

Original Article

Prevalence of Hypothyroidism with and Without Gestational Diabetes Mellitus in Pregnancy at Civil Hospital Karachi

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Abstract

Objective: To compare the hypothyroidism among pregnant woman with and without gestational diabetes mellitus GDM at *Civil hospital Karachi*.

Methodology: A descriptive cross sectional study was conducted at Department of Gynae & Obs, Civil Hospital, Karachi, during six months from 07-09-20 to 07-03-21. Pregnant women aged 20-40 years with a single viable fetus assist on scan and gestational age of 24 weeks, early week scan were included. Women were screened for hypothyroidism (abnormal thyroid function tests) and GDM (abnormal plasma glucose values obtained during the 2 hours, 75-g OGTT) at 24 weeks of pregnancy. All the information was entered and analyzed using SPSS version 26.

Results: A total of 250 patients who met the inclusion criteria were enrolled. Mean age, gestational age and thyroid stimulating hormone (TSH) was 32.61 ± 3.14 years, 24.78 ± 4.49 weeks and 2.34 ± 0.58 μ IU/mL respectively. Hypothyroidism was more frequent 11.9% among those with gestational diabetes mellitus (GDM), compared to 4.2% in non-GDM cases with statistically significant ($p=0.035$), suggesting a higher likelihood of hypothyroidism in women with GDM.

Conclusion: Thyroid dysfunction, particularly hypothyroidism was found to be high in pregnant women with GDM compared to without GDM and therefore requires early screening and treatment to prevent adverse maternal and fetal outcomes.

Keywords: Pregnancy, GDM, thyroid function and hypothyroidism

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Introduction

Gestational diabetes mellitus (GDM) is generally characterized as elevated blood sugar levels identified or emerging during pregnancy,¹ presenting health risks for both the mother and the baby. It impacts about 15% of pregnancies, equating to around 18 million births each year.² GDM is among the most frequent medical complications during pregnancy, and if left inadequately managed, it can result in significant health risks for both the mother and neonates.^{2,3} During pregnancy, the body's sensitivity to insulin decreases, prompting pancreatic beta cells to produce more insulin to compensate.^{4,5} Insulin, released by these beta cells, is crucial for helping peripheral tissues absorb glucose, reducing glucose production in the liver, and regulating lipid release from fat stores. However, when standard

insulin levels do not elicit a sufficient response from insulin receptors, insulin resistance may occur.⁴ Consequently, reported prevalence rates of GDM in Pakistan vary widely, ranging from 4.41% to 57.90% across different studies.⁶ Despite this variability, comprehensive multi-center studies, community surveys, and local data limited within the country.⁶

Women with GDM face heightened risks of gestational hypertension, pre-eclampsia, and a higher likelihood of needing a Caesarean section.² Furthermore, GDM increases the risk of subsequent problems, including as cardiovascular diseases, overweight, and poor glucose metabolism, that may raise the possibility of type-II diabetes mellitus for mother as well as child.² As Pregnancy requires several compensatory mechanisms

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to establish a new balance.^{7,8} Thus, even a minor reduction in functional reserve, such as insulin resistance or low thyroid reserve before conception, can hinder adaptation and lead to conditions like gestational diabetes mellitus or various thyroid dysfunctions during pregnancy, including subclinical hypothyroidism, thyroid autoantibodies in the women with euthyroid and women with lower FT4 concentrations.⁷

GDM may result in complications such as miscarriages, birth trauma, and macrosomia.⁹ Therefore, if pregnant women with GDM also develop hypothyroidism, the risk of both fetal and maternal complications could further increase.⁹ Research globally has shown a higher prevalence of overt and subclinical hypothyroidism, as well as anti-thyroid peroxidase antibodies, among individuals in pre-GDM and GDM groups.⁹⁻¹² These findings highlight the importance of routine screening for thyroid dysfunction in all patients with diabetes or those at elevated risk for GDM.¹⁰ Although hypothyroidism has been linked with pregnancy complications like GDM, evidence for this connection remains inconsistent. We propose that hypothyroidism in pregnancy is associated with GDM and aim to study this potential relationship. Confirming such an association could indicate that early diagnosis and treatment of hypothyroidism in pregnant women may help reduce GDM risk and allow for enhanced monitoring throughout pregnancy.

Methodology

A descriptive cross sectional study was conducted at Department of Gynae & Obs, Civil Hospital, Karachi. Duration of study was six months from 07-09-20 to 07-03-21. The sample size of 250 pregnant women was calculated by "WHO calculator", using prevalence of GDM in pregnancy is 36%,⁶ with 5% margin of error and confidence level 95%. Non-probability consecutive sampling technique was used. All the pregnant women aged 20-40 years with a single viable fetus assist on scan and gestational age of 24 weeks, early week scan were included. Women suffering from diabetes prior to the pregnancy or diabetic complications identified during the initial prenatal assessment, polycystic ovarian disease, family or personal history of thyroid disorder, history of hormonal substances before or during the gestation or obtaining thyroid hormone replacement therapy, history of autoimmune disorders, and multiple pregnancies were excluded

After approval of proposal from college of physician and surgeon of Pakistan (CPSP) and taking their informed consent women were screened for hypothyroidism (abnormal thyroid function tests) and GDM (abnormal plasma glucose values obtained during the 2 hours, 75-g OGTT) at 24 weeks of pregnancy. A diagnosis of GDM is confirmed if any of the following thresholds are exceeded: fasting plasma glucose levels are ≥ 92 mg/dL (5.1 mmol/L), plasma glucose levels are ≥ 180 mg/dL (10.0 mmol/L) one hour after glucose intake, or levels are ≥ 153 mg/dL (8.5 mmol/L) two hours after intake. Furthermore, the diagnosis of hypothyroidism was evaluated in terms of low T₄ and T₃ levels and a raised TSH level (FT₃ <3.1 ng/dl and FT₄ < 7.39 pM/L respectively and TSH levels >4.86 μ U/mL). All information was recorded in self-designed proforma by researcher herself under supervision of consultant gynecologist. Data was analyzed by Statistical packages for social science version 17. Mean and standard deviation was computed for age, gestational age and TSH. Frequency and percentage were calculated for qualitative observations such as GDM, miscarriage, parity, and hypothyroidism. Chi-square test or Fisher exact test was used at $p \leq 0.05$ level of significant.

Results

A total of 250 patients visiting Department of Gynae & Obs, Civil Hospital Karachi, were studied. Mean age, gestational age and TSH in our study were 32.61 ± 3.14 years, 24.78 ± 4.49 weeks and 2.34 ± 0.58 μ U/mL. Out of 250 patients, 59 (23.6%) and 191 (76.4%) had and did not have gestational diabetes mellitus (Table I)

VARIABLE	Statistics	
Age (years)	32.61 \pm 3.14 years	
Gestational age (weeks)	24.78 \pm 4.49 years	
TSH (μU/mL)	2.34 \pm 0.59 μ U/mL	
Parity	Primiparous	67(34.80%)
	Multiparous	163(35.20%)
Miscarriage history	Yes	8(3.20%)
	No	242(96.80%)
GDM	Yes	59(23.6%)
	No	191(76.4%)

Out of 250 patients, 15 (6%) and 235 (94%) had and did not have hypothyroidism as shown in Figure 1.

Hypothyroidism was more frequent among those with gestational diabetes mellitus (GDM), with 11.9% of GDM cases having hypothyroidism, compared to 4.2% in non-GDM cases. The association between

hypothyroidism and GDM was statistically significant ($p = 0.035$), suggesting a higher likelihood of hypothyroidism in women with GDM. (Table II)

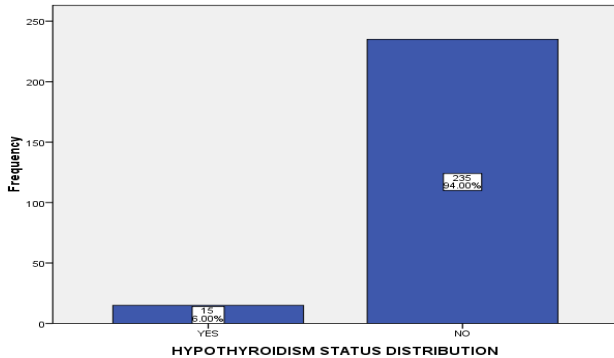


Figure 1. Hypothyroidism distribution. (n=250)

Table II: Frequency of hypothyroidism among pregnant woman with and without GDM. (n=250)

HYPOTHYROIDISM	GESTATIONAL DIABETES MELLITUS		p-value
	YES	NO	
YES	07 (11.9%)	08 (4.2%)	0.035
NO	52 (88.1%)	183 (95.8%)	
TOTAL	59 (100%)	191 (100%)	

Discussion

Endocrine disorders and its treatment during pregnancy represent significant therapeutic challenges for both endocrinologists and obstetricians, as these conditions can have serious implications for both maternal and fetal health. Approximately 10-15% of pregnant women experience thyroid dysfunction in the first trimester.¹³

Nevertheless, the frequency of thyroid-related disorders among pregnant women having diabetes is roughly three times more prevalent than in the rest of the population, and subclinical thyroid dysfunction has become more common.¹³ However this study included a total of 250 patients compare the hypothyroidism among pregnant woman with and without GDM with an overall mean age and mean gestational age as 32.61 ± 3.14 years and 24.78 ± 4.49 weeks respectively. In aligns to this study Shahbazian H et al¹³ reported that the overall mean age of all diabetic patients was 30 ± 6.5 years, with a mean age of 28.9 ± 5.53 years for those with gestational diabetes mellitus (GDM) and 30.6 ± 7.10 years for those with pre-gestational diabetes. In another study by Ali SH et al¹⁴ reported that the patients had a mean age of 29.43 ± 5.21 years, while the average gestational age was 36.45 ± 2.72 weeks. In the comparison of this study Kiran Z et al¹⁵ reported that the average age of pregnant women with hypothyroidism was 30.91 years (± 5.68), compared to

29.44 years (± 4.85) in the group of healthy pregnant women. The difference in mean age observed across different studies can be attributed to several factors.

For instance, the demographics of the study populations may differ, as some studies focus on specific geographical regions, socioeconomic backgrounds, or healthcare settings that influence the age of pregnant women participating in the research. Furthermore, differences in inclusion criteria, such as age limits or the specific types of diabetes studied, can affect the average age of participants.

In this study out of 250 patients, 23.6% had gestational diabetes mellitus and amongst them 6% had hypothyroidism. Consistently Arif R et al¹⁶ reported that the among the 250 patients, 15 (6%) were diagnosed with hypothyroidism, while 235 (94%) did not have the condition. In the comparison of this study Alotaibi EA et al⁹ found that 43 patients (10.85%) had subclinical hypothyroidism, while 74 patients (18.69%) were diagnosed with hypothyroidism. Furthermore, in this study Hypothyroidism was more frequent among those with gestational diabetes mellitus (GDM), with 11.9% of GDM cases having hypothyroidism, compared to 4.2% in non-GDM cases. In aligns to this study Luo J et al¹² reported that the low FT4 levels were strongly associated with GDM during the first and second trimesters of pregnancy.

Additionally, hypothyroxinemia, both overt and subclinical hypothyroidism, overt hyperthyroidism, and the presence of positive thyroid antibodies were significantly linked to an increased risk of GDM.¹² In the comparison of this study Moosazadeh M et al¹⁷ reported that the occurrence of GDM was more common in the group with hypothyroidism than in those without. Furthermore, women with hypothyroidism had a 1.11-fold increased risk of developing GDM however; this relationship did not reach statistical significance.

The study by Akdulum MF et al¹⁸ investigated the link between thyroid function tests conducted in the first trimester and the onset of GDM, finding a notable association between first-trimester subclinical hypothyroidism and the risk of developing GDM. Çetiner S et al¹⁹ found a statistically significant association was observed between women with GDM and the control group in terms of TSH and FBS levels (p -value < 0.001). TSH levels were higher in the GDM group (2.81 ± 1.48) compared to the controls (1.77 ± 0.51).

Furthermore, a meta-analysis by Gong LL²⁰ also suggests that hypothyroidism could be a risk factor for developing gestational diabetes. Özişik H et al²¹ also observed that the subclinical hypothyroidism was identified more often in pregnant women with gestational diabetes mellitus compared to those without it. However, this study contributes valuable insights to the field by highlighting the relationship between hypothyroidism and GDM among pregnant women. It reveals a significantly higher rate of hypothyroidism in women with GDM compared to those without, suggesting a potentially important clinical link. This finding underscores the need for heightened screening and monitoring of thyroid function in pregnant women with GDM, as managing thyroid levels may improve maternal and fetal outcomes. This study possesses several limitations, including a limited sample size and an unequal distribution between groups, which may affect the generalizability of the findings. Additionally, fetal and maternal outcomes were not analyzed, leaving gaps in understanding the full clinical implications. Therefore, further longitudinal studies with larger, well-balanced samples and a focus on maternal and fetal outcomes are recommended to validate and expand upon these findings.

Conclusion

A high prevalence of hypothyroidism observed in women with gestational diabetes mellitus compared to the non GDM women, underscoring the importance of assessing thyroid function in these patients during pregnancy. Findings can help guide discussions between clinicians and patients on the potential benefits of thyroid hormone therapy. Research into the timing of thyroid hormone initiation, particularly in the first trimester when it may reduce the risk of pregnancy loss, is also warranted. For those undergoing treatment, regular monitoring and dose adjustments are essential. Universal thyroid screening during pregnancy could be beneficial and cost-effective, with potential improvements in maternal and fetal outcomes.

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