

## Gestational Diabetes and Its Role in Thyroid Hormone Profile of Infant

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### Original Research Article

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**Abstract:** Gestational Diabetes Mellitus (GDM) is a carbohydrate intolerance that begins and diagnosed during pregnancy. The prevalence of GDM worldwide varies from 0.15 to 12.8%. Thyroid hormones are fundamental for growth and neurocognitive development. Though fetal endocrine system functions largely independent of the mother but maternal endocrine disorder can influence the fetus adversely. A relationship between GDM and thyroid hormone exist but yet to be established. The purpose of this study is to explore whether any correlation exist between birth weight, placental weight and thyroid hormone profile. The study design comprised of forty patients of GDM and twelve healthy controls were also included. Venous cord blood samples were obtained by sterile syringe from the double clamped venous cord immediately after delivery. Free T4 and TSH were measured. The mean maternal age was significantly lowered ( $p < 0.05$ ) in control group ( $27.1 \pm 2.5$ ) by 5 years compared to GDM ( $33.6 \pm 2.3$ ). Significantly ( $p < 0.001$ ) higher placental weight was observed in GDM patients ( $585 \pm 60$ ) compared to controls ( $425 \pm 20$ ). Cord blood of GDM patients and controls showed a significant difference in FreeT4 ( $p < 0.001$ ) and TSH values ( $p < 0.001$ ) as ( $1.0 \pm 0.25$ ), ( $2.2 \pm 0.54$ ) and ( $18.3 \pm 7.5$ ), ( $7.5 \pm 1.1$ ) respectively. Hyperglycemia is associated with adverse outcome of pregnancy. GDM was found to be associated with hypothyroidism. Further investigation and research is needed and attention should be given for evaluation of thyroid function in pregnant females with impaired glucose tolerance or GDM.

**Keywords:** Gestational Diabetes Mellitus, thyroid hormone, hypothyroidism

### INTRODUCTION

Gestational diabetes mellitus represents both a clear pathological condition of glycaemic dysregulation and a factor aggravating the risk of future diabetes in both the mother and child. Thus it is of paramount importance to control and manage pregnancy complicated by diabetes to improve the health and well-being of the mother and avert the risk of diabetes across generations [1]. Gestational Diabetes Mellitus (GDM) is a carbohydrate intolerance of variable severity that begins and diagnosed during pregnancy [2]. The prevalence of GDM worldwide varies from 0.15 to 12.8%. However, incidence in India is being approximately 16.55%. Previous studies have documented a definite rising trend. Thus implying that the universal screening for glucose intolerance during pregnancy is essential as Indian women have high prevalence of diabetes, their relative risk of developing GDM being 11.3 times compared to the white women [3].

Thyroid hormones play an important role in

normal brain development of fetus and severe deficiency during gestation is found to be associated with permanent brain damage. Neonatal screening for hypothyroidism has been extensively implemented in developed countries. Cord blood is a source for determination of thyroid hormones. In most screening programs, blood samples are collected at 5-6 days of age. But with large number of babies being discharged early, cord blood samples are being used as useful tool. Indian academy of pediatrics recommends the use of cord blood samples for screening for congenital hypothyroidism [4].

Newborn screening procedure has to take into account the complex interaction between fetomaternal and placental unit though fetal endocrine system functions largely independent that of mother but maternal endocrine disorder can influence fetus adversely. We also intended to explore whether any correlation exist between birth weight, maternal age, thyroid profile. Such related research will help us to

reach GDM patients whose fetus are at risk of dual endocrinopathy and should be followed and delivered as high risk pregnancy.

**MATERIALS AND METHODS**

The present study included 40 gestational diabetes mellitus [GDM] patients with 12 healthy controls. Diagnosis of GDM was established by a 75gm oral glucose tolerancetest [OGTT] at 24-28 week of gestation [2]. The pregnant women with GDM were well managed by dietary intervention and blood glucose monitoring for achieving euglycemia. Dietary intervention included low carbohydrate, low fat diet intake as well as optimizing of dietary fatty acid composition. In the GDM patients, group 3 patients were put on insulin. There was no abnormal labour (prolonged labour or precipitate delivery) in every subject with or without GDM in this study. Placental weight was measured after trimming the umbilical cord. Venous cord blood samples were obtained by syringe from the double clamped venous cord immediately after delivery. FT4 (free T4) and TSH were measured using CLIA. Statistical analysis was carried out using SPSS for windows 19.0 software [SPSS Inc., Chicago, IL, USA). Data was expressed in mean t standard deviation values. The data between the two groups was analyzed by using students’ unpaired T test and Pearson correlation test was used to define correlation

between thyroid hormones and other parameter levels. A p value of less than 0.05 was accepted as significant.

**RESULTS**

A total of 40 women with GDM who were recruited for study were matched for gestational age. Mean maternal age was significantly lower (p value <0.05) in control group (33.6±2.7 yrs) by at least 5 years compared to cases (25.1±2.5 yrs). We observed significantly higher placental weight (585±60 g) in GDM compared to controls (425±20 g) with p <0.001. There was significant trend towards very low FT4 concentration in GDM infants cord blood compared with those in the healthy pregnant infants cord blood (p<0.001). The mean FT4 in cord blood of patients who developed GDM showed significant low concentration compared to that observed in cord blood of healthy pregnancy (1.0±0.25 ng/dl compared to 2.2±0.54 ng/dl) (table 1).

Among the GDM pregnant women, 4.8% infants cord blood has shown FT4 <1 ng/dl (range 0.8-1.9 ng/dl). High TSH values were also seen in GDM infants cord blood (18.3±7.5 IU/ml compared to 7.5±1.1 IU/ml, p<0.001). About 3.2 % infants among GDM cases had free TSH >20 IU/ml which is significantly high (table 1).

**Table-1: Table showing maternal age, placental weight, birth weight, free T4 and TSH of cases and controls**

Parameter	Cases	Controls	p value
Maternal age (years)	33.6±2.7	25.1±2.5	<0.05
Placenta weight (g)	585±60	425±20	<0.001
Birth weight (kg)	2.9±0.24	2.5±0.28	NS
Cord blood TSH (IU/ml)	18.3±7.5	7.5±1.1	<0.001
Cord blood FT4 (ng/dl)	1.0±0.25	2.2±0.54	<0.001

**Table-2: Correlation between thyroid parameters with birth weight and maternal age**

	Free T4	TSH
Birth weight	-0.449	0.862
Maternal age	0.411	-0.2

**DISCUSSION AND CONCLUSION**

Diabetes mellitus [DM] and hypothyroidism are the most common endocrinopathies during pregnancy. The prevalence of DM during pregnancy is 7%, out of which most of them are gestational diabetes mellitus.

GDM is one of the risk factors for the development of congenital/transient hypothyroidism. Hyperglycemia is associated with adverse outcome of pregnancy in women with GDM. Increasing prevalence of GDM which presents as complication in about 5% of pregnancy is associated with the occurrence of long term risk of diabetes in both mother and offspring [6].

This study was conducted to determine the

effect of GDM on cord blood thyroid profile. In our study, placental weight was more in GDM patients than controls [585±60grns compared to 425±20gms, p <0.001]. Increased glycogenin gene expression in placenta with GDM supports this hypothesis. Although diet treated GDM is associated with even lower than normal glycogen levels. Elevation of placental glycogen level in all forms of diabetes has been well established. So increased weight is correlated to maternal nutrition oversupply, the placenta increases its surface to enhance maternal fetal transport.

The neonatal hyperthyrotropenemia has found to be more associated with pregnancy with gestational diabetes than in non-diabetic pregnancy with normal glucose tolerance. The FT4 levels were found to be

more frequently lower in patients started on insulin compared to patients without. The finding of raised TSH in GDM fetus as compared to control shows that it could not be due to Immaturity of fetal HPT axis or transient hypothyroidism of prematurity which is not possible as gestational age was appropriate (37 weeks). There are studies which demonstrated that pregnant women with increased risk of GDM have a high prevalence of raised ThyAb [Thyroid Antibody] than observed in general women population. However few studies have reported no association between diabetes in Pregnancy and thyroid function [ThyAb) in pregnant women with GDM [6].

But as the thyroid profile was normal in our study, we didn't go for measurement of ThyAb. Influence of mode of delivery over the thyroid hormone status has many contradictory views and the difference is negligible also. So we have not considered the mode of delivery to influence our results. Maternal thyroid disorder can affect the fetus and newborn.

Maternal ingestion of antithyroid drugs can alter thyroid profile but in our patients they were not on any thyroid treatment as they had normal thyroid profile. So, we can conclude that there could be immune hyperreactivity or non-autoimmune etiology which favours hypothyroidism in GDM patients.

The weight of newborn was higher in GDM patients rather than controls due to 37 weeks of gestation. In our results, the weight of newborn was significantly correlated with cord blood TSH. But we found no correlation with maternal age and FT4 levels.

So, a good screening program should be introduced in high risk pregnancy groups for better pre and post pregnancy care of both mother and child.

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