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Lipid Profile in Thyroid Dysfunction: A Study on Patients of Bastar

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Özet

Amaç: Tiroid bezinin fonksiyonu bazı parametreler üzerinde doğrudan etkisi metabolik faaliyetleri geniş bir yelpazeye düzenlemektedir. Bu çalışmanın amacı Bastar'da bölge halkı arasında serum lipid profili parametreleri üzerine tiroid disfonksiyonu etkisini görmekti. Gereç ve Yöntem: Kan örnekleri 60 denekten toplanmıştır.Kan tiroid uyarıcı hormon (TSH), mikroplak bağışıklık enzymetric testi ile tri-iodothyroinine (T3), tetra-iodothyronine (T4), serbest tri-iodothyronine (FT3), serbest tetra-iodothyronine (FT4) düzeyleri için analiz edildi. Tiroid fonksiyon bozukluğu olan hastalarda sırasıyla TSH artmış ve düzeylerinde azalma ile birlikte hipotiroidi ve hipertiroidili ayrıldı. Total kolesterol (TK), trigliserit (Tg), düşük dansiteli lipoprotein kolesterol (LDL-C) ve yüksek dansiteli lipoprotein kolesterol (HDL-C) düzeyleri ölçüldü ve normal arasında ve tiroid fonksiyon bozukluğu olan hastalarda karşılaştırıldı. Bulgular: TK, Tg, LDL-C, VLDL-C, TK / HDL oranının yüksek seviyelerde ve anlamlı HDL-K azalmış hipotiroidi hastalarında gözlendi. Hipertiroidi hastalarında TK, Tg, LDL-C, VLDL-K ve TK / HDL oranı anlamlı değişiklikler ile düşük HDL-C düzeyleri saptandı. Varyans analizi (ANOVA) tüm gruplar arasında anlamlı farklılık gösterdi ve Tukey dürüst testi anlamlılık 0.05 düzeyinde tüm gruplarda biyokimyasal parametrelerin ortalama değerleri arasındaki anlamlı fark saptandı. Tartışma: lipid profili üzerine tiroid disfonksiyonu etkisi konusunda bir tartışma var gibi, mevcut iş Bastar'da tiroid disfonksiyonu aşiret hasta üzerinde yapılan ve normal kişilerde ile karşılaştırıldı.Çalışma hipotiroid olgularda artmış lipid profili sonucuna ve hipertiroid konuların lipid profili üzerine etkisi olmadığı bulunmuştur.

Anahtar Kelimeler

Hipotiroidi; Hipertiroidi; Lipid Profili; Bastar'da

Abstract

Aim: Function of thyroid gland is regulating a wide array of metabolic activities which have direct impact on some parameters. The objective of this study was to see the effect of thyroid dysfunction on serum lipid profile parameters among the people of Bastar region. Material and Method: Blood samples were collected from 60 subjects. The blood was analyzed for the levels of thyroid stimulating hormone (TSH), tri-iodothyroinine (T3), tetra-iodothyronine (T4), free tri-iodothyronine (FT3), free tetra-iodothyronine (FT4) by microplate immune enzymetric assay. Patients with thyroid dysfunction were categorized into hypothyroid and hyperthyroid with increased and decreased levels of TSH respectively. Levels of total cholesterol (TC), triacylglycerol (Tg), low density lipoprotein-cholesterol (LDL-C) and high density lipoprotein-cholesterol (HDL-C) were measured, and compared between normal and patients with thyroid dysfunction. Results: Elevated levels of TC, Tg, LDL-C, VLDL-C, TC/HDL ratio, and significantly decreased HDL-C were observed in hypothyroid patients. Hyperthyroid patients revealed low HDL-C levels with no significant changes in TC, Tg, LDL-C, VLDL-C, and TC/HDL ratio. Analysis of variance (ANOVA) showed the significant difference among all the groups and Tukey's honest test revealed the significant difference in the mean values of the biochemical parameters in all groups at 0.05 level of significance. Discussion: As there is a controversy regarding effect of thyroid dysfunction on lipid profile, the present work was conducted on thyroid dysfunction tribal patients of Bastar, and compared with the normal subjects. The study concluded increased lipid profile in hypothyroid subjects and found no effect on the lipid profile of hyperthyroid subjects.

Keywords

Hypothyroid; Hyperthyroid; Lipid Profile; Bastar

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Introduction

Thyroid function regulates a wide array of metabolic activities. Thyroid failure is more common in women and epidemiological rate of prevalence rises with age. Hypothyroidism is a condition of thyroid dysfunction in which less amount of thyroid hormones are produced by thyroid gland, such subjects eventually will lead to have lower metabolic rate and clinical manifestation such as overweight , fatigue, hypotension and depression [1;2]. The serum TSH assay is an accurate test for detecting out-of-range circulating levels of thyroid hormones for either of hypothyroidism and hyperthyroidism [3]. The prevalence of thyroid dysfunction is determined by testing patients in geographic areas, primary care clinics, and in populations that have not been screened previously [4]. Thyroid function significantly affects lipoprotein metabolism as well as some cardiovascular disease (CVD) risk factors [5].Thyroid hormones can influence HDL metabolism by increasing cholesteryl ester transfer protein (CETP) activity, which exchanges cholesteryl esters from HDL to VLDL and Tg to the opposite direction [6]. In addition, thyroid hormones stimulate the lipoprotein lipase (LPL), which catabolizes the Tg-rich lipoproteins, and the hepatic lipase (HL), which hydrolyzes HDL2 to HDL3 and contributes to the conversion of intermediate-density lipoproteins (IDL) to LDL [7;8]. Another effect of T3 is the up-regulation of apolipoprotein AV (ApoAV), which plays a major role in Tg regulation [9]. Indeed, increased levels of ApoAV have been associated with decreased levels of Tg [10].

Our main concern in this study is to clarify the lipid profile status of thyroid patients of Bastar, a region where population has a sex ratio of 1024 females for every 1000 males. Health status of the tribes is very poor. Nutrient intake in the food consumed by tribes were calculated from Nutritive Value of Indian Foods and compared with recommended dietary allowances to know the inadequacy in diet, and was found insufficient [11;12]. Thyroid dysfunction is very common health problem in Bastar region [13]. Food crops and water derive iodine from the soil and because of heavy rainfall frequent flooding occurs which is particularly likely to wash away the superficial layer of the soil in which iodine is present and therefore decreases the iodine content of the soil [14].

Material and Method

Chemicals

The quantitative determination of TSH, T3, T4, FT3, FT4 in human serum was estimated by a microplate immunoenzymetric assay using the reagent kit by Monobind, Lake forest, USA [15]. Serum lipids (TC, Tg, HDL-C) were determined by enzymatic method using kits of Merck Ltd.and LDL-C, VLDL-C, TC/HDL-C ratio were calculated using Friedwalds formula.

Patients

Study consists of a total of 60 subjects, 40 with thyroid dysfunction and 20 normal subjects. There were 38 females, 2 males in thyroid dysfunction group and 20 females in normal group. All subjects were between 27 to 58 years of age group. All the subjects included were recruited from Maharani Hospital, Jagdalpur, and having almost similar economic status, food habits and physical activities. Patients with any known chronic Illness and pregnancy were excluded from the study. Recently diagnosed patients from thyroid dysfunction were chosen for the study.

Sample collection

Study was carried out at Biochemistry Laboratory of MATS University, Raipur. Institutional ethical committee approved the study protocol. Blood samples were collected in the morning after at least a 12-h over night fast, followed by a general questionnaire. For biochemical investigation serum was separated by centrifugation at 3000 rpm for 10 min and was stored at 4°C until analysis.

Reference range

The normal reference ranges according to the kits are: TSH (0.4-4 µIU/ml), T3 (0.52-1.85 ng/ml), T4 (4.0-11.0 µg/dl), FT3 (2.23-6.43 pmol/l), FT4 (10-23.81 pmol/l). For these analyses, hypothyroidism was classified by clinicaly high TSH concentration ≥ 4.5µIU/ml. Hyperthyroidism was defined as clinically significant if TSH ≤ 0.1 µIU/ml. Normal values for lipid profile parameters are total cholesterol (150-250 mg/dl), triglycerides (100-15mg/dl), HDL-Cholesterol (60 mg/dl), LDL- Cholesterol (60-130 mg/dl), VLDL-Cholesterol (5-40 mg/dl) and total cholesterol/ HDL-Cholesterol ratio is 4.0 mg/dl

Statistical Analysis

Statistical analysis was done by using one way ANOVA test to find out the difference among the groups, followed by Tukey's honest test to find the significant difference between each pair of means.

Results

Table 1 depicts the mean ±SD levels of age, thyroid hormones and lipid profile parameters in thyroid dysfunction and normal subjects. Hypothyroid subjects showed significant increase in TSH levels and normal T3, T4, FT3, FT4 levels. While, in hyperthyroid subjects elevated T3, T4 levels were noticed with

Table1. Mean ±SD values of thyroid and lipid profile parameters in thyroid dysfunction and normal groups

Parameters	Hypothyroid (n=20)	Hyperthyroid (n=20)	Normal (n=20)
Age	36.75±5.65^{a}	37.8±7.99^{a}	39.15±9.89^{a}
TSH	12.76±4.43^{a}	0.24±0.05^{b}	1.26±0.66^{c}
T3	1.14±0.57^{b}	4.74±2.14^{a}	1.3±0.48^{b}
T4	6.45±2.72^{b}	19.88±4.69^{a}	6.2±2.18^{c}
FT3	4.55±1.45^{b}	4.74±0.87^{b}	5.5±1.42^{a}
FT4	16.92±3.34^{b}	17.41±6.46^{c}	11.16±4.67^{a}
TC	322.45±51.19^{a}	155.85±27.75^{b}	176.15±16.9^{b}
TG	291.8±65.7^{a}	83.1±9.2^{b}	110.45±9.8^{c}
HDL	34.45±6.58^{b}	41.45±5.8^{c}	56.45±5.84^{a}
LDL	231.1±49.36^{b}	94.34±32.3^{c}	98.25±16.6^{a}
VLDL	58.31±12.99^{b}	16.62±1.84^{c}	22.09±1.96^{a}
TC/HDL Ratio	9.6±2.47^{a}	3.83±0.80^{b}	3.11±0.41^{b}

Values are mean ±SD for each group. Values not sharing same superscripts differ significantly at $P < 0.05$

Table 2. ANOVA of all Parameters in Hypothyroid, Hyperthyroid and Normal groups.

Parameters	F Value
Age	5.54*
TSH	44.03*
T3	47.77*
T4	107.4*
FT3	3.56*
FT4	9.67*
TC	134.9*
TG	171.2*
HDL	68.10*
LDL	96.84*
VLDL	174.8*
TC/HDL Ratio	109.7*

*(Significant difference), F Value at 0.05 level of significance.

relatively low TSH and normal FT3 and FT4. From the Tukey's honest test it was observed that TSH, T3, T4, and FT4 were significantly different in hypothyroid and hyperthyroid subjects while FT3 significantly differ in normal and hypothyroid groups. High levels of TC, Tg, LDL-C, VLDL-C and TC/HDL ratio with low levels of HDL-C were observed in hypothyroid subjects compared to normal. Whereas hyperthyroid subjects showed decreased levels of HDL-C with no changes in TC, Tg, LDL-C, VLDL-C. Mean ±SD values having different superscripts are significantly different at 0.05 level of significance when df 2, 57 = 3.15. Tg, HDL-C, LDL-C, VLDL-C were significantly differ in all the groups while TC, TC/HDL-C ratio differ significantly in thyroid dysfunction groups.

Table 2 shows the significant difference among the mean values of individual parameters in hypothyroid, hyperthyroid and normal groups by one way ANOVA test, at 0.05 level of significance.

Discussion

Due to heavy rainfall in Bastar region of Chattisgarh state, the tribes of this area suffered from severe and prolonged iodine deficiency and the effect of this is observed as increased thyroid problem in the population. Also the tribes are not much aware of nutrient intake and consume goiterogenic food, which can interfere in thyroid function by inducing antibodies that cross react with thyroid gland and interfere thyroid peroxidase, the enzyme that organifies iodode to iodine and adds the iodine to tyrosine residues on the thyroglobulin during the production of thyroid hormones [11].

Like studies showing high prevalence of subclinical hypothyroidism in elder women [16] present study also found the maximum incidence of subclinical hypothyroid in elder tribal women in Bastar region. Thyroid function affects lipoprotein metabolism as well as CVD risk factors [17]. Studies show subclinical hypothyroidism is associated with increased levels of TC and LDL-C [18], additionally increased TG [19] and decreased HDL-C levels [20]. We observed 17 subjects with subclinical hypothyroid and 3 subjects with clinical hypothyroid. Both the types showed significantly increased levels of TC, Tg, LDL-C, VLDL-C, TC/HDL-C ratio and decreased HDL-C. There is some controversy regarding the presence or severity of thyroid induced altered lipid profile. Indeed there have been studies indicating no significant difference in lipid profile between subclinical hypothyroid patients and controls [21;22]. In our study hyperthyroid subjects showed decreased HDL-C levels and rest all parameters of lipid profile in reference range. Low HDL-C levels are due to increased CETP mediated transfer of cholesteryl esters from HDL to VLDL [6]. Levels of TC, Tg, LDL-C, VLDL-C remained unchanged in hyperthyroid subjects under the study. Therapy of clinical hyperthyroidism results in restoration of alteration in lipid metabolism while effects of treatment of subclinical hyperthyroidism subjects are not yet clear. Biochemical screening for thyroid dysfunction is critical in all dyslipidemic patients as well as in all patients with unexpected improvement or worsening of their lipid profile [23].

Our study concludes that hypothyroid patients show a hyperlipidemic profile, while in hyperthyroid patients lipid profile remains unchanged. The study is regionally important because no such work has been conducted so far in tribal area of Bastar.

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Competing interests

The authors declare that they have no competing interests.

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