



EVALUATION OF THYROID DYSFUNCTION IN PREGNANT WOMEN WITH GESTATIONAL & PRE-GESTATIONAL DIABETES AT A TERTIARY CARE CENTRE GONDA, UTTAR PRADESH

Anshika Saxena^{1*}, Priyanka Yadav², Ujala Tripathi³

¹Tutor, Department of Allied Health Sciences, GIMS Noida, U.P
anshikasaxena0304@gmail.com

²Assistant Professor Department of Allied Health Sciences, SINPS, Sultanpur U.P
priyankayd816@gmail.com

³Assistant Professor Department of Allied Health Sciences, SINPS, Sultanpur U.P
ujalatripathi0786@gmail.com

***Corresponding Author:** Anshika Saxena

Tutor, Department of Allied Health Sciences, GIMS Noida, U.P Email ID:
anshikasaxena0304@gmail.com,

ABSTRACT

Introduction- The thyroid gland, a key organ of the endocrine system, can be affected by persistently elevated blood glucose levels and the body's compensatory mechanisms to correct carbohydrate imbalance. Pregnancy significantly influences hormonal balance, particularly thyroid activity. Gestational diabetes mellitus (GDM) was historically defined as a spectrum of glucose metabolism abnormalities. Gestational diabetes mellitus (GDM) and thyroid dysfunction are among the most common endocrine disorders affecting pregnant women.

Objectives- To investigate the prevalence and risk of thyroid disturbance in pregnant women with gestational and pre-gestational diabetes.

Methods- This was a descriptive analytical study with a cross-sectional design aimed at evaluating thyroid dysfunction in pregnant women with gestational diabetes mellitus (GDM) and pre-gestational diabetes mellitus (PGDM). A total of 100 pregnant women were enrolled in the study.

Results- The mean age of participants with pre-gestational diabetes was 30.8 ± 4.7 years, while those with gestational diabetes had a mean age of 30.2 ± 4.5 years. The most frequently observed pattern in both groups was mild to moderate hypertension, indicating a comparable trend across the two categories. Participants with pre-gestational diabetes showed a higher mean TSH level 10.2 ± 4.8 μ IU/mL) with slightly elevated FT3 (1.8 ± 0.6 pg/mL) and FT4 (11.4 ± 2.7 ng/dL), indicating altered thyroid function associated with gestational diabetes.

Conclusion -This study demonstrates that while pre-gestational diabetes (PGDM) and gestational diabetes (GDM) patients are comparable in age and gestational period, PGDM is associated with more pronounced metabolic and endocrine disturbances. Specifically, patients with PGDM exhibited higher fasting blood glucose, reflecting impaired glycaemic control during pregnancy, along with adverse lipid profiles characterized by elevated triglycerides, LDL, and total cholesterol, and reduced HDL, indicating an increased cardiovascular risk.

Key words: Gestational diabetes, Thyroid function etc.

Introduction

The thyroid gland, a key organ of the endocrine system, can be affected by persistently elevated blood glucose levels and the body's compensatory mechanisms to correct carbohydrate imbalance. Research has demonstrated a coexistence between diabetes and thyroid disorders, where thyroid dysfunction can alter glucose metabolism, while untreated thyroid abnormalities may complicate diabetes management. Although several studies have reported an association between different forms of diabetes and hypothyroidism, the supporting evidence remains inconsistent. Nonetheless, certain factors increase the risk of thyroid dysfunction (TD) in individuals with type 2 diabetes mellitus (T2DM), including higher body mass index (BMI), advancing age, smoking, family history, pregnancy, and parity [1].

Pregnancy significantly influences hormonal balance, particularly thyroid activity. During early gestation, thyroid hormone concentrations may temporarily decline before stabilizing, reflecting an initial reduction in serum free thyroxine (FT4) by about 10–15%, followed by an hCG-driven compensatory increase in FT4. This results in elevated requirements for both thyroid hormones and iodine. Thyroid disease (TD) and diabetes mellitus (DM) are both frequently observed during pregnancy [2]. In Saudi Arabia, the prevalence of hypothyroidism among pregnant women is reported to be as high as 9.3%, posing a serious public health issue.

Hypothyroidism in pregnancy is linked to adverse outcomes such as pregnancy loss, fetal death, preterm birth, low birth weight, and neurocognitive impairment in the offspring, including reduced intelligence quotient. Furthermore, Saudi women have high rates of gestational diabetes mellitus (GDM) and pre-gestational diabetes (pre-GDM) compared to global trends. GDM increases the likelihood of complications such as miscarriage, macrosomia, and birth trauma [3]. Indian study suggested that women with concurrent GDM and hypothyroidism require close monitoring and screening for comorbidities, given their elevated risk of perinatal complications.

Globally, multiple studies have also found higher rates of overt and subclinical hypothyroidism, as well as anti-thyroid peroxidase antibody (anti-TPO) positivity, among women with pre-GDM and GDM. These findings highlight the importance of routine thyroid screening in women with DM or at risk for GDM. However, some investigations have reported no significant association between TD and GDM, while still confirming elevated risks in pre-GDM cases [4]. Pregnancy itself induces major physiological changes in thyroid metabolism and urinary iodine excretion, influenced by hormonal and metabolic adjustments. In the first trimester, human chorionic gonadotropin (hCG), due to its structural resemblance to thyroid-stimulating hormone (TSH), stimulates the thyroid, leading to elevated thyroxine (T4) and triiodothyronine (T3) levels, with a corresponding decline in TSH. Additionally, rising estrogen concentrations, increased thyroid-binding globulin (TBG) production, expanded plasma volume, enhanced renal iodine clearance, and accelerated thyroid metabolism all contribute to altered thyroid function during pregnancy [5]. The presence of thyroid antibodies has been linked to adverse outcomes, including pregnancy loss, preterm labor, postpartum thyroiditis, and placental abruption.

Iodine is essential for thyroid hormone production, and deficiency during pregnancy can result in poor obstetric outcomes and impaired neurocognitive development of the fetus. Urinary iodine excretion (UIE) remains the gold standard for assessing iodine status [6].

Gestational diabetes mellitus (GDM) was historically defined as a spectrum of glucose metabolism abnormalities first recognized during pregnancy. Global prevalence rates of GDM range between 1% and 14%, depending on genetic, metabolic, and lifestyle differences across populations. Although GDM usually resolves after delivery, up to 70% of affected women subsequently develop type 2 DM within 6 weeks to 28 years postpartum, while fewer than 10% require insulin beyond pregnancy [7].

The prevalence of thyroid peroxidase antibodies (TPOAbs) ranges from 5% to 25%, whereas

thyroglobulin antibodies (TgAbs) occur in 3% to 16% of cases. The presence of these antibodies is linked to an increased risk of unexplained infertility, recurrent pregnancy loss, preterm delivery, and postpartum thyroiditis [8].

Material And Methods:

This descriptive analytical cross-sectional study was conducted over a period of six months at SCPM Super Specialty Hospital and Trauma Centre, Gonda, Uttar Pradesh, India. A total of 100 pregnant women aged 18–35 years with singleton pregnancies were enrolled after obtaining written informed consent. The study included women diagnosed with gestational diabetes mellitus (GDM) or pre-gestational diabetes mellitus (PGDM), while those with pre-existing thyroid disorders, multiple pregnancies, significant systemic illnesses, medications affecting thyroid function, or unwillingness to participate were excluded.

Demographic and clinical information, including age, gestational age, body mass index (BMI), blood pressure, and obstetric history, was collected using a structured proforma. Venous blood samples were collected under aseptic conditions after overnight fasting. Serum and plasma samples were processed immediately or stored at -20°C until analysis.

Fasting blood glucose and lipid profile (total cholesterol, triglycerides, HDL-C, LDL-C, and VLDL-C) were analysed using an ERBA Chem-7 automated analyser with standard enzymatic methods. Thyroid function tests, including thyroid-stimulating hormone (TSH), triiodothyronine (T3), and thyroxine (T4), were measured using the AIA-360 automated analyser based on fluorescence immunoassay techniques. All laboratory analyses were performed according to the manufacturers' standard operating procedures, and results were interpreted using established reference ranges [9].

Ethical approval for the study was obtained from the Institutional Ethical Committee of SCPM College of Nursing and Paramedical Sciences, Gonda. Data were entered into Microsoft Excel and analysed using SPSS version 20.0. Continuous variables were expressed as mean $\pm$ standard deviation, while categorical variables were presented as frequencies and percentages. Group comparisons were performed using the independent t-test or Mann–Whitney U test, and the chi-square test was used for categorical variables. A p-value of <0.05 was considered statistically significant.

Results:

A total of 100 pregnant women were enrolled in the study, including 50 with gestational diabetes mellitus (GDM) and 50 with pre-gestational diabetes mellitus (PGDM). Both groups were comparable in baseline characteristics, with a mean age of approximately 30 years and a mean gestational age of 18–19 weeks. (Table no 1)

Table no 1: Baseline demographic characteristics

Parameter	GDM	PGDM
Mean Age	30.2 $\pm$ 4.5	30.8 $\pm$ 4.7
Gestational Age (weeks)	18.9 $\pm$ 9.5	18.5 $\pm$ 10.1
Gender	Female	Female

Blood pressure profiles were similar between the two groups, with no statistically significant difference ($p = 0.31$). Mild to moderate hypertension was the most common finding in both groups. (Table no 2)

Table no 2: Blood pressure

Parameter	GDM	PGDM	p
Range	114/74–130/100	116/74–140/100	0.31
Pattern	Mild–Moderate HTN	Mild–Moderate HTN	-

Fasting blood glucose levels were significantly higher in the PGDM group (160 ± 15 mg/dL) than in the GDM group (124 ± 10 mg/dL; $p < 0.001$), indicating poorer glycaemic control. (Table no 3)

Table no 3: Fasting blood glucose

Group	Mean $\pm$ SD	Range	p
GDM	124 $\pm$ 10	110–130	<0.001
PGDM	160 $\pm$ 15	116–172	<0.001

Lipid profile analysis showed significantly higher triglycerides, LDL cholesterol, and total cholesterol, along with lower HDL cholesterol, in the PGDM group, indicating more pronounced dyslipidaemia. (Table no 4)

Table no 4: Lipid profile

Parameter	GDM	PGDM	p
TSH	5.6 $\pm$ 3.2	10.2 $\pm$ 4.8	<0.001
FT3	1.6 $\pm$ 0.5	1.8 $\pm$ 0.6	0.08
FT4	11.2 $\pm$ 2.5	11.4 $\pm$ 2.7	0.65

Thyroid assessment demonstrated significantly elevated TSH levels in the PGDM group, while FT3 and FT4 levels were comparable between groups. (Table no 5)

Table no 5: Thyroid function

Parameter	GDM	PGDM	p
TSH	5.6 $\pm$ 3.2	10.2 $\pm$ 4.8	<0.001
FT3	1.6 $\pm$ 0.5	1.8 $\pm$ 0.6	0.08
FT4	11.2 $\pm$ 2.5	11.4 $\pm$ 2.7	0.65

Overall, women with pre-gestational diabetes exhibited poorer glycaemic control, adverse lipid profiles, and greater thyroid dysfunction, highlighting the need for comprehensive metabolic and endocrine monitoring during pregnancy.

Discussion:

The findings of the present study demonstrate that pre-gestational diabetes is associated with significantly greater metabolic derangements compared to gestational diabetes. Elevated fasting blood glucose levels in PGDM women reflect the chronicity of hyperglycaemia and its persistence before conception, in contrast to GDM, where glucose intolerance develops during pregnancy. Similar trends have been reported by previous studies (Gupta et al., 2021) [10], where pre-existing diabetes was linked with higher maternal complications due to inadequate metabolic adaptation

during pregnancy. The lipid profile analysis further supports the presence of dyslipidaemia in diabetic pregnancies, with notably increased triglycerides, LDL, and total cholesterol and decreased HDL in PGDM cases. This pattern is consistent with an atherogenic lipid state, commonly associated with insulin resistance and prolonged hyperglycaemia. Such lipid abnormalities can exacerbate endothelial dysfunction, predisposing to hypertensive disorders, preeclampsia, and fetal growth abnormalities. The observed elevation in TSH levels among pre-gestational diabetics aligns with earlier reports suggesting a bidirectional relationship between diabetes and thyroid disorders. Chronic hyperglycaemia and autoimmune mechanisms may impair thyroid function, resulting in subclinical hypothyroidism. Although FT3 and FT4 levels remained within normal limits, the increased TSH indicates a compensatory response to maintain thyroid hormone homeostasis. These hormonal alterations could influence glucose metabolism and pregnancy outcomes, warranting thyroid function monitoring in diabetic pregnancies. Collectively, these observations highlight that pre-gestational diabetes imposes a heavier metabolic and endocrine burden compared to gestational diabetes. Early diagnosis and strict control of blood glucose and lipid levels, along with regular thyroid function assessment, are critical for reducing adverse outcomes such as macrosomia, preterm delivery, and maternal cardiovascular complications. In another study, thyroid dysfunction was observed more frequently in pregnant women with gestational diabetes (GD) compared to those with pre-gestational diabetes (PGD). The mean TSH values were significantly higher in the GD group, indicating a higher prevalence of subclinical or overt hypothyroidism. This finding is consistent with the hypothesis that pregnancy-induced metabolic stress may unmask latent thyroid dysfunction in susceptible women (Dhanwal et al., 2013) [11]. Thyroid hormones play a critical role in maintaining maternal metabolic balance, and even mild disturbances can worsen glycaemic control and pregnancy outcomes (Casey & Leveno, 2006) [12]. The higher HbA1c and fasting blood glucose levels among GD women further support the bidirectional relationship between thyroid disease and glucose intolerance. Hypothyroidism is known to impair insulin-mediated glucose uptake and exacerbate insulin resistance, thereby increasing the risk of hyperglycaemia during pregnancy (Maratou et al., 2010) [13]. Conversely, hyperglycaemia may alter thyroid hormone metabolism by affecting deiodinase activity, which could partially explain the abnormal FT3 and FT4 trends observed in both groups (Kadiyala et al., 2010) [14]. Dyslipidaemia was more pronounced in GD women, with elevated triglycerides, LDL cholesterol, and total cholesterol, alongside reduced HDL cholesterol. Thyroid dysfunction itself is associated with lipid abnormalities, as TSH elevation and reduced thyroid hormones impair lipid clearance (Duntas & Brenta, 2012) [15]. The combination of diabetes, thyroid dysfunction, and dyslipidaemia in pregnancy creates a synergistic risk for cardiovascular complications, preeclampsia, and adverse neonatal outcomes. Previous studies have demonstrated that untreated maternal thyroid dysfunction can increase the risks of miscarriage, preterm birth, and impaired neurocognitive development in the offspring (Negro et al., 2010) [16]. The present findings highlight the importance of routine thyroid function testing in pregnant women with diabetes. International guidelines increasingly recommend TSH screening in high-risk pregnancies, particularly in women with diabetes or other autoimmune disorders (Stagnaro-Green et al., 2011) [17]. Early detection and management of thyroid abnormalities may not only optimize glycaemic control but also reduce the risk of maternal and fetal complications.

Conclusion:

The present study concludes that women with pre-gestational diabetes mellitus (PGDM) exhibit significantly higher levels of fasting blood glucose, triglycerides, LDL, total cholesterol, and TSH compared to those with gestational diabetes mellitus (GDM). These findings indicate that PGDM is associated with more severe metabolic disturbances, dyslipidemia, and subclinical thyroid dysfunction. In contrast, GDM patients demonstrate relatively better glycemic and lipid control, likely due to the shorter duration and pregnancy-induced onset of glucose intolerance. The results emphasize the importance of comprehensive metabolic profiling in diabetic pregnancies to guide individualized management strategies. Regular monitoring of blood glucose, lipid parameters, and

thyroid function can aid in early identification of risks, allowing timely intervention to ensure optimal maternal and fetal outcomes.

Clinical Significance:

Pre-gestational diabetes demonstrated poorer glycaemic control, more severe dyslipidaemia, and significantly higher TSH levels than gestational diabetes, while blood pressure profiles were similar. These findings support comprehensive metabolic and endocrine monitoring during pregnancy

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