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Study on Lipid Profile of Obese Female Hypothyroid Patients: A Hospital based prospective study

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Abstract

Objectives: This present study was to evaluate the lipid profile of hypothyroid obese female patients receiving levothyroxine.

Methods: A detail history, clinical examination and relevant investigation were performed to all cases receiving thyroxine. Fasting venous blood samples were collected, centrifuged promptly, and separated sera was stored at -20˚C. TSH, FT3, FT4 measured by ELISA Method using BeneSphera manufactured by Avantor Performance Material India Limited and TC, TG and LDL were measured using SEIMENS kits by fully automated biochemistry anayser CPC 240.

Results: Data was analyzed by using latest version SPSS software. Mean ± S.D. was observed. Unpaired t – test was applied. T value and P value were observed. P value was considered less than or equal to 0.05 ($p \leq 0.05$) for significant differences.

Conclusions: Hypothyroid obese women had mild increased BMI, But, greater increase of TSH level with respect to euthyriod women. FT3 and FT4 were markedly reduced in hypothyroid women. Total cholesterol, triglyceride and LDL were greatly increased in hypothyroid women with respect to euthyroid women. Thus, it proves that levothyroxine therapy is beneficial for the normalisation thyroid as well as lipid parameter.

Keywords: Obese female, euthyroid, hypothyroid, levothyroxine, lipid profile.

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INTRODUCTION

Hypothyroidism occurs at a much higher frequency than widely recognised. The National Health and Nutrition Examination Survey (NHANES III) survey concluded from their data base of 17,353 patients that 9.2% had "clinically significant thyroid disease" based on biochemical criteria [1]. That number included both hypothyroid and hyperthyroid patients; however hyperthyroid patients frequently end up hypothyroid after ablative therapy. In addition, in the large scale Colorado Thyroid Disease Study 9.5% of results exceeded the upper range limit for TSH [2]. Within those percentages of biochemically hypothyroid patients there will be some that are not clinically hypothyroid. By the same token, some of the people having TSH within range will be clinically hypothyroid.

Further evidence of the magnitude of thyroid problems comes from an ATA estimate that "20 million Americans have some form of thyroid disease" and that "up to 60% are unaware of their condition" [3]. It was also noted that "women are 5 to 8 times more likely than men to have thyroid problems" [3].

In a survey from 110 countries (mostly in developing countries), hyperthyroidism and hypothyroidism were considered responsible for the morbidity at large [4]. TSH regulates the synthesis and secretion of the thyroid hormone through the hypothalamic-pituitary-thyroid axis [5] and is considered the primary indicator to assess thyroid function [6]. Currently, thyrotropin (TSH), free thyroxine (FT4), or FT4 combined with total triiodothyronine (TT3) is recommended for use as indicators in laboratory testing to assess thyroid function clinically (e.g., in the guidelines of the American Thyroid Association (ATA)) [7].

Several scientific studies have shown that reference ranges based on the specific thyroid test results of individuals were approximately half those of population ranges. This applies to all thyroid tests [8,9]. So, trying to identify abnormality by comparing an individual's TSH, FT4, or FT3 test result to the much wider reference range for the entire population can be very misleading [10] Furthermore, the current upper range limit for TSH, calculated from group data, has been purposely set even higher than would be expected from the normal distribution, in order to avoid excessive false positive diagnoses, and instead may result in excessive false negative diagnoses[10, 11].

Disorders of the metabolism of lipoproteins, including lipoprotein overproduction and deficiency are classified as dyslipidemia. These may manifest in one or more

of the following ways, a raised total cholesterol (CH) levels, a raised low density lipoprotein (LDL)cholesterol levels, a raised triglyceride (TG) levels and a decreased high density lipoprotein (HDL)cholesterol levels. Lipoproteins are a family of lipid carrying, water soluble proteins includingchylomicrons (CM), high, intermediate, low and very low density lipoproteins (HDL, IDL, LDL,VLDL) which are responsible for the transport of cholesterol (CH), cholesterol esters (CE), phospholipids and triglycerides throughout the Circulation.[12]

Aim of our study was to evaluate the biochemical profile of obese women with

hypothyroidisms who were received levothyroxine.

MATERIAL AND METHODS

This present study was conducted in department of Biochemistry, Katihar Medical College and Hospital, Katihar, Bihar, India during a period from January 2018 to July 2018.

Entire subjects signed an informed consent approved by institutional ethical committee of Katihar Medical College, Katihar, Bihar was sought.

A total of 60 obese women patients (30: euthyroidism, 30 : hypothyroidism) with age group 40 to 50 years were enrolled in this study. All the hypothyroidism patients were receiving levothyroxine treatment. Patients who were BMI < 30 kg/m^2 or not receiving thyroxine preparation or history of alcohol abuse, smokers, patients receiving drugs such as oestrogens, diuretics and beta-blockers, patients with familial or secondary dyslipidaemia, diabetic mellitus and renal, hepatic or other systemic diseases were excluded.

METHODS

A detail history, clinical examinations and relevant investigations were performed to all cases. Impaired thyroid function was recorded.

Procedures

Fasting venous blood samples were collected, centrifuged promptly, and separated sera was stored at -20˚C. TSH, FT3, FT4 measured by ELISA method using BeneSphera manufactured by Avantor Performance meterial India limited and TC, TG and LDL were measured using SEIMENS kits by fully automated biochemistry analyser CPC 240. Euthyroid subjects were defined as those having normal serum free T4 and TSH levels.

STATISTICAL ANALYSIS

Data was analyzed by using latest version SPSS software. Mean ± S.D. was observed. Unpaired t – test was applied. T value and P value were observed. P value was considered less than or equal to 0.05 ($p \leq 0.05$)for significant differences.

OBSERVATIONS

Mean age of euthyroid women was 44.9 and hypothyroid women was 46.06. When mean ± standard deviation (S.D) of euthyroid subjects were compared with mean ± S.D of hypothyroid subjects. P value was found to be 0.0885. Which is greater than 0.05. That was non significant.

Mean ± S.D of BMI of euthyroid subjects and hypothyroid subjects was compared. P value was found to be less than 0.05. It was significantly differences.

Table.1. Comparison of all parameters of euthyroid and hypothyroid obese females.

Parameter	**Euthyroid (N=30)**	**Hypothyroid (N=30)**	**T - value**	**P – value**
Age (years)	44.9±2.468	46.06±2.741	1.732	0.0885(Non significant)
BMI (Kg/m^2)	34.44±0.666	34.93±0.85	2.484	0.015 (Significant)
TSH (Mu/L)	2.92±0.466	6.01±0.947	16.009	< 0.0001 (extremely significant)
FT4 (ng/dl)	3.19±0.133	1.55±0.083	56.852	<0.0001 (extremely significant)
FT3 (ng/dl)	3.49±0.131	2.47±0.277	18.143	<0.0001 (extremely significant)
Total cholesterol (mg/dL)	224.72±32.668	249.4±24.831	3.294	0.0017 (very significant)
Triglyceride (mg/dL)	122.66±37.882	201.02±34.000	8.432	<0.0001 (extremely significant)
LDL (mg/dL)	94.63±10.760	121.46±17.694	7.097	<0.0001 (extremely significant)

Similarly, when mean ± S.D of TSH was compared between euthyroid and hypothyroid subjects. Data was extremely significant ($p< 0.0001$). It was showed that TSH level of hypothyroid women were greatly increased.

There was extremely significant differences ($p < 0.0001$) seen in between FT4 level of euthyroid and hypothyroid subject. It was showed that FT4 level was greatly reduced in hyptothyroid subject who were continuously received levothyroxine.

Similarly, FT3 level was extremely significant decreased in hypothyroid subjects with respect to euthyroid subjects ($p < 0.0001$).

There was a very significant difference seen between total cholesterol of euthyroid and hypothyroid subjects ($p< 0.0017$). Total cholesterol level was greatly increased in hypothyroid subjects.

Mean of triglyceride level was greatly increased in hypothyroid women. It was extremely significant differences ($p< 0.0001$) between euthyroid and hypothyroid women.

Similarly, mean LDL level was greatly increased in hypothyroid women. P value was found to be less than 0.0001. It was extremely significant differences.

DISCUSSIONS

TSH is considered the most important indicator for the evaluation of thyroid function [6]. FT3 and FT4 are the active biological state in plasma, and therefore, FT3 and FT4 are considered to be sensitive and meaningful indicators for the diagnosis of thyroid disease. [18]

Hypothyroidism accounts for about 2% of all casesof hyperlipidemia, and is second only to diabetesmellitus as a cause of secondary hyperlipidemia[13].Various other studies**[14]**have also reported thatdyslipidemia is commonly associated withhypothyroidism. Jung et al [**15]**and Duntas **[16]**have observed higher levels of total cholesterol andLDL-cholesterol in both subclinical and overt hypothyroidism. The effect of hypothyroidism inlipid metabolism is more marked in patients withhigher serum TSH levels i.e. patient with overthypothyroidism and observed significant correlation between raised TSH levels and serum total cholesterol and LDL cholesterol.**[17]**

In this present study, mean age of euthyroid women and hypothyroid women were 44.9 and 46.06 years respectively. All the cases were belonged in age 40 to 50 years.

AmitSaxena, et al. conducted a study on dyslipidemia of patients with hypothyroid and observed that maximum cases belonged to the age group of 21-30 years and minimum number of patients was in the 61-70 years.[12]

In our present study, all cases were continuously taking levothyroxine, TSH level was significantly increased ($p<0.0001$) in cases with hypothyroid with respect to euthyroid cases. BMI was mildly significant ($p=0.015$) increase in hypothyroid cases.FT4 and FT3 level was extremely significant decreased ($p<0.0001$) in hypothyroid cases than euthyroid cases.

Hongi Li, et al. (2014) were studied on among the 500 patients diagnosed with hyperthyroidism, 500 patients diagnosed with hypothyroidism, and 1,673 healthy persons, we analysed the Pearson correlations for serums TT3, TT4, FT3, and FT4 with TSH. FT4 is found to be associated with TSH at the maximum level in healthy people. The correlation between TT4 and TSH in patients diagnosed with hyperthyroidism or hypothyroidism is the maximum, which suggests that FT4 and TSH are the most valuable indicators to consider in a healthy population, and TT4 and TSH are the most valuable indicators to consider in patients with hyperthyroidism or hypothyroidism.[18]

The role of serum T3 is limited, either TT3 or FT3, because they are generally normal in patients diagnosed with hypothyroidism. This is mainly due to the increased TSH and the functional role generated by the increased conversion of type 2 iodinated thyroninedeiodinase to residual thyroid tissue. Because 80% of T3 comes from deiodination of T4, the T4 levels increase and in theory T3 levels should also increase concomitantly. However, in patients diagnosed with hypothyroidism who are treated long-term with levothyroxine (L-T4), serum T3 is usually maintained at a stable level, which suggests that energy metabolism is changed by a T4 dependent pathway [19]. Therefore, T4 is more reliable than T3 in assessing thyroid function in patients with

hypothyroidism. From Castellano's study, the analyses of five serum indicators, including TT4, TT3, FT4, FT3, and TSH, in patients with hypothyroidism showed that the correlation between TT4, FT4, and TSH was closer than the correlation of TT3, FT3, and TSH with

TSHwhich was the most important indicator in the diagnosis of hypothyroidism [6]. Thus, it can be interpreted that T4 is more suitable than T3 in assessing thyroid function in hypothyroidism patients. In a case report, a 59-year-old woman diagnosed with hypothyroidism was treated with LT4,and TSH concentrations expectedly fell three months later. However, after stopping L-T4 treatment, TSH level increased quickly but with a still higher FT4 and FT3 status[20].

In this present study, total cholesterol level was statistically very significant increased in hypothyroid cases with respect to euthyroid ($p<0.0017$). Triglyceride level and LDL were statistically extremely significant increased in hypothyroid women with respect to euthyroidwomen($p<0.0001$).

Hypothyroidism leads to atherogenic lipid abnormalities as well as a number of other cardiovascular risk factors. Levothyroxine treatment may reduce serum cholesterol and thereby decrease the incidence of coronary artery disease, stroke, and peripheral vascular disease. Various other authors (Monzani et al, Akbar et al)[21,22] also reported significant reduction in the levels of lipid parameters following levothyroxine replacement therapy, thus supporting our results.

Our findings was also supported the findings of Asranna, et al, [23] who were observed a mild increase in HDL from mean pretreatment levels of 41.14 to 43.43 mg/dl after replacement therapy with levothyroxine.

CONCLUSIONS

This present study concluded that the obese women cases who were receiving levothyroxine, had mild increased BMI, But, greater increase of TSH level with respect to euthyriod women. FT3 and FT4 were markedly reduced in hypothyroid women. Total cholesterol, triglyceride and LDL were greatly increased in hypothyroid women with respect to euthyroid women. Thus, it proves that levothyroxine therapy is beneficial for the normalisation thyroid as well as lipid parameter.

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