies, among 200,000 diagnosed each year with this disease.[1] Hyperglycemia occurred during pregnancy and the chances of recovery were acknowledged after delivery, from last 50 years.[2] GDM, a public health problem, exerted a large proportion of

the female population repercussions for the fetus and the mother.[3] GDM was a condition characterized by β-cell dysfunction in various categories.[4]

Gestational diabetes not only cause vision changes but can also lead to blindness. It was crucial to have a look on our vision changes, any symptom like dim vision or blur vision could lead to a risky condition. This specific study compared the mean value of CCT and IOP, between pregnant females with and without GDM in third trimester. Blur vision could be a first alarming sign of gestational diabetes to have a influence on vision. Progression of pregnancy, can cause a increase in blood sugar level which could create a vision change, that can exaggerate metabolism and hormonal level. The reason to do this study, was the increasing rate of Diabetic Mellitus in Pakistan mainly in pregnant females. In Pakistan, the risk is increasing day by day. Therefore, this research would help to record causes of GDM in this modern era. Like GDM, the signs of glaucoma had been noticed during the different trimester of pregnancy. Glaucoma, that is already present in the body, can be increase or decrease during pregnancy.[5]

The potential causes of IOP reduction during pregnancy results in increase aqueous humor (AH) outflow.[6] The mean central corneal thickness (CCT) was also found higher in the second and third trimesters.[7] Limited work had done in Pakistan at this topic. Only few researches had been done at this topic.

This study helped in understanding the effects of GDM on central corneal thickness and intraocular pressure of eye in third trimester pregnant females with GDM and will compare it with normal third trimester pregnant females having no GDM.

MATERIAL AND METHODS

Study design: This was a case-control study, third trimester pregnant women with GDM were taken as cases and third trimester pregnant women without GDM were taken as controls.

Setting:

The study was conducted in the Institute of Ophthalmology, Mayo Hospital Lahore,

Duration:

In the time period of six months from October, 2023 to March, 2024.

Sampling technique:

Non-Probability convenient sampling technique was used in this study.

Sample size:

The sample size was estimated using testing two independent means (two-tailed test)

Mean CCT in GDM (μ_1) = 552.28, SD. of CCT in GDM (σ_1) = 22.59 [8]

Mean CCT in non GDM (μ_2) = 538.75, SD of CCT in non GDM (σ_2) = 22.92[8]

Ratio (r) = 1.00

Alpha (α) = 0.05, Z(0.975) = 1.959964

Beta (β) = 0.200, Z(0.800) = 0.841621

Sample size: Group1 (n_1) = 45, Group2 (n_2) = 45

90 pregnant females, with and without gestational diabetes mellitus were taken for the study, 45 were cases and 45 were controls.

Sample selection criteria

Inclusion criteria

- Age 18-45
- Booked cases
- All 90 subjects across the two groups had a best-corrected visual acuity of 6/6 (20/20).
- Anterior segment and fundus

examinations showed clear lenses and normal funduscopic findings with no signs of diabetic retinopathy.

- Third trimester pregnant females referred by Gynecologist were taken into consideration for further checkup.

Exclusion criteria

- Pregnant females with other known eye diseases
- Pregnant females with other systematic diseases, other eye diseases,
- Refractive errors greater than 3.00 dioptre

Data collection procedure:

Data was collected in Mayo hospital having ophthalmology department with corneal topography (Pachymetry) and air-puff tonometer facility.

Females were referred by gynecologist to ophthalmology department for the examination. Both eyes were checked in detail according to the criteria, set for the study.

Consent was taken from all the participants. Socio-demographic data was also taken which includes age, gravidity, parity, gravida, duration of gestational age and family history of diabetes mellitus (DM).

A whole ophthalmic examination was performed which includes visual acuity, refraction, intraocular pressure measurement, anterior and posterior segment and fundus examination to observe sign of diabetic retinoscopy.

Both eyes were checked in this study. Central corneal thickness was measured with corneal topographer.

It measured the corneal thickness by taking a picture of the endothelium cells and gave the readings of corneal thickness and also described the status of keratoconus.

The readings were given in graph form, named as corneal topography. Intraocular pressure was measured at non-contact tonometer. It characterize the properties of cornea and does not affect the tear film or cornea at all. An average of three consecutive readings were taken in auto mode, with acceptable scores for data analysis. No local anesthesia or topical agent was used for intraocular pressure measurement. A comparison was done between these two groups.

RESULTS

Data was entered and analyzed using SPSS 26. Mean (SD) was applied for quantitative data. Independent sample t-test was applied to compare the values of intraocular pressure and central corneal thickness in both groups of pregnant females. P-value less or equal 0.05 was considered as significant.

In table 1 comparison of age, gestational age, gravida, parity and family history of diabetes mellitus, in pregnant females is taken.

Table shows mean and standard deviation values of all variables.

Mean value for age in GDM group are 29.69 and for Non-GDM group is 26.40 with standard deviation values of 4.327 and 4.882 respectively.

P-value shows that results are statistically significant. Gestational age (in weeks), gravidity, Parity and family history mean and standard deviation values for both groups are as follows 30.78 (1.941), 32.98 (2.572), 2.93 (1.116), 3.33 (1.261), 2.02 (0.783), 2.93 (1.261), 1.27 (0.451), 1.72 (0.455).

P-value for all the variables are statistically significant but gestational age show p-value greater than 0.05 which indicates results for this variable are not statistically significant.

Table 1: Comparison of age, gestational age, gravidity and parity of pregnant females with respect to with and without gestational diabetes mellitus

Variables	Study Group	Mean (SD)	P-Value
Age (SD)	GDM (n=45)	29.69 (4.327)	0.001*
	NON-GDM (n=45)	26.40 (4.882)	
Gestational Age (in weeks) (SD)	GDM (n=45)	30.78 (1.941)	<0.001**
	NON-GDM (n=45)	32.98 (2.572)	
Gravidity (SD)	GDM (n=45)	2.93 (1.116)	0.115
	NON-GDM(n=45)	3.33 (1.261)	
Parity (SD)	GDM(n=45)	2.02 (0.783)	<0.001**
	NON-GDM (n=45)	2.93 (1.261)	

SD:Standard deviation; GDM:Gestational diabetes mellitus; NON-GDM:Non-gestational diabetes mellitus

Table 2 show mean values of central corneal thickness and intraocular pressure in both eyes. A significant difference in values is present in both groups. P-values are statistically significant which shows that pregnancy has direct effect at central corneal thickness and intraocular pressure of pregnant female. Third trimester pregnant females, with gestational diabetes mellitus shows values of central corneal thickness and intraocular pressure as 556.89µm, 555.89µm and 14.44mmHg, 14.5mmHg, without gestational diabetes mellitus shows values of 528.00µm, 529.22µm and 11.47mmHg, 11.56mmHg of right and left eye respectively.

Table 2: Comparison of central corneal thickness and intraocular pressure with respect to both study groups of third trimester pregnant females

		Study Group	Mean (SD)	P-Value
Central Corneal Thickness	Right eye	GDM	556.89 (9.960)	<0.001**
		NON-GDM	528.00 (8.006)	
	Left eye	GDM	555.89 (10.515)	<0.001**
		NON-GDM	529.22 (7.534)	
Intraocular Pressure	Right eye	GDM	14.44 (1.546)	<0.001**
		NON-GDM	11.47 (0.919)	
	Left eye	GDM	14.53 (1.646)	<0.001**
		NON-GDM	11.56 (0.893)	

**shows independent smaple t-test (P-value<0.001)

In Table 3 comparison of means between both study groups of third trimester pregnant females is done. Values are statistically significant which shows that there is a difference in central corneal thickness and intraocular pressure in both study groups of third trimester pregnant females. Mean difference, confidence interval, t-statistics and degree of freedom values of both study groups are given in this table.

Table 3: Comparison of CCT and IOP means in both study groups of third trimester pregnant females

Comparison	Study Group	Mean Difference (95 % CI)	T-Statistics (df)	P-Value
Mean CCT (Right eye)	GDM	28.889 (25.103,32.674)	5.231 (88)	<0.001**
	NON-GDM	28.889 (25.101,32.677)	5.231 (84.113)	<0.001**
MEAN CCT (Left eye)	GDM	26.667 (22.835,30.499)	6.352 (88)	<0.001**
	NON-GDM	26.667 (22.829,30.504)	6.352 (79.758)	<0.001**
Mean IOP (Right eye)	GDM	2.978 (2.445,3.511)	12.775 (88)	<0.001**
	NON-GDM	2.978 (2.443,3.512)	12.775(71.677)	<0.001**
MEAN IOP (Left eye)	GDM	2.978 (2.423,3.533)	16.801(88)	<0.001**
	NON-GDM	2.978 (2.421,3.535)	16.801 (67.852)	<0.001**

** Highly Significant
CI:Confidence interval; df:degree of freedom; CCT:Central corneal thickness; IOP:Intraocular pressure

DISCUSSION

In this study, CCT and IOP of pregnant females having third trimester was studied. During third trimester different ocular changes occurred as different body changes. This was hospital based study, data was divided into two groups consist of cases and controls. Data was collected according to inclusion and exclusion criteria. Previous studies had not justify this criteria within is included in this study. Multiple studies publish reports, that showed intraocular pressure was lower in pregnant females as compared to non-pregnant

females. Hormonal changes such as high progesterone level in pregnant females could also increase the fluid outflow from the eye and could cause reduction in episcleral venous pressure, which totally decrease systemic vascular resistance. [9-11]

The purpose of the study was, to investigate the eye care in the pregnancy. The findings suggest that strong collaboration between obstetricians and ophthalmologists is necessary to implement a clear protocol and guidelines for eye care during pregnancy.[12] Hormonal changes also occur during pregnancy, which increase water retention in the corneal stroma.[13]

This study evaluate the association between glucose levels in fasting stage during pregnancy. This study, assessed 829 pregnant females which were healthy, including those with gestational diabetes mellitus and having complications during the pregnancies and the delivery stage. The mean glucose levels of GDM patients in fasting stage, was high in second and third trimester .[14]

Intraocularpressureandcentralcornealthicknesswerethemainoutcomesofthestudythatwereinvestigated. As a result we find out that in the 2nd and 3rd trimester of the pregnancy, intraocular pressure decreases and central corneal thickness increases specifically.[15] Regular check-ups are essential for pregnant women due to the increased risk of diabetic retinopathy.6 All parameters returned to baseline levels after one year of delivery. These findings suggest that ocular changes during pregnancy are physiological and reserve back to normal after delivery.[16]

Furthermore, results showed that central corneal thickness and intraocular pressure values are different for both groups taken in this study. As, intraocular pressure was higher in third trimester pregnant females with gestational diabetes mellitus as compared to the third trimester pregnant females without gestational diabetes mellitus. Central corneal thickness values were also found higher in first group as compared to second. Additionally, the results showed a decrease in quality of life (QoL) in pregnant women with GDM compared to those with uncomplicated pregnancies.[17]

During pregnancy, a variety of ocular pathologies can occur.[18] Pregnancy often brought about ocular changes, which are typically temporary but can sometimes be permanent.[19] This study also aware the females about glaucoma and the side effects caused by higher intraocular pressure and central corneal thickness due to gestational diabetes mellitus in third trimester.

CONCLUSION:

It was concluded that pregnancy affect the values of central corneal thickness and intraocular pressure especially in third trimester. Pregnant females with gestational diabetes mellitus show tremendous increase in values as compared to non-gestational diabetes mellitus pregnant females in third trimester.

AUTHOR'S CONTRIBUTION

RB: Main author, idea conception, write up and data collection

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