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Thyroid status of conditionally healthy pregnant women in Baku

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Keypoints

The conducted research examined the thyroid status of conditionally healthy pregnant women in the city of Baku.

Abstract

Introduction

The conducted research examined the thyroid status of conditionally healthy pregnant women in the city of Baku.

Materials and Methods

To achieve the objective of the study, based on the developed clinical and laboratory criteria, 48 conditionally healthy pregnant women in the 1st trimester of pregnancy aged 18–35 years (average age 26.5±4.4 years) were selected for the period from 2021 to 2023 and underwent examination at the surgical clinic of the Azerbaijan Medical University.

Results

The average gestational age at the time of examination was 9.9 weeks. In the structure of thyroid pathology in conditionally healthy pregnant women, subclinical hypothyroidism predominated (10 women; 20.8%). In 16.7% of cases (8 women), an increase in the AT-TPO level was observed. Gestational subclinical thyrotoxicosis was detected in 3 pregnant women (6.25%). Diffuse goiter was detected in 2 pregnant women (4.16%). And in 1 case each, nodular goiter (2.08%) and manifest hypothyroidism (2.08%) were detected.

Conclusion

Considering the high prevalence of subclinical hypothyroidism based on the results of continuous screening of healthy women without a history of thyroid pathology, it confirms the need to include TSH testing in the 1st trimester for all pregnant women, and in the case of its excess of ≥2.5 mIU/L, it is recommended to determine free T4 and AT-TPO for early diagnosis and timely administration of replacement therapy.

Keywords

thyroid status, thyroid gland, pathology, pregnant women, thyroid stimulating hormone, free fraction of thyroxine traumatic cataract, demographic and clinical characteristics, comorbidity

Introduction

In recent decades, there has been a significant increase in autoimmune endocrinopathies, including thyroid diseases, which is caused by a complex interaction of genetic, endogenous and environmental factors that activate the immune system against target cells [1, 2]. The prevalence of autoimmune thyroid pathology among women is 5-15% [3, 4, 5, 6]. Thyroid dysfunction (both increase and decrease) has a significant impact on the development of pregnancy, the formation and development of organs and systems of the fetus, and increases the risk of miscarriage, stillbirth, fetal growth retardation, and congenital malformations [7, 8].

Thyroid diseases are the most common pathology of the female endocrine system. Any thyroid dysfunction can cause problems in the female reproductive system and also carry the risk of developing pathological changes in the fetus. Thyroid diseases are 10 times more common in women than in men and manifest at a young, reproductive age. Pathological processes in the thyroid gland,

especially changes in its functional state, can cause: infertility, pregnancy failure, pathological effects on the fetus [9,10]. Pregnancy itself can cause changes in the functioning of the woman's thyroid gland and acquire a pathological state. Changes in the functioning of the thyroid gland in a woman occur already from the first weeks of pregnancy under the influence of various factors that directly or indirectly stimulate the woman's thyroid gland. This mainly occurs in the first half of pregnancy, i.e. during the period when the fetus's own thyroid gland does not yet function, and all embryogenesis is provided by the mother's thyroid hormones [11, 12].

Risk factors for thyroid dysfunction during pregnancy include: iodine deficiency, autoimmune thyroiditis (AIT) with preserved thyroid function, history of thyroid disease, presence of thyroid peroxidase antibodies (TPO antibodies), type 1 diabetes mellitus or other autoimmune diseases, history of miscarriages or premature births, head and neck irradiation, infertility, intake of amiodarone, lithium or recent administration of iodine-containing contrast agents, grade III obesity (BMI> 40), age over 30 years [13, 14].

The combination of thyrotoxicosis or hypothyroidism and pregnancy has an adverse effect on the course of the latter and the condition of the fetus. In diffuse toxic goiter, in 30-50% of cases, complications develop in the first trimester of pregnancy (threat of miscarriage, intrauterine bleeding, gestosis of the first half of pregnancy); during labor, there is weakness of labor forces, hypotonic bleeding, intrauterine asphyxia of the fetus. In addition to factors contributing to an increase in the incidence of thyroid diseases, pregnancy itself is a factor predisposing to thyroid dysfunction. The problem of iodine deficiency and thyroid dysfunction during pregnancy is of great medical and social importance due to the possibility of deviations in the mental and intellectual development of children [15, 16]. In women with endocrine diseases affecting reproductive function, the risk of perinatal diseases and losses increases. Therefore, studies of the characteristics of the course of pregnancy, birth outcomes and risk prediction for the fetus and newborn in case of endocrine diseases of the mother are relevant.

The aim of this study was to investigate the thyroid status of conditionally healthy pregnant women in the city of Baku.

Material and Methods

In our study, to achieve the objective of the study, based on the developed clinical and laboratory criteria, for the period from 2021 to 2023, 48 conditionally healthy pregnant women in the 1st trimester of pregnancy aged 18–35 years (mean age 26.5±4.4 years) were selected, who were examined at the surgical clinic of the Azerbaijan Medical University. The average gestation period during the examination was 9.9 weeks. Two groups were formed: the main group - 25 pregnant women with a detected urinary iodine excretion level (UIE) of 124.8 μg/L (range from 4.2 μg/L to 633.4 μg/L) and the control group - 23 women with an average UIE level of 108.0 μg/L (range from 9.9 μg/L to 353.2 μg/L), which suggests adequate iodine intake. The groups were formed according to the principle of continuous selection using random and typological sampling – the method of equalized groups identical in age, social, educational and family status.

Inclusion criteria. The study included pregnant women aged 18–35 years who registered with a women's clinic in the first trimester and signed informed consent to participate in the study.

Exclusion criteria. Women with any history of thyroid pathology, receiving drugs that may affect the results of the study (cordarone, X-ray contrast agents administered during examinations 6 months before the study, other drugs containing pharmacological doses of iodine above 1000 mcg), as well as conditions and diseases that, in the opinion of the physician-researcher, may affect the results of the study were excluded from the study.

Description of medical intervention. The examination of women, in addition to the mandatory study of the obstetric-gynecological and somatic anamnesis, included the collection of data on hereditary anamnesis (in particular, oncological), menarche, the nature of specific

functions (menstrual and secretory), and the characteristics of sexual life (time of its onset, number of partners, methods of contraception). The patients provided information about their place of work and contacts with industrial hazards. The obtained data on the health status and medical history of the women were entered into a specially designed questionnaire to simplify the statistical processing of the results. Pregnant women included in the study were given a questionnaire to assess the use of iodized salt in households, and an examination by an endocrinologist, including a palpation examination of the thyroid gland. In addition, they were asked to record information about their dietary lifestyle in a questionnaire. Specifically, they were asked whether they regularly consumed iodized salt and/or vitamin/mineral supplements containing iodine. The questionnaire also included questions about their education level, number of previous pregnancies and possible abortions, type of diet (e.g., varied, vegetarian), amount of water consumed per day, smoking habits, whether they regularly used mouthwashes containing iodine, or whether they had recently used iodine-based disinfectants.

The examination of women, in addition to the mandatory study of the obstetric-gynecological and somatic anamnesis, included the collection of data on hereditary anamnesis (in particular, oncological), menarche, the nature of specific functions (menstrual and secretory), and the characteristics of sexual life (time of its onset, number of partners, methods of contraception). The patients provided information about their place of work and contacts with occupational hazards. The obtained data on the health status and medical history of women were entered into a specially designed questionnaire to simplify the statistical processing of the obtained results. Ultrasound examination of the thyroid gland in pregnant women was performed using a portable ultrasound scanner 200 Pie Medical, a sensor with a frequency of 7.5 MHz, with determination of the size and structure of the thyroid gland. Determination of the level of urinary iodine excretion (UII) was carried out by the cerium-arsenite method in the laboratory of the Educational and Surgical Center of the AMU, with the calculation of the median concentration of ioduria and presented in μg / l. The coefficients of variation (CV) within and between analyses were 8.6% and 11.9%, respectively. The severity of iodine deficiency was assessed according to the criteria of the World Health Organization 2007.

To assess the thyroid status, the level of thyroid stimulating hormone (TSH), free fraction of thyroxine (T4 free), antibodies to thyroid peroxidase (AT-TPO) were determined by the enzyme immunoassay method in the laboratory of the Educational and Surgical Center of the AMU. The standards recommended by the European Thyroid Association in 2014 were used in the work [8].

Statistical analysis

The baseline characteristics are summarized as proportions and mean ± standard deviation. The sample parameters presented in the tables have the following designations: M – mean, σ – standard deviation, n – volume of the analyzed subgroup, p – achieved significance level. In case of normal distribution, statistically significant difference of sample means was tested using Student's t-test; in other cases, nonparametric Mann–Whitney test was used. Testing of statistical significance of differences between relative frequencies of two or more events was performed using $\chi 2$ criterion.

Results

The study analyzed thyroid hormone and EI levels in 48 apparently healthy pregnant women aged 18–35 years in the first trimester (mean age 26.5±4.4 years). Two groups were formed: the main group—25 pregnant women with an EI level of 124.8 μg/L (range 4.2 μg/L to 633.4 μg/L) and the control group—23 women with an average EI level of 108.0 μg/L (range 9.9 μg/L to 353.2 μg/L), which suggests adequate iodine intake. The results of thyroid pathology screening among apparently healthy pregnant women with no history of thyroid pathology are presented in Table 1.

Nosological form	Number of women (n=48)	
	Abs.	%
Gestational subclinical thyrotoxicosis	3	6,25
Manifest hypothyroidism	1	2,08
Subclinical hypothyroidism	10	20,8
Increased AT-TPO levels	8	16,7
Nodular goiter	1	2,08
Diffuse goiter	2	4,16

Table 1. Identified thyroid pathology in conditionally healthy pregnant women (n=48)

As it turned out, thyroid pathology was detected among the conditionally healthy pregnant women. In the structure of thyroid pathology in conditionally healthy pregnant women, subclinical hypothyroidism prevailed (10 women; 20.8%). In 16.7% of cases (8 women), an increase in the level of AT-TPO was observed. Gestational subclinical thyrotoxicosis was detected in 3 pregnant women (6.25%). Diffuse goiter was detected in 2 pregnant women (4.16%). And 1 case each of nodular goiter (2.08%) and manifest hypothyroidism (2.08%) were detected (Fig. 1).

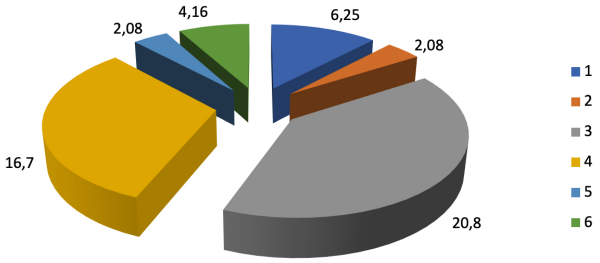

Fig. 1. Structure of thyroid pathology among conditionally healthy pregnant women (n=48).
1- Gestational subclinical thyrotoxicosis; 2- Manifest hypothyroidism; 3- Subclinical hypothyroidism; 4- Increased AT-TPO level; 5- Nodular goiter; 6- Diffuse goiter

When analyzing the results of TSH indicators, it was found that in 23 (47.9%) pregnant women, TSH indicators were within the reference values recommended for the first trimester of pregnancy - 0.1-2.5 mIU/L [10, 12]. An increase in the TSH level above the upper limit of the reference interval (2.5 mIU/L) was determined in 25 (52.1%) women (Fig. 2). During the study, we found an increase in the TSH level in the examined women, which may indicate a dysfunction of the thyroid gland characteristic of these patients, confirmed by data from other authors [4, 5, 9].

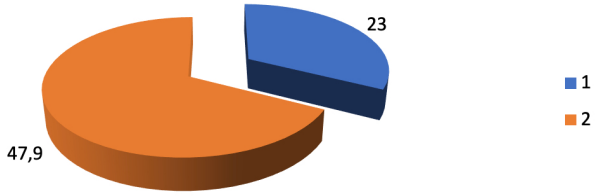

Fig. 2. TSH levels in pregnant women in the 1st trimester
1- 0.1–2.5 mIU/L; 2- above 2.5 mIU/L

When studying the frequency distribution of the level of indicators in 25 pregnant women with the level of TSH indicators above 2.5 mIU/l, 14 (29.16%) pregnant women had a TSH level above 4.0 mIU/l and 1 (2.08%) was diagnosed with manifest hypothyroidism. The remaining 9 (18.75%) examined women had a TSH level in the range of 2.5–4.0 mIU/l. The TSH level below the reference (below 0.1 mIU/l) was determined in 2 (4.16%) pregnant women (Fig. 3). These data coincide with the opinion of the majority of scientists about the etiology and pathogenesis of the development of thyroid pathology in pregnant women [14, 16].

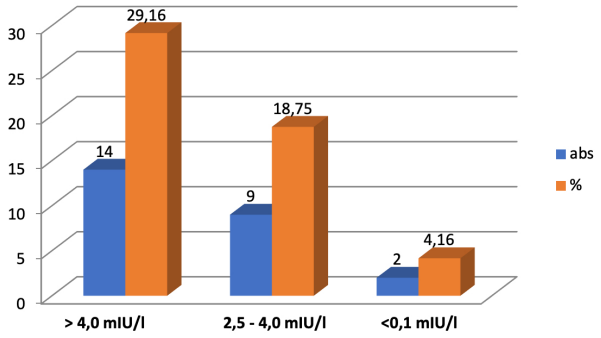

Fig. 3. Frequency distribution of TSH levels in 25 pregnant women in the 1st trimester

An increase in the level of AT-TPO indicators was detected in 8 (16.7%) pregnant women. According to the results of an ultrasound examination of the thyroid gland in pregnant women, nodular goiter was first detected during pregnancy in 1 pregnant woman (2.08%), and diffuse

goiter was detected in 2 (4.16%), which is also confirmed by data from other authors [5, 9, 13].

The median urinary iodine concentration (mUIC) in pregnant women was 158.9 [87–286.8] µg/L, which corresponds to the optimal iodine supply in this cohort. However, only 52.08% of pregnant women had urinary iodine levels in the target range; 4.16% (2 pregnant women) had urinary iodine exceeding 500 µg/L; 43.76% of women had urinary iodine excretion rates below the recommended level for pregnant women; no results below 20 µg/L were found. The obtained data are consistent with the results of previously published works by a number of authors [4, 6]. Along with this, there are very few data on the analysis of thyroid pathology in pregnant women. When surveying pregnant women, it was found that only 54.16% (26 pregnant women) of respondents use iodized salt for food in order to prevent iodine deficiency in the family. In 22 (45.84%) women who did not use iodized salt in the household for cooking, the volume of the thyroid gland was slightly higher (7.7 ml) than in pregnant women who use it (7.3 ml) (p=0.0432) (Fig. 4).

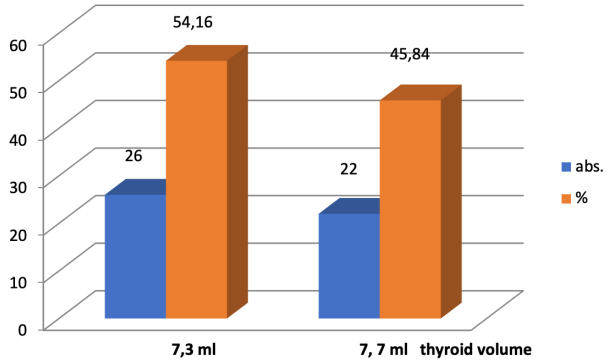

Fig. 4. Analysis of the thyroid gland volume in pregnant women depending on the use of iodized salt in the diet (p = 0.0444)

In general, the results of our study correspond to those conducted in areas of mild iodine deficiency in European ethnic groups. In this regard, for group prevention of iodine deficiency in risk groups, which include pregnant women, it is recommended to use medicinal iodine preparations in physiological concentrations. It is also recommended to use multivitamin complexes containing the physiological daily dose of potassium iodide recommended for pregnant women. Safe doses of potassium iodide are considered to be doses of no more than 500 mcg per day [8].

Discussion

The results we obtained differ primarily with the demographic characteristics of the patients. The proportion of boys was 95.8±4.1% in our observation, while it was 72.8% in China [4]. In our observation, there were no cataracts in children under 5 years of age. In China, the majority of childhood cataracts were recorded in the age range of 2-8 years [4].

The distribution of patients according to age and gender in our observation is very close to the corresponding results obtained in Malaysia [1] (specific weight of boys 95.8 and 82.8%% age 14 and over 41.6 and 44.8%). Our results on the mechanism and causes of acquired trauma are also consistent with the corresponding results in Malaysia.

The results of treatment of pediatric traumatic cataract depend on age. A positive result (visual acuity ≥0.5) in our observation was 60.0±15.4% in 15-18-year-olds, 50.0±15.8% in 10-14-year-olds, 25.0±21.6% in 5-9-year-olds. received in % cases. According to Chinese scientists, the positive result (visual acuity ≥0.3) was 33.9% in those aged ≤5 years, 53.4% in those aged 60-10 years, and 52.6% in those aged 11-14 years.

Thus, the demographic and clinical profile of children with traumatic cataract and the results of treatment in Azerbaijan are characterized by different and similar aspects.

Conclusion

1. A study of the thyroid status of conditionally healthy pregnant women revealed a high prevalence of subclinical hypothyroidism (20.8%). The obtained results on the frequency of subclinical hypothyroidism, gestational thyrotoxicosis and AT-TPO carriage are comparable with the results obtained by other researchers . At the same time, the rates of diffuse and nodular goiter differ, which is associated with a different study design (in our work, patients with thyroid pathology were excluded).

2.Considering the high prevalence of subclinical hypothyroidism based on the results of continuous screening of healthy women without a history of thyroid pathology, it confirms the need to include TSH testing in the 1st trimester for all pregnant women, and in the case of its excess of ≥2.5 mIU/L, it is recommended to determine free T4 and AT-TPO for early diagnosis and timely administration of replacement therapy.

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