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Original Research Article

Effect of Grand Multiparity on Certain Thyroid Function Tests

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Abstract

Background: The physiology of the thyroid gland changes during pregnancy as a result of the effects of increased thyroxine binding globulin and human chorionic gonadotropin levels and enhanced iodine metabolism. These normal hormonal changes can sometimes make thyroid function tests during pregnancy difficult to interpret.

Objective: To compare the levels of thyroxine (T4), triiodothyronine (T3), thyrotropin (TSH) and Thyroxine Binding Globulin (TBG) in grand multiparas, nulliparas (control) and primiparas.

Materials: A cross-sectional study was performed in50 non-pregnant ladies as control group, 50 primiparity pregnant women, and 50 grand multiparity pregnant women. All pregnant women were between 10^{th} -14^{th} weeks gestation.

Methods: Serum for T4, T3, TSH and TBG were measured by Enzyme-Linked Immunosorbent Assay (ELISA).

Results: When compared to control group, serum levels of T4, T3 and TBG were increased significantly in primiparity and grand multiparity groups, while serum level of TSH was decreased significantly in both groups of pregnant women. Serum level of T4 increased significantly in grand multiparity group comparing to primiparity group.

Conclusion: The results suggest that grand multiparity increased the risk of pregnancy-related complication secondary to thyroid dysfunction.

Keywords: thyroxine, triiodothyronine, thyrotropin, Thyroxine Binding Globulin, grand multiparas, primiparas, nulliparas

1.Introduction

The reports defined grand multiparity as parity starts from 5 because the threshold of risks of any obstetric complication, neonatal morbidity, and perinatal death increase markedly at parity ≥5.[1] High parity and reduced inter-pregnancy interval are reported to be risk factors for poor maternal and perinatal outcome. These factors together or independently may predispose the mother to many diseases[2]. During pregnancy, the mother's thyroid physiology undergoes many well-defined changes, leading to an increase in thyroid volume which is often associated with higher urinary iodine excretion. It is also associated with the formation of new thyroid nodules with the histological features of nodular hyperplasia[3]. Thyroid hormones are major factors for the normal development of foetal brain, and until the end of the first trimester, when the hypothalamic-pituitary- thyroid axis becomes functional, the foetal brain is strictly dependent on local deiodination of maternal thyroxine[4]. Thyroid hormone is critical to normal development of the baby's brain and nervous system. During the first trimester, the fetus depends on the mother's supply of thyroid hormone, which comes through the placenta. At around 12 weeks, the baby's thyroid begins to function on its own[5]. Two pregnancy-related hormones—human chorionic gonadotropin (hCG) and estrogen—cause increased thyroid hormone

levels in the blood. Made by the placenta, hCG is similar to TSH and mildly stimulates the thyroid to produce more thyroid hormone. Increased estrogen produces higher levels of thyroid-binding globulin, also known as thyroxine-binding globulin, a protein that transports thyroid hormone in the blood[6]. TBG is one of several proteins that transport thyroid hormones in blood, and has the highest affinity for T4 (thyroxine) of the group. Estrogens stimulate expression of TBG in liver, and the normal rise in estrogen during pregnancy induces roughly a doubling in serum TBG concentrations[7]. Because of the lack of consistent evidence demonstrating that universal screening for thyroid disorders in pregnancy results in improved population outcomes, several clinical organizations recommend obtaining serum TSH early in pregnancy only in women at high risk for overt hypothyroidism[8].

The aim of this study was to investigate the concentrations of Total thyroxine (TT4), total triiodothyronine (TT3), thyrotropin (TSH)and Thyroxine Binding Globulin (TBG) in grand multiparas in comparison to nulliparas (non-pregnant, control) and primiparas (first time pregnancy).

2. Materials and methods

2.1 Study design

This study was designed as a cross-sectional study.

2.2 Study area

This study was carried in Khartoum state, in Al-Ajyal hospital, the fertility Center of Dr. Suraj and Dr. Amel Hospital for Obstetrics and Gynaecology.

2.3 Study period

The study was carried between August 2012 and July 2014.

2.4 Study size

The study included 50 normal healthy non-pregnant ladies as control group (nulliparity), 50 pregnant ladies for the first time (primiparity), and 50 were pregnant for more than 5 times (grand multiparity). All pregnant women were between 10^{th}-14^{th}weeks gestation during the time of collection of samples.

2.5 Exclusion criteria

1) The pregnant women take drugs that have effect on estimation and/or with major hormonal disorder
2) Those that refused to participate in this study were excluded.

2.6 Sampling

Informed consent was obtained from all study participants. Pre-prepared questionnaire including data concerning patients and their breast cancer information (such as age, menstrual cycle, type of treatment, and number of pregnancies, smoking, complications during pregnancy period, diabetes mellitus, and hypertension) was used. This study was approved by the ethical committee of Omdurman Islamic University. Seven ml venous blood samples were obtained from each female using standard venipuncture technique in serum separator tubes (SST). After 15 minutes, serum specimens were collected in plane container after centrifugation at 3000 rpm for 5 minutes. The serum stored frozen (-20°C) in a tightly sealed tube for only 2 weeks and then analyzed. Specimens should be allowed to come to room temperature and then mixed thoroughly by gentle inversion before assaying. Then thyroxine (T4) and triiodothyronine (T3) concentrations, as well as the pituitary thyroid stimulator, thyrotropin (Thyroid Stimulating Hormone, TSH) and Thyroxine Binding Globulin (TBG) were measured by automated Enzyme-Linked Immunosorbent Assay (ELISA) kit as described by Kazerouni *et al*[9].

2.7 Statistical analysis

Statistical analysis was performed using statistical package for socials ciences (SPSS). Statistical significance and differences from control and test values were evaluated by student *t*-test, at which the p value of less than0.05 considers the significance.

3. Results

Total thyroxine (TT4), total triiodothyronine (TT3) and Thyroxine Binding Globulin (TBG) levels showed significant increasing in primiparity group and grand multiparity group when compared to control (nulliparity group), while thyrotropin (TSH) concentration showed significant decreasing in pregnant ladies (primiparity group and grand multiparity group) when compared to control (nulliparity group). TT4 level was significantly raised in grand multiparity group comparing to primiparity, while the other levels showed insignificant changes.

Table1: Comparison of T4, T3, TSH, and TBG levels between nulliparity and primiparity

	Nulliparity	Primiparity	P value
TT4 (µg/dL)	5.1	10.4	0.00
TT3 (ng/dL)	143	455	0.02
TSH (mIU/L)	2.8	0.9	0.03
TBG (mg/dL)	1.7	3.9	0.01

Table2: Comparison of T4, T3, TSH, and TBG levels between nulliparity and grand multiparity

	Nulliparity	Grand Multiparity	P value
TT4 (µg/dL)	5.1	18.2	0.00
TT3 (ng/dL)	143	502	0.00
TSH (mIU/L)	2.8	0.6	0.00
TBG (mg/dL)	1.7	3.5	0.03

Table3: Comparison of T4, T3, TSH, and TBG levels between primiparity and grand multiparity

	Primiparity	Grand Multiparity	P value
TT4 (µg/dL)	10.4	18.2	0.00
TT3 (ng/dL)	455	502	0.12
TSH (mIU/L)	0.9	0.6	0.16
TBG (mg/dL)	3.9	3.5	0.20

4. Discussion

The management of thyroid disorders during pregnancy is one of the most frequently disputed problems in modern endocrinology. It is widely known that thyroid dysfunction may result in subfertility, and, if inadequately treated during pregnancy, may cause obstetrical complications and influence fetal development[10].

In the present study, the results of serum T4, T3 and TBG concentrations were raised significantly (p value <0.05) in pregnant women whether it was primiparity or grand multiparity. Also in both groups, TSH concentration was decreased significantly (p value <0.05) when compared to control group (nulliparity). Lee *et al*[11] reported that thyroid dysfunctions during pregnancy showed rising in T3 and T4 those reflected on TSH which then altered to low concentration. One way or another, our results were disagreed the report of Negro *et al*[12], who found that there is a conclusive subclinical hypothyroidism in pregnancy; this disorder includes low T4, T3 and TSH.

In the present study, the concentrations of T4 and T3 showed increased values in grand multiparity than primiparity comparing to control group; while TSH and TBG concentration showed lower level in grand multiparity than primiparity comparing to control group. On the other hand, T3, TSH, and TBG levels when compared between primiparity and grand multiparity, showed insignificant changes (p value>0.05), while T4 level was significant increase in grand multiparity much more than primiparity (p value<0.05). These findings were disagreed with Khadem *et al*[13] who considered that the parity has no effect on thyroid hormones, as much as the pregnancy itself.

In conclusion, the results suggest that grand multiparity increased the risk of pregnancy-related complication secondary to thyroid dysfunctions.

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