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A Study of the Prevalence of Subclinical Thyroid Dysfunction in Pregnant Women in the First Trimester in Kirkuk City

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Abstract

Thyroid diseases have become increasingly prominent among endocrine disorders in recent years. There is a close functional relationship between the thyroid gland and the reproductive system, leading to a high probability of co-occurring disorders. Reproductive health problems are a major concern worldwide, and investigating the effects of thyroid diseases on pregnancy is relevant. Subclinical and overt hypothyroidism is mostly attributed to thyroiditis and causes risks such as premature birth, miscarriage, and failure neurodevelopment in the child.

The aim of the current study is to determine the prevalence of subclinical hypothyroidism in the first trimester of pregnancy and to compare the results with mothers with normal thyroid function.

Methods: This study was conducted over a period of seven months. Women in the first months of pregnancy underwent a thyroid-stimulating hormone (TSH) level test. For women with high TSH levels, fT3 and fT4 hormones were also measured in the same sample. The women were divided into two groups: Group 1: all women with (TSH) levels above (2.5 mIU/ml), considered to have hypothyroidism (12 women); and Group 2: women with normal thyroid function, with (TSH) levels between (0.1- 2.5 mIU/ml) 88 women.

Results: Patients ranged in age from (19- 37 years), with a mean age of (26.50±3.778 years). The average gestational age of the study participants was (8.136±2.731) weeks. The mean TSH, fT3, and fT4 values were (2.376 ± 1.241mIU/ml), (2.168±0.7969nmol/L), and (97.95±33.50nmol/L), respectively. Thyroid disorders were found in 12% of the 100 patients. 88% of the patients had normal thyroid function.

Conclusion: The current study revealed a high prevalence of hypothyroidism (12%) among pregnant women in the first trimester. Because of the significant impact of thyroid dysfunctions on the health of both mother and fetus, we recommend routine thyroid testing before, during, and after pregnancy.

Keywords: TSH, fT3, fT4, Thyroid diseases, pregnancy

Introdaction

During pregnancy, most of the fetus's hormones are produced in the first trimester by the mother's thyroid gland. These hormones are distributed to the fetus via the placenta and perform various neurophysiological functions, contributing to its growth and development, including the (cardiovascular system, the central nervous system, and the musculoskeletal system), in addition to other physiological functions(Akhter et al.,2020). Therefore, pregnancy is a condition that requires an increase in thyroid hormone levels due to the increased need for it in fetal growth and neurological development(Yasmin et al.,2022).

Pregnancy is an environment of numerous fluctuations in most of the body's hormones throughout its three trimesters. Due to the changing levels of the pregnancy hormone hCG in the blood during pregnancy, thyroid-stimulating hormone (TSH) levels are affected. This makes thyroid dysfunction the second most common endocrine disorder after gestational diabetes(Zhou et al.,2019). The most common cause of hypothyroidism is primary thyroid dysfunction. In some cases, this is attributed to hypothalamic dysfunction(Mn and Reddy ,2019) and various other factors such as congenital factors, genetic predisposition, surgery, viral infections, and even autoimmune diseases(Mainali et al .,2023). For pregnant women, the most common causes are thyroiditis, iodine deficiency, radioactive iodine therapy, and surgical removal of the thyroid gland(Mn and Reddy ,2019).

Thyroid disorders are classified into overt and subclinical disorders. Overt hyperthyroidism is defined as a low level of thyroid-stimulating hormone (TSH) with a normal level of thyroxine (T4) in the blood, while subclinical hypothyroidism is defined as an elevated level of (TSH) with a normal level of (T4)(Han et al ., 2022). Overt thyroid disorders, on the other hand, are characterized by marked changes in all thyroid hormones(Akhter et al.,2020). The prevalence of subclinical and overt hypothyroidism during pregnancy varies according to several factors, including age, family history, and demographics. Prevalence rates are high in many countries(Hypothyroidism et al., 2021). Therefore, the Endocrine Society recommends prenatal thyroid screening for women over 30 years of age who experience pregnancy complications, have a family history of thyroid disorders, or have autoimmune disease(Anandappa et al .,2020) the upper limit for TSH levels are (2.5 mIU/ml in the first trimester) and (3.0 mIU/ml in the second and third trimesters), (according to the standards published in the 2011 American Thyroid Association (ATA) guideline). However, subclinical hypothyroidism may be over diagnosed using this standard(Study,2022).

Thyroid hormones play a major role in regulating fetal growth through processes that facilitate placental development, fetal oxygen and glucose consumption, and other contributing factors that affect fetal skeletal growth, and accumulation(Puthiyachirakal et al ., 2025). Therefore, overt hypothyroidism in pregnant women usually results from serious maternal complications such as cardiac arrhythmias, anemia, gestational hypertension, congestive heart failure, myopathies, and postpartum hemorrhage(Pokhrel,2024). Also, high rates of fetal morbidity and mortality, including (premature birth, spontaneous abortion, preeclampsia, low birth weight, and high perinatal mortality)(Khakurel et al.,2021)(Abbas et al.,2023) Newborns of mothers with hypothyroidism may develop attention deficit hyperactivity disorder (ADHD). Without replacement therapy, the absence of thyroid hormones can lead to intellectual disability because these hormones play a crucial role in translating genetic information into a specific human trait. In other words, no matter how advanced the genetic information inherited from the child's ancestors may be, it will not be fully realized without thyroid hormones(Ghassabian et al.,2012).

The link between thyroid disorders and early miscarriage stems from maternal resistance to thyroid hormone receptors, resulting from the transfer of high levels of thyroid hormone to the fetus via the placenta. Autoimmune causes are the most common reason for irreversible neurological deficits, in addition to fetal thyroid dysfunction(Varner et al.,2024). Despite the significant harm that overt hypothyroidism can cause to pregnancy and childbirth in women, the effects of subclinical hypothyroidism on adverse pregnancy outcomes have not yet been determined(Li et al.,2020).

Most studies on postpartum thyroid disorders indicate that the incidence of persistent hypothyroidism ranges from 20% to 40% within 3–12 years following an episode of puerperal thyroiditis. However, few studies have examined the development of postpartum thyroid function in women with subclinical hypothyroidism during pregnancy(Pregnancy and Yang ,2020). Given the close functional relationship between the thyroid gland and the reproductive system, this is a major concern worldwide regarding reproductive health disorders (Pasyechko et al.,2020).

Oral administration of levothyroxine (LT4) is one of the treatment options for overt maternal hypothyroidism. The question that arises for clinicians is: Is subclinical hypothyroidism (SCH) a disease that requires treatment, or is it merely a biochemical diagnosis with no clinical implications? Although some observational studies suggest a benefit of levothyroxine (LT4) treatment in pregnant women with subclinical hypothyroidism, the results of large-scale randomized trials indicate the opposite(Maraka et al.,2018).

Materials and methods

Study Participants

This study was conducted in Kirkuk and included 100 pregnant women in their first trimester attending the outpatient clinic. Blood samples were taken from all enrolled patients to perform thyroid function tests and determine the prevalence of hypothyroidism. 5ml of venous blood were drawn from each pregnant woman into standard serum vials, allowed to coagulate, and then centrifuged to separate the serum.

Thyroid gland status assessment

Blood samples were collected to measure (serum TSH, free triiodothyronine (fT3), and free thyroxine (fT4) levels) using electro-chemiluminescence technology on a Cobas e 411 Analyzer (Apal-Japan).

Statistical Analysis

Standard methods were used to calculate the arithmetic mean and standard deviation. Statistical comparisons performed using (paired-samples t-test). Results were considered statistically significant at the ($p < 0.05$).

Result

This study included measuring thyroid hormones in (100) women in the first months of pregnancy, whose ages ranged from (19-37) years. The results showed that the highest level of TSH hormone diagnosed was (4.880 mIU/ml) while the lowest level was (0.3300 mIU/ml). As for fT3 and fT4 hormones, their highest levels were (3.020 nmol/L) and (166.9 nmol/L) respectively, while the lowest levels of fT3 and fT4 hormones were (1.110nmol/L) and (73.90 nmol/L) respectively, as shown in Table (1).

Table (1) shows the highest and lowest values of thyroid hormones

	Max	Min	Mean±SD
Age (yrs.)	37	19	26.50 ± 3.778
Gest Age (weeks)	13	4	2.731 ± 8.136
TSH level (mIU/ml)	4.880	0.3300	2.376 ± 1.241
fT3 level (nmol/L)	3.020	1.110	0.7969±2.168
fT4 level (nmol/L)	166.9	73.90	97.95 ± 33.50

The results of these study showed that 12 women out of the total number of pregnant women (i.e., 12%) had significantly elevated TSH levels. When compared to the 88% of pregnant women, there was a statistically significant difference ($p < 0.0001$). (fT3 and fT4 were not considered, as their levels did not change significantly in the first trimester.) These results confirm the diagnosis of subclinical hypothyroidism in 12% of the total number of pregnant women, as shown in Table (2).

Table (2) shows the level of thyroid hormones between two groups of pregnant women

Parameter	Percentage	Mean±SD	P value
TSH level (mIU/ml)	88%	0.7028±1.52	<0.0001
	12%	0.5554±3.586	
fT3 level (nmol/L)	88%	0.9068±2.11	0.3574
	12%	2.390±0.5789	
fT4 level (nmol /L)	88%	101.5±37.41	0.5422
	12%	93.24±30.35	

Discussion

The results of this study were found to be supported by various studies conducted in different countries. For example, the results of a study by Shanqeeti, Shatha A Al et al. in Saudi Arabia found that the prevalence of subclinical hypothyroidism among pregnant women reached 13%(Shanqeeti et al.,2018), and a prevalence rate of (11%) was found in a study conducted in India (Sharma and Sharma,2019). Studies show that pregnant women in Eastern countries are more prone to subclinical hypothyroidism compared to Western countries. The differences between regions may be attributed to the lack of standardization in study settings or laboratory techniques(Shanqeeti et al.,2018). While the Indian study by (SINGH et al.) found the prevalence of thyroid dysfunctions to be low, noting that the prevalence of subclinical hypothyroidism was 6.1%(Singh,2018).the prevalence was very high (26.5%) in a study by Rajput, Rajesh et al (Rajput et al.,2015). These results are inconsistent with the current study.

The endocrine and metabolic changes that occur in pregnant women may contribute to altered thyroid hormone levels. Possible causes of these changes in thyroid function during pregnancy include the (effect of human chorionic gonadotropin (hCG) on thyroid activation, elevated estrogen levels during pregnancy, relative iodine deficiency, and the placenta's effect on removing iodine from T4 hormone)(Zhang et al.,2017).

Autoimmune thyroid disorders occur as a result of the presence of antibodies to both the thyroid peroxidase enzyme (TPO) and thyroglobulin, leading to hypothyroidism. TPO is responsible for iodine oxidation and regulation, as well as for the synthesis of T4 and T3 hormones. (TG) helps in the synthesis of thyroid hormones, and autoimmune thyroiditis can cause recurrent miscarriages, which may result from a general activation of the immune system, leading to embryo rejection(Twig et al.,2012). Hypothyroidism can cause preeclampsia due to constriction of vascular smooth muscles in systemic and renal blood vessels, leading to elevated diastolic blood pressure, increased peripheral vascular resistance, and decreased tissue perfusion(Mahadik et al.,2020).

Thyroid disorder can cause imbalances in sex hormones, irregular menstrual cycles, and luteal phase deficiency. All of these factors may lead to infertility and irregular menstruation(Singh,2018).

Numerous studies have shown that mild maternal hypothyroidism negatively affects children's neurodevelopment. Many studies have demonstrated that both low and high levels of free T4 hormone in the mother at the beginning of pregnancy are associated with lower IQ scores in the child and an increased likelihood of the child having a lower IQ score compared to normal maternal free T4 levels(Lee and Pearce ,2022)

Conclusion

the current study found a significant prevalence of thyroid disorders among women in the early stages of pregnancy. These findings highlight the need for an early screening program for thyroid function during pregnancy, as elevated thyroid-stimulating hormone (TSH) levels were observed alongside normal levels of fT3 and fT4 hormones.

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