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A Study of Thyroid Profile in Pregnant Women With Gestational Diabetes Mellitus

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Abstract
Background: *GDM is defined as glucose intolerance first diagnosed during pregnancy or onset occurs during pregnancy. Diabetes and hypothyroidism are the two most common endocrine abnormalities during pregnancy. Diabetes is the most common metabolic disease associated with elevated blood glucose levels and metabolic alterations. Thyroid hormones plays an important role in glucose metabolism , growth and maturation in fetus.*
Materials and methods: *In this case control study, 31 GDM women and 31 normal pregnant women in 24-28 weeks of gestation were included. 5 ml of venous blood was collected and analysed for thyroid profile and routine biochemical investigations. The levels of thyroid profile was analysed by using Elisa kit. Statistical analysis was done by student "t" test.*
Results: *The Levels of FT3, FT4 in serum of GDM women were found to be significantly lower when compared with pregnant women without GDM.*
Conclusion: *Significant low levels of FT3 and FT4 reflects the possibility of sub clinical hypothyroidism associated with GDM. Therefore, screening women in reproductive age will help in the early diagnosis of GDM. Regular monitoring of GDM women during pregnancy and post-partum period will help in identifying GDM related complications at an early stage.*
Keywords: *Gestational diabetes mellitus, FT3, FT4, TSH*

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I. Introduction

Diabetes is one of the prevalent endocrine disorders during pregnancy. Hyperglycemia is one of the most common condition during pregnancy. It was estimated by the International Federation of Gynaecology and Obstetrics (FIGO) that one in six live births occur among pregnant women with some degree of hyperglycemia. The elevated levels of diabetogenic hormones, decreased physical activity, higher carbohydrate consumption and stress of pregnancy, increased insulin requirement of pregnant women leads to gestational diabetes development in susceptible pregnant women. As per WHO 2005-2015 data, the median prevalence of GDM was reported to be 11.7% in the South East Asian region (1) and in India it was reported between 3.8% to 17.9%. The prevalence in urban areas was between 4.6% to 14% and that of rural areas was between 1.75 to 13.2% (2).

Thyroid hormones are important for maintaining the metabolic functions as well as growth of the fetus. Studies reported that higher FT3, FT4 concentration were found to protect against GDM (3). Some studies reported negative or no association between TSH concentration and GDM. Thyroid dysfunction impact maternal and fetal outcomes. The levels of TSH and FT4 in early pregnant GDM women were significantly lower than in pregnant women without GDM. In pregnant women, thyroid hormone is very important for the growth and maturation of many target tissues in fetus more importantly, brain and skeleton. As FT4 levels increased, GDM gradually decreased, and low FT4 levels was an independent risk factor for GDM (4).

Maternal hypothyroidism was found to be associated with gestational hypertensive disorders, anemia, maternal bleeding complications and intrauterine growth restriction. It increases the risk of miscarriage, preeclampsia, preterm delivery, stillbirth and fetal neurological disorders and because of these maternal and fetal co-morbidities it is essential to consider screening and treatment of hypothyroidism in patients with diabetes. Our study was conducted with the aim of comparing thyroid function between pregnant women with and without gestational diabetes mellitus.

II. Methodology

Study Design:

Our study is case control study carried out with 31 GDM and 31 normal pregnant women in the Department of Biochemistry with Department of Obstetrics and Gynaecology, Rajah Muthiah Medical College. Study population are from rural areas around Chidambaram for a study period of 1 year between May 2021 to May 2022. Our Study was approved by Institutional Human ethics committee (IHEC/759/2021).

Inclusion criteria:

Pregnant women in the age group of more than 20 years at gestational period of 24 to 28 weeks.

Exclusion criteria:

Women with Type 1 Diabetes Mellitus, Pregnancy induced Hypertension (PIH) and overt diabetes.

Procedure methodology:

A written informed consent was obtained from all subjects after clearly explaining about the purpose and duration of the study in their own Vernacular language5ml of Venous blood sample were collected and analysed for Hemoglobin, Total WBC count, Total cholesterol, HDL, LDL,TG, Urea, Creatinine, Alanine aminotransferase, Aspartate aminotransferase, Alkaline phosphatase, Bilirubin, FT3, FT4 and TSH. The levels of FT3 and FT4 is estimated by competitive solid phase immunoassay, TSH by solid phase double antibody sandwich method. The concentration of the parameters were measured by ELISA reader (MINDRAY MR-96).

Data Analysis:

The collected data was tabulated and analysed using SPSS Version 26. Statistical analysis was performed using student "t" test and results were compared with controls.

III. Results

In our study, marginal increase in weight in GDM patient signifies the increased complications of GDM. Table-1 shows mean and standard deviation of gestational age, weight, height, random blood glucose, urea, creatinine, Na and K electrolytes, Alanine aminotransferase, Aspartate aminotransferase, Alkaline phosphatase of pregnant women with GDM and pregnant women without GDM. Student "t" test was applied. "p" value of less than 0.05 was considered to be statistically significant.

Table: 1 General characteristics and blood parameters

Parameter	GDM women n=31	Pregnant women without GDM n=31	p-value
Gestational age(weeks)	25.84±1.31	25.39±1.45	0.205
Weight (Kg)	66.68±11.90	61.16±13.06	0.087
Height (cm)	153.06±7.28	153.19±5.71	0.938
BMI(Kg/m^2)	28.50±4.91	26.04±5.43	0.067
Random blood glucose (mg/dl)	155.73±6.39	125.54±8.31	**0.001***
Urea	20.74±3.54	20.81±5.27	0.955
Creatinine	0.720±0.8	0.71±0.08	0.561
ALT	27.26±5.95	27.42±8.44	0.931
AST	22.87±4.79	20.77±5.31	0.108
ALP	113.23±53.01	94.58±35.43	0.109
Total count	10325±2813.29	9100±2112.02	0.057
GCT	116±50.61	91.48±16.65	**0.015***

*p value less than 0.05 is statistically significant.

Table 2: FT3, FT4, TSH values among GDM and control groups

Variable	GDM (n=31)		Control (n=31)		p value
	Mean	SD	Mean	SD	
FT3 values (pmol/litre)	1.49	1.27	2.35	1.51	**0.019***
FT4 values (pmol/litre)	5.79	3.59	8.13	3.72	**0.015***
TSH values (microIU/L)	2.24	1.71	1.80	0.81	0.200

Fig 1: Bar chart showing mean FT3 and FT4 values among the cases and controls.

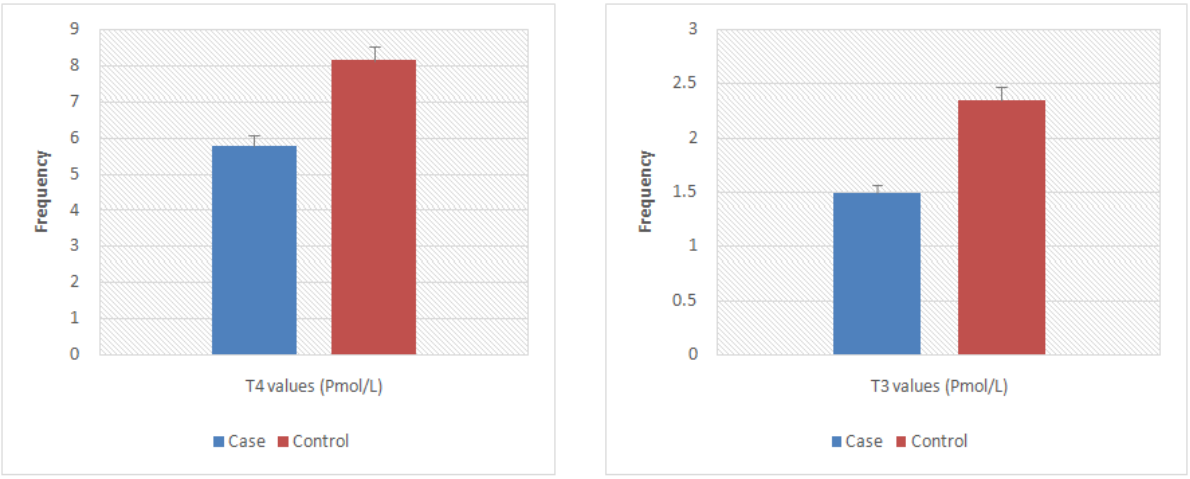
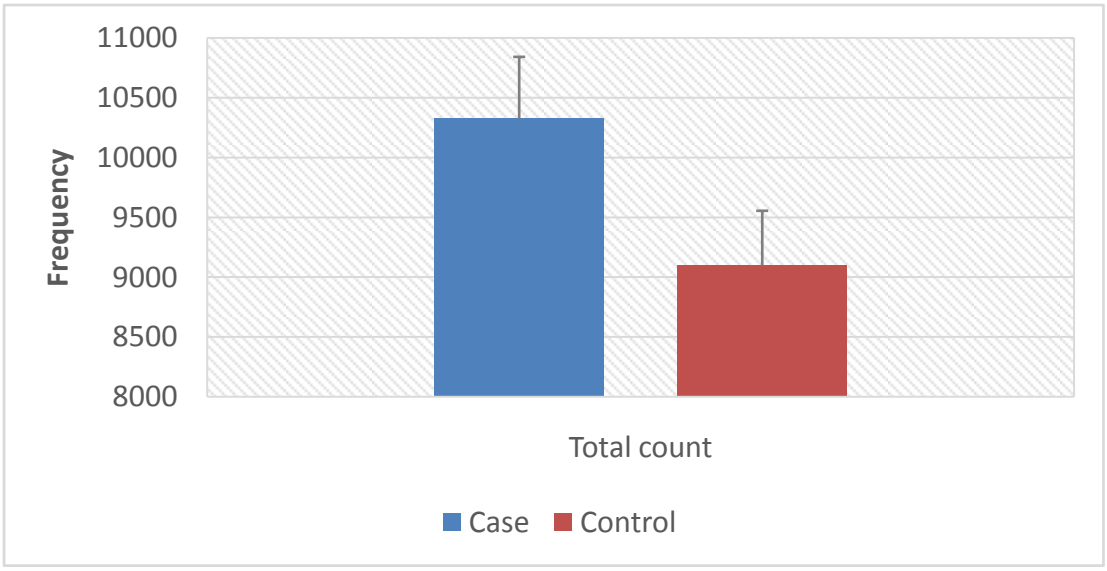


Table 3: Comparison of mean total WBC count between the groups.

Groups	Total count (per microlitre of blood)		p value
	Mean	SD	
GDM	10325.81	2813.29	0.057
Control	9100	2112.02	

Fig : 2 Bar chart showing comparison of mean total WBC count between groups.



IV. Discussion

Diabetes and hypothyroidism are the most common endocrine disorders during pregnancy. In our study, Gestational Diabetes Mellitus (GDM) mothers were found to have significant lower FT3 and FT4 levels compared to pregnant women without GDM. GDM is an major risk factor for pregnancy related complications affecting both fetus and mother increasing the incidence of caesarean section, macrosomia in fetus, shoulder dystocia, preterm labor and placental abruption (7). There was no significant changes in LFT, RFT and Hemoglobin levels compared to control group.

Paranee *et al* ., study had reported that when there was significant increase in white blood cells (WBC) count in the first or second trimester of pregnancy there was increased risk of GDM , so early screening or prevention can improve pregnancy outcome. In our study, the total WBC count was found to be significantly higher in GDM group and may be due to associated inflammation (6). Leukocytosis is an indicator for chronic inflammation which was in the high normal range, indicating an impending inflammation. Paranee *et al* ., study had established association between high total WBC count and inflammation. In our study values were within normal limits but at high in range. A second sample at a later date would have given a clear picture of inflammation.

With regard to thyroid hormones in our study, the mean FT3 and FT4 levels were lower among GDM group than control group. Study done by shahin safian *et al.,* reported that hypothyroidism were observed in pregnant women with GDM than pregnant women without GDM (5). Hassani *et al.*, suggested that hypothyroid was most common in women with GDM than in control groups (8). The results of shahin safian *et al.,* and Hassani *et al.*, correlates with the finding of our study.

The thyroid value in GDM group reflect the possibility of sub clinical hypothyroidism which is usually associated with GDM. Monitoring of thyroid status in GDM is very important to prevent the progression to clinical hypothyroidism. Women with GDM will have the higher chances of getting type 2 Diabetes Mellitus in future. So, healthcare providers should monitor those women to do OGTT at 6-12 weeks postpartum (3).

In our study, TSH levels were found to be marginally higher in test group when compared to control group. Such high TSH level indicates the development of insulin resistance in pregnant women and may lead to GDM, its complications and it may progress to Type 2 diabetes mellitus at a later date. Correcting the thyroid hormone levels would contribute to decrease in fetal and maternal morbidity.

V. Conclusion

Our study has shown a significant low levels of FT3 and FT4 in rural pregnant women with GDM when compared with women without GDM. This will increase the risk for miscarriage, placental abruption, fetal loss, cesarean section and pre-eclampsia. The thyroid values in the GDM samples reflect the possibility of subclinical thyroiditis which is usually associated with GDM. Regular monitoring of thyroid profile and GDM during pregnancy and postpartum period will help in identifying GDM related complications at an early stage and to prevent the progression to clinical hypothyroidism.

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