Original Article

Hypercholesterolemia

# Significance of Hypercholesterolemia in Hypothyroid Patients

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## ABSTRACT

**Introduction:** Lipid and lipoprotein is influenced by thyroid hormone. Global distribution thyroid disease is very common in Indo- Pak. Hypercholesterolemia is common finding in hypothyroid patients.

**Objective:** This study was conducted to know the prevalence of thyroid dysfunction and its relationship with dyslipidemia.

**Study Design:** Cross Sectional Study

**Place & Duration of Study:** This study was conducted at the Department of Pathology Jinnah Medical College Warsak Road Peshawar for the period from December 2012 to May 2013.

**Materials and Methods:** 300 patients suspicious of thyroid element were included in study group. 100 healthy control subjects with no history of any thyroid and other chronic illness were included in control group, serum FT4, TSH and total cholesterol was estimated by Elisa and colorimetric method respectively and Results were analyzed by applying "student T test" and "Chi- square".

**Result:** Out of 300 sera tested 78 (260) had thyroid dysfunction Hypothyroid patients serum showed significantly raised cholesterol level, however no significant association between total cholesterol and raised thyroxin level observed.

**Conclusion**: Hypercholesterolemia was noted significantly in hypothyroid patients indicating need for monitoring the cholesterol level in thyroid dysfunction to avoid the risk of development of cardiovascular disease.

**Key Words:** Hypercholesterolemia, Hypothyroidism

## INTRODUCTION

Global distribution thyroid disease is very common in Indo- Pak[1]. Hypercholesterolemia is common finding in hypothyroid patients. Dyslipidemia is essential risk factor in the development of hypertension epithelial dysfunction and cardiovascular diseases[7-9]. High serum cholesterol level in hypothyroidism is resulted from decrease fractional clearance of LDL by a reduced number of LDL receptor in liver [2,5,10]. Present study was planned to observe the association of hypothyroidism and high cholesterol level. Hypothyroidism affects 0.5-2.4% of the population. In the first stages it may go unnoticed as the symptoms may proceed insidiously. Before overt hypothyroidism is established, the only abnormality which may be detected is elevated serum thyrotropin (TSH) [15]. At this stage, when thyroid hormones are still in the normal range, the diagnosis of subclinical hypothyroidism is made. Several studies have shown that this disorder is quite common (10% in an elderly population). It is still a matter of controversy whether this disorder should be screened and treated [16]. Subclinical Hypothyroidism (SCH) has been detected with increasing frequency in recent years and is causing major controversies concerning management and treatment[17]. This syndrome is characterized by the finding of elevated TSH levels in the presence of normal circulating thyroid hormones, $T^4$ and $T^3$. In a classical epidemiological study the prevalence of SCH was 7.5% in women and 2.8% in men [18]. The highest prevalence (up to 16%) was found in elderly women over 60 year of age). It is to be expected that an increasing number of patients with SCH will be detected by the widespread use of TSH measurements, as TSH screening has been shown to be cost-effective[19]. Patients with SCH may present with variable clinical manifestations, showing signs and symptoms of hypothyroidism. SCH has been linked with abnormalities of lipid metabolism increased serum total cholesterol and low density lipoprotein cholesterol (LDL-C) [3]. Associated with increased with risk for coronary heart disease, and depression [(7, 8).] In addition, several target tissues were shown to be affected (e.g. ankle reflex time [(9, 10)] systolic time intervals [(11-15)], and PRL levels [(10, 13)]. The hypercholesterolemia of hypothyroidism and hypercholesterolemia of hyperthyroidism are long recognized and well-accepted clinical finding. The mechanisms of hypercholesterolemia in hypothyroidism of hypercholesterolemia in hypothyroidism have been ascribed variously to decreased clearance of cholesterol from plasma, reduced conversion of cholesterol to bile acids in the liver and delayed removal of low density lipoprotein from the plasma. The reverse actions have been suggested as being responsible for the low cholesterol concentrations in hyperthyroidism [20]. The hypocholesterolemic action of thyroid hormones is well

known, and hypothyroid patients commonly is well known, and hypothyroid patients commonly have elevated plasma cholesterol while those with hyperthyroidism have the reverse. A wealth of clinical and human experimental observation indicates a potent influence of the thyroid gland on the metabolism of cholesterol and other lipids. Blood cholesterol, serum phosphatides, and fatty acids are increased in myxedema. In cretinous children, a high ratio of free to total serum cholesterol has been described [22]. In adults with myxedema, however, normal or increased ester :total cholesterol ratio occurs. The rise in serum cholesterol is greater than that of phospholipid, and the Cholesterol : Phospholipid ratio is increased. An increase of low density (beta) lipoproteins, both in spontaneous and in induced myxedema, is largely in the SF 0-12 moiety but is found also in fractions SF 12-400; all of the abnormalities are reversed by the administration of desiccated thyroid. The lipoprotein abnormality may be reversed with very small doses of desiccated thyroid (15 to 30 mg.) [23] - Similar findings are reported in most animal studies: hypercholesteremia accompanies decreased thyroid function whether this results from surgical extirpation, $I^{131}$ radiation, or thiourea administration. The domestic pig is a notable exception. The mechanism of the hypercholesteremia has been explained by studies in animals and man. In hyperthyroidism, the serum cholesterol falls in the face of increased cholesterol synthesis, due to increased bile acid excretion (particularly chenodesoxycholic acid). Conversely, in hypothyroidism, cholesterol synthesis is depressed, but bile acid excretion is also decreased; there is a slow turnover of the serum cholesterol, which is elevated apparently because excretion is depressed more than synthesis. Despite the changes in serum cholesterol, available evidence indicates that there is no change in the total body pool of cholesterol in myxedema [24].

# MATERIALS AND METHODS

A cross sectional study was undertaken in the department of Pathology Jinnah Medical College Warsak Road Peshawar for the period from December 2012 to May 2013. Three hundred patients suspicious of thyroid disorder were selected. 100 healthy control with normal thyroid profile and no history of other chronic illness ere included in normal control group. Detailed information of patients was collected after informed consent with the help of pretest Performa that include age, sex, family and personal history of chronic disorder. After 12 hours overnight fast 5 ml blood was aseptically collected from medical cubical vein by using disposable syringe for each patient aseptic measures were followed strictly. The serum was separated in properly labeled sterilized vials, stored, A+ T -20C$^{o}$ till analyzed.$FT_4$ and $FT_3$ and TSH were estimated quantitatively by using commercially available Elisa kit (International immune diagnostic Junalane Foster City Canada). The method is base on the principle of competitive solid phase enzyme immunoassay. The total cholesterol was estimated by colorimetric method using kit and standard protocol of RANDOX UK. The data was represented as mean plus minus SD value and significance was determined by using "student T test" and "chi square test"

# RESULTS

Among 300 patient suspected of thyroid disorder 78(26%) showed thyroid dysfunction. Subclinical hypothyroidism was 16.1% (48 subjects) Positive correlation between TSH and total cholesterol (p= 0.454) in overt hypothyroidism.

**Table No.1: Comparison of mean total cholesterol and overt hypothyroid patients (Total cholesterol mg/dl)**

| Overt hypothyroid patient(study group) | Normal control group |
|---|---|
| 218.1± 69<br>P= 0.001 | 163± 41 |

**Table No.2: Total cholesterol with various TSH values**

| TSH uv/ml | Total cholesterol regular (mean+-SD) |
|---|---|
| 0.0 to 0.3 | 15502±31.1 |
| 0.3 to 0.3 | 158.5± 29.1 |
| 6.8 to 10.0 | 196.2±49.2 |
| 16.2 to 20.0 | 208.1± 35.1 |
| P value | 0.000 |

**Table No.3: Pearson correlation coefficient between $FT_3$, $FT_4$, TSH and total cholesterol in overt hypothyroid patient.**

| | $FT_3$ | $FT_4$ | TSH |
|---|---|---|---|
| Total Cholesterol | -0.051 | -0.361 | 0.429 |

Correlation is significant at 0.05 levels (1- tailed)

# DISCUSSION

The association between hypothyroidism and raised cholesterol level was observed[11]. Hypercholesterolemia was noted in 46% of hypothyroid patients where as percentage was 4.1% in control group. P-Value was 0.000 highly significant. Cabral et al reported 50% present hypercholesterolemia in hypothyroid patient. It is reported over hypothyroidism is always been associated. Hypercholesterolemia with statistical significant difference[3, 4, 12]. Increase of total cholesterol can be attributed to the effect of thyroid hormones on expression of LDL receptors and CYP7A, a rate limiting enzyme in bile acid synthesis[5, 10]. Canorisetal reported the rise of total cholesterol level, with significant trend across grades of thyroid function[13]. In this study raised mean total cholesterol with modest

elevation of TSH was observed as compared to that of euthyroid group[14]. Hypercholetmaolemia is linked with cardiovascular morbidity as observed with moralizing of hyppthpodism[14.] Study done by Georgic et al. concluded that subjects with high normal TSH levels combined with positive ThAab may, in fact, have subclinical hypothyroidism due to autoimmune thyroiditis presenting with elevated cholesterol levels[20].

# CONCLUSION

Hypothyroidism is associated with abnormal total cholesterol which can lead to cardiovascular morbidity. It has been noticed that treatment with thyroxin totally reverses the total cholesterol level. So monitoring of hypercholesterolemia with thyroxin replacement therapy is necessary to overcome the cardiovascular morbidity in hypothyroid patients.

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