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Effects of subclinical hypothyroidism on maternal and obstetric outcomes during pregnancy

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ABSTRACT

Objectives: Subclinical hypothyroidism has been defined as normal free thyroxine (FT4) with elevated thyroid stimulating hormone (TSH) levels. The aim of this study is to examine the relationship between the first trimester subclinical hypothyroidism with adverse obstetric outcomes in pregnant women.

Methods: This retrospective cohort study was conducted by examining the pregnant women who applied to the Gynecology Department of Okmeydani Training and Research Hospital at their 6th to 14th gestational weeks and had antenatal follow-ups between February 1, 2017 and December 31, 2020.

Results: Fetal weight (OR: 1; 95% CI, 0.99-1.03, $p = 0.023$), gestational age at delivery (OR: 0.91; 95% CI, 0.83-0.99, $p = 0.022$), and preterm delivery (OR: 0.79; 95% CI, 0.48-1.06, $p = 0.005$) were found to be statistically significant parameters in univariate risk analyses performed in the group whith patients normal T4 levels and TSH levels ≥ 2.5-4 mIU/L. Lower gestational age at delivery (OR: 1; 95% CI, 0.93-1.88, $p = 0.016$), and higher preterm delivery rates (OR: 0.99; 95% CI, 0.96-1.01, $p = 0.003$) were found to be statistically significant in multivariate risk analysis.

Conclusions: The rate of preterm delivery was statistically higher, and fetal weight and week of delivery were significantly lower in the group of pregnant women diagnosed with SCH having TSH values between 2.5 and 4 mIU/L.

Keywords: Pregnancy, preterm birth, subclinical hypothyroidism

Thyroid diseases are frequently seen during pregnancy. The frequency of thyroid disorders in pregnancy is 2-3%. It can be overt hypothyroidism, subclinical hypothyroidism or hyperthyroidism [1]. Elevated serum levels of thyroid stimulating hormone (TSH) greater than 10 mIU/L and/or lower free thyroxine (fT4) levels are observed in overt hypothyroidism. However, subclinical hypothyroidism has been defined as normal FT4 with elevated TSH levels [2, 3]. Size of the thyroid gland increases by 10% in iodine-rich, and by 20-40% in iodine deficient countries [4]. Maternal thyroid hormone regulates fetal growth and development through transplacental transfer between the first 18-20 weeks of pregnancy and plays an important role in the development of fetal brain [5].

Since fetal thyroid tissue does not mature before 12-14 weeks of pregnancy, maternal fT4 is the only source of thyroid hormone for the developing fetus. In early pregnancy, maternal thyroid hormones are required for neural proliferation and migration. From mid-pregnancy, both maternal and fetal thyroid hormones are crucial for neurogenesis, neuronal migration, axonal growth, dendritic arborization, and synaptogenesis [6].

During pregnancy, many physiological changes

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occur in the thyroid gland in women. From the 4th-8th weeks of pregnancy, thyroxine-binding globulin (TBG) levels double in circulation due to the increase in estrogen production and total T4 and T3 concentrations increase in the first half of pregnancy and reach a plateau at the 20th gestational week. Human chorionic gonadotropin (hCG) hormone shows thyrotropic activity [7]. During the first trimester, a temporary increase in free thyroxine (FT4) and a decrease in thyroid-stimulating hormone (TSH) levels are observed. Later on, while FT4 concentration decreases by 10-15%, TSH returns to normal values. With these variations the reference intervals of both FT4 and TSH change throughout pregnancy [8].

According to recommendations of 2011 American Thyroid Association (ATA) guidelines, trimester specific- reference ranges have been established. Indeed, TSH values should be 0.1-2.5 mIU/L in the first, 0.2-3.0 mIU/L in the second, and 0.3-3.5 mIU/L in the third trimesters [9]. In some studies, as recommended by the National Academy of Clinical Biochemistry (NACB), values ranging between 2.5th and 97.5th percentiles are accepted as normal [10]. However, ATA revised its recommendations in 2017 and if the pre-pregnancy TSH value is unknown, 4.0 mIU/L has been accepted as the upper limit of normal (ULN) of cut-off value [4].

There are studies showing the relationship between maternal thyroid diseases and preterm birth, birth weight, gestational diabetes mellitus, and preeclampsia [11, 12]. Overt hypothyroidism is treated without hesitation, but there is no clear consensus on the treatment of subclinical hypothyroidism.

In the present study, universal screening of thyroid function was conducted in a pregnant population and the prevalence of SCH in antenatal pregnant women was investigated. The aim of this study is to examine the relationship between the first trimester subclinical hypothyroidism with adverse obstetric outcomes in pregnant women.

METHODS

This retrospective cohort study was conducted by examining the pregnant women who applied to the Gynecology Department of Okmeydani Training and Research Hospital at their 6th to 14th gestational weeks and had antenatal follow-ups between February 1, 2017 and December 31, 2020. Gestational age was calculated according to the last menstrual period or findings of ultrasound performed before the 20th gestational week. Gravida, parity, number of abortions, gestational weeks of all patients were recorded. Written consent was obtained from all pregnant women for delivery. Multipl pregnancy, smokers, alcohol users, pregnant women under 18 years old, those with diagnoses of chromosomal anomalies, maternal heart disease, history of autoimmune disorders, chronic drug users, overt thyroid disorder, or pregnants who were treated previously or presently with thyroxin or antithyroid drugs, were not included in this study.

Maternal blood samples were obtained from all mothers at first trimester visit after an also overnight fasting. Maternal thyroid stimulating hormone (TSH) and free thyroxine (fT4) levels were measured in routine antenatal follow-ups. All data were entered in a computerized database.

In our laboratory, reference ranges for serum TSH (0.27-4.2 mIU/L), and f T4 (0.93-1.6 ng/dl) were determined as indicated. However, since in some studies, normal T4 values in pregnant women were accepted as ranging between 0.8-1.53 ng/dl for the first trimester, these values were also taken as normal values in our study [13].

The 2011 American Thyroid Association (ATA) guidelines accepted the upper limit of normal of the first trimester TSH as 2.5 mIU/L, but in 2017 the ULN was revised as 4 mIU/L [4, 9].Therefore, both values were used separately in our study.

Pregnant women with normal TSH and fT4 levels were considered to be euthyroid and served as control subjects (Group 1). Patients with normal T4 levels and TSH levels ≥ 2.5-4 mIU/L were included in Group 2, and patients with normal T4 levels and TSH levels ≥ 4-10 mIU/L were included in Group 3.

Although our study started with 878 pregnant women, 804 patients were selected as the study group because 74 patients did not have subclinical hypothyroidism and normal values. Gestational week at delivery, fetal weight, type of delivery, indications for cesarean section and gender of the newborns were recorded. Besides, maternal, and obstetric outcomes as preeclampsia, oligohydramios, polyhydramnios, large for gestational age (LGA) ,small for gestational age (SGA), preterm birth, postterm birth, preterm pre-

mature rupture of membranes (PPROM), premature rupture of membranes (PROM), low birth weight (LBW), gestational diabetes mellitus (GDM), fetal demise, macrosomia were recorded.

The diagnosis of oligohydramnios was defined ultrasonographically as the amniotic fluid index less than 2 cm in a single quadrant and less than 5 cm in the total of 4 quadrants. Polyhydroamnios, on the other hand, was defined as amniotic fluid index over 8 cm in a single quadrant and over 20 cm in total of 4 quadrants. The diagnosis of GDM was made with a 2 step procedure as recommended by the American College of Obstetricians and Gynecologists (AGOC) [14].

Intrauterine fetal death after 24 weeks of gestation was defined as fetal demise. Macrosomia was defined as fetal weight above 4000 g and low birth weight was considered when it was below 2500 g. Births before 37 weeks of gestation were termed as premature births, and deliveries over 42 weeks were called post-term births. Birthweights below the 10th percentile were termed as SGA, and LGA if they were over the 90th percentile.

The diagnosis of preeclampsia was made according to the criteria set by the International Society for the Study of Hypertension in Pregnancy [15].

Rupture of fetal membranes before the onset of labor was termed as premature rupture of membranes (PROM), while rupture of membranes before 37th gestational week was designated as preterm premature rupture of membranes (PPROM).

Ethical Approval

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of University of Health Sciences , Okmeydanı Training and Research Hospital (Date: 10/08/2021/No: 48670771-514.10./297).

Statistical Analysis

In this study, statistical analyzes were performed with NCSS (Number Cruncher Statistical System) 2007 Statistical Software (Utah, USA) package program. In addition to descriptive statistical methods (mean, standard deviation, median, interquartile range) used in the evaluation of the data, the distribution of the variables was examined with the Shapiro-Wilk normality test. For pairwise comparison of the variables with normal distribution, the independent t-test, while for pairwise comparison of the groups of non-normally distributed variables the Mann-Whitney U test were utilized. Chi-square and Fisher's exact tests were used in the comparison of qualitative data. Univariate and multivariate risks of the groups were determined by logistic regression analysis. The results were evaluated at the significance level of $p < 0.05$.

RESULTS

A total of 804 patients included in our study were divided into 3 groups according to their T4 and TSH values. Group 1 was chosen as the control group, while Groups 2 and 3 were defined as the groups with subclinical hypothyroidism as follows: Group 1 (n = 592) T4 normal and TSH = 0.1-2.5 mIU/L; Group 2 (n = 146) T4 normal and TSH ≥ 2.5-4 mIU/L; Group 3 (n = 66), T4 normal and TSH ≥ 4-10 mIU/L.

Demographic characteristics of the patients and maternal and fetal adverse obstetric outcomes are shown in Table 1 and Table 2. When Groups 1 and 2 were compared with each other, no statistically significant difference was observed between the 2 groups as for maternal age, delivery type, cesarean section indications, gravida, parity and abortion averages, test week, and gender distributions. For all these parameters, no significant difference was found when Groups 1 and 3 were compared with each other.

Fetal weight averages and mean gestational age at delivery in Group 2 were found to be statistically significantly lower than Group 1 ($p = 0.023$ and $p = 0.044$ respectively). However, no statistically significant difference was observed between Groups 1 and 3 as for fetal weight averages and mean gestational age at delivery.

Regarding obstetric outcomes, any statistically significant difference was not observed between Groups 1 and 2 and also between Groups 1 and 3 as for abruptio placentae, preeclampsia, GDM, PPROM, PROM, SGA, fetal demise, macrosomia, LBW, post-term birth, need for neonatal intensive care unit, oligohydramnios, polyhydramnios, and LGA.

The frequency of preterm births in Group 2 was statistically significantly higher than Group 1 ($p = 0.004$). However, no statistically significant difference was observed between Groups 1 and 3 as for the the

Table 1. **Demographic characteristics**

		Group 1 (n = 592)	Group 2 (n = 146)	Group 3 (n = 66)	*p* value G1-G2	*p* value G1-G3
Age (mean ± SD)		29.42 ± 5.81	29.34 ± 5.95	29.7 ± 6.84	0.886*	0.715*
Delivery, n (%)					0.847⁺	0.532⁺
Vaginal		281 (47.47)	68 (46.58)	34 (51.52)		
Cesarean		311 (52.53)	78 (53.42)	32 (48.48)		
Indications for cesarean sections, n (%)					0.346⁺	0.928⁺
Previous Cesarean		179 (57.37)	49 (62.82)	22 (68.75)		
Fetal Distress		50 (16.03)	13 (16.67)	3 (9.38)		
Progress failure		24 (7.69)	5 (6.41)	2 (6.25)		
Cephalopelvic disproportion		24 (7.69)	5 (6.41)	3 (9.38)		
Macrosomia		14 (4.49)	0 (0.00)	1 (3.13)		
Malpresantation		17 (5.45)	4 (5.13)	1 (3.13)		
Placenta previa		2 (0.64)	0 (0.00)	0 (0.00)		
Cord prolapsus		0 (0.00)	1 (1.28)	0 (0.00)		
Maternal factor		2 (0.64)	1 (1.28)	0 (0.00)		
Gravida	**Mean ± SD**	2.75 ± 1.48	2.75 ± 1.36	2.53 ± 1.36	0.689‡	0.234‡
	median (IQR)	3 (2-4)	3 (2-4)	2 (2-3)		
Parity	**Mean ± SD**	1.36 ± 1.17	1.33 ± 1.08	1.17 ± 0.97	0.960‡	0.295‡
	median (IQR)	1 (0.25-2)	1 (0-2)	1 (0-2)		
Abortus	**Mean ± SD**	0.4 ± 0.84	0.42 ± 0.75	0.36 ± 0.8	0.564‡	0.627‡
	median (IQR)	0 (0-1)	0 (0-1)	0 (0-1)		
Test weeks (mean ± SD)		8.06 ± 2.29	7.94 ± 2.44	8.08 ± 2.62	0.597*	0.929*
Fetal Weight (mean ± SD)		3272.16 ± 544.02	3156.61 ± 560.61	3299.02 ± 443.94	**0.023***	0.699*
Gestational age (mean ± SD)		38.59 ± 1.83	38.17 ± 2.31	38.76 ± 1.44	**0.044***	0.463*
Gender, n (%)					0.268⁺	0.337⁺
Female		306 (51.69)	68 (46.58)	30 (45.45)		
Male		286 (48.31)	78 (53.42)	36 (54.55)		

*Independent t test, ⁺Chi-Square test, ‡Fisher's Exact Test, Group 1 = T4 normal (0.8-1.53 ng/dl), TSH = 0.1-2.5 mIU/L, Group 2 = T4 normal (0.8-1.53 ng/dl), TSH ≥ 2.5-4 mIU/L, Group 3 = T4 normal (0.8-1.53 ng/dl), TSH ≥ 4-10 mIU/L

distribution of preterm births.

Univariate and multivariate logistic regression risk analyzes were performed for Group 2 (Table 3). Fetal weight (OR: 1; 95% CI, 0.99-1.03, $p = 0.023$), gestational age at delivery (OR: 0.91; 95% CI, 0.83-0.99, $p = 0.022$), and preterm delivery (OR: 0.79; 95% CI, 0.48-1.06, $p = 0.005$) were found to be statistically significant parameters in univariate risk analyses performed in Group 2.

Maternal age and parity were adjusted by performing a multivariate risk analysis. Lower gestational age at delivery (OR: 1; 95% CI, 0.93-1.88, $p = 0.016$), and higher preterm delivery rates (OR: 0.99; 95% CI, 0.96-1.01, $p = 0.003$) were found to be statistically significant in multivariate risk analysis.

Univariate and multivariate logistic regression risk analysis were performed for Group 3 (Table 4). No statistical significance was observed in the variables examined in Group 3 ($p > 0.05$)

Table 2. **Adverse obstetric outcomes**

	Group 1 (n = 592)		Group 2 (n = 146)		Group 3 (n = 66)		*p* value	*p* value
	n	%	n	%	n	%	G1-G2	G1-G3
Abruptio placentae	4	0.68	0	0.00	0	0.00	0.319ǂ	0.503ǂ
Preeclampsia	23	3.89	8	5.48	0	0.00	0.390+	0.103ǂ
GDM	52	8.78	16	10.96	8	12.12	0.416+	0.372+
PPROM	12	2.03	1	0.68	2	3.03	0.270ǂ	0.592ǂ
PROM	45	7.60	11	7.53	5	7.58	0.978+	0.994+
SGA	30	5.07	10	6.85	5	7.58	0.394+	0.389+
Fetal demise	4	0.68	0	0.00	0	0.00	0.319ǂ	0.503ǂ
Makrosomia	43	7.26	5	3.42	5	7.58	0.092+	0.926+
LBW	40	6.6	13	8.90	1	1.52	0.368+	0.095ǂ
Preterm birth	62	10.47	28	19.18	7	10.61	**0.004**+	0.973+
Postterm birth	1	0.17	1	0.68	0	0.00	0.283ǂ	0.738ǂ
Neonatal intensive care	26	4.39	6	4.11	1	1.52	0.881+	0.264ǂ
Oligohydramnios	8	1.35	4	2.74	2	3.03	0.235+	0.290ǂ
Polyhidramnios	14	2.36	5	3.42	0	0.00	0.469+	0.207ǂ
LGA	89	15.03	14	9.59	12	18.18	0.089+	0.501+

+Chi-square test, ǂFisher's Exact Test.LGA = Large for gestational age, SGA = Small for gestational age , GDM = Gestational Diabetes Mellitus, PROM = Premature rupture of membrane, PPROM = Preterm premature rupture of membrane, LBW = Low birth weight

Group 1 = T4 normal (0.8-1.53 ng/dl) , TSH = 0.1-2.5 mIU/L

Group 2 = T4 normal (0.8-1.53 ng/dl), TSH ≥ 2.5-4 mIU/L

Group 3 = T4 normal (0.8-1.53 ng/dl), TSH ≥ 4-10 mIU/L

Table 3. **Results of univariate and multivariate logistic regression risk analysis performed for Group 2 with TSH levels ≥ 2.5-4 mIU/L**

	Univariate risk		Multivariate risk	
	OR (95% CI)	*p* value	OR (95% CI)	*p* value
Fetal weight	1.00 (0.99-1.03)	**0.023**	1.01 (0.87-1.57)	0.058
Gestational age	0.91 (0.83-0.99)	**0.022**	1.09 (0.93-1.88)	**0.016**
Preterm delivery	0.79 (0.48-1.06)	**0.005**	0.99 (0.96-1.01)	**0.003**

In multivariate analysis ORs adjusted for maternal age and parity.

Group 2 = T4 normal (0.8-1.53 ng/dl), TSH ≥ 2.5-4 mIU/L

DISCUSSION

Subclinical hypothyroidism is a condition characterized with increased thyroid stimulating hormone (TSH) levels with normal free thyroxine (fT4) levels without any symptoms of hypothyroidism. Although a correlation was found between adverse maternal outcomes and overt maternal hypothyroidism, the relationship between subclinical hypothyroidism (SCH) in pregnancy and perinatal complications is not clear. There is no clear consensus on the normal and cut-off values of TSH in pregnancy. Therefore, in our study we found it appropriate to examine pregnant women with SCH in 2 separate groups.

In our study, the rate of preterm delivery was statistically higher, and fetal weight and week of delivery

Table 4. Results of univariate and multivariate logistic regression risk analysis performed for Group 3 with TSH levels ≥ 4-10 mIU/L

	Univariate risk		Multivariate risk	
	OR (95% CI)	*p* value	OR (95% CI)	*p* value
Fetal weight	1.00 (0.94-1.07)	0.698		
Gestational age	1.06 (0.91-1.23)	0.462		
Preterm delivery	0.99 (0.43-2.25)	0.973		
LBW	2.71 (0.65-4.83)	0.129	0.99 (0.97-1.02)	0.715

In multivariate analysis ORs adjusted for maternal age and parity.
Group 3 = T4 normal (0.8-1.53 ng/dl), TSH ≥ 4-10 mIU/L

were significantly lower in the group of pregnant women diagnosed with SCH having TSH values between 2.5 and 4 mIU/L, when compared to pregnant women with normal thyroid function test results. However, no statistically significant adverse obstetric outcomes were encountered in pregnant women with SCH having TSH values between 4 and 10 mIU/L.

There is no clear consensus on universal application of thyroid function screening tests before pregnancy. Some clinicians recommend testing especially around the 9th gestational week at the first antenatal visit, while others recommend screening high-risk women. The optimal time for thyroid function tests is at the end of the first trimester or before pregnancy in high-risk pregnant women [16]. In our study group, we performed this screening test at a mean 8.02 gestational weeks namely at the first trimester antenatal visit as recommended.

SCH is considered as a milder thyroid function test abnormality and is seen more frequently than overt maternal hypothyroidism. Overt hypothyroidism has a prevalence of 0.2-0.5%. However, the prevalence of SCH in pregnancy is between 2% and 2.5% [17]. In our study, when all SCH cases with TSH cut-off values above 2.5 mIU/L were examined, the prevalence rate was found to be 24.14%. However, when the TSH cut-off value was taken as 4 mIU/L, the prevalence of SCH was found to be 7.5%. Unlike other studies, these rates were extremely high. The reason may be that our hospital is a tertiary center and too many patients are followed up during the antenatal period.

It is not always easy to determine cut-off values for normal TSH levels. Geographic and ethnic diversity may also have a significant effect on TSH and FT4 reference limits in pregnancy [18, 19]. In a study from India the authors used 5th to 95th percentile as normal reference range. The upper limit of normal for TSH in the first trimester was 5.0-6.0 mIU/L [20, 21]. However, in another study from India, the researchers concluded that it was more accurate to accept 3.0 mIU/L as the cut-off value of TSH for SCH instead of 4.0 mIU/L as accepted in the revised ATA 2017 guidelines [22]. However, we examined fetal and maternal outcomes in 2 separate groups by taking both 2.5 mIU/L and 4 mIU/L as TSH cut-off values for SCH. We thought that we could get more accurate results in this study.

In the study by Chen *et al*. [23], 4.63% of pregnant women were diagnosed with SCH when all trimesters were examined without discrimination. Risks of gestational hypertension, SGA, LBW and PROM were relatively higher in pregnant women with SCH. There was no significant difference in the incidence of fetal distress, stillbirth, GDM, placenta previa, placental abruption, and preterm birth. However, when the first trimester was examined separately, and normal TSH levels were taken as 0.09-3.47 mIU/L, any difference was not found between groups with SCH and euthyroid in terms of obstetric outcomes [23].

In the study of Casey *et al*. [24], premature birth before 34 weeks of gestation was observed 2 times more frequently in women with SCH. However, in other studies, no significant difference was found regarding rates of preterm delivery in SCH [23, 25]. In our study, preterm birth was seen at a rate of 19.18% in the group with TSH values ranging between 2.5 and 4 mIU/L which were found to be statistically significantly higher when compared to the euthyroid group. ($p = 0.004$) In the univariate and multivariate logistic regression analyses, statistically significantly higher

rates of preterm birth (p = 0.005, p = 0.003 respectively) were detected. However, no significant difference was found as for preterm birth rates in the group with TSH levels ranging between 4 and 10 mIU/L. It was suprising that there was less premature birth in this group.

In one study, an increased risk of severe preeclampsia was found in pregnant women with SCH compared to the euthyroid group [26]. In another study, placental abruption was observed 3 times more frequently in pregnant women with SCH compared to the normal group [24]. However, in our study, no increased risk was found in rates of either preeclampsia or placental abruption in pregnant women with SCH.

In the study of Monen *et al*. [27], maternal TSH ≥ 97.5th percentile in the first and third trimesters was correlated with SGA, but no relationship was found between maternal FT4 levels and SGA. In another study, 16.52% of pregnant women who gave birth to babies with SGA were in the SCH group [28]. In our study, SGA was found at a rate of 7% in the SCH group and 33.33% of the pregnant women who gave birth to a baby with SGA were detected in the SCH group. However, any statistically significant difference was not found between the group with SCH, and the euthyroidism as for the rate of SGA.

In the study of Cleary-Goldman *et al*. [29], no relationship was found with subclinical hypothyroidism and adverse outcomes. In their studies, a relationship was found between overt hypothyroidism and GDM, but no relationship was detected between GDM, and SCH in pregnant women [29]. However, in a large population-based study, the risk of GDM was found to be associated with increased TSH during pregnancy [30]. In our study, GDM was found at rates of 10.96%, and 12.12% in the groups with TSH levels between 2.5-4 mIU/L, and 4-10 mIU/L, respectively without any increased risk in GDM in all patients with SCH.

In another study, pregnants under 20 gestational weeks were examined and the 5-95th percentile was considered normal for TSH. No correlation was found between thyroid status and stillbirth rate. While stillbirth rate increased at TSH levels above10 mU/L, any corresponding increase was not observed in the incidence of SCH [24]. In our study, fetal demise was not observed in the SCH patient group. In the study of Negro *et al*. [25], the group with TSH levels between 2.5 and 5.0 mIU/ L group was compared with the euthyroid group, and pregnancy loss was found to be significantly higher in the SCH group. They found an increased risk in gestational diabetes and stillbirth in subsequent pregnancies in patients who were diagnosed with SCH in their previous pregnancies [31].Therefore, it is important to diagnose SCH during pregnancy and follow up these patients after delivery.

In a meta-analysis of 18 cohort studies, pregnant women with SCH were found to be at a higher risk for pregnancy loss, placental abruption, premature rupture of membranes, and neonatal death [32]. However, in this meta-analysis, the studies were performed in different trimesters. However, our study was conducted by screening only first trimester pregnant women and no increase in risk was detected in any of these adverse effects.

Limitations

We acknowledge that this study has some limitations Data related to race, ethnicity, iodine intake, maternal pre-pregnancy body mass index and socioeconomic status, were not analyzed in this study. When diagnosing SCH, factors that affect TSH values such as gestational age and the time of day when the blood sample is obtained should also be considered. All the patients in our study were in the first trimester, and blood samples were drawn in the morning. We acknowledge that TSH cut-off values for the diagnosis of SCH differ in previous studies. Our study, unlike other studies, was conducted with two separate cut-off values and obstetric and maternal outcomes were examined separately.

CONCLUSION

The current study was performed to gain insight into the impact of SCH on maternal and perinatal outcomes. In pregnant women diagnosed with SCH, and TSH values between 2.5 and 4 mIU/L, the rate of preterm delivery was statistically significantly higher, and fetal weight and gestational week at birth were significantly lower. Routine maternal thyroid function testing is necessary to improve maternal and perinatal outcomes during the antenatal period, and especially in the first trimester. However, further prospective multicenter studies with large patient groups are needed. Performing thyroid function tests only on

pregnant women with symptoms of thyroid disease or with a relevant personal history may be insufficient to predict pregnant women who may be in the high-risk pregnancy group.

Authors' Contribution

Study Conception: SG, BC; Study Design: SG, BC; Supervision: SG, BC; Funding: N/A; Materials: N/A; Data Collection and/or Processing: SG, BC; Statistical Analysis and/or Data Interpretation: SG; Literature Review: SG; Manuscript Preparation: SG and Critical Review: SG, BC.

Conflict of interest

The authors disclosed no conflict of interest during the preparation or publication of this manuscript.

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