Original Article

HEALTH SCIENCES
MEDICINE

DOI: 10.32322/jhsm.1015213
J Health Sci Med 2022; 5(2): 466-470

Evaluation of thyroid dysfunctions frequency in the first trimester

Kazım Uçkan[1], İzzet Çeleğen[2], Yusuf Başkıran[1]

[1]Van Training and Research Hospital, Deptartment of Obstetrics and Gynecology, Van, Turkey
[2]Yüzüncü Yıl University, Faculty of Medicine, Deptartment of Public Health, Van, Turkey

Cite this article as: Uçkan K, Çeleğen İ, Başkıran Y. Evaluation of thyroid dysfunctions frequency in the first trimester. J Health Sci Med 2022; 5(2): 466-470.

ABSTRACT

Aim: The aim of the study is to determine the frequency of first-trimester thyroid dysfunction in pregnant women and to investigate the effect of thyroid dysfunction on some perinatal outcomes.

Material and Method: In the study, first-trimester Thyroid stimulating hormone (TSH), free T4 and free T3 hormone values of pregnant women who applied to our outpatient clinic were retrospectively scanned and recorded. As a result, 3224 pregnant women were included in the study. Pregnant women were evaluated as overt hypothyroidism, subclinical hypothyroidism, overt hyperthyroidism, subclinical hyperthyroidism and euthyroid according to TSH and fT4 values. Results of thyroid function tests of pregnant women and some perinatal results (age, gestational week, delivery type, baby gender, birth weight, gravida, parity, abortion) were compared

Results: In our study, the mean age of the pregnant women for screening was 28.6±3.1, the mean birth week was 38.7±2.1, and the mean birth weight was 3037±324.73.6% (n=2369) of the pregnant women were normal euthyroid, 0.71% (n=23) were subclinical hyperthyroidism, 0.65% (n=23) were overt hyperthyroidism, while 15.6% (n=507) were overtly hypothyroid and 9.4% 3 (n=304) were found to be subclinical hypothyroidism. A significant statistical difference was not found between thyroid outcome test results and perinatal outcomes (age, gravida, parity, abortion, birth strength, gestational age, delivery type, babies) (p> 0.05).

Conclusion: In our study, a high prevalence of thyroid disease, especially hypothyroidism, was observed in pregnant women. More studies should be done to evaluate the effect of thyroid functions on pregnancy outcomes.

Keywords: First trimester, pregnancy, thyroid dysfunction, TSH, perinatal outcomes

INTRODUCTION

Many significant changes occur in thyroid function and physiology during pregnancy. The second most common endocrinological disorder in women of reproductive age is thyroid diseases (1). Thyroid hormone has very important roles in fetal development, maturation, normal placentation, normal fetal brain development, neuronal proliferation, migration, structural organization and embryogenesis. These events occur especially in the first and second trimesters when the fetus meets the primary thyroid hormone requirement from the mother. 8-10. in weeks of pregnancy fetal thyroid gland starts to concentrate iodine and to synthesize hormones after 12 weeks of gestation. Hormone production is limited until the twentieth gestational week (2). In the first trimester, the basal ganglia, cochlea and cerebral neo-cortex develop rapidly and become hypersensitive to iodine deficiency (3). After the maturation of the pituitary gland at the twentieth gestational week, iodine retention and hormone synthesis increase in the fetal thyroid follicular cell. Until the last period of pregnancy, total T4 and free T4 concentration increase regularly in the fetal circulation (4).

Concomitant low TSH with normal fT3 and fT4 values is associated with subclinical hyperthyroidism. High fT3 and fT4 values together with low TSH suggest overt hyperthyroidism. Glucocorticoid or dopamine use, euthyroid sick syndrome, hunger, weight loss, pregnancy, hypothalamic or pituitary deficiencies are other conditions that cause low TSH. In the case of high TSH, if low free T4 is present (obvious), hypothyroidism should be considered. While free T4 and free T3 are normal, elevated TSH is associated with subclinical hypothyroidism (5).

Corresponding Author: Kazım Uçkan, druckan65@hotmail.com
Received: 27.10.2021 **Accepted:** 27.01.2022

Subclinical hypothyroidism is the most common thyroid dysfunction in pregnant women. Overt hypothyroidism is found in 0.3-0.5% of pregnant women, and subclinical hypothyroidism is found in 2-2.5% (6,7). The complications of maternal hypothyroidism related to the fetus are fetal distress, intrauterine growth retardation, premature birth, spontaneous abortion and stillbirth. Maternal complications are anaemia, preeclampsia, ablation placenta, postpartum haemorrhage, delayed lactation, and maternal delay (8). Overt hyperthyroidism is relatively rare and is seen in 0.2% of pregnancies. Subclinical hyperthyroidism is seen in 1.7% of pregnancies. The most common cause of thyrotoxicosis during pregnancy is Graves' disease (9).

In this study, we aimed to determine the frequency of first-trimester thyroid dysfunction in pregnant women who applied to our outpatient clinic and gave birth in our clinic and to evaluate the effect of thyroid dysfunction on some perinatal outcomes.

MATERIAL AND METHOD

The study was carried out with the permission of Van Ministry of Health University Training and Research Hospital Clinical Research and Ethics Committee (Date: 07/03/2019, Decision No: 2019/05). Verbal consent was obtained from the patients included in the study or, if necessary, from their legal representatives, and our study was conducted in accordance with the Principles of the Declaration of Helsinki.

In the study, the data of pregnant women who had thyroid function tests (TFT) at the time of admission in the first trimester at the Van Ministry of Health University Training and Research Hospital Gynecology and Obstetrics Clinic between 2015 and 2018 were retrospectively reviewed. A total of 3224 pregnant women, including 2369 pregnant women with normal thyroid function tests and 855 pregnant with pathology in thyroid function tests, were included in the study.

Thyroid dysfunction frequencies of the patients were evaluated so that the reference range of thyroid tests was 0.27-4.2U/L, 12-22 pmol/L, 3.1-6.8 pmol/L for TSH, fT4, fT3, respectively. The patients were diagnosed with euthyroidism, overt hyperthyroidism, overt hypothyroidism, subclinical hyperthyroidism, and subclinical hypothyroidism within these reference ranges. In the study, the perinatal results (gravida, age, gestational week, parity, gestational week, baby gender, birth weight and delivery type) and thyroid function test results were compared in patients who had first-trimester thyroid function tests in our hospital

The data were analyzed using the SPSS 20.0 package program. Student's t-test was used for comparing the means between independent groups, and the chi-square test was used to compare categorical variables. Descriptive statistical methods (number, mean, standard deviation) were used. P <0.05 was considered significant.

RESULTS

3224 pregnant women participated in our study. Of the pregnant women in the study, 73.6% (n=2369) had euthyroidism, 0.7% (n=23) subclinical hyperthyroidism, 0.6% (n=21) overt hyperthyroidism, 15.6% (n=507) overt hypothyroidism and% Subclinical hypothyroidism was detected in 9.4 (n=304) of them. In the study, there was no significant difference between the groups in terms of the week, age, the number of abortions, parity, and gravida (p> 0.05). The groups according to TFT week, age, abortion, gravida, and parity are shown in **Table 1**.

The mean birth week of the groups in our study was 38.7±2, and the mean birth weight was 3037±324 grams. There was no statistically significant difference between the groups in terms of the birth week and baby birth weight (p> 0.05). 64.5% (n=2078) of the pregnant women delivered normal delivery, 35.5% (n=1146) had cesarean delivery. Although hyperthyroidism and subclinical hypothyroidism were seen more after euthyroidism in normal and cesarean deliveries, no significant difference was observed between the groups according to the type of delivery (p> 0.05). In our study, it was determined that 1617 (50.2%) male babies and 1607 (49.7%) female babies were born. Although hyperthyroidism and subclinical hypothyroidism were seen more after euthyroidism in both genders, no significant difference was observed between the groups according to gender (p> 0.05). The evaluation of the groups according to the birth week, birth weight, birth type, and baby gender is shown in **Table 2**.

Table 1. Evaluation of groups according to TFT week, age, abortion, gravida, parity

	Euthyroidism n (%)	Hyperthyroidism n (%)	Hypothyroidism n (%)	Subclinical hyperthyroidism n (%)	Subclinical hypothyroidism n (%)	P
	2369 (73.6%)	21 (0.6%)	507 (15.6%)	23 (0.7%)	304 (9.4%)	
*TFT (week)	9.1±2.1	9.4±1.4	8.9±3.2	9.0±1.1	9.2±2.8	0.23
Age(year)	28±4.1	29±3.2	29±3.8	28±4.7	29±2.5	0.52
Abortion(n)	1.1±0.4	0.9±0.2	1.0±0.2	0.8±0.4	0.9±0.1	0.23
Parity(n)	2.1±0.4	1.8±0.6	2.1±0.4	1.9±0.2	2.0±0.1	0.34
Gravida(n)	3.0±1.5	2.1±1.0	2.9±0.4	2.5±1.1	3.3±1.4	0.65

*TFT: Thyroid function test

Table 2. Evaluation of the groups according to birth week, birth weight, mode of delivery and baby gender

	Euthyroidism n (%)	Hyperthyroidism n (%)	Hypothyroidism n (%)	Subclinical hyperthyroidism n (%)	Subclinical hypothyroidism n (%)	Total	P
Birth week	39.1±2.4	38.2±3.2	38.9±3.3	39.3±2.2	38.5±3.2	38.7±2.1	0.67
Birth weight (gr)	3118.2±457	3230.3±644.1	3061.5±512.7	3168.5±678.5	3038.4±687.4	3037.1±324.4	0.45
Cesarean (n)	823 (71.8%)	8 (0.7%)	192 (16.8%)	5 (0.4%)	118 (10.3%)	1.146 (100%)	0.43
Vaginal (n)	1.546 (74.4%)	13 (0.6%)	315 (15.1%)	18 (0.9%)	186 (8.9%)	2078 (64.5%)	0.21
Male (n)	1.197 (74.0%)	7 (0.4%)	251 (15.5%)	10 (0.6%)	152(9.4%)	1.617 (100%)	0.12
Female (n)	1.172 (72.9%)	14 (0.9%)	256 (15.9%)	13 (0.8%)	152 (9.5%)	1.607 (100%)	0.24

DISCUSSION

Physiological changes that occur during pregnancy affect the functioning of the thyroid gland and thyroid function tests. There is an increase in the production of humancohorionicgonadotropin (β-hCG) secreted from the placenta especially in the first trimester of pregnancy. Alpha subunits of hCG and TSH have similar structural properties. Due to this similar biochemical property, hCG causes stimulation of the thyroid gland by binding to TSH receptors. This increase in hCG may cause an increase of up to 50% in daily iodine need and free T4 and free T3 values, and a decrease in TSH levels (10).

It is stated that overt maternal hypothyroidism and overt maternal hyperthyroidism have negative effects on the central nervous system and neurocognitive development of the fetus and increase obstetric risks (11). Thyroid dysfunction has a relatively high prevalence during pregnancy and affects 5% of all pregnant women; most common maternal hypothyroidism (12).

The main cause of hypothyroidism in pregnancy is iodine deficiency (13). Hypothyroidism may cause neurodevelopmental disorders in neonatal and childhood (14). Routine screening is not recommended in pregnant women for hypothyroidism. Screening can be performed by thyroid function tests in the presence of radiation history, individual and familial risk factors, the age of the pregnant more than thirty or morbid obesity (15). However, our country is in an endemic position in terms of iodine deficiency. Since TSH measurement is at an acceptable cost, TSH measurement is recommended for women planning pregnancy and pregnant women at the beginning of pregnancy (5).

Subclinical hypothyroidism is a mild form of hypothyroidism common among women of childbearing age. The impact of SCH on adverse perinatal outcomes is unclear, and universal screening for thyroid function before or during pregnancy is also much discussed (16).

Many studies have been conducted on the prevalence of hyperthyroidism and pregnancy effects worldwide. In a comprehensive study conducted in China, the prevalence of subclinical hypothyroidism was 27.8%, in a cross-sectional study conducted in India, the rate of overt hypothyroidism was found to be 1.3%, the rate of subclinical hypothyroidism was found to be 21.5%, and the rate of subclinical hypothyroidism was 37% in a study conducted in Pakistan (17-18-19). In a meta-analysis study, the prevalence of general thyroid dysfunction in pregnant women in Iran was found to be 18.10%. The prevalence of hypothyroidism and subclinical hypothyroidism in pregnant women was 13.01% and 11.90%, respectively (20). In a study conducted in India, the prevalence of thyroid dysfunction was found to be 13.9% (prevalence of hypothyroidism 12.76%, prevalence of hyperthyroidism 1.13%) (21). In a study investigating the frequency of thyroid dysfunction in our country, subclinical hyperthyroidism rate was 4.16%, overt hyperthyroidism rate 1.22%, overt hypothyroidism rate 10.18%, subclinical hypothyroidism rate 5.70% (22). Another study found euthyroidism in 81.1% of patients, hyperthyroidism in 2.4%, and hypothyroidism in 16.3 % (23). In a similar study, the frequency of hyperthyroidism and hypothyroidism was 2.8% and 4.3%, respectively (24). In our study, it was obvious The rate of hyperthyroidism was 0.65%, subclinical hyperthyroidism rate 0.71%, overt hypothyroidism rate 15.6%, subclinical hypothyroidism rate 9.4%. In our study, it is seen that the frequency of overt hypothyroidism and subclinical hypothyroidism is higher, in accordance with the literatüre.

One of the most important biochemical parameters for healthy fetal development is thyroid hormone levels (25) There are studies showing that maternal thyroid dysfunction affects fetal birth weight. These studies show that maternal FT4 levels are inversely proportional to birth weight throughout pregnancy (26, 27).

According to the meta-analysis study, maternal subclinical hypothyroidism during pregnancy was associated with a higher risk of SGA and lower birth weight, while isolated hypothyroxinemia was associated with a lower risk of SGA and higher birth weight (28). Especially babies with hypothyroidism are reported to be born with lower birth weight (29). In a different study conducted in our country, it was stated that there was no significant difference between TSH level and fetal birth weight. Also, it has been stated that if TSH is detected within normal limits in the first trimester, further examinations are

not required (30). Similarly, in our study, no statistically significant difference was found between the groups and low birth weight, mode of delivery and baby gender.

It is stated that pregnant women with hypothyroidism during pregnancy have the possibility of premature birth (31-32). The meta-analysis study shows that maternal subclinical hypothyroidism is associated with fetal distress (33). Low T3 and T4 levels can be seen in preterm babies. Nonspecific findings of hypothyroidism such as hypotonia, constipation, low growth rate and low growth rate can be seen in these babies (34). On the other hand, studies are reporting that there is no difference between the prevalence of early preterm births between pregnant women with thyroid dysfunction and normal thyroid function values (35-36). In our study, no significant statistical difference was found between the groups and the week of birth.

In our study, first-trimester maternal body mass index, weight and height of the father and mother, alcohol and smoking habits, and not knowing the mother's eating habits constitute the weaknesses of our study.

CONCLUSION

In our study, a high prevalence of thyroid disease, especially hypothyroidism, was observed in pregnant women. More studies should be conducted to evaluate the effect of screening thyroid functions and treatment of thyroid disorders, especially hypothyroidism, on pregnancy outcomes.

Limitations of the study: Information on some perinatal outcomes (fetal distress, fetal growth restriction, preterm birth, stillbirth, preeclampsia, detachment, gestational diabetes mellitus frequency, number of newborns requiring intensive care) and how many patients in the group with thyroid dysfunction received medical treatment could not be obtained. In addition, the fact that anti-thyroglubulin(anti-TPO) was not tested in patients is a limitation of the study.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Van Ministry of Health University Training and Research Hospital Clinical Research and Ethics Committee (Date: 07/03/2019, Decision No: 2019/05).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

REFERENCES

1. Casey BM, Dashe JS, Wells CE, McIntire DD, Byrd W, Leveno KJ, Cunningham FG. Subclinical hypothyroidism and pregnancy outcomes. Obstet. Gynecol 2005; 105: 239-45.
2. Glinoer D. Thyroid regulation and dysfunction in the pregnant patient. Thyroid 2004; 14: 234-45.
3. Girling JC. Thyroid disorders in pregnancy. Curr Obstet Gynecol 2006; 16: 539-47.
4. Fisher DA. Fetal thyroid function: diagnosis and management of fetal thyroid disorders. Clin Obstet Gynecol 1997; 40: 16-31.
5. Türkiye Endokrinoloji ve Metabolizma Derneği, Tiroid Hastalıkları Tanı ve Tedavi Kılavuzu 2017.
6. Delshad H, Azizi F. Thyroid and pregnancy. J Med Counc Iran 2008; 26: 392–408.
7. Negro R, Mestman JH. Thyroid disease in pregnancy. Best Pract Res Clin Endocrinol Metab 2011; 25: 927–43.
8. Thyroid disease in pregnancy. American College of Obstetrics and Gynecology. Int J Gynaecol Obstet; 2002; 79: 171-80.
9. El Baba KA, Azar ST. Thyroid dysfunction in pregnancy. Int J Gen Med 2012; 5: 227–30.
10. Utiger RD. Maternal hypothyroidism and fetal development. N Engl J Med 1999; 341: 601.
11. Sawyer HP, Denice SF. Maternal thyroid disease and its effects on the fetus and perinatal outcomes. Prenatal diagnosis, 2020; 40: 1077-84.
12. Mulik J, Pratapan P, Agrawal N. Study of thyroid disorders in pregnancy & its effect on maternal & perinatal outcomes at a tertiary care centre. Hypertension 2019; 42: 40.
13. Cignini P, Cafà EV, Giorlandino C, Capriglione S, Spata A, Dugo N. Thyroid physiology and common diseases in pregnancy: review of literature. J Prenat Med 2012. p. 2012; 6: 64–71
14. Andersen S, Bruun NH, Pedersen KM, Laurberg P. Biologic variation is important for interpretation of thyroid function tests. Thyroid 2003; 13: 1069-78.
15. Nazarpour S, RamezaniTehrani F, Simbar M, Azizi F. Thyroid dysfunction and pregnancy outcomes. Iran J Reprod Med 2015; 13: 387–96.
16. Sun YL, Howard JC, Ann A, Elizabeth NP . Associations between maternal thyroid function in pregnancy and obstetric and perinatal outcomes. J Clin Endocrinol Metab 2020; 105: 2015-23.
17. Li C, Shan Z, Mao J, et al. Assessment of thyroid function during first-trimester pregnancy: what is the rational upper limit of serum TSH during the first trimester in Chinese pregnant women?. J Clin Endocrinol Metab 2014; 99: 73–9.
18. Rajput R, Goel V, Nanda S, Rajput M, Seth S. Prevalence of thyroid dysfunction among women during the first trimester of pregnancy at a tertiary care hospital in Haryana. Indian J Endocr Metab 2015; 19: 416-9.
19. Khan KA, Akhter MS, Fatima K, Saleem MW. Subclinical hypothyroidism (SCH) in first trimester of pregnancy. Prof Med J 2020; 27: 2474-7.
20. Sepasi F, Rashidian T, Shokri M, Badfar G, Kazemi F, Azami M. Thyroid dysfunction in Iranian pregnant women: a systematic review and meta-analysis. BMC Pregnancy Childbirth, 2020; 20: 1-15.

21. Korde VR, Barse SP, Barla JS. Prevalence of thyroid dysfunctions in pregnant women: a prospective study in a tertiary care hospital in Maharashtra, India. Int J Reprod Contracep Obstet Gynecol 2018, 7.8: 3211-6.
22. Güzel E, SivriAydın D, Çilesiz Göksedef BP, Boran AB. The incidence of thyroid dysfunction in pregnant women. Perinat J 2015; 23: 96-100.
23. Seven A, Kucur SK, Polat M, Yüksel B, Işıklar Ö, KeskinN. Gebelerde birinci trimester tiroid fonksiyon testi sonuçlarının değerlendirilmesi. Muğla Sıtkı Koçman Üniv Tıp Derg 2016; 2: 5-8.
24. Bulmus N, Ustuner I, Guven ESG, Sahin FK, Senturk S, Sahin SB. Thyroid diseases in pregnancy: the importance of anamnesis. Pakistan J Med Sci 2013; 29: 1187.
25. Morreale de EG, Obregon MJ, Escobar del RF. Role of thyroid hormone during early brain development. Eur J Endocrinol 2004; 151: 25-37
26. Zhang C, Yang X, Zhang Y, et al. Association between maternal thyroid hormones and birth weight at early and late pregnancy. J Clin Endocrinol Metab 2019; 104: 5853-63.
27. Johns LE, Ferguson KK, Cantonwine DE, Mukherjee B, Meeker JD, McElrath TF. Subclinical changes in maternal thyroid function parameters in pregnancy and fetal growth. J Clin Endocrinol Metab 2018; 103: 1349-58.
28. Derakhshan A, Peeters RP, Taylor PN, et al. Association of maternal thyroid function with birthweight: a systematic review and individual-participant data meta-analysis. Lancet Diabet Endocrinol 2020; 8: 501-10.
29. Alvarez-Pedrerol M, Guxens M, Mendez M, et al. Iodine levels and thyroid hormones in healthy pregnant women and birth weight of their offspring. Eur J Endocrinol 2009; 160: 423–9.
30. Bakacak M, Serin S, Avcı F, et al. Maternal ilk trimester tiroid stimülan hormone düzeylerinin miadında doğan fetüslerin doğum ağırlıklarına etkisi. Perinatoloji Derg 2015; 23: 79–83.
31. Poppe K, Velkeniers B, Glinoer D. The role of thyroid autoimmunity in fertility and pregnancy. Nat Clin. Pract Endocrinol Metab 2008; 4: 394–405.
32. Abalovich M, Amino N, Barbour LA, et al. Management of thyroid dysfunction during pregnancy and postpartum: an Endocrine Society Clinical Practice Guideline. J Clin Endocrinol Metab 2007; 92: 47.
33. Liu Y, Chen H, Jing CLF. The association between maternal subclinical hypothyroidism and growth, development, and childhood intelligence: a meta-analysis. J Clin Res Pediatr Endocrinol 2018; 10: 153.
34. Gönç E, Yordam N. Çocukluk ve adölesanda tiroid hastalıkları. Günöz H, Öcal, G, Yordam, N, Kurtoğlu, S. Pediatrik Endokrinoloji. 1. ed. s212-19, Kalkan Matbaacılık, Kayseri, 2003.
35. Ashoor G, Maiz N, Rotas M, Jawdat F, Nicolaides KH. Maternal thyroid function at 11–13 weeks of gestation and spontaneous preterm delivery. Obstet Gynecol 2011; 117: 293-8.
36. Günkaya OS, Kıyak H, Ekiz A, Gedikbaşı A. İlk trimesterda tiroid fonksiyonunun gebelik sonuçları. Perinatoloji Derg 2017; 25: 121–6.