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Prevalence and impact of thyroid dysfunction in pregnant women with gestational diabetes: A comprehensive evaluation

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Abstract
Gestational diabetes mellitus (GDM) is a common metabolic disorder during pregnancy, and thyroid dysfunction is a prevalent endocrine condition among pregnant women. This research paper aims to comprehensively evaluate the prevalence, clinical significance, and potential implications of thyroid dysfunction in pregnant women with gestational diabetes. The study will involve a large cohort of pregnant women diagnosed with GDM, and their thyroid function will be assessed through thyroid hormone levels (TSH, T3, and T4) and thyroid autoantibodies. The prevalence of thyroid dysfunction (hypothyroidism, hyperthyroidism, or thyroid autoimmunity) will be determined, and its association with GDM severity, pregnancy outcomes, and maternal-fetal health will be analyzed. Additionally, the research will investigate the impact of thyroid dysfunction on insulin resistance, glucose control, and the need for medical intervention in managing GDM. The findings from this study will provide valuable insights into whether routine thyroid function screening should be recommended for pregnant women with GDM and whether addressing thyroid dysfunction could improve pregnancy outcomes in this high-risk population.

Keywords: Pregnant women, comprehensive evaluation

Introduction
In addition, a number of studies led by different researchers demonstrated that elevated levels of thyroid peroxidase antibodies [TPO] in euthyroid pregnant women were associated with an increased risk of pregnancy complications. These complications included pre-labour rupture of membranes [PROM], an unnatural birth cycle, and preterm labour During pregnancy, the prevalence of TPO antibodies in asymptomatic women has been estimated to be between 6 and 19 percent, and around 10 percent of pregnant women in their sixteenth week of pregnancy had TPO Ab, which may be associated with hyperthyroidism The prevalence of thyroid dysfunction in pregnant women who have type 1 diabetes is significantly higher than the prevalence of thyroid dysfunction in the general population. In point of fact, even in certain research, there was a correlation between type 1 diabetes and thyroid dysfunction in forty percent of the pregnant women. Subclinical hypothyroidism is the most common form of thyroid malfunction. Other forms of thyroid dysfunction are far less common Clinical and subclinical thyroid hyperthyroidism, like type 2 diabetes, is an insulin blockage disease. This illness, on its own, would be able to suggest a relationship between the two infections. There have been a few studies that point to the possibility that maternal diabetes during pregnancy might have an effect 3 on T3 emission or the dynamic T4 to T3 transition in the hatchling this lends credibility to the hypothesis that diabetes and thyroid problems are linked [1].

It was estimated that between 4.7 and 7.4 percent of the population in Iran was affected by GDM 10-15 percent of pregnant women will, throughout the primary half of their pregnancies, be affected negatively by the adverse consequences of thyroid dysfunction Several studies have shown that women who have GDM had a higher than average prevalence of hypothyroxinemia and higher than average levels of TPO's enemy According to what was stated previously, and taking into consideration the possibility of a connection between diabetes and thyroid dysfunction, in spite of the fact that a number of have been conducted on the subject, the kind of causal relationship between these infections has not yet been demonstrated in every single one of the studies [2].

Hyper thyroidism in pregnancy

At the point when thyroid organ delivers “more [overactive] thyroid chemicals that condition is called Hyperthyroidism the predominance of clinical Hyperthyroidism is seen as in 0.1-0.4% of pregnant ladies”.

Types

Nearly 0.002 percent of pregnancies are diagnosed with clear hyperthyroidism, which is characterized “by a decreased TSH level and an increased FT3/FT4 In 1.7 percent of pregnancies, a condition known as subclinical hyperthyroidism presents itself. This condition is characterised by a suppressed serum TSH and typical FT4 levels

Causes

Graves' disease is the most common explanation for this. Other causes of hyperthyroidism in pregnancy, according to “include subacute thyroiditis, dangerous multinodular goitre, deadly thyroid adenoma, and inappropriate LT4 consumption” [3].

Complications

“If left untreated hyperthyroidism significantly increases the risk of pregnancy and poor fetal outcomes, which includes”.

Treatment

“According to the Endocrine Society Clinical Practice Guideline [ESCPG] and the American Thyroid Association [ATA], the treatment of decision is with two anti thyroid medications [ATDs], MMI and propylthiouracil [PTU]. Both MMI and propylthiouracil [PTU] cross the placenta, and consequently are utilised to treat hyperthyroidism” When treating hyperthyroidism in pregnant women with ATD, the goal is to keep the maternal serum FT4 level at or just over the maximum possible range that is normal for pregnancy while applying as little ATD as is humanly possible. The drug propylthiouracil [PTU] [4].

Hypothyroidism during pregnancy

Hypothyroidism is the medical term for the condition that occurs when the thyroid gland produces much less thyroid compounds than normal, making the thyroid gland underactive In pregnant women, clinical hypothyroidism presents itself at a prevalence of between 0.3 and 0.5 percent.

Increases in iodine renal clearance

As a result of an increase in the glomerular filtration rate, there is an increase in the urine loss of iodine that occurs during pregnancy. This results in iodine shortage and goitre in the mother.

Gestational diabetes mellitus [GDM]

The term "gestational diabetes" refers to glucose intolerance that worsens during the course of pregnancy or is diagnosed for the first-time during pregnancy. The percentage of India's population that has GDM ranged “percent in different parts of the country, depending on the geological regions and the suggestive methods that were used. It has been hypothesised that GDM is more prevalent in urban areas compared to rural areas and provincial regions. The fact that two ages are at increased risk of developing diabetes in the future is the relevance of GDM. Women who come from families with a history of gestational diabetes have an increased risk of developing type 2 diabetes, as do their offspring [5].

Pathophysiology of GDM

“GDM is defined as glucose intolerance of varying degrees commencing during pregnancy or being recognised for the first-time during pregnancy. The percentage of India's population that has GDM ranged from 3.8 percent to 21 percent in different parts of the country, depending on the geological regions and the indicative methods that were applied. It has been hypothesised that GDM is more widespread in urban areas as compared to provincial areas The relevance of GDM lies in the fact that two ages are at risk of developing diabetes in the future. Women who come from families with a history of gestational diabetes [GDM] have an increased risk of developing type 2 diabetes, as do their offspring [6].

Treatment for GDM

“The initial treatment for type 2 diabetes is clinically healthy treatment; modest exercise has been employed in the management of type 2 when clinically sound treatment and healthy lifestyle changes are not successful, pharmacotherapy is the next line of defense. Insulin is the cornerstone of modern pharmaceutical treatment. Transitional and short-acting insulin, such as the conventional recombinant insulin analogues as part and lispro, are examples of the types of insulin that can be incorporated into insulin regimens Insulin has, for the most part, been the medicine of choice for the management of GDM in female patients. Oral hypoglycemic medicines such as glyburide [a second generation sulfonylurea] and metformin [a biguanide] are appealing alternatives to insulin due to their reduced cost, ease of organisation, and improved ability to maintain adherence” [7].

Parameters

Thyroid function assessment

At the primary prenatal appointment, which occurred between weeks 9 and 13, the maternal blood tests were collected in vacutainer tubes of 10 millilitres, centrifuged, and stored in aliquots at a temperature of -80 degrees Celsius until they were analysed. Chemiluminescent microparticle immunoassays were utilised in order to carry out quantitative research on thyroid chemicals [TSH].

Oral Glucose Tolerance Test [OGTT]

At 24-28 weeks, the women were tested for Gestational Diabetes Mellitus [GDM], and they were classified “as having GDM in the file pregnancy at that time if any abnormal plasma glucose esteems were obtained during the 2-hour, 75g OGTT This was done in accordance with the Diabetes in Pregnancy Study Group India [DIPSI] demonstrative measures”.

Objectives

1. “To explore the relationship between thyroid dysfunction in pregnancy and hazard of creating gestational diabetes mellitus”.
2. “To recognize the other danger factors for creating gestational diabetes mellitus”.

Research methodology

The protocol for conducting the review was completed and presented to the Institutional Human Ethical Committee [IHEC] in order to receive their approval. IHEC has given its approval to the convention. "After that, education was provided on it, and a license was obtained from the heads of the departments of obstetrics and gynecology and endocrinology at PSG Hospitals in Coimbatore". "Within a short period of time, the evaluation was initiated in the Obstetrics and Gynecology and Endocrinology Departments of PSG Hospitals in Coimbatore. All of the pregnant women older than 18 who were present for prenatal care were given information about the review convention in a language that was understandable to them [English, Tamil]".

The patients who agreed to participate in the review and gave their written informed agreement to do so were recruited for the study. Details on the participants' demographic profiles, including their age, body mass index [BMI], occupation, and contact information, as well as their whole medical history, were "Read up members were evaluated for Serum Thyrotropin levels [TSH, FT4] during their first trimester weeks], based on which they were assembled cut off qualities were acquired from 'American Thyroid Association' 2017 and they were followed as of the most recent trimester". They were given an oral glucose resilience test between the ages of 24 and 28 weeks, as required by the DIPSI criteria for the GDM analysis [8].

Diagnosis of GDM

"Diabetes in pregnancy study group India [DIPSI] diagnostic criteria, diagnosed based on the 2 – hour 75gm oral glucose tolerance test [OGTT] with a threshold plasma glucose concentration greater than 140 mg/ dl at 2 hour, performed in fasting /non – fasting state irrespective of the last meal timing" [9].

Table 1: TSH cut off values according to American thyroid association guidelines

Groups	TSH Values	Patient Condition
Group-1	0.1-2.5mU/L	Euthyroid
Group-2	> 2.5mU/L	Subclinical hypothyroid
Group-3	> 10mU/L	Overt hypothyroid

Table 2: TSH reference values in different trimesters.

Gestational age	TSH reference values
First trimester	0.1-2.5mU/L
Second trimester	0.2-3.0mU/L
Third trimester	0.3-3.0mU/L

"The information was analysed with the use of the Statistical software package for sociologists [IBM SPSS, An analysis of variance [ANOVA] and a student's t-test were used to research the incidence of GDM in relation to the segment variables and clinical Pearon's x2 test was used to analyse the group astute association between clinical characteristics and GDM. GDM risk assessment between the groups was performed using odds ratios [OR] and rigorous confidence intervals that extended to 95 percent [CI]. P values less than 0.5 were considered to be appreciably large" [10].

Study Procedure

Patients who meet the consideration requirements and provide their consent to be reviewed are included in the analysis. The patient's clinical history and the results of any major exams are obtained in accordance with the proforma that has been enclosed. Screening will be performed on all of the patients who are eligible, and their thyroid status will be Patients who are diagnosed with hypothyroidism or who have subclinical hypothyroidism will be monitored until delivery is complete. The clinical progress that has been made as a result of the treatment will be recorded. Sincere investigation will be conducted into the findings of the review [11].

Results and Discussion

Percent of the population under study was underweight, and there was a 9.09 percent prevalence of GDM within this group. 36.9 percent of the people in the population who were considered to be of a normal weight had a 12 percent prevalence of The analysis found that those who were overweight made up 40.19 percent of the population and had a GDM rate of 17.07 percent. 17.64 percent of the population under study had obesity, and 16.66 percent of those obese people had GDM [12].

Table 3: Comparison of the clinical characteristics across the study population

Clinical Characteristics	Total Number of Patient[%]		No. of GDM patients [%]		P values
	With	Without	with	without	
Family history of diabetes	51[24.5%]	153[75%]	9[17.6%]	21[13.7%]	0.257
History of GDM	8[3.9%]	196[96%]	2[25%]	28[14.2%]	0.280
History of PCOD	12[5.8%]	192[94.1%]	5[41.6%]	25[13%]	0.037*
History of thyroid	22[10.7%]	182[89.2%]	4[18.1%]	26[14.2%]	0.589
History of infertility	10[4.9%]	194[95%]	4[40%]	26[13.4%]	0.003***

"Data was analyzed using Student's t test, P values <0.5 were considered as statistically significant"

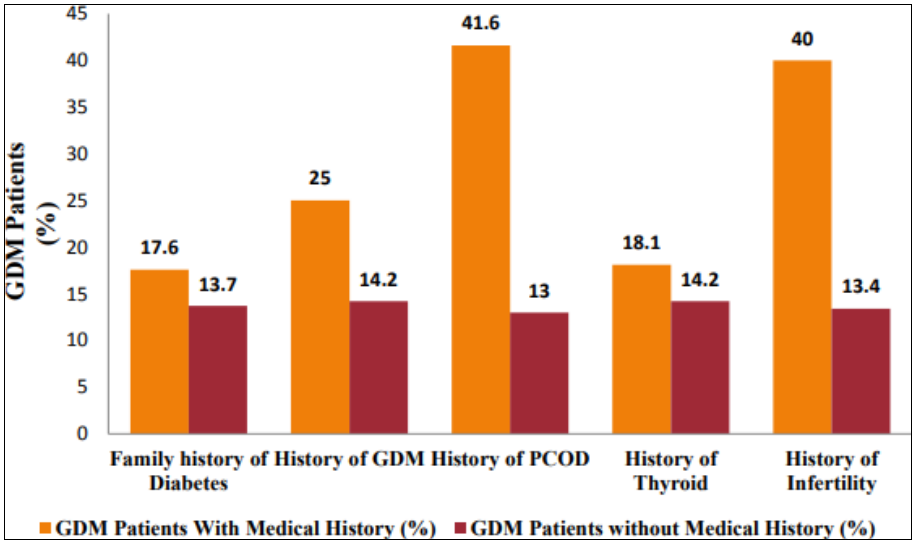

Fig 1: Incidence of GD Min patients with and without medical history

"There was a slight increase in the rate of GDM among patients who had a family history of diabetes when compared to patients who did not have a family history of percent versus 13.7 percent], among patients who had a history of thyroid than among patients who did not have a history of thyroid [18.1 percent versus 14.2 percent], among patients who had a history of GDM when compared to patients who did not have a history of GDM when compared to patients who did not have a percent versus There was a significant increase in the frequency of GDM in patients who had a history marked by PCOD when compared to those who did not have a history of PCOD [41.6% versus 13%], and there was also a significant increase in the frequency of GDM in patients who had a history of barrenness when compared to those who did not have a history of fruitlessness percent versus 13.4 percent".

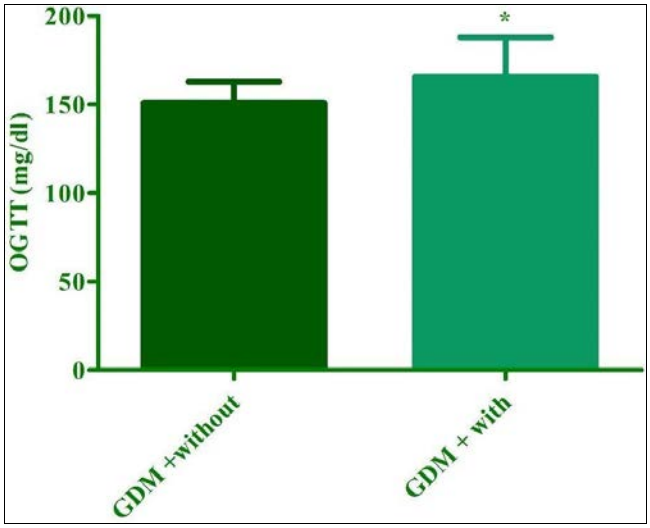

Fig 2: Incidence of GDM in patients with and without History of PCOD

The information is conveyed using the mean and standard deviation. The results of a study that used the student's t-test to measure data indicate that pregnant women who come from families with a history of polycystic ovary syndrome have a significantly higher risk of developing gestational diabetes than pregnant women who do not come from families with a history of polycystic ovary syndrome [41.6% versus 13.0%, p=0.037, P.05] [13].

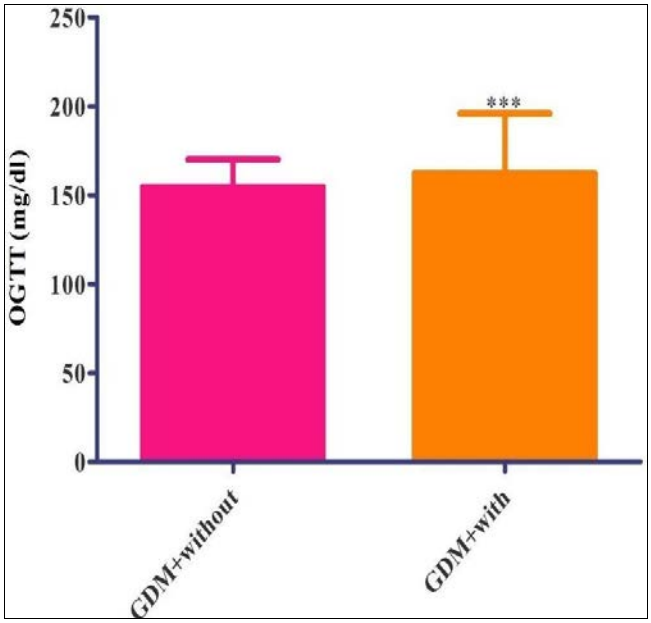

Fig 3: Incidence of GDM in patients with and without History of Infertility

The information is conveyed using the mean and standard deviation. The Student's t test was utilised in the gathering of factual information. Denotes the reality that pregnant women who come from families with a history of infertility have a much higher risk of developing gestational diabetes than pregnant women who do not come from families with a history of infertility [14].

Table 4: Comparison of Thyrotropin [TSH] values in early pregnancy between GDM and non-GDM pregnant women

Patients	TSH values [mU/liter]		P values
	Non-GDM	GDM	
Total Patient	3.662[n=174]	7.299[n=30]	0.3558*
Euthyroid	1.485[n=89]	1.431[n=11]	0.8022
Subclinical HypoThyroid	4.961[n=32	4.611[n=14]	0.5584
Oert Hypo Thyroid	11.18[n=19]	24.16[n=5]	0.0145*

Information was investigated utilizing Student's t test, P esteems <0.5 were considered as measurably Significant

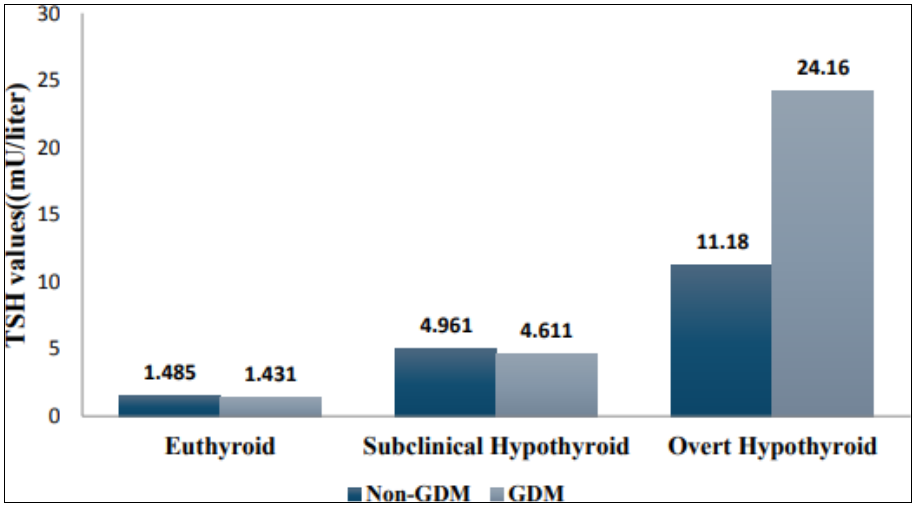

Fig 4: Correlation of mean TSH esteems among GDM and non GDM patients.

In the Euthyroid group, the mean TSH values were somewhat lower in GDM patients as compared to non-GDM according to the study [14]. In individuals with type 2 diabetes who had subclinical hypothyroidism, the group mean TSH values were somewhat lower than in those who did not have type 2 diabetes When compared with individuals who did not have diabetes, those who did have diabetes had significantly higher mean TSH levels mU/liter as opposed to 11.18 mU/liter] in the Overt Hypothyroidism group [15].

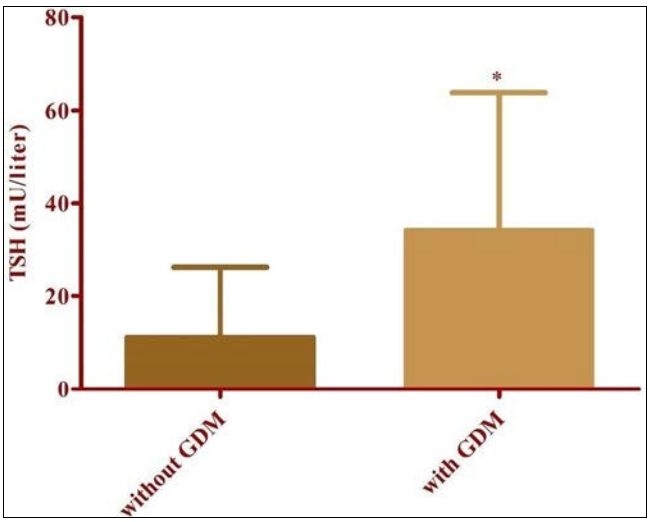

Fig 5: Comparison of mean TSH values in overt hypothyroid group between GD M and non GDM patients

"The information is conveyed using the mean and standard deviation. The Student's t test was utilised to carry out the quantitative research. * denotes the quantifiable significance of mean serum TSH in clear hypothyroid people with GDM as compared to non-GDM patients inside the same gathering [24.66 mU/liter versus 11.18 mU/liter, p=0.014]".

Table 5: Comparison of OGTT values in GDM patients

OGTT Values	Euthyroid	Subclinical Hypothyroid	Overt Hypothyroid
≥140	144.8(n=11)	149.6(n=14)	169.2(n=5)
P value		0.0617	< 0.001***

Conclusion

"The substance produced by the thyroid is essential for the early development of the placenta In particular, during the first twelve weeks of pregnancy, the embryo is wholly dependent on the thyroid chemical produced by the mother for the normal development of its neurological and skeletal systems. Therefore, an early diagnosis and effective treatment of maternal hypothyroidism during pregnancy is essential to reducing the frequency of complications associated with hypothyroidism, such as the removal of the foetus, toxaemia, intrauterine growth restriction [IUGR], placental abruptness, oligohydramnios, and low birth weight. Women with hypothyroidism who were not given adequate treatment had a threefold increased risk of developing toxaemia in my study group. In the group that was inadequately treated, there was a significant increase in the rate of foetal removal or foetal growth restriction.

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