Original Article

Study of Serum FT_3, FT_4 and TSH Levels in Pregnant Women

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Abstract

Thyroid disease have a strong predominance in woman of childbearing age. Pregnancy may be associated with thyroid dysfunction. Our objective was to assess the serum FT_3, FT_4 and TSH levels in pregnant women. This cross-sectional analytical study was done in the Department of Physiology of Dhaka Medical College from July 2006- June 2007. Total 50 apparently healthy women of low socioeconomic class, age ranged from 18-40 years were selected from the Outpatient Department of urban primary health care project at Mirpur, Dhaka. Out of them 30 pregnant women of different trimester were taken as study group and 20 age matched non pregnant women were taken as control. Serum FT_3, FT_4 and TSH levels were parameters in both groups. Statistical analysis was done by the SPSS 12.0 programme. The means (±SD) of serum FT_3 levels were 6.36 ± 1.16 p mol/L and 6.38 ± 1.38 p mol/L, FT_4 levels were 20.25 ± 4.77 pmol/L and 19.39 ± 8.17 pmol/L and TSH levels were 0.96 ± 0.96 mIu/L and 1.27 ± 0.86 mIu/L in group A (Study) and group B (control) respectively. The difference of means (±SD) of serum FT_3 , FT_4 and TSH levels were not significant ($p>0.05$) between group A and B. From the statistical analysis of the results obtained in the present study and their comparison with those of published reports, it may be concluded that there is no change of serum FT_3, FT_4 and TSH levels in pregnancy.

Keywords: Thyroid hormone level, TSH, Pregnancy, Antenatal checkup.

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Introduction

Pregnancy is a physiological condition in female. Many changes occur in pregnancy. During pregnancy hormonal changes include not only oestrogen and progesterone level but also other hormones like thyroid hormone[1]. The endocrine glands play very important role in the physiology of reproduction. During pregnancy, physiological alteration of various endocrine glands namely the pituitary, thyroid, parathyroid, adrenals and pancreas, show distinct physiological changes leading to increase in output of respective hormones. The basic purpose of these changes is to adjust the internal environment of the mother to meet the additional requirements impose by metabolic changes during pregnancy as well as to met the extra demands by the growing fetus[2]. Common thyroid diseases have a strong predominance in women of childbearing age. For this reason, assessment of thyroid function during pregnancy is very important. Proper diagnosis and treatment of thyroid dysfunction during pregnancy is important to avoid both fetal & maternal complications. Assessment of both hyper & hypothyroidism during pregnancy should be done with a careful measurement of TSH & free thyroid hormones[3]. Thyroid hormones are essential for normal growth and skeletal maturation. They potentiate the effect of growth hormone on the tissue. In hypothyroid children bone growth is slowed and epiphyseal closure is delayed[4]. Thyroid hormones have important roles in embryogenesis and fetal maturation[5]. In hypothyroidism mentation is slow and the CSF protein level is elevated. Thyroid hormones have marked effects on brain development and its deficiency affects the cerebral cortex, basal ganglia and cochlea. Consequently, thyroid hormones deficiency during development causes mental retardation, motor rigidity and deaf-mutism[4]. Thyroxine plays a very important role in the development and maturation of the central nervous system in utero and in the immediate post natal periods[6]. Mildly increased serum TSH levels during pregnancy might also increase the risk of fetal death. So, TSH measurement should be a routine screening for thyroid dysfunction before or during first trimester of pregnancy[7]. Currently FT_3, FT_4 and TSH are the front line tests for evaluating thyroid functional status. The TSH test is the best early indicator of thyroid dysfunctions. In screening the TSH test is considered a cost-effective gold standard for evaluating thyroid function. If the TSH result

is abnormal, the FT_4 level is tested. If FT_4 is normal, the FT_3 level is tested for disorders[8]. The thyroid abnormalities during gestation suggests that screening for thyroid dysfunction in relation to pregnancy should be strongly considered. A free serum level is more accurate in detecting thyroid activity than a total serum level, which is affected by protein binding. Free T_3 & T_4 levels are not influenced by the degree of protein binding, which can be affected by numerous factors (illness, genetics, medications). So, FT_3 & FT_4 are the true markers of thyroid hormones biological activity[9]. So, the present study has been designed to asses the thyroid functional status by measuring FT_3, FT_4 & TSH levels in pregnant women and to compare these values with the control group (non- pregnant). The study result will help us to determine whether the thyroid function tests are to be included as a routine test during antenatal check-up or not.

Materials and Methods

This Cross-sectional analytical study was done in the Department of Physiology in Dhaka Medical College, Dhaka from July 2006- June 2007. Permission was taken from the concerned Departments & authorities after getting recommendation of ethical committee. Informed written consent was taken from all the study subjects after full explanation of nature and purpose of the study. Total 50 subjects of age ranged from 18-40 years were selected from the out patient department of urban primary health care project at Mirpur, Dhaka, who belong to low socio-economic status. Out of total 50 subjects 30 were pregnant women(Group-A) and 20 were non-pregnant women of child bearing age (Group-B). Group A was again subdivided in to three sub-groups (A_1- Pregnant women of first trimester, A_2- Pregnant women of second trimester, A_3- Pregnant women of third trimester). Estimation of serum FT_3 and FT_4 of study subjects by RIA and estimation of serum TSH of study subjects by IRMA at center for nuclear medicine & ultrasound, DMCH campus, Dhaka were taken as parameters of both groups. Study subjects were selected considering inclusion and exclusion criteria. Inclusion criteria were - a)Age 18 - 40 years b) Pregnant women c) No clinical evidence of thyroid disease.

Exclusion criteria were - a) Subject with pregnancy complication b) Subject with Diabetes Mellitus, renal or hepatic disorders c) Subject received lipiodol injection or any other medication known to influence thyroid function. All the subjects were explained about the aim and objective of this study. The test procedure was briefed and demonstrated. Written consent was taken before performing the test. Detailed history of each subject was obtained by using a pretested questionnaire. Clinical examination of these subjects was done before taking blood samples. The sample was selected randomly according to the inclusion & exclusion criteria. With all aseptic precautions 5ml venous blood was drawn from the ante-cubital vein in a disposable syringe and then blood was immediately transferred to a dry clean test tube and allowed to clot. After clot formation, serum was separated by centrifuging the blood at 3000 rpm for 5 minutes. Serum was kept in micro centrifuge tube after labeling and was preserved at-40ºC until analysis. All data were checked and edited after collection. Then the data were entered into computer and analyzed with the help of SPSS 12 programme and significance test were done by unpaired Student's 't' test.

Results

The means (±SD) of serum FT_3 levels were 6.36 ±1.16 pmol/L and 6.38 ±1.38 pmol/L in group A (Study) and group B (control) respectively. The difference of means (± SD) of serum FT_3 levels were not significant ($p>0.05$) between group A and B. (table I)

Table I: FT_3 level in study and control group (n=50)

Group	n=50	Minimum pmol/L	Maximum pmol/L	Mean± SD	t	p	Remark
Study	30	2.83	8.53	6.36± 1.16	0.048	>0.05	Not Significant
Control	20	4.78	11.22	6.38± 1.38			

Data were expressed as mean ±SD n: Number of the subject

Group A: pregnant women (Study)

Group B : Non pregnant women(Control)

SD : Standard deviation p : probability value

The means (±SD) of serum FT_4 levels Were 20.25 ±4.77 pmol/L and 19.39 ±8.17 pmol/L in group A (study) and group B (control) respectively. The difference of means (± SD) of serum FT_4 levels were not significant ($p>0.05$) between group A and B.(table II)

Table II: FT_4 level in study and control group(n=50)

Group	n=50	Minimum pmol/L	Maximum pmol/L	Mean± SD	t	p	Remark
study	30	12.04	33.69	20.25± 4.77	.470	>0.05	Not Significant
Control	20	6.38	48.40	19.39± 8.17			

The means (±SD) of serum TSH levels were

0.96 ± 0.96 mIu/L and 1.27 ± 0.86 mIu/L in group A (study) and group B (control) respectively. The difference of means (±SD) of serum TSH levels were not significant ($p>0.05$) between group A and B.(table III)

Table III: TSH level in study and control group (n=50)

Group	n=50	Minimum mIu/L	Maximum mIu/L	Mean SD	t	p	Remark
Study	30	0.16	3.35	0.96±0.96	1.169	>0.05	Not Significant
Control	20	0.20	3.58	1.27±0.86			

The results are expressed as follows:

1. Serum FT_3 : p mol 2. Serum FT_4 : p mol/L 3. Serum TSH : mIu/L

Results were expressed as mean ± SD (Standard deviation). The statistical significance of difference between the groups were evaluated by using Student's 't' test in case of control and study groups and by ANOVA test in case of subgroups (study).

Group A- Pregnant women (study), Group A_1-Pregnant women of first trimester, Group A_2-Pregnant women of second trimester, Group A_3-Pregnant women of third trimester, Group B-Non pregnant women of child bearing Age (control).

p values were obtained by Student's 't' test and by ANOVA test.

$p > 0.05$ = Not significant, $p < 0.05$ = Significant

$p < 0.01$ = Very significant, $p < 0.001$ = Highly significant

Discussion

The present study has been undertaken to evaluate the changes of serum FT_3, FT_4 and TSH levels in pregnant women and non pregnant women. For that purpose serum FT_3, FT_4 and TSH levels were estimated in pregnant and non pregnant women.

Total 50 subjects age ranged from 18-40 years were selected, of whom 30 were pregnant women (study group) and 20 were non pregnant women (control group). The pregnant women were again grouped into three groups according to the duration of pregnancy. The subjects were from low socio economic status and were free from disease. Pulse rate, resting blood pressure of all the subjects were recorded before collection of blood.

In this study the mean serum FT_3 levels were 6.36±1.16 p mol/L and 6.38±1.38 p mol/L in case and control group respectively and mean serum FT_4 levels were 20.25±4.77 p mol/L and 19.39±8.17 p mol/L in pregnant and non pregnant women respectively. The difference of means (±SD) of serum FT_3 and FT_4 levels were not statistically significant (p>0.05).

These findings are also consistent with those reported by Corinne *et. al* (1999) [3] . Some studies have shown a decrease in free hormones during pregnancy[10]. Pregnant women on average had lower free hormone concentrations at term than non pregnant women and studies have shown that serum FT_3 and FT_4 are about 25% lower in women at delivery than non pregnant women[11]. Where as some other studies have shown an increase[12]. However most pregnant women (>78%) remain within the same reference interval as non pregnant women[13] . Serum free T_4 and T_3 levels were significantly elevated throughout the pregnancy in comparison with non pregnant. FT_4 concentration was elevated after 10 weeks of pregnancy and FT_3 concentration was elevated at 13-20 weeks[14]. During the first 5 weeks of pregnancy mean serum free T_4 and free T_3 levels were 50% higher than in non pregnant women or women during the third trimester. FT_4 was increased significantly throughout the first trimester but FT_3 was significantly above control values only during the first 5 weeks. FT_4 and FT_3 levels decreased to control levels in the third trimester. These changes in FT_4 and FT_3 concentrations are consistent with a weak thyrotropic action of Human Chorionic Gonadotropin hormone (HCG), which attained maximum concentrations early in the first trimester and then decreased markedly in the second and third trimester[12] .

In present study the mean (± SD) serum TSH levels were 0.96 ±0.96 mIu/L and 1.27± 0.86 mIu/L in experimental and control group respectively. The difference of means (±SD) of serum TSH levels were not statistically significant (p>0.05).This finding is also consistent with those reported by Corinne *et. al* (1999) [3] . TSH levels are significantly lower at 9-12 weeks compared with the rest of the pregnancy. HCG may be a weak thyroid stimulator that causes a modest rise in free thyroid hormones early in the pregnancy which in turn causes a modest reduction in pituitary TSH secretion[14]. High concentration of HCG present in the first trimester of pregnancy causes the reduction in TSH level[15]. TSH level is decreased in the first trimester and then return to normal throughout the duration of pregnancy. Normal TSH level throughout the pregnancy indicates thyroid is functioning normally [16]. From the statistical analysis of the results obtained in the present study and their comparison with those of published reports, it may be concluded that there is no change of serum FT_3, FT_4 and TSH levels in pregnancy. So, the study result will help us to determine that the "Thyroid function tests" are not necessary to include as a routine test during antenatal check-up.

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