

## Thyroid Dysfunction in Pregnant Women Attending Antenatal Clinic

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### ABSTRACT

**Background:** Thyroid dysfunction in pregnancy may be accompanied by both maternal and fetal complications. Hypothyroidism in pregnancy is associated with premature birth, fetal cardiac complications, low birth weight, increased frequency of cesarean delivery, placental complications, preeclampsia and gestational hypertension, perinatal morbidity-mortality, and cognitive dysfunction.

**Objective:** The aim of the current work was to study early diagnosis of thyroid dysfunction in pregnant women for better health care.

**Patients and method:** A prospective cross-sectional study was conducted at Gynecology and Obstetrics Department, Abukabir Central Hospital in co-operation with Gynecology and Obstetrics Department, Zagazig University hospitals on 229 healthy pregnant women with uncomplicated singleton pregnancy and without history of previous thyroid problems. Detailed medical and obstetrical history were taken from all selected participants, and they were subjected to thorough clinical examination. Routine laboratory and ultrasonographic examination were also performed to all of them.

**Results:** Participants were divided into 4 groups including those with Euthyroid, subclinical hypothyroidism, subclinical hypothyroidism was the most prevalent disorder (7.9%) followed by overt hypothyroidism (3.5%) and subclinical hyperthyroidism (0.87%). No cases with overt hyperthyroidism were reported. There was no statistically significant difference between the 4 groups as regard age. Regarding BMI, results showed that patients with overt hypothyroidism had significantly higher BMI than those in the other groups. Also, there were no statistically significant differences between different groups regarding gravidity, parity, and gestational ages.

**Conclusion:** It could be concluded that most pregnant women have normal thyroid functions (Euthyroid). The most prevalent pattern of thyroid dysfunction in pregnant women is subclinical hypothyroidism.

**Keywords:** Thyroid, Pregnant Women, Zagazig University.

### INTRODUCTION

Thyroid disease commonly affects women of childbearing age<sup>(1)</sup> and is the second most common endocrinological disorder diagnosed in pregnancy after gestational diabetes. It is four to six times more common in women than in men, and prevalence increases with age<sup>(2)</sup>.

Thyroid physiology plays a major role in pregnancy. The thyroid gland adapts its structure and function to satisfy increasing functional demands. It undergoes reversible physiological changes such as increase in size (by 10%) and increased vascularization due to the influence of human chorionic gonadotropin ( $\beta$ -hCG)<sup>(3)</sup>.

Pregnancy is associated with profound modifications in the regulation of thyroid function. These changes are the result of various factors like an increase of thyroxine-binding globulin (TBG) due to elevated estrogen and human chorionic gonadotropin (hCG), increased renal losses of iodine due to increased glomerular filtration rate, modifications in the peripheral metabolism of maternal thyroid hormones, and modification in iodine transfer to the placenta<sup>(4)</sup>.

The developing fetus synthesizes thyroid hormones only by the end of the first trimester and, hence, depends on the maternal thyroid hormone for organogenesis, general growth, and development of the central nervous system<sup>(5)</sup>. Moreover, thyroid hormones are essential for the maintenance and successful completion of normal pregnancy<sup>(6)</sup>.

Inadequate maternal thyroid hormone production, particularly during the first stages of gestation when the fetus is reliant on maternal thyroxine, has been associated with multiple obstetric and neonatal adverse outcomes. **Mannisto and Mendola**<sup>(7)</sup> including inadequate neuropsychological development in the offspring<sup>(8)</sup>.

The physiological changes of pregnancy can simulate thyroid disease. Symptoms of heat intolerance, sluggishness, fatigue, and constipation and examination findings of tachycardia, edema, and wide pulse pressure are common to pregnancy and thyroid disease much in same way.

During pregnancy, demands on the hypothalamic-pituitary-thyroid axis increases which commonly leads to borderline thyroid abnormalities. Both hyper and hypothyroidism types of thyroid disorders can occur during pregnancy and correction of these disorders dramatically reduces the risk of adverse fetomaternal outcomes<sup>(4)</sup>.

The main obstetric complications are abortion, preeclampsia, eclampsia, abruption placentae and preterm labor and the fetal complications are prematurity, low birth weight, whereas increased risk of impaired neurological development in fetus still birth and perinatal death<sup>(9)</sup>.

The aim of the current work was to study early diagnosis of thyroid dysfunction in pregnant women for better health care.

**PATIENT AND METHODS**

This prospective cross-sectional study included a total of 229 healthy pregnant women with uncomplicated singleton pregnancy and without history of previous thyroid problems, attending at Department of Gynecology and Obstetrics, Abukabir Central Hospital in co-operation with Department of Gynecology and Obstetrics, Zagazig University Hospitals. This study was conducted between June 2021 to June 2022.

**Ethical consent:**

This study was ethically approved by Zagazig University's Research Ethics Committee, and submitted them to Zagazig University. Every patient signed an informed written consent for acceptance of participation in the study. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

**Inclusion criteria;** Uncomplicated intrauterine singleton pregnancy at any trimester.

**Exclusion criteria:** Ages < 18 years. History of complicated or multiple pregnancies. History of thyroid diseases, thyroid surgeries, or treatment with anti-thyroid drugs. Family history of thyroid disorders. History of chronic medical diseases, e.g. diabetes mellitus, hypertension, chronic liver disease, chronic kidney disease, cardiac disorders, malignancy, autoimmune collagen diseases etc. History of treatment with immunosuppressive drugs, chemotherapy, or radiotherapy.

All participants were subjected to full detailed medical history and thorough clinical examination. Body weight and height were measured for participants while wearing a hospital gown and without shoes. Ultrasonographic examination at any trimester was done using AB 2-7 convex abdominal probe on Voluson 730 Pro Machine (Ge Healthcare, Austria) included; Biometric measurements to assess gestational age, fetal growth, and expected fetal weight. Investigations including Complete blood count (CBC), Serum TSH, free T3 and free T4.

**Statistical analysis**

The collected data were coded, processed and analyzed using the SPSS (Statistical Package for Social Sciences) version 22 for Windows® (IBM SPSS Inc, Chicago, IL, USA). Data were tested for normal distribution using the Shapiro Walk test. Qualitative data were represented as frequencies and relative percentages. Chi square test ( $\chi^2$ ) to calculate difference between two or more groups of qualitative variables. Quantitative data were expressed as mean  $\pm$  SD (Standard deviation). Independent samples t-test was used to compare between two independent groups of

normally distributed variables (parametric data). P value < 0.05 was considered significant.

**RESULTS**

Table 1 shows that the overall ages of studied groups were ranging from 19 – 35 years with average age of  $30.7 \pm 3.8$  years, 38.4% of them were younger than thirty years. Their BMI was ranging between 18.8 – 28.4 kg/m<sup>2</sup> with mean BMI  $23.3 \pm 2.2$  kg/m<sup>2</sup>.

**Table (1): Basic demographic and obstetrical characteristics of studied group:**

Variable	Mean $\pm$ SD/ N(%)
<b>Maternal Age (years):</b>	
- Mean $\pm$ SD	30.7 $\pm$ 3.8
- Range	19 – 35
- 18 – 29 years	88 (38.4%)
- $\geq$ 30 years	141 (61.6%)
<b>BMI (kg/m<sup>2</sup>):</b>	
- Mean $\pm$ SD	23.3 $\pm$ 2.2
- Range	18.8 – 28.4
<b>Resident:</b>	
- Urban	119 (52.0%)
- Rural	100 (48.0%)
<b>Gravidity:</b>	
- Mean $\pm$ SD	2.5 $\pm$ 0.2
- Range	1-5
<b>Parity:</b>	
- Mean $\pm$ SD	1.2 $\pm$ 0.21
- Range	0 - 4
<b>Trimester:</b>	
- First	112(48.9%)
- Second	66 (28.8%)
- Third	51 (22.3%)
<b>GA at time delivery (weeks):</b>	
- Mean $\pm$ SD	37.7 $\pm$ 1.1
- Range	36 - 40
<b>Mode of delivery:</b>	
- Normal Vaginal delivery	97 (42.4%)
- Cesarean delivery	132 (57.6%)

Table 2 shows that TSH level was  $2.9 \pm 0.61$  mIU/l, free T3 level was  $2.4 \pm 0.5$  ng/ dl, and free T4 level  $1.2 \pm 0.2$  ng/dl.

**Table (2): Thyroid laboratory findings of studied group:**

Variable	Mean $\pm$ SD
<b>TSH (mIU/l)</b>	2.9 $\pm$ 0.61
<b>Free T4 (ng/dl)</b>	1.2 $\pm$ 0.2
<b>Free T3 (ng/dl)</b>	2.4 $\pm$ 0.5

Table 3 shows that there were a statistically significant differences between different groups regarding TSH and free T4. While there was no

statistically significant difference between them regarding serum free T3 levels.

**Table (3): Thyroid function tests in different trimesters:**

Variable	First Trimester N = 112	Second Trimester N = 66	Third Trimester N = 51	f-value	p-value
<b>TSH (mIU/l)</b> Mean ± SD	2.3 ± 0.42	3.0 ± 0.61	4.0 ± 0.91	34.059	< 0.001**
<b>Free T4 (ng/dl)</b> Mean ± SD	1.1 ± 0.3	1.4 ± 0.2	1.4 ± 0.2	28.61	< 0.001**
<b>Free T3 (ng/dl)</b> Mean ± SD	2.4 ± 0.4	2.5 ± 0.5	2.3 ± 0.5	2.819	0.062

Table 4 shows the prevalence of thyroid dysfunction among studied group. Results showed that of the 229 pregnant women, 201 (87.73%) had normal thyroid functions results (Euthyroid) and 28 patients (12.27%) had thyroid dysfunction.

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**Table (4): Incidence of thyroid dysfunction among studied group:**

	No	Percent
<b>Thyroid function:</b>		
- Thyroid dysfunction	28	12.27 %
- Euthyroid	201	87.73%

Table 5 shows that among those with thyroid dysfunction, our results showed that subclinical hypothyroidism was the most prevalent disorder (7.9%) followed by overt hypothyroidism (3.5%) and subclinical hyperthyroidism (0.87%). No cases with overt hyperthyroidism was reported.

**Table (5): Prevalence of types of thyroid disorders among studied group:**

Type of thyroid disorder	No	Percent
- Subclinical hypothyroidism	18	7.9 %
- Overt hypothyroidism	8	3.5 %
- Subclinical hyperthyroidism	2	0.87%
- Overt hyperthyroidism	0	0.0 %
<b>Total</b>	28	12.27%

Table 6 shows that there was no statistical significant difference between studied groups regarding age, BMI, GA, gravidity and parity.

**Table (6): Comparison between patients with different thyroid function disorders regarding demographic and obstetrical data:**

Variable	Euthyroid N = 201	Subclinical hypothyroidism N = 18	Overt hypothyroidism N = 8	Subclinical hyperthyroidism N = 2	f-value	p-value
<b>Age:</b>						
- Mean ± SD	30.5 ± 3.9	31.0 ± 4.0	33.5 ± 1.3	30.5 ± 0.7	1.618	0.186
<b>BMI:</b>						
- Mean ± SD	23.2 ± 2.2	23.1 ± 2.4	25.3 ± 0.7	22.7 ± 0.3	2.462	0.063
<b>GA:</b>						
- Mean ± SD	37.7 ± 1.2	37.8 ± 0.8	37.5 ± 0.6	37.5 ± 0.7	0.144	0.933
<b>Gravidity:</b>						
- Mean ± SD	2.5 ± 0.1	2.7 ± 0.3	3 ± 1.8	1.5 ± 0.3	1.383	0.249
<b>Parity:</b>						
- Mean ± SD	1.1 ± 0.15	1.2 ± 0.2	2.0 ± 0.4	0.5 ± 0.1	2.041	0.109

Table 7 shows that there was a statistically significant difference between different groups of thyroid dysfunctions as regard TSH, Free T4 and free T3.

**Table (7): Comparison between patients with different thyroid function disorders regarding thyroid function tests:**

Variable	Euthyroid N = 201	Subclinical hypothyroidism N = 18	Overt hypothyroidism N = 8	Subclinical hyperthyroidism N = 2	f-value	p-value
<b>TSH (mIU/l) Mean ± SD</b>	2.5 ± 0.4	4.6 ± 0.4	8.2 ± 0.4	0.3 ± 0.05	236.9	< 0.001**
<b>Free T4 (ng/dl) Mean ± SD</b>	1.3 ± 0.3	1.3 ± 0.2	0.7 ± 0.1	1.2 ± 0.1	11.15	< 0.001**
<b>Free T3 (ng/dl) Mean ± SD</b>	2.5 ± 0.3	1.4 ± 0.2	1.3 ± 0.2	1.1 ± 0.1	126.9	< 0.001**

## DISCUSSION

Regarding demographic data of the studied group, our results showed that the overall ages were ranging from 19 – 35 years with average age  $30.7 \pm 3.8$  years, 38.4% of them were younger than thirty years old. Their BMI was ranging between 18.8 – 28.4 kg/m<sup>2</sup> with mean BMI  $23.3 \pm 2.2$  kg/m<sup>2</sup>. Out of the 229 participants in our study, 119 (52.0%) were resident in urban areas while the other 100 (48%) were resident in rural areas.

Our findings were in agreement with **Dulek et al.**<sup>(10)</sup> who reported in their study about the prevalence of thyroid dysfunction in pregnant women that the patients' age range was 18-45 years (mean ± SD =  $27.8 \pm 5.7$ ). Also, **Karcaaltincaba et al.**<sup>(11)</sup> reported that their study group had an overall average age of  $30.7 \pm 5.1$  years.

In the study done by **Abo El-Roose et al.**<sup>(12)</sup> they reported that the study population age ranged from 18 to 39 years with average of  $28.5 \pm 5$  years. Seventy two women were residents in urban areas.

Regarding obstetrical characteristics, our results showed that 23.6% of our study group (n = 57) were primigravida while, 76.4% (n = 172) were multigravida. Regarding their trimester, our results showed that 48.9% of our participants were in the first trimester, 28.8% were in the second trimester and 22.3% were in the third trimester. A total of 97 (42.4%) patients were delivered by normal vaginal delivery and 132 (57.6%) patients were delivered by cesarean delivery. The mean gestational age at time of delivery was  $37.7 \pm 1.1$  weeks.

Regarding thyroid function findings, our results showed that Mean TSH level was  $2.9 \pm 0.61$  mIU/l, free T3 level was  $2.4 \pm 0.5$  ng/ dl, free T4 level  $1.2 \pm 0.2$  ng/dl.

The mean±SD values for the fT3, fT4 and TSH between each trimester showed no significant variation in fT3 and fT4 levels.

Regarding the prevalence of thyroid dysfunction among studied group, our results showed that of the 229 pregnant women, 201 (87.73%) had normal thyroid

functions results (Euthyroid) and 28 patients (12.27%) had thyroid dysfunction.

Among those with thyroid dysfunction, our results showed that subclinical hypothyroidism was the most prevalent disorder (7.9%) followed by overt hypothyroidism (3.5%) and subclinical hyperthyroidism (0.87%). No cases with overt hyperthyroidism was reported.

Similar findings were reported by **Sharma and Sharma**<sup>(13)</sup> as they reported in their study on 200 pregnant women that thyroid disorders were found in 14% of patients out of 200 study participants. 86% patients were euthyroid among the study participants. 7% patients were found to have subclinical hypothyroidism, 4% were having overt hypothyroidism and 3% had subclinical hyperthyroidism. Also, **Dulek et al.**<sup>(10)</sup> who reported that out of the 573 pregnant women, 492 (86.7%) had normal TFT and 76 patients (13.2%) had abnormal results. They also reported that 8.9% had subclinical hypothyroidism 0.5% had overt hypothyroidism, and 2.8% had hyperthyroidism.

Against our findings was **Abo El-Roose et al.**<sup>(12)</sup> who reported in their study on 100 pregnant women that most of the pregnant women had normal thyroid functions (51%) and 49% of the studied population had thyroid disorder. They also reported that subclinical hypothyroidism was the most prevalent disorder representing 39% of the total population followed by 6% had clinical hypothyroidism and 4% had isolated hypothyroxemia.

According to their thyroid profile, we subdivided our participants into 4 groups including those with Euthyroid, subclinical hypothyroidism, overt hypothyroidism and subclinical hyperthyroidism. We compared between these groups regarding their demographic, obstetrical data and their thyroid function tests. Our results showed that there was no statistical significant difference between the 4 groups as regard age. Regarding their BMI, our results showed that patients with overt hypothyroidism had significantly higher BMI than those in the other groups. Also, there

was no statistically significant differences between different groups regarding gravidity, parity, and gestational ages.

In agreement with our findings regarding patients' ages was **Dulek *et al.***<sup>(10)</sup> who reported that there was no statistical significant difference between different groups regarding their ages, gravidity and parity. Also, **Abo El-Roose *et al.***<sup>(12)</sup> found that no statistical significant difference between different thyroid functions and age was revealed.

In agreement with our findings regarding BMI was **Krishnamma *et al.***<sup>(14)</sup> who reported that the mean  $\pm$  SD BMI for euthyroid patients, subclinical hypothyroid, overt hypothyroid and overt hyperthyroid pregnant women were 22.9 $\pm$ 1.5, 23.6 $\pm$ 1.4, 25.2 $\pm$ 1.28 and 20.3 $\pm$ 0.7 respectively and found that those with overt hypothyroidism were having significantly higher BMI compared to other groups.

## CONCLUSION

It could be concluded that most pregnant women have normal thyroid functions (Euthyroid). The most prevalent pattern of thyroid dysfunction in pregnant women is subclinical hypothyroidism.

For the prevalence of thyroid dysfunction among studied group, our results showed that of the 229 pregnant women, 201 (87.73%) had normal thyroid functions results (Euthyroid) and 28 patients (12.27%) had thyroid dysfunction.

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