

SHORT COMMUNICATION

Comparison of FT₃, FT₄ and TSH levels in Pregnant Women in Dehradun, India

Vishal Kumar Deshwal^{1*}, Abhay Yadav² and J.B. Gogoi³

¹Dept. of Microbiology, ²Dept. of Medical Laboratory Technology, Doon (P.G.) Paramedical College, Dehradun-248001, India;

³Dept. of Biochemistry, Veer Chandra Singh Garhwali Government Institute of Medical Science and Research, Srinagar, Pauri Garhwal, Uttarakhand

vishal_deshwal@rediffmail.com*; +91 9897538555

Abstract

This study was carried out to investigate thyroid hormone TSH (Thyroid-stimulating Hormone), Free T₃ (FT₃) and Free T₄ (FT₄) status in pregnant women at Dehradun, Uttarakhand (India). Only 100 healthy pregnant women were selected for the present study. TSH, Free T₃ (FT₃) and Free T₄ (FT₄) were quantitatively analyzed. FT₃, FT₄ and TSH in the first trimester of pregnant showed 07.40±1.26 pmol/L, 14.20±1.75 pmol/L and 01.41±0.93 mIU/L respectively. Second trimester of pregnant FT₃, FT₄ and TSH was 04.05±1.13 pmol/L, 12.02±2.01 pmol/L and 01.56±0.86 mIU/L and third trimester of pregnant FT₃, FT₄ and TSH was 02.92±0.93 pmol/L, 07.96±1.78 pmol/L and 02.73±0.63 mIU/L respectively. The study suggests that FT₃ and FT₄ gradually reduced from first trimester to third which showed that fetus and mother required more thyroid hormones.

Keywords: Thyroid hormone, Free T₃, Free T₄, Dehradun, trimester, pregnant women, fetus.

Introduction

Thyroid is a small endocrine gland found in the front of the neck. Thyroid hormones are essential for proper growth, proliferation, differentiation, apoptosis, development, neurotransmission, behavior and metabolic homeostasis (Karapanou and Papadimitriou, 2011). Thyroid gland generates the hormones thyroxine (T₄), 3,5,3-triiodothyronine (T₃), calcitonin and secretes them into the bloodstream. All thyroid hormone actions are mediated by the binding of 3,5,3-triiodothyronine (T₃) to specific nuclear receptors and T₃ is the chief bioactive form of TH, whereas T₄ acts as a prohormone to T₃ (Karapanou and Papadimitriou, 2011).

Thyroid disorders are commonly divided into two main categories, hyperthyroidism and hypothyroidism. In hyperthyroidism, tissue is exposed to excessive amounts of circulating thyroid hormone. The most common cause of this syndrome is Graves' disease, followed by toxic multinodular goitre and solitary hyperfunctioning nodules. Autoimmune postpartum and subacute thyroiditis, tumors that secrete thyrotropin and drug-induced thyroid dysfunction are also important causes (Sharma *et al.*, 2011). Hyperthyroidism in pregnant women is low but untreated overt hyperthyroidism are at increased risk for spontaneous miscarriage, fetal growth restriction, congestive heart failure, thyroid storm, preterm birth, pre-eclampsia, increased perinatal morbidity and mortality (Davis *et al.*, 1989; Kriplani *et al.*, 1994; Chang and Pearce, 2013). Hypothyroidism is a condition in which the thyroid gland does not produce enough amounts of the thyroid hormones—thyroxine (T₄) and triiodothyronine (T₃).

Hypothyroidism is related with a broad spectrum of reproductive disorders. Hypothyroidism is related with a broad spectrum of reproductive disorders ranging from abnormal sexual development through menstrual irregularities to infertility. The impact of hypothyroidism on the menstrual cycle has been identified since the 1950s (Goldsmith *et al.*, 1952; Benson and Dailey, 1955). Wang and Crapo (1997) mentioned an abnormal thyroid-stimulating hormone level and 5% of women have overt hypothyroidism or hyperthyroidism. Low secretion of thyroid reduces growth of pregnant woman and her fetus as well as the child's neuropsychological development is adversely affected (Haddow *et al.*, 1999; Pop *et al.*, 1999). Joshi *et al.* (1993) investigated 178 women of menstrual and reproductive history and reported 31.8% of hypothyroid and 35.3% of hyperthyroid women had normal menstrual pattern in contrast with 56.3% of Euthyroid and 87.8% of healthy controls (p<0.001). Literature suggests that no detailed investigation on thyroid hormones of pregnant women at Dehradun city. Therefore, this study was carried out to investigate thyroid hormone TSH, Free T₃ (FT₃) and Free T₄ (FT₄) status in pregnant women at Dehradun, Uttarakhand (India) during first, second and third trimester of pregnancy.

Materials and methods

Study population: This study comprises 100 pregnant women at Dehradun with age ranging from 20-35 years, visiting Doon (PG) Paramedical College, Dehradun, Uttarakhand (India). These cases were selected over a period of 3years (2010-13).

Gestational age was calculated from the first day of the last normal menstrual period and gestational age <14, 14-27 and >28 weeks comprised the first, second and third trimesters of pregnancy (Mehran *et al.*, 2013).

Collection of blood: Venous blood (5 mL) of pregnant women was collected in fasting state. Serum was prepared within 60 min of blood collection. Serum was store at -20°C till get analyzed for thyroid function test. These samples were analyzed within 24 h from blood collection time.

Hormone analysis: Thyroid stimulating hormone (TSH), Serum free 3,5,3'-triiodothyronine (FT₃) and free 3,5,3',5'-tetraiodothyronine (FT₄) were analyzed using ERBA THYROKIT. Measurement of Free T₃ (FT₃) and Free T₄ (FT₄) was based on a direct, labeled antibody, competitive immunoassay, but TSH assay is based on one step immunoenzymatic sandwich principle in conjunction with biotin-streptavidin technology.

Statistical analysis: Data were represented as percentile, mean and standard deviation.

Results and discussion

About 107 pregnant women had visited in all trimester. But we analyzed only 100 pregnant women for present study. Pregnant women around 7% were excluded because of pre-existing thyroid disorder. When compared with FT₃, FT₄ and TSH in first trimester, second trimester and third trimester. It was noted that FT₃ concentration reduced by 54.73 and 39.36% respectively in the 2nd and 3rd trimesters as compared to first trimester. FT₄ concentration also reduced by 84.65 and 56.05% in 2nd and 3rd trimesters as compared to first trimester. TSH concentration increased by 110.64 and 193.62% in 2nd and 3rd trimesters as compared to first trimester (Fig. 1). FT₃ showed 5.81 and 1.71 pmol/L in 5th percentile of first and third trimesters respectively. FT₄ showed 11.43 and 5.18 pmol/L in 5th percentile of first and third trimesters respectively. TSH showed 0.20 and 1.87 mIU/L in 5th percentile of first and third trimesters respectively (Table 1).

This study provides trimester specific reference ranges for FT₃, FT₄ and TSH among pregnant women in Dehradun, Uttarakhand (India). Each trimester showed variations. The reference intervals for the healthy adults were 2.56-6.36 pmol/L for FT₃, 11.24-26.86 pmol/L for FT₄ and 0.17-4.23 mIU/L for TSH (Hubl *et al.*, 2002). In first trimester, most pregnant women showed more FT₃ as compared to reference but gradually reduced in second and third trimesters. 5th percentile in 3rd trimester was low in limit as compared to references. Similar observation was observed in FT₄ of 3rd trimester where mean value was 7.96±1.78. This FT₄ values was very low as compared to reference. TSH levels were maintained in all three trimesters.

Fig. 1. FT₃, FT₄ and TSH levels in pregnant women during various trimesters.

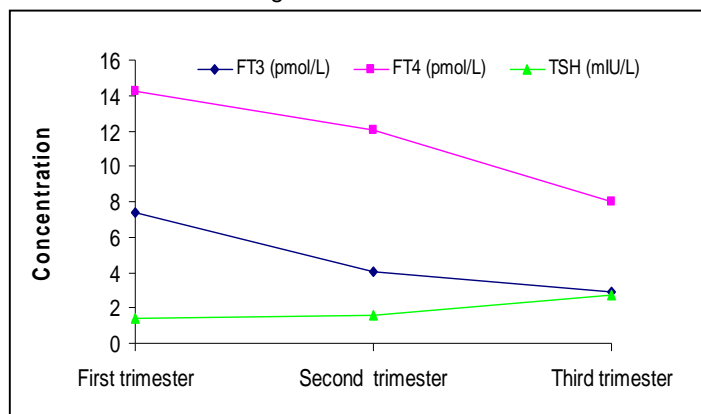


Table 1. Gestation specific percentile values of FT₃, FT₄ and TSH of pregnant women (n = 100).

Trimester/thyroid hormones	Percentile			Mean value ± SD
	5 th	50 th	95 th	
First trimester				
FT ₃ (pmol/L)	05.81	07.08	09.60	07.40±1.26
FT ₄ (pmol/L)	11.43	13.89	16.96	14.20±1.75
TSH (mIU/L)	00.20	01.35	02.97	01.41±0.93
Second trimester				
FT ₃ (pmol/L)	02.60	03.84	05.97	04.05±1.13
FT ₄ (pmol/L)	09.22	11.56	15.50	12.02±2.01
TSH (mIU/L)	00.39	01.43	02.93	01.56±0.86
Third trimester				
FT ₃ (pmol/L)	01.71	02.85	04.44	02.92±0.93
FT ₄ (pmol/L)	05.18	08.06	10.52	07.96±1.78
TSH (mIU/L)	01.87	02.69	03.70	02.73±0.63

Reduction in FT₃ and FT₄ concentrations clearly indicated that pregnant lady and fetus required more T₃ and T₄ hormones. Similarly, Bocos-Terraz *et al.* (2009) reported TSH values (µIU/mL): 1.12±0.69 (<10 weeks), 1.05±0.67 (11-20 weeks), 1.19±0.60 (21-30 weeks), 1.38±0.76 (31-36 weeks) and 1.46±0.72 (>36 weeks) in his study. Similarly Marwaha *et al.* (2008) mentioned FT₃ of third trimester ranged from 3.3-5.18 pmol/L which was slightly higher as compared to our finding. Kurioka *et al.* (2005) studied of 522 pregnant women from Japan and showed significant decrease in both FT₃ and FT₄ and increase in TSH with advancing pregnancy.

Conclusion

Present study is concerned only on pregnant women at Dehradun city and our study suggest that FT₃ and FT₄ gradually reduced from first trimester to third which showed that fetus and mother required more thyroid hormones. Thyroid stimulating hormones (TSH) was constant. Authors find that over all free thyroid level was less as compared to non-pregnant women. Further, authors suggest taking more iron, iodine to maintain free thyroid level.

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