E-ISSN: 2664-6773
P-ISSN: 2664-6765
Impact Factor: RJIF 5.6
IJCBS 2024; 6(2): 37-41
www.chemicaljournal.org
Received: 18-04-2024
Accepted: 21-05-2024

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The risk of high level of TSH hormone in pregnancy women

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DOI: https://doi.org/10.33545/26646765.2024.v6.i2a.100

Abstract
A very unique structure located on the posterior aspect of the neck has the shape of butterfly. The organ in question by formal and most popular name is the thyroid gland. It achieves this in the following manner; Through the production of hormones that control the use of energy in our bodies. These hormones are important in virtually all cells in the body as they affect different organs for example, the heart. They work on the overall weight of the body besides the central body temperature and the strength of muscles and play a role in controlling the moods. Hypothyroidism – condition in which the concentration of hormones in the blood is low – results in deceleration of numerous functions occurring in an organism. In such conditions characterized by excess, several unique biological functions increase in speed. Based on the aforementioned rationale, the following research question will be addressed in this study: what is the likelihood that healthy pregnant and healthy non-pregnant women will have increased maternal serum TSH levels in the second trimester of pregnancy? This study was performed on fifty women and all women in this group were characterized by the same age and weight values. Among the females, 50% of them were second trimester pregnant females, while the others were non pregnant females – the control group. The serum concentrations of thyroid stimulating hormone (TSH), thyroxine (T_4), triiodothyronine (T_3), and tetraiodothyronine (T_4) were assessed in two groups: it was established that one group was the control group while the other was the case group. The TSH hormone in the case group proved significant from the TSH hormone in the control group in the present study (p = 0. 00001). However, the analysis of the results did not reveal a statistically significant difference between the case group and the control group as for the other three hormones. According to these findings, there is a rise in the levels of thyroxine binding protein, an increase in the speed of production of thyroid hormone, and a boost in the effectiveness of hCG in stimulating the thyroid.

Keywords: TSH hormone, pregnancy women, triiodothyronine

Introduction
The thyroid gland is one kind of endocrine gland and is located in vertebrates. The thyroid gland is located in the front part of the neck, just below the larynx where the prominence known as the ‘Adam’s apple is’. This gland is bipartite with two fused lobes. It is a small strap of tissue that links two lobes at their lower parts [1]. The thyroid gland is made up of spherical glandular sacs called “thyroid vesicles” and these are the secretory units of the gland. The follicle is made up of a single layer of epithelial cells called ‘‘follicular cells,’’ which surrounds the vesicle lumen. The vesicle space contains colloidal solution and apart from the vesicle there are some more cells known as parafollicular cells, which are found in the inter vesicle spaces [2]. The thyroid gland releases three hormones:, the two major products are iodine-containing hormones, triiodothyronine (T_3) and thyroxine (T_4) and calcitonin, a peptide. Other effects of thyroid hormones include regulation of the metabolic rate as well as the rates of synthesis of proteins including growth and development of children. Calcitonin plays its role in the regulation of the calcium balance in the organism. Hormones secreted by the thyroid are controlled by Thyroid Stimulating Hormone (TSH) from the anterior pituitary gland which in turn is controlled by Thyrotropin Releasing Hormone (TRH) from hypothalamus. The user text is: [3] Thyroid-stimulating hormone (TSH): Then the pituitary hormone encourages the thyroid gland to produce T_4 out of the inactive substance. T_3 is the next form and raises metabolism in nearly every tissue in the body [4]. Tetraiodothyronine (T_4) and thyroxine: Another hormone called T_4 is manufactured in thyroid gland especially in follicular cells and is released in the bloodstream. This is the major hormone produced in the thyroid gland and is essential in metabolism and growth of tissues and organs [5]. T_3 is a triiodothyronine hormone produced by the thyroid endocrine gland. This hormone affects multiple physiological in the human body; these affects are regarding metabolism and growth,

heart rate and body temperature regulations [6]. T_3 synthesis is only 20% of thyroid hormone [7]. The standard range for thyroid hormone (TSH) is 0 which should remain within the above-stated range if a woman wants to have a chance of getting pregnant. 4 mU/L to 4. 0 mU/L. Still, several nonadjustable variables also affect the levels of TSH in a person and determine his or her normal range of TSH. This extends to those that repeat themselves over the course of one or another season of the year and the ones that radicalize depending on one's age or biological sex [8]. Another camp of scholars would like to observe that a normal TSH should have maximum numerical value within the scope of no more than 2. 5 mU/L. This is backed with the knowledge that TSH levels in most normal adult groups with no history of thyroid disease are disseminated between 0. 45 to 4. 12 mU/L. To some extent this is true more so to younger girls in particular. [9]. In normal pregnancy there is thyrotoxicity as manifested by rise in thyroid hormones, T_3 binding proteins, renal clearance of iodine and thyroid stimulating effect of hCG. Many changes occur in thyroid physiology and function during pregnancy hence it is a special period in a woman's life. These alterations are considered helpful during the first trimester of pregnancy when the baby is in circulation exclusively with the maternal thyroxine (T_4). which is mainly due to alterations of the hypothalamic-pituitary-adrenal (HPA) and hypothalamic-pituitary-thyroid (HPT) axes. Distortions in thyroid function testing within the framework of the HPT axis have been described in many papers. The abnormal laboratory tests that should be present for the diagnosis of thyroid autoimmune disease alongside clinical signs of failure of thyroid hormones include anti-TPO-Ab and TG-Ab. The HPT and HPA axes are under functioning in older adults with mental health problems. This writing unveils a similar decreased HPA and HPT in our elderly patients with psychiatric problems with that of the findings in [11] that showed a direct relationship between the TC and TSH. It is evident that placental development remained to be positively assotiated with thyroid status in the euthyroid range, even after controlling for confounders such as maternal BMI, blood glucose, and lipid concetrations. It has been established that TSH reference ranges fluctuate during the first trimester of pregnancy because of this rather dynamic alteration in thyroid function, and this phenomenon is more likely to occur in early pregnancy [12]. Depending on hormonal regulation dysfunction of the thyroid gland, an early pregnancy fluctuation in tests in a woman with norma hypothalamic-pituitary-thyroid gland function is associated with unfavorable outcomes for the mother and the baby (Table 1).

Table 1: Changes in thyroid function that the main mechanisms leading to changes in early pregnancy.

Physiological change	TSH	Total T_4	Free T_4
hCG secretion	High decrease (↓↓↓)	Low increase (↑)	Low increase (↑)
Estrogen induced TBG increase	Low increase (↑)	Middle increase (↑↑)	Low decrease (↓)
Effected intact thyroid	Middle decrease (↓↓)	Middle increase (↑↑↑)	Low increase (↑)

Serum concentrations of TBG increase as well as the distribution space of extrathyroidal T_4 during the first trimester of pregnancy. This is means that in order to replace the T_4 that has been utilized and to establish a new set point, the amount of T_4 is increased by the thyroid mechanism and this is usually attained around mid gestation. By the time twenty weeks of pregnancy have been completed, TBG is two to three folds what it used to be before pregnancy pregnancy. Advances in the ability to assess thyroid function applied the findings of these tests should be read in a different manner depending on the gestational age of the woman. Pregnancy and puerperium are the periods associated with higher prevalence of thyroid disorders' manifestations since up to 10% of reproductive-aged women suffer from these conditions [13].

This review will start with a description of the normal thyroid function during pregnancy, after which abnormalities in thyroid function will be described. control the thyroid hormone production as well as other physiological processes that occur during pregnancy. Pregnant women dwelling in endemic cretinism areas who have low T_4 level and/or clinical maternal goitre are iodine deficient [14].

The elderly's panel suggested by the WHO raised the daily iodine dosage from 200mcg to 250mcg. At the present, thyroid function testing is only recommended for women who have risk factors for thyroid disorders although we have recommended its use in prenatal and intrapartum care. Women who live in places that have sufficient iodine in their diet experience a 10% increase in the size of the thyroid gland; in those areas with low iodine concentrations, the thyroid gland increases in size to between 20% and 40%. For instance, as recently as in 1999, the WHO's panel lifted the daily iodine consumption from 200 micrograms to 250 micrograms a day. The following ranges for median urine iodine (UI) excretion levels during pregnancy: If the magnesium level is lower than 150 mg/L, it is considered insufficient; if ranges between 150 and 249, normal; if between 250 and 499, rich; and if it's equal to or more than 500 mg/L it is considered hypermagnesemia. According to the studies, the size of thyroid gland increases 10% during pregnancy, if the iodine is present in plenty; if iodine is deficient the increase is 20% to 40%. The meaning of laboratory values is different when a woman is not pregnant; and still, it is difficult to define thyroid function in the mother and the fetus during pregnancy. Therefore, while a woman is pregnant, it is considered essential to carry out a test of the thyroid's function. a woman is pregnant. Pregnant and non-pregnant patients' test results have different interpretations for diagnosing any condition, so there is no way to state how the thyroid function in both the mother and foetus is progressing. As a result, the estimated thyroid function of pregnant women is distinct from that of non-pregnant healthy women [15].

In addition, populations reference range of the two most common assays that include the Free thyroxine (FT_4) and TSH may vary widely. In their research, the majority of authors prove that both the initial and the higher level of TSH reference range decreases during pregnancy [16]. Some studies have drawn a conclusion that thyroid hormone serum concentrations may decrease, increase, or be unchanged in pregnant women depending on assays. increase or remain at the same level with the duration of pregnancy. To the relative amount of the whole T_4 test findings, the non pregnant value is slightly 1. 5 times lower. According to most scholars, patients may experience a transitory increase in FT_4 concentration in the first trimester because of relatively high levels of hCG. While it remains in the normal reference range it is, however, lower in the second and third trimester than in the first.

So, it is supposed that the interconnection between thyroid hormone and high molecular weight adiponectin (HMW) may play a role in the control of energy metabolism in human pregnancy. Aponectin is a HMW protein. Thyroid hormones also regulate the degrees of glucose transporters on the both mRNA and protein levels – these are the markers of insulin

sensitivity and glucose tolerance [17]. The fluctuations in the serum FT_4 and the FT_3 are as follows and the kind of fluctuation is Dissimilar. Moreover, there are some modulations of thyroid hormones on the insulin sensitivity, glucose tolerance and hepatic gluconeogenesis; nevertheless, the changes in FT_4 and free T_3 (FT_3) are reciprocal but opposite. Moreover, thyroid hormones that act in liver affect hepatic gluconeogenesis. Luteinizing hormone, (TSH), (TSH) decreases and then increases (but does not regain its pre-gravid levels) the first trimester of pregnancy. and then increases (but not to the Gravid level) up to the first trimester of pregnancy. This relationship persists even after controlling for the variable of insulin in addition to fat distribution across the body in relation to obesity and metabolic indexes Therefore, an association between smoking and FT_3 persists even after controlling for other variables. even when other factors that derive from insulin, distribution of fat in the body, obesity and markers for metabolic syndrome are taken into consideration.

These calculations would probably suit the pregnant women who do not have hypothyroidism or antibodies to thyroid. Where iodine is readily available, it is advised to use the local people to set up TSH reference ranges for the trimester in question. In line with the objectives of the present study, as presented in table 2, the following organisations' pregnancy guidelines have been reviewed: the Endocrine Society, the American Thyroid Association (ATA), and the European Thyroid Association (ETA).

Table 2: TSH reference ranges in pregnancy

	TSH reference ranges (mIU/L) and upper limit		
Screening at any moment during pregnancy	**American Endocrine Society**	**American Thyroid Association and European Thyroid Association**	**Observation Study**
First trimester	0.1 ~ 2.5	<2.5	3.47
Second trimester	0.2 ~ 3.0	<3.0	3.81
Third trimester	0.3 ~ 3.0	<3.5	4.99
Before 20 weeks of gestation			4.08
Before 14 weeks of gestation			2.5
Before 15 weeks of gestation			2.53

However, objective questions have been still posed on the screening and management of maternal thyroid status in achieving better perinatal outcomes. Thus, this review offers a presentation of thyroid function reference intervals during pregnancy, the factors that influence these references, and the clinical consequences of minor thyroid abnormalities during pregnancy [18]. Therefore, although universal screening as opposed to case finding for Thyroid dysfunction boosted the diagnosis and subsequently its management it did not significantly affect the primary outcomes. TSH Levels During Pregnancy: The levels of TSH during pregnancy differentiates with the stage of pregnancy where TSH increases during the first trimester then declines in the second trimester and slightly rises at the final trimester. According to the American Endocrine Society, TSH levels during pregnancy should be:First trimester: 0. 1 to 2. 5 mU/L . Second trimester: 0. 2 to 3. 0 mU/L. Third trimester: 0. 3 to 3. 0 mU/L. TSH levels greater than 4. 5 mU/L in early pregnancy increases the risk of miscarriage [19, 20].

Material and Method

Study design

This study included (25) samples of pregnant women as a case group and (25) samples of pregnant women as a control. The ages of the study population in ranged between (16-35) years.

Parameter measurement: Triiodothyronine (T_3), Thyroxin (T_4) and thyroid-stimulating hormone (TSH) it is measured by Finecare™ FIA Meter. method

Sample collection

Blood samples were collected from individuals from both teams. (5ml) of venous human blood were collected in gel tube and leave it to coagulate at 37°c for 30 minutes, the samples were separated by centrifugation at 3000 rpm for 15minutes and the isolated serum

Statistical analysis

Data are stated as means standard deviation (SD). The correlations use one way ANOVA. Non-parametric kruskal Wallis test distribution, A value of $P < 0.05$ was considered - statistically was also applied and P. significant >0.05 non-significant.

Results

Table 3: Comparing of T_3 hormone between pregnant women and nonpregnant women (control group) in the same Age and weight.

	Pregnant group	Control group
ave	1.00	1.07
sd	0.17	0.27
se	0.03	0.05
p value	0.596	

Table 4: Comparing of T_4 hormone between pregnant women and nonpregnant women (control group) in the same Age and weight.

	Pregnant group	Control group
ave	6.46	6.17
sd	1.24	1.61
se	0.25	0.32
p value	0.417	

Table 5: comparing of TSH hormone between pregnant women and nonpregnant women (control group) in the same Age and weight.

	Pregnant group	Control group
ave	4.53	2.34
sd	1.66	0.90
se	0.33	0.18
p value	0.00001	

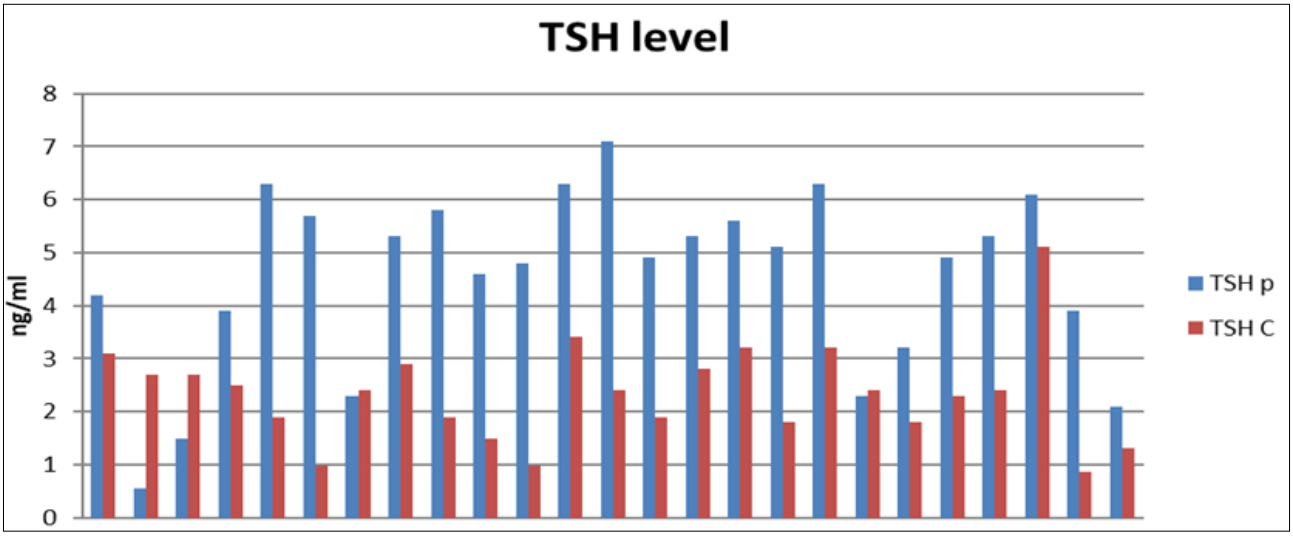

Fig 1: comparing of TSH hormone between pregnant women and nonpregnant women (control group) in the same Age and weight.

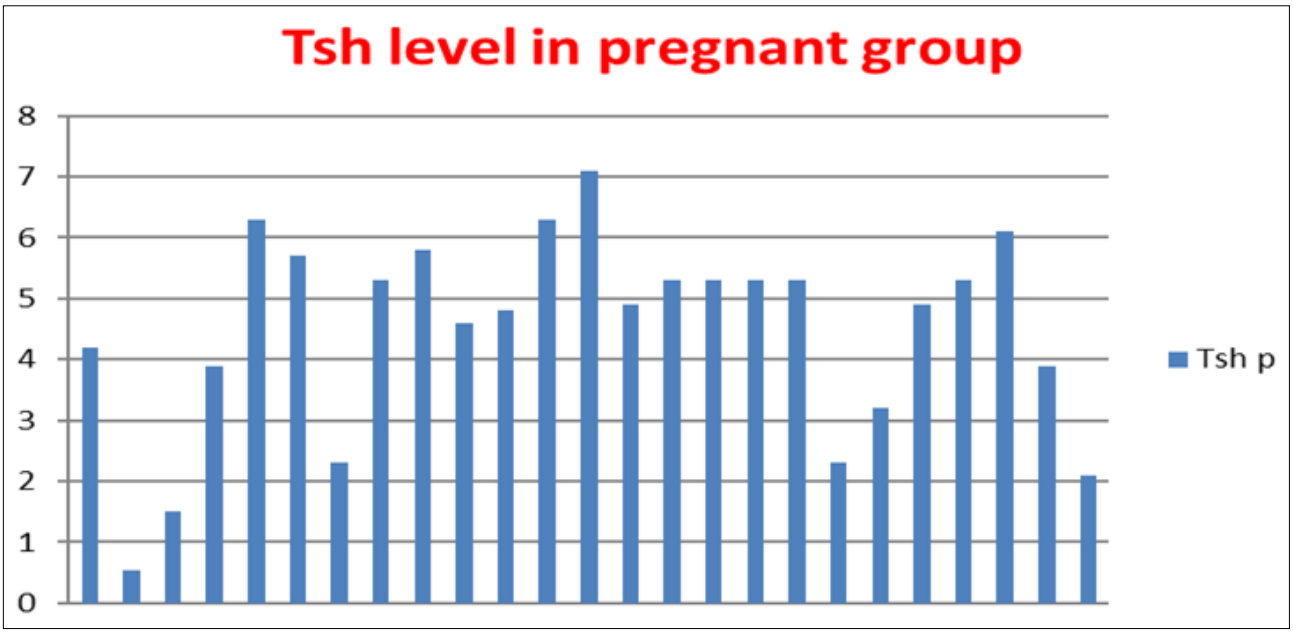

Fig 2: Level of TSH hormone between pregnant women group.

Discussion

The result of this study as shown in table (3) for level of T_3 hormone was displayed that there are not statistically significant variations regarding age between pregnant group and non-pregnant women (control group) with (P value = 0.596).

However, as show in table (4) for level of T_4 hormone also shown there is not statistically significant variations regarding age between pregnant group and nonpregnant women (control group) with (P value =0.417). in table (5) and figure (1) for level of TSH hormone also shown there statistically significant variations regarding age between pregnant group and non-pregnant women (control group) with (P value =0.00001). in figure (2) for level of TSH hormone in pregnant women group shown that TSH levels may increase by up to 50% during pregnancy

Furthermore, women with high TSH levels during pregnancy are more likely to develop gestational hypertension or preeclampsia. These conditions can lead to complications such as high blood pressure, swelling, and organ damage. High TSH levels during pregnancy can also increase the risk of miscarriage, preterm birth, and low birth weight. Thyroid hormones are essential for the proper functioning of the placenta and the growth and development of the baby. When thyroid hormone levels are imbalanced, it can disrupt these processes, putting the pregnancy at risk.

Conclusion

Study have shown that TSH levels may increase by up to 50% during pregnancy, having high TSH levels during pregnancy can have significant risks and complications. It can negatively impact fetal brain development, increase the risk of miscarriage and preterm birth, and contribute to gestational hypertension. Therefore, it is crucial for pregnant women to undergo thyroid screening and receive appropriate treatment if necessary to ensure a healthy pregnancy and optimal fetal development.

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