

A STUDY ON RISK OF DEVELOPMENT OF GESTATIONAL DIABETES MELLITUS IN PREGNANT PATIENTS WITH OVER & SUBCLINICAL HYPOTHYROIDISM

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ABSTRACT

Background: Gestational diabetes mellitus (GDM) & hypothyroidism are among common endocrine pathologies encountered during pregnancy. The prevalence of GDM varies from 1% to 28%, taking into consideration the diversified screening methods & various risk stratifications depending on ethnicity & body mass index.

Objectives: To calculate the prevalence of overt and subclinical hypothyroidism and gestational diabetes mellitus among pregnant females and to find out if there is an association between these two pathologies.

Methods: It is a cross-sectional descriptive case series carried out over a period of 08 months from November 1st 2025 to July 1st 2026 at Department of Obstetrics & Gynecology, Sheikh Zayed Hospital, Lahore, which is a tertiary care hospital in Lahore, Pakistan. 300 pregnant females of age 18-40 years with single viable fetus were included in this study. Thyroid function tests (serum TSH, free T3 and free T4) were done at 16-20 weeks followed by oral glucose tolerance test (OGTT) at 24-28 weeks of gestation. Data was analysed by SPSS version 29.0 using Chi square test. P value equal to or less than 0.05 was considered statistically significant.

Results: The odds of developing gestational diabetes mellitus (GDM) were approximately 10 times higher among women with hypothyroidism (OR = 10.24, 95% CI: 4.32–24.28) & this association was statistically significant (p = 0.001)

Conclusion: Presence of hypothyroidism was significantly associated with an increased likelihood of development of gestational diabetes mellitus (GDM) in the study population.

Key words: Subclinical hypothyroidism, overt hypothyroidism, gestational diabetes mellitus (GDM).

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INTRODUCTION

Gestational diabetes mellitus (GDM) & hypothyroidism are among common endocrine pathologies encountered during pregnancy.¹ The prevalence of GDM varies from 1% to 28%, taking into consideration the diversified screening methods & various risk stratifications depending on ethnicity & body mass index.² In Pakistan,

however, prevalence of GDM has been reported to be as high as 57.90%.³ Based on the latest American Thyroid Association recommendations, subclinical hypothyroidism and overt hypothyroidism are found in 3.47% and 0.50% of pregnant females respectively.⁴

Hypothyroidism is associated with insulin resistance⁵ due to which disturbance in glucose metabolism & reduced thyroid gland function can exist simultaneously during pregnancy.⁶ Reduced thyroid reserve preconception can lead to subclinical hypothyroidism during pregnancy.⁷ Both GDM & hypothyroidism are associated with adverse maternal & fetal outcomes including preterm birth, caesarean delivery & preeclampsia.⁸ Co-existence of both of these disorders can multiply the risk of maternal & fetal complications.⁹

Research shows that pregnant females with hypothyroidism are at higher risk of developing hyperglycemia during pregnancy.⁹ This highlights the

importance of routine screening not only of thyroid profile in pregnant females, but also of gestational diabetes mellitus in those found to have decreased thyroid gland function. However, data from Pakistan remains scarce to prove relationship between these two important endocrine disorders. Thus the objective of this study is to estimate the prevalence of hypothyroidism and gestational diabetes mellitus among pregnant females and to find out whether there is an association between these two. This will help establish a protocol for early detection of these pregnancy related problems, which in turn can reduce the various maternal and fetal complications associated with undiagnosed and untreated hypothyroidism and hyperglycemia during pregnancy.

METHODS

This cross-sectional descriptive case study was conducted over a period of 08 months from November 1st 2025 to July 1st 2026 at Department of Obstetrics & Gynecology, Sheikh Zayed Hospital, Lahore, which is a tertiary care hospital in Lahore, Pakistan.

A sample size of 300 was calculated by OpenEpi calculator using prevalence of GDM in pregnancy of 36%³ with 5% margin of error and 95% confidence level. Pregnant women at 14-16 weeks of gestation attending routine antenatal checkups during the study period who were willing to participate were included in this study using a non-probability consecutive sampling technique. Eligible participants were enrolled until the required sample size was attained. Pregnant females aged 18-40 years with viable singleton pregnancy and who were not taking any hypoglycemic drugs before pregnancy were included. Pregnant females with type 1 or type 2 diabetes mellitus, those with diabetic retinopathy or diabetic nephropathy identified at antenatal booking were excluded. Additionally, those with history of thyroid disease or autoimmune diseases and those taking drugs causing hyperglycemia e.g. corticosteroids were not included in study. Pregnant females with multiple pregnancies, those not willing to participate in study or those with incomplete data on record were also excluded. After taking approval from institutional review board of Sheikh Zayed Hospital and verbal and informed written consent, 300 pregnant females presenting to outpatient department of Sheikh Zayed Hospital who fulfilled the inclusion criteria were enrolled for this study. A structured data collection proforma which was designed in accordance with the objectives of study was used and it was filled by the researcher herself. The proforma included information about potential risk factors for developing gestational diabetes mellitus, including age, weight, body mass index (BMI), parity and a family history of diabetes. Gestational age was calculated by the date of first day of last menstrual period (LMP) and was mentioned on proforma. Patients had their serum TSH (thyroid stimulating hormone) levels done between 16-20 weeks of gestation and results included in proforma. A level of serum TSH above 4.0 mIU/L was labelled as

hypothyroid. Females who were found to be hypothyroid were further advised free T4 (tetraiodothyroxine) levels and free T3 (triiodothyroxine) levels to differentiate between overt and subclinical hypothyroidism. Females included in this study were also advised 75 grams oral glucose tolerance test (OGTT) at 24-28 weeks of gestation. Gestational diabetes mellitus was diagnosed if any of these values were attained : a plasma glucose value in fasting above 92 mg/dl or above 180 mg/dl 1 hour after glucose intake or above 153 mg/dL 2 hour after glucose intake. All of this information was entered in proforma and proformas were rechecked for any missing details.

Data was entered and analyzed on Statistical packages for social science version 29.0. Mean and standard deviation was calculated for quantitative variables including age, weight, height, body mass index (BMI) gestational age, oral glucose tolerance test values and serum TSH, free T3 and free T4 values. For qualitative variables like GDM, hypothyroid status i.e. overt or subclinical hypothyroidism, history of miscarriage, family history of diabetes and management of GDM, frequency and percentage was calculated. Chi square test was applied and a P value of less than or equal to 0.05 was considered statistically significant.

RESULTS

The mean age of the participants was 28.48 ± 4.84 years, with a median age of 28 years (IQR: 25–32). The mean weight and height were 72.67 ± 13.90 kg and 160.02 ± 7.01 cm, respectively, while the mean BMI was 28.30 ± 4.65 kg/m². The mean gestational age at assessment was 27.38 ± 5.86 weeks. The mean serum TSH, FT4 and FT3 levels were 2.52 ± 1.65 , 1.13 ± 0.18 and 3.14 ± 0.50 , respectively. The mean fasting, 1-hour and 2-hour OGTT values were 84.32 ± 9.11 mg/dL, 143.82 ± 23.89 mg/dL and 135.40 ± 18.46 mg/dL, respectively.

Among the 26 women with hypothyroidism, 16 (61.5%) developed GDM, whereas 10 (38.5%) did not develop GDM. In comparison, among the 274 women without hypothyroidism, 37 (13.5%) developed GDM, while 237 (86.5%) did not. The proportion of GDM was therefore substantially higher among women with hypothyroidism (61.5%) compared with women without hypothyroidism (13.5%). The odds of developing GDM were approximately 10 times higher among women with hypothyroidism (OR = 10.24, 95% CI: 4.32–24.28). This association was statistically significant ($p = 0.001$), indicating that hypothyroidism was significantly associated with an increased likelihood of GDM in the study population.

Among the 274 euthyroid women, 37 (13.5%) had GDM, while 237 (86.5%) did not. Among the 9 women with overt hypothyroidism, 6 (66.7%) developed GDM, whereas 3 (33.3%) did not. Similarly, among the 17 women with subclinical hypothyroidism, 10 (58.8%) developed GDM, while 7 (41.2%) did not. Thus, the

prevalence of GDM was highest among women with overt hypothyroidism (66.7%), followed by those with subclinical hypothyroidism (58.8%), compared with only 13.5% among euthyroid women. The difference in the distribution of GDM according to thyroid-function status was statistically significant ($p = 0.001$), suggesting a significant relationship between thyroid dysfunction and the development of GDM

Table-1: Demographic, clinical and biochemical characteristics of study participants (n = 300)

Variables	Mean±S.D. / Median (IQR) / Frequency (%)
Age (years)	28.48±4.84 / 28 (25 – 32)
Weight (kg)	72.67±13.90 / 71 (63 – 81)
Height (cm)	160.02±7.01 / 160 (155 – 165)
BMI (kg/m ²)	28.30±4.65 / 28 (25 – 31)
Gestational age (weeks)	27.38±5.86 / 28 (23 – 31)
TSH	2.52±1.65 / 2.22 (1.61 – 2.80)
FT ₄	1.13±0.18 / 1.14 (1.04 – 1.26)
FT ₃	3.14±0.50 / 3.12 (2.80 – 3.51)
Fasting OGTT (mg/dl)	84.32±9.11 / 83 (78 – 88)
1 hour OGTT (mg/dl)	143.82±23.89 / 143 (125 – 161)
2 hour OGTT (mg/dl)	135.40±18.46 / 133 (122 – 145)
Thyroid status	Euthyroid 274(91.3%)
	Overt hypothyroidism 9(3.0%)
	Subclinical hypothyroidism 17(5.7%)
GDM status	Yes 53(17.7%)
	No 247(82.3%)
Hypothyroidism	Yes 26(8.7%)
	No 274(91.3%)
Previous miscarriage	Yes 41(13.7%)
	No 259(86.3%)
Family history of DM	Yes 69(23.0%)
	No 231(77.0%)
	None 247(82.3%)
GDM management	Oral 23(7.7%)
	hypoglycemic Dietary management 21(7.0%)
	Insulin 9(3.0%)

Table-2: Association between hypothyroidism and gestational diabetes mellitus

GDM	Hypothyroidism		Total	Odds ratio (OR) 95% CI	p-value
	Yes	No			
Yes	16 61.5%	37 13.5%	53 17.7%	10.24 (4.32 – 24.28)	0.001
No	10 38.5%	237 86.5%	247 82.3%		
Total	26 100.0%	274 100.0%	300 100.0%		

Table-3: Gestational diabetes mellitus according to thyroid-function status

Thyroid-function status	GDM		Total	p-value
	Yes	No		
Euthyroid	37 13.5%	237 86.5%	274 100.0%	0.001
Overt hypothyroidism	6 66.7%	3 33.3%	9 100.0%	
Subclinical hypothyroidism	10 58.8%	7 41.2%	17 100.0%	
Total	53 17.7%	247 82.3%	300 100.0%	

DISCUSSION

Thyroid dysfunction is around three times more common in pregnant females who develop gestational diabetes¹⁰ highlighting the importance of screening for early diagnosis and prompt management to prevent possible maternal and fetal complications associated with these two pathologies.

In our study, the mean age of participants was 28.48 ± 4.84 years, which was comparable to the study conducted by Shahbazian H et al.¹⁰ where females with GDM had mean age of 28.9 ± 5.53 years. However Kiran Z et al.¹¹ reported mean age to be 29.44 ± 4.85 years in her research. Mean body mass index (BMI) of pregnant females in our study was 28.30 ± 4.65 kg/m² which is less than mean BMI of 32.78 ± 4.78 kg/m² reported by Alotaibi EA et al.⁹ Mean gestational age of participants of this study was 27.38 ± 5.86 weeks which is different from mean gestation of 24.78 ± 4.49 weeks in the study conducted by Alvi S. et al.¹² These differences in age, BMI and gestational age of participants can be explained by the diversity in geographical regions, socioeconomic conditions and healthcare services available to pregnant females in various parts of world.

According to the findings of this study, prevalence of hypothyroidism was 8.7%, including 3.0% overt hypothyroidism and 5.7% subclinical hypothyroidism. This was in contrast with studies from other regions, including from India where out of 32% hypothyroid pregnant females, 6.3% had overt hypothyroidism and 25.3% had subclinical hypothyroidism.¹³ Similarly in a study from Somalia, out of 23.6% of pregnant females who were found to be hypothyroid, 8% and 15.6% had overt and subclinical hypothyroidism respectively.¹⁴ These variations can be due to different laboratory ranges of thyroid function tests in different areas, as well as higher prevalence of dietary iodine deficiency in certain parts of world.

17.7% of pregnant females included in this study developed gestational mellitus. This was less than reported prevalence of GDM of 23.8% in a recent study in Pakistan.¹⁵ In contrast a higher percentage of 32.34% has been reported by researchers from Bangladesh.¹⁶ A wide range of diagnostic criteria and difference in demographic variables can explain the differences in prevalence of GDM throughout the world. In keeping with this

consideration, a study from Nigeria found 19% of pregnant females with diabetes.¹⁷

In this study, out of 26 women with reduced thyroid function, 16 (61.5%) developed gestational diabetes mellitus later on. This percentage was significantly higher than that found by Alvi S. et al in a study carried out in Karachi, Pakistan where 11.9% pregnant hypothyroid females were found to suffer from diabetes later in gestation.¹² Various studies worldwide have pointed to similar association but with varying statistics. In a study of Iran (18), 18.8% pregnant females had hypothyroidism as well as gestational diabetes mellitus, and p value was found to be statistically significant. A similar research carried out by Moosazadeh M et al.¹⁹ found that the incidence of developing gestational diabetes in hypothyroid pregnant females was 11.8%. Similarly 8% hypothyroid pregnant females developed gestational hyperglycemia in a study conducted by Prasad et al.²⁰

This study will add to the limited available data from Lahore, Pakistan to prove that females who are found to have decreased thyroid function during pregnancy are at an increased risk of developing gestational diabetes mellitus, suggesting a significant relation between these two disorders. This highlights the importance not only of routine screening for thyroid disorders in early second trimester, but also of the need to introduce further surveillance for hyperglycemia during pregnancy in those females diagnosed to have hypothyroidism. This will in turn result in better management and improved maternal and fetal outcomes in such females. However, possible maternal and fetal outcomes associated with coexistence of hypothyroidism and hyperglycemia in pregnancy were not studied in this research, leaving an area of potential research for future.

CONCLUSION

A higher prevalence of gestational diabetes mellitus was found in pregnant hypothyroid females as compared to their counterparts who were euthyroid. Thus those with decreased thyroid reserve identified during gestation need further investigations for earlier detection of derangements in blood glucose levels during pregnancy. This calls for a need to introduce routine screening for hyperglycemia in pregnant females with hypothyroidism.

ETHICAL APPROVAL

Approval of article was granted by the Institutional Review & Research Advisory Board, Shaikh Zayed Federal Postgraduate Medical Institute of Nursing & Health Sciences, Lahore vide Reference No: 02-TERC/NHRC-SZH/INT-SC/970, Dated: 31 Dec, 2025.

AUTHOR'S CONTRIBUTIONS

RR: Conceived idea, design, data collection, data analysis, manuscript writing

AK: Concept, Review of Literature, critical analysis

All Authors: Approval of the final version of the manuscript to be published.

CONFLICT OF INTEREST

Authors declare no conflict of interest.

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