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Assessment of thyroid function in pregnant women attending Suez Canal University Hospitals

Abstract

Introduction: Pregnancy is a physiological state in which significant changes in thyroid function occur. Several factors contribute to these changes. These factors could contribute to thyroid dysfunction during pregnancy especially when a deficiency of iodine intake exists and when thyroid reserve is not sufficient.

Aim: To assess thyroid function tests during pregnancy.

Subjects and methods: cross-sectional study was carried out on 100 pregnant women attending obstetrics outpatient clinic in Suez Canal university hospitals were invited to enroll in the study. At end of study, the blood samples were assessed for free T3, free T4 and TSH.

Results: Our study revealed that most of pregnant women had normal thyroid functions (51%), while subclinical hypothyroidism (39%) was the most prevalent disorder followed by clinical hypothyroidism (6%) and isolated hypothyroxinemia (4%).

Conclusion: The most prevalent pattern of thyroid dysfunction in pregnant women was subclinical hypothyroidism.

Keywords: endocrine disorder, thyroid hormones, physiological state, pregnant women

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Abbreviations: ATA, American thyroid association; HCG, human chorionic gonadotrophin; TSH, thyroid stimulating hormone.

Introduction

Thyroid dysfunction is the second most common endocrine disorder, only after diabetes mellitus, affecting females in reproductive age group. Thyroid gland performs it's very important functions. These hormones also play a very important role in maturation of fetal brain cells.[1] Pregnancy is a physiological state in which significant changes in thyroid function occur. Several factors contribute to these changes. Indeed, since the beginning of pregnancy, the HCG (human chorionic gonadotrophin) secreted by the placenta, given its homology of structure with TSH (thyroid stimulating hormone), exerts a stimulatory effect on thyroid gland leading to an increase in the secretion of thyroid hormones (T3 and T4) and a decrease in TSH, especially during the first trimester.[2] In addition, pregnancy induces increase in metabolic function and requires a higher production of thyroid hormone. Demand for iodine intake increases especially as there is a greater urinary excretion of iodine and a transfer of iodine to the fetus when his thyroid becomes functional.[3]

All these factors could contribute to thyroid dysfunction during pregnancy especially when a deficiency of iodine intake exists and when thyroid reserve is not sufficient

Subject and methods

Study design

The present study was descriptive cross-section study. The study was carried out in Suez Canal university hospitals, obstetrics outpatient clinic, Ismailia, Egypt.

Study population

A total number of one hundred pregnant women attending obstetrics outpatient clinic at Ismailia university hospitals for antenatal care were invited to enroll in this study. The included patients had the following criteria:

a. Age: 18 -40years old pregnant females.

b. Single embryo.

c. First, second and third trimester of pregnancy.

d. Patients were excluded if they were:

e. Smokers.

f. Patients on medications that affect thyroid profile as amiodarone.

g. Patients refuse to be included in the study.

h. Women with a family history of thyroid disease.

i. Women with a history of either miscarriage or preterm delivery.

j. Women with certain other autoimmune disorders which are frequently associated with autoimmune thyroid dysfunction as vitiligo, adrenal insufficiency etc.

k. Women with prior therapeutic head or neck irradiation.

Tools and data collection

Patients were assessed through personal interview. The assessment included History taking, general and neck examination. All patients had thyroid function test included TSH, FT3,FT4.As no trimester-specific reference ranges for the assessment of thyroid function in pregnancy had been established for the Egyptian population at the time of the study, the Guidelines of the American Thyroid Association (ATA) for the Diagnosis and Management of Thyroid Disease during Pregnancy and Postpartum recommendations were applied.[4]

Primary objective: to assess magnitude of thyroid dysfunction problem during pregnancy and to predict when pregnant woman needs thyroid disorder management.

Secondary objective: to avoid pregnancy complications associated with either hypo or hyperthyroidism.

Statistical analysis

Collected data was processed using SPSS 18. Quantitative data were presented as mean±SD while qualitative data were expressed as numbers and percentages. Unpaired T-test was used to test the significance of difference between quantitative data while Chi-Square test was used for qualitative data. A probability value (P-value) less than 0.05 was considered significant. Results were presented in tables and graphs

Results

In the present study, we assessed various thyroid disorders among one hundred (N=100) pregnant women.

Table 1 demonstrates the demographic data of the studied population; it showed that study population age ranged from 18 to 39 years with average of 28.5±5 years. Sixty percent of studied population was younger than thirty years. Chart 1 showed that 49% of the studied population had subclinical hypothyroidism was the most prevalent disorder representing 39% of the total population. Table 2 showed that highest prevalence of hypothyroidism was in the second trimester (50%) followed by first trimester (48.9%) and finally third trimester (47.6%) which showed that no statistically significant relationship between each trimester of pregnancy and development of thyroid disorders. Concerning the Relation between thyroid function and age. Table 3 showed that 3 (50%) of patients with clinical hypothyroidism were less than 30 years and 3 (50%) were 30-40 years old and no statistically significant relationship between thyroid functions and age. Table 4 showed that according to ATA guide-lines 2017 the thyroid function laboratory results of the enrolled pregnant women were as 77% has a normal thyroid function, 13% diagnosed to have subclinical hypothyroidism, 3% clinical hypothyroidism and 7% isolated hypothyroxinemia. So, there is over estimation of thyroid dysfunction using ATA guide lines 2017 and under estimation using only selected high risk population screening

Table 1 demonstrates the demographic data of the studied population

Demographic characteristics	No.	%
Age		
18-29	60	60
≥30	40	40
Min.–Max.	18.0–39.0	
Mean ±SD	28.53± 4.90	
Median	28	
Residency		
Rural	28	28
Urban	72	72
Gravidity		
Nullipara	19	19
Multigravida	81	81

Table 2 relationship between every trimester and thyroid function

Thyroid function	Trimester						x^2	MCp
	1st		2nd		3rd			
	(n=45)		(n=34)		(n=21)			
	No.	%	No.	%	No.	%		
Normal	23	51.1	17	50	11	52.4	0.848	1
Sub clinical hypothyroidism	17	37.8	14	41.2	8	38.1		
Clinical hypothyroidism	3	6.7	2	5.9	1	4.8		
Isolated hypothyroxinemia	2	4.4	1	2.9	1	4.8		

Table 3 Relation between thyroid function and age (years) (n=100)

	Thyroid function								Test of sig.	P
	Normal		Sub clinical hypothyroidism		Clinical hypothyroidism		Isolated hypothyroidism			
	(n= 51)		(n= 39)		(n= 6)		(n= 4)			
Age (years)										
<30	30	58.8	26	66.7	3	50	1	25	x^2=	MCp=
30-40	21	41.2	13	33.3	3	50	3	75	3.308	0.379
Min.–Max.	18.0 – 38.0		21.0 – 39.0		22.0 – 38.0		28.0 – 35.0		F=	0.536
Mean±SD.	28.55±5.36		28.03±4.31		29.67±5.39		31.50±3.11		0.731	
Median	28		28		29.5		31.5			

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Table 4 Prevalence of thyroid dysfunction according to ATA guide-lines 2017 (n = 100)

	No.	%
Normal	77	77
Subclinical hypothyroidism	13	13
Clinical hypothyroidism	3	3
Isolated hypothyroxinemia	7	7

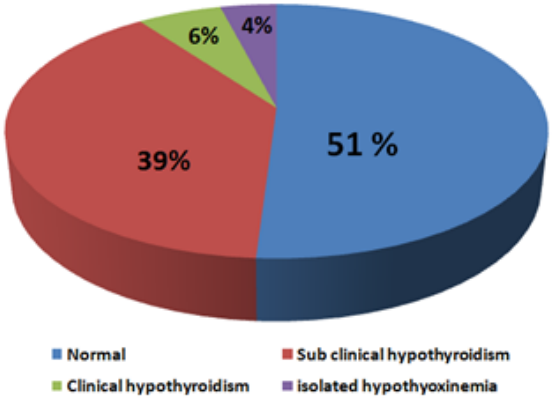

Chart 1 Percentage of thyroid dysfunction.

Discussion

Considerable changes occur in the thyroid hormone physiology and thyroid gland anatomy during pregnancy. Specifically, the thyroid gland of the pregnant woman is characterized by glandular hyperplasia, increased vascularity, and an approximately 30% increased volume, despite a normal echo structure.[5] Furthermore, thyroid function test changes can occur because of androgen-mediated increases in thyroid-binding globulin and a decline in iodide because of increased renal clearance and placental loss.[6] In the present study, we assessed various thyroid disorders among one hundred (n=100) pregnant women attending obstetric outpatient clinic in Suez Canal university hospitals. These pregnant women ages' ranged from 18 to 39 years with average of 28.5±5 years. It was found that sixty percent of studied population was younger than thirty years old. Seventy two women were residents in urban areas. Most women were multi-gravida, representing eighty one percent. Majority of women were in their first trimester (45%) followed by second trimester (34%), while least cases were in third trimester.

Our study found that most of pregnant women (n=51) had normal thyroid functions, while subclinical hypothyroidism (n=39) was the most prevalent disorder followed by clinical hypothyroidism (n=6) and isolated hypothyroxinemia (n=4).

In Egypt, across-sectional study among 168 pregnant women who attend the outpatient obstetric clinic at Ain Shams university hospital, they were subdivided into high-and low-risk groups for thyroid disease according to ATA guidelines as well as groups by trimester and shows that prevalence of hypothyroidism was 56% in the high risk group and 44.6% in the-low risk group with no statistically significant differences.[7]

According to our findings, the overall incidence of thyroid disorders in low risk pregnant women was 49%.Our study came in accordance with who noted hypothyroidism in 55.8 % of pregnant women in a study held in Egypt mostly subclinical hypothyroidism (42.3%). A study conducted in Jordan on 322 pregnant women in the first trimester where 20.8% of women were considered to have subclinical hypothyroidism comparable to 37.8% in this study.[8] Across-sectional study in referral hospital in Spain among 2509 pregnant women in the first trimester reported prevalence of thyroid dysfunction at 16 %.[9]

In china, a multicenter cohort study among 2899 pregnant women enrolled during their first trimester of gestation demonstrated a prevalence of thyroid dysfunction at 10.2%.This study did not use the trimester specific reference ranges recommended by American Thyroid Association.[10] A prospective observational study in India among 1000 pregnant women attending a tertiary public hospital in the first trimester reported a prevalence of thyroid dysfunction at 14.3%,with subclinical hypothyroidism being the most common.[11] In Sudan, cross-sectional hospital-based study among 500 pregnant Sudanese women aged 15-45 years in all trimesters, found a prevalence of 9.4 % this study use national reference ranges instead of the ATA trimester specific reference ranges.[12] A cross-section study carried out in Tunisia among 1519 pregnant women in all trimesters demonstrated prevalence of thyroid dysfunction at 9.7%.[13] In Saudi Arabia, across-sectional study among 384 pregnant women the majority (89.3%) of women aged less than 40 years and obesity was found to be 53.9%, the mean age was 32.6, the prevalence of subclinical hypothyroidism was 13%, and Chi-square analysis indicated that age and obesity were not significantly associated with subclinical hypothyroidism which is consistent with our results.[14] This variability in thyroid disorders prevalence in pregnant women could be explained by the iodine status of study population, the sample size, the references used to define thyroid status or by ethnicity specificity.

Another study in Africa comparing the prevalence of thyroid functions in pregnancy using 2011ATA guidelines and 2017 ATA guidelines. In a study by Awede et al.,[15] Two hundred and forty (240) pregnant women were included in the study. It showed that Thyroid dysfunction was present in 24.17% of the pregnant women. Hypothyroidism was observed in 22.5% of subjects with 19.17% of subclinical hypothyroidism, 0.87% of overt hypothyroidism and 2.5% of hypothyroxinemia while hyperthyroidism was present in 1.67% of the subjects, while using 2017 ATA guidelines (TSH upper reference limit of 4.0mU/L). In this case, thyroid disorders were present in 14.58% of pregnant women. The frequency of subclinical hypothyroidism, overt hypothyroidism, hypothyroxinemia and hyperthyroidism were respectively 9.58%, 0.42%, 2.91% and 1.67%.

In our study we did similar comparison and we found that prevalence of thyroid dysfunction according to 2011 ATA reference ranges was 49 % (39% SCH, 6% OH, 4% isolated hypothyroxinemia), while according to 2017 ATA reference ranges was 23% (13% SCH, 3% OH and 7% isolated hypothyroxinemia).

It was found that there was no statistically significant relationship between trimester of pregnancy and development of thyroid disorders. These results support a study by Brent who recommended performing universal screening for thyroid dysfunction early in pregnancy as well as during the second- and third trimesters.[16] Moleti found that 40% of screened women were diagnosed with hypothyroidism in the early and late second trimester and would not have been identified, if we had limited our observation to the first thyroid function test alone.[17] Several researchers have also expressed great concern regarding hypothyroidism during the first trimester, as the fetus at that period is

entirely dependent on maternal thyroid hormone levels, having not yet become able to make its own endogenous supply.[18]

Among different clinical parameters presented at clinics, it was found that theses parameters didn't show any statistically significant relationship with certain thyroid disorders. This observation could be explained by similarity of pregnancy associated physiological changes and signs of hypo and hyperthyroidism.

Most of women were overweight (n=62), this could be related to the common belief among Egyptian pregnant women that increased caloric intake during pregnancy is encouraged for healthier fetal development. Although the weight gain in pregnancy did not correlate with hypothyroidism, it sheds lights on the importance of increasing awareness about adequate weight gain during pregnancy.

However, women with normal body mass index came next (n=25) and least cases were obese (n=13). Also there was no statistically significant relationship between thyroid disorders and body mass index of pregnant women. These results are in contrast with Dima et al with a study was done on 920 pregnant females in Lebanon found that women with a BMI >35kg/m^2 might have a greater risk of developing hypothyroidism, this may be due to that maximum BMI in our study was 33kg/m2 and also difference in sample size. They found that prevalence of hypothyroid disorders with pregnancy was 17.1% which is lower than our finding (49%).[19]

In the current study, we had found that there was no statistically significant relationship between development of thyroid disorders and age of women, nor gravidity status nor the trimester. This comes in contrary with Awede et al.,[15] who observed positive relationship between hypothyroidism with age, trimester and number of gravidity. This may be due to the difference in the sample size, population characteristics.

Conclusion

In conclusion, most of the studies that were concerned about Assessment of Thyroid Function in Pregnant Females noted that there was no statistically significant relationship between development of thyroid disorders and age of women, nor gravidity status .Our current study was in agreement with most of these studies. Only few studies were disagreed with these findings. Also we concluded that these findings from the present study underscore the prevalence of hypothyroidism among pregnant women and the most prevalent pattern of thyroid dysfunction in pregnant women was subclinical hypothyroidism. Factors affecting thyroid dysfunction during pregnancy especially subclinical hypothyroidism needs further studies to be assessed.

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Conflicts of interest

No conflicts to declare.

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