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Relation of Hypothyroidism on BMI and Dyslipidemia

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Abstract

Introduction: Hypothyroidism is a common medical disorder in the general population especially in women. Over-weight, obesity and dyslipidemia are major public health problem in both developed and developing countries. The present study is an effort to determine the association between hypothyroidism with body mass index (BMI) and dyslipidemia. ***Materials and Methods:*** This is a cross sectional descriptive type of observational study of 100 cases of primary hypothyroidism in the age group 15-75 years of both sexes from February 2018 to January 2019 in CMH, Momenshahi. BMI was measured by weight in kg/ height in m^2 and lipid profiles were analyzed by semi-automated biochemistry analyzer. Data was analyzed by X-cel. ***Results:*** Among 100 cases mean BMI were 28.51±4.52, 75 cases (75%) obese, 16 (16%) over-weight, 8 (8%) normal. Mean serum cholesterol, Triglyceride (TG), high density lipoprotein (HDL) and low density lipoprotein (LDL) are195.1±44.57, 164.49±83.87, 40±3.91 and 122±41 mg/dl respectively. ***Conclusion:*** Here data statistically showed primary hypothyroidism is significantly correlated with high BMI and serum cholesterol, TG, LDL levels were also significantly correlated to this disorder. But HDL is not correlated with primary hypothyroidism.

Key words: Primary hypothyroidism, Body mass index (BMI), Triglycerides (TG), High density lipoprotein (HDL), Low density lipoprotein (LDL), Cholesterol.

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Introduction

Thyroid disorders are common in the general population, with hypothyroidism being the predominant disorder in the adult population[1,2]. Thyroid hormone plays a very key role in energy homeostasis and is directly involved in glucose[3] and lipid metabolism[4,5]. The spectrum of presentation ranges from fatigue or mild forgetfulness to a severe impairment of consciousness termed myxedema coma[6].

Over weight and obesity are major public health problems in both developed and developing countries[7]. A number of large epidemiological studies proved that mortality increases with obesity[8-10]. Weight reflects health and nutritional status and adjusted for height is a useful tool to predict fitness and Body Mass Index (BMI = weight in kg / height in $meter^2$) is a useful proxy measure of adiposity.

Though thyroid stimulating hormone levels were progressively increased according to the severity of obesity and were positively correlated with body mass index (BMI)[11] yet the opposite suggestion had also been put forwarded that TSH was not correlated with BMI[12]. Thyroid function significantly affects lipoprotein metabolism as well as some cardiovascular risk factors thus influencing overall CVD risk[13-15]. Indeed, hypothyroidism is a common cause of secondary dyslipidemia[16-17].

The aim of the present study was to investigate the correlation of hypothyroidism with BMI and dyslipidemia.

Materials and Methods

This was a cross sectional descriptive type of observational study of hypothyroidism patients where a total of 100 were studies during February 2018 to January 2019. All those patients were seen in medical outdoor department of Combined Military Hospital (CMH) Momenshahi. A detailed history and clinical examination were carried out in a predesigned case report form.

Blood collection and sample preparation

After 12 hours overnight fasting venous blood was taken from patients of hypothyroidism with dry disposable syringe and needle under taking all aseptic precaution. Serum FT4, TSH were measured by chemiluminescence immune assay by ELECSYS 1010. Patients with TSH over 6 µ IU/ ml and above were considered are to be having hypothyroidism.

Body mass index (BMI) was measured by height in kg/ m^2. BMI more than 23 and 25 were considered as overweight and obese respectively in this study. Fasting lipid profiles were carried out

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by semi-automated biochemistry analyzer.

Inclusion criteria are patients of both sexes attending OPD in CMH, age limit from 13 to 70 years and presented with suspected case of hypothyroidism.

Exclusion criteria are hepatitis including liver cirrhosis, hepatotoxic drug intake, associated any debilitating illness and pregnant women.

Results

Fig-1: Pie chart showing 95% are female and 5% are male.

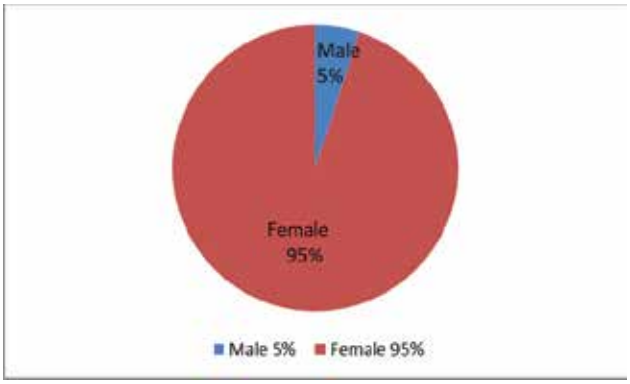

Fig-1: Sex Variation (n=100).

Fig-2: Bar chart showing age of presentation. <15 yrs only 1(1%), 16-25 yrs 11(11%), 26-35 yrs 56(56%), 36-45 yrs 26(26%), 46-55 yrs 3(3%), 66-75 yrs 1(1%). Minimum age of presentation 13 yrs and maximum 70 yrs.

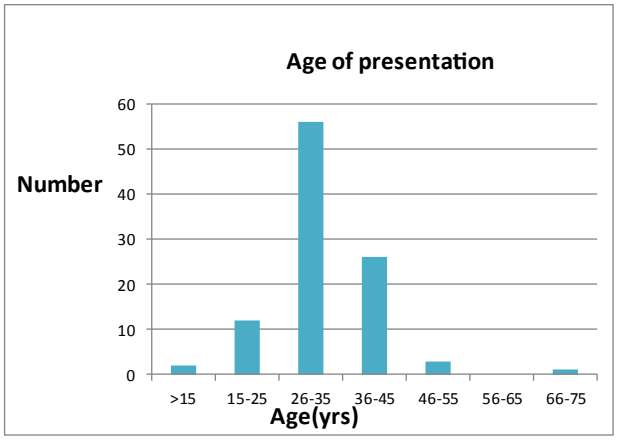

Fig-2: Presentation of Different age group (n=100).

Fig-3: Bar chart showing clinical presentation of hypothyroidism patients. Most of the patients (18%) presented with vague symptoms like general weakness, 15% with menstrual irregularity, 14% with weight gain. Other presentations are thyroid swelling(11%), subfertility(10%), leg swelling(8%), body ache (8%), incidental finding(5%), abortion(4%), cold intolerance(2%), decreased libido(2%), alopecia(1%), whitish spots(1%) and recurrent syncope (1%).

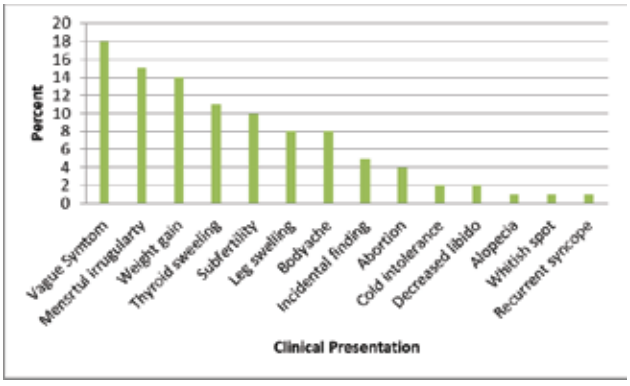

Fig-3: Clinical presentation of hypothyroidism.

Fig-4: Barr chart showing mean level of cholesterol, TG, HDL and LDL 195.14±44.57, 164.49±83.87, 40± 3.91 and 122±41.72 respectively (in mg/dl) which is much more higher than mean level of general population.

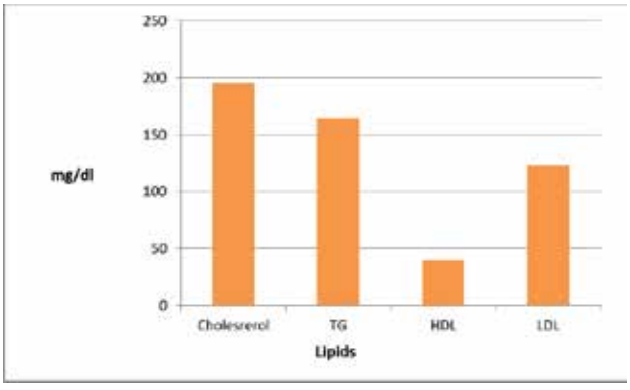

Fig-4: Mean level of lipid profile (F).

Fig-5: Pie chart showing out of 100 cases 75(75%) are obese, 17(17%) over weight, 8(8%) normal and no underweight.

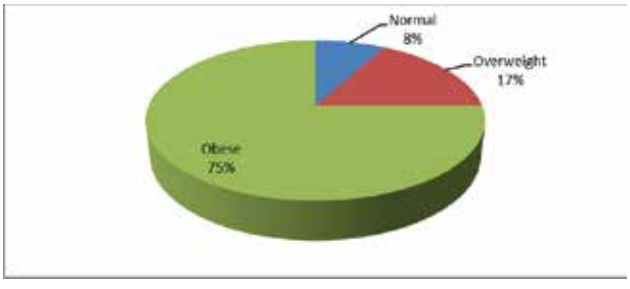

Fig-5: BMI Status (n=100).

Table-I: showing mean, minimum and maximum height, weight and BMI. Mean height, weight and BMI were 1.53±.07 m, 66.93±10.76 kg and 28.51±4.52 respectively.

Table- I: Height, Weight & BMI (n=100).

	Height ±SD	Weight ±SD	BMI±SD
Mean	1.53±.07 m	66.93±10.76 kg	28.51±4.52
Min	1.244 m	45 kg	18.14
Maximum	1.778 m	95 kg	39.57

Discussion

World health organization (WHO) has recommended classification of body weight that include degree of underweight and gradation of excess weight or overweight that are associated with increased risk of some non-communicable diseases[18,19] BMI is calculated as weight in kilogram divided by height in meters squared (kg/ m^2) and it is easy to obtain[20]. For Asian people cut-off point of BMI is little lower than international standard. For Asian BMI more than 23 is considered as overweight and more than 25 is considered as obese.

In our study out of total 100 patients no underweight case is seen. BMI in normal range was 8 (8%), overweight 17 (17%) and obese 75 (75%). Prevalence of overweight and obese in Bangladesh is 17%, out of them 4% are obese only[21].

In the present study we have found that high BMI is significant in hypothyroidism patients (with z value 19.70 and p value 0.000 which is < 0.005) and positively associated in both sexes.These findings are similar to the findings of A Nyrnes et al [22] and G. Lacobellis et al[23].

In our findings among hypothyroidism patients obese are 75% which is much more than the prevalence of obesity in Bangladesh. Hypothyroidism is a risk factor for obesity, in spite of that other factors may be responsible for this high percentage of obesity. Study was conducted among Armed Forces personnel and their family members intake more calorie than general population of Bangladesh. Beside that in our study group maximum are female usually having more BMI than male.

Thyroid disorder especially hypothyroidism is more common in female[24]. Though our female male ratio much higher than other findings[25]. This can be explained by the sample we have taken from Armed Forces personnel and their family members. The male are recruited after proper medical check-up but their wives are not.

Thyroid hormones play an important role in regulating body weight, lipid metabolism and insulin resistance all of these cause increase BMI. The recent discovery of leptin, a peptide hormone produced by adipose tissue, has led to a renewed interest in the pathophysiology of obesity; some studies have focused on the relationship between leptin and energy expenditure as well as thyroid function[26].

The level of leptin is directly correlated to the amount of adipose tissue and leptin has been reported to stimulate the biosynthesis of TSH in vitro. Furthermore, there is synchronicity between secretion of leptin and TSH both in children[27] and adults[28]. In our findings mean cholesterol, TG, LDL were 195.14±44.57, 132.5±35.3 and 122.98±41.72 mg/dl which were significantly correlated with hypothyroidism (p value 0.0002, 0.000 and 0.000 respectively). On the contrary serum HLD level was 40±3.91mg/dl which is not significantly correlated with hypothyroidism. Thyroid hormones are involved in both lipogenesis and lipolysis[29]; an effect that possibly is mediated by affecting local nor adrenalin level and or adrenergic post receptor signaling[30].

This high level of lipid may be due to reduction in the hepatic LDL receptors, and a decreased hepatic cholesterol catabolism by the T3-regulated 7-alpha-hydroxylase enzymes[31]. On the other hand, hypothyroidism is associated with increased oxidation of LDL particles. Such modification of LDL particles can impair their receptor-mediated uptake causing accumulation[32].

Conclusion

The results of present study confirmed the correlation between hypothyroidism and BMI. Overweight and obesity are interlinked to high TSH level. It is also confirmed that fasting serum cholesterol, TG and LDL levels were significantly correlated with primary hypothyroidism. While treating hypothyroidism patients clinician should always care about dyslipidemia and high BMI also.

Conflict of Interests: None.

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