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IN PRIMARY HYPOTHYROIDISM ROLE OF THYROID HORMONE REPLACEMENT THERAPY ON LIPID PROFILE

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Abstract:

Objective: *To investigate the effect of thyroid hormone replacement therapy on lipid profile in primary hypothyroidism.*

Study Design:*A Prospective and Observational Study.*

Place and Duration: *In the Endocrinology Department of Services Hospital Lahore for One year duration from January 2018 to January 2019.*

Methods: *Eighty subjects were included in this study. Forty patients (group of patients before G1 treatment) were each treated with increasing doses of "thyroxine" (50,100 and 150 g / day "doses set by the attending physician") to achieve a 20-day condition euthyroid. Thyroxine was administered as a maintenance dose of 100-150 / g / day for 30 days until fasting blood samples were taken from the same patients (patient group after G2 treatment). In the control group (CG Group), euthyroid individuals with age and sex were selected. We selected 40 individuals aged 18-40 years who were diagnosed with primary hypothyroidism (TSH> 10 µIu). Euthyroid age and gender and 40 control groups were selected as the control group. Subjects with diabetes mellitus and ischemic heart disease were excluded. We have also excluded those involved in any pharmacological treatment that may alter thyroid function and lipid metabolism. In the morning (0800-1000), 10 ml of antecubital venous blood samples were taken after fasting overnight (12-14 hours) and after half hour of supine rest. For thyroid profile, Serum sample was taken.*

Results: *Serum T3 levels rised significantly in subjects with primary hypothyroidism after treatment compared to the pre-treatment group. Serum T4 rised significantly in primary hypothyroidism patients after treatment compared to the patient group. In primary hypothyroidism, Serum TSH levels decreased significantly after treatment compared to the patient group before treatment. Serum LDL-c,TC, TG levels showed a major decline in serum TG, LDL-c,TC, levels before treatment in patients with primary hypothyroidism after treatment.*

Conclusion: *Our results showed beneficial effects of L-thyroxine on lipid profile of patients with primary hypothyroidism and showed a decrease in TG, LDL-c andTC levels after treatment.*

Key words: *hypothyroidism, cholesterol, LDL.*

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INTRODUCTION:

Hypothyroidism is the generic term used to expose the tissues of the body to sub-normal quantity of thyroid hormone. Hypothyroidism is a risk factor for coronary heart disease and atherosclerosis due to its strong relation with the atherogenic lipid profile. Conditions of hypothyroidism can also result in early atherosclerosis. Overt hypothyroidism is linked with high cardiovascular disease risk. Untreated hypothyroidism in humans is a common cause of reversible hyperlipidemia. In addition, thyroid hormones reduce the oxidative modification of LDL-c and can function as natural antioxidants and inhibitors of atherosclerosis. Hypothyroidism is strongly associated with lipid profile, with hyperlipidemia even in patients with subclinical hypothyroidism. L-thyroxine treatment has been proposed as the most effective way to treat patients with primary hypothyroidism. It has beneficial effects on clinical and biochemical parameters that reduce cardiovascular risk factors due to its antiatherogenic effect (lowering lipid levels) and antioxidant properties.

MATERIALS AND METHODS:

This Prospective and Observational Study was held in the Endocrinology Department of Services Hospital Lahore for One year duration from January 2018 to January 2019.Eighty subjects gathered for this study. Forty patients (group of patients prior to G1 treatment) were treated with increasing doses of "thyroxine" (50.100 and 150 g / day "doses set by the attending physician") each to achieve a 20-day condition (euthyroid). Thyroxine was administered as a maintenance dose of 100-150 / g / day for 30 days until fasting blood samples were taken from the treatment of the same patients (patient group after G2 treatment). In the control group (CG Group), euthyroid individuals with age and sex were selected.

RESULTS:

The details of results are given in tables 1 and 2.

Table-1: T3, T4, TSH levels in control group and patients of primary hypothyroidism before and after treatment

Groups	T3	T4	TSH
CG(control)	1.78±0.3	114.1+24.2	3.4+0.8
G1(Before treatment)	0.6±0.3	19.9±8.1	109.3±23.9
G2 (After treatment)	1.7±0.3	113.0±29.7	3.63±0.61
Statistical			
CG VS G1	P<0.01 (HS)	P<0.01 (HS)	P<0.01 (HS)
CG VS G2	P>0.05 (NS)	P>0.05 (NS)	P>0.05 (NS)
G1 VS G2	P<0.01 (HS)	P<0.01 (HS)	P<0.01 (HS)

Table 2: TC, TG, HDL, LDL levels in control group and patients of primary hypothyroidism before and after treatment

Groups	Cholesterol	Triglyceride	HDL-C	LDL-C
CG(control)	178.5±12.9	125.9±11.2	44.6±5.7	106.3±13.6
G1(Before treatment)	304.9±45.4	209.5±43.8	47.5±12.1	213.1±41.7
G2 (After treatment)	183.2±17.5	130.2±14.9	45.7±9.1	107.1±19.4
Statistical analysis				
CG VS G1	P<0.01 (HS)	P<0.01 (HS)	P>0.05(NS)	P<0.01 (HS)
CG VS G2	P>0.05 (NS)	P>0.05 (NS)	P>0.05 (NS)	P>0.05 (NS)
G1 VS G2	P<0.01 (HS)	P<0.01 (HS)	P>0.05(NS)	P<0.01 (HS)

DISCUSSION:

In this study, total serum cholesterol (TC) was rised (group G1) in patients with primary hypothyroidism before treatment. Compared to the control group (CG), the variation among group G1 and CG was significantstatistically (p <0.001). The comparison between the G1 and G2 groups showed decline in the TC level in G2 group (patient group after treatment) and the difference was significantstatistically (p <0.01). The findings of this analysis were reported by Pazos et al. (1995); Engler and Riesen (1993); Martínez et al. (1998); Ness et al. (1998), Petersson and Kjellstrom (2001); Morris (2001) observed rise in CT level and a decrease in TC after treatment in primary hypothyroidism patients before treatment. This rise in TC (group G1) in subjects with primary hypothyroidism before treatment was because of the consequence on LDL receptor protein. There is less activity and number of LDL receptor protein in hypothyroidism. This decline in activity and number may result in decrease in cholesterol clearance causingrise in cholesterol levels in primary

hypothyroidism patients. Since it may be due rise in the activity and number of LDL receptor protein, it was found that CG decreased in patients with primary hypothyroidism after treatment (group G2). This rise in the activity and number of the receptor may be responsible for the decrease in TG level after treatment (G2 group) (Pazos et al. (1995) 3; Engler and Riesen (1993). There is alsorise in gene expression may be responsible for the rise in LDL receptor number. In this study, serum LDL-c levels were rised before treatment (G1 groups) in primary hypothyroid patients. When compared with the control group (CG), the variation between the G1 group and CG was significantstatistically ($p < 0.01$). Comparison of G1 group with G2 showed a decrease in c-LDL level in G2 group (patient group after treatment) and the difference was significant statistically ($p < 0.01$). The findings of this analysis were reported by Huesca et al. (2002), Diekman et al. (2000) also notedrise in LDL-c levels and a reduction in LDL-c levels after treatment in primary hypothyroid patients before treatment. This rise in LDL-c (group G1) in patients with primary hypothyroidism prior to treatment may be due to the effect on the LDL-c receptor. Thyroid hormones control metabolism of lipids through different methods, but the LDL receptor pathway can play an important role. There may be less activity and number of the LDL receptor in hypothyroidism. This reduction in activity and numberresults in decrease in LDL clearance causingrise in LDL-c levels in primary hypothyroidism. In hypothyroidism, LDL-c abnormalities can occur due to variability in activity due to down-regulation of the LDL receptor on the cell surface and degradation of LDL-c clearance. It was found that LDL-c decreased after treatment in patients with primary hypothyroidism (G2 group) and may be due to the rise in the number and activity of LDL receptors. This rise in the number and activity of LDL receptors appears to be responsible for the decrease in LDL-c level after treatment (group G2). There is alsorise in the transcription of the LDL receptor protein gene. Thus, rise expression of LDL receptor genes may be responsible for upregulation of the LDL receptor. In this study, serum HDL-c levels were found to rise or decrease normally in patients with primary hypothyroidism before treatment (group G1). When compared with the control group (CG), the difference between G1 and CG was not statistically significant (p 0.05).Rise, normal or decreased HDL-c levels of G1 group compared to G2 and the difference between G1 and G2 groups were not statistically significant ($p > 0.05$).

CONCLUSION:

Our results showed beneficial effects of L-thyroxine on lipid profile of patients with primary hypothyroidism and showed a decrease in TG, LDL-c andTC levels after treatment.

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