Journal Homepage: - www.journalijar.com
INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)
Article DOI: 10.21474/IJAR01/4174
DOI URL: http://dx.doi.org/10.21474/IJAR01/4174

RESEARCH ARTICLE

EFFECT OF H DL AND LDL CHOLESTEROL ON HYPOTHYROID PATIENTS

Bijay K.M[1], Sangita. K[2], Dhiraj. M[3], Reshu.T[4], Jaswant. K[4] , K.S.Sodhi[5] and Jasbir S[5].

1. Demonstrator in N.C. Medical college Israna, Panipat, Haryana India.
2. Assoc Prof. in TMMC & RC, Moradabad.
3. Demo. KDMC & H in Mathura.
4. Asst. Prof in NCMCH in israna, Panipat, Haryana, india.
5. Professor,NCMCH,israna,Panipat,haryana,India.

Manuscript Info

Manuscript History

Received: 15 March 2017
Final Accepted: 10 April 2017
Published: May 2017

Key words:-
Hypothyroidism, total cholesterol, triglycerides, LDL cholesterol, HDL cholesterol, VLD cholesterol

Abstract

Study design: It was a case control study, conducted upon 30 cases of hypothyroid patients attending at TMMC & RC (Teerthankar Mahavir Medical College & Research Centre) during the 6 months of study period (2014). Sample size included 30 patients and 30 healthy controls without any thyroid disorder.

Result:- Hypothyroidism is an important metabolic disorder and is associated with many biochemical abnormalities. Many studies were done regarding the biochemical status of hypothyroid patients including lipid profile. Altered lipid profile functions were significantly increased among cases than control. In our study we found that parameters [total cholesterol (195.80 ±49.838mg/dl), triglycerides (163.24±91.64mg/dl), HDL cholesterol (53.47±13.70mg/dl) and VLDL cholesterol (32.64±18.33mg/dl)] of lipid profile were significantly increased.

Copy Right, IJAR, 2017,. All rights reserved.

Introduction:-

Hypothyroidism is a clinical syndrome resulting from a deficiency of thyroid hormones, which results from reduced secretion of both T4 (thyroxine) and T_3 (triiodothyronine), irrespective of cause which results in a generalized slowing down of metabolic processes[1]. Biochemically, decrease in T_4 and T_3 concentration leads to hypersecretion of pituitary TSH and an amplified increase in serum TSH levels. This is a key laboratory finding, particularly in the early detection of thyroid failure [2].

Thyroid disease ranks second only to diabetes mellitus in prevalence, affecting over 1% of the general population and about 5% of individuals over the age of 60 years [3, 4]. Thyroid dysfunction increases with age, especially in women. In hypothyroid patients, due to an increased concentration of low density lipoproteins (LDL), decreased activity of the lipoprotein lipase and increased fatty acid esterification, certain lipid derangements may be expected [5]. Hypothyroid patients may also exhibit elevated levels of high-density lipoprotein cholesterol (HDL-c), mainly due to increased concentration of cholesterol- and phospholipid-enriched HDL-2 particles (Pearce et al., 2008). A decreased HDL2 catabolism and cholesteryl ester transfer protein activity has been observed. This decrease leads to a reduced transfer of cholesteryl esters from HDL to very-low-density lipoprotein (VLDL), thus increasing HDL-C levels (Dullaart et al., 1990).So this study is aimed to access various lipid profiles in hypothyroidism patients.

Corresponding Author: - Bijay K.M.
Address: - Demonstrator, N. C. Medical college Israna, Panipat, Haryana India.

Materials and Methods:-

It was a hospital based case control study and conducted upon known with hypothyroidisms patients at TMMC &RC in Moradabad, UP, India during the period of six month (2014). In the present study, 30 patients aged 40-70 years who were diagnosed as hypothyroidism and confirmed by the estimation of fasting serum TSH ≤ 3.5- 6 ng/dl by ELISA reader. On two occasions were selected from the Medicine OPD and IPD of TMMC &RC in Moradabad. 30 normal healthy subjects were selected as controls. A written consent in English and Vernacular language was taken on performa.

Sample Collection:-

Under aseptic and antiseptic condition 5ml of the blood sample collected from anticubital vein of each of the subjects. All the blood samples were allowed to clot for serum separation. Blood samples were centrifuged at 4000 rpm for 15 minutes.

Analysis of the Sample:-

All the sample were processed according to exhausting standard laboratory guidelines after using institution guidelines for quality control fasting TSH was diagnosis in ELISA , Serum Cholesterol ,serum Triglyceride tested and serum HDL were tested by End Point CHOD- PAP, End Point GPO-TRINDER, and End Point Trinder reaction were respectively. Serum LDL and VLDL tested by Friedwald's equation) [6]

Data Analysis:-

Statistical analysis of the data's was done by SPSS (version 2013) where the values ≤ 0.05 was considered as significant.

Result:-

A total of 30 hypothyroidism patients and 30 age and sex matched normal individuals were selected for the study. The statistical analysis of the parameter is as follows. The mean level of serum cholesterol, Triglyceride, HDL, LDL and VLDL activity of hypothyroid patients was significantly increased when compared to normal subjects.

Comparison of serum lipid profile levels in controls and hypothyroid patients.

Parameter (mg/dl)	Control group(n=30) Mean ± SD	Hypothyroid group (n=30) Mean ± SD	P – Value
Total cholesterol	163.56± 34.98	**195.8**± 49.83	**0.005**
Triglycerides	**121.03** ± 39.11	**163.24** ±91.69	**0.024**
HDL	**38.22** ± 14.52	**53.47** ± 13.7	**0.001**
LDL	**24.20** ± 7.82	**32.64** ± 18.33	**0.024**
VLDL	**101.13** ± 35.22	**109.13** ± 44.22	**0.411**

Statistically significant increased amount of serum total Cholesterol, Triglycerides, HDL, and VLDL was found in hypothyroid patients. Statistically significant difference was not found for serum LDL level in hypothyroid patients and controls. ($p<0.05$)

Discussion:-

Hypothyroidism is a common endocrine disorder in which the thyroid gland does not produce enough thyroid hormones. Thyroid dysfunction has a great impact on lipids as thyroid hormones have significant effects on synthesis, mobilization and metabolism of lipids.

Present study was undertaken to assess the serum lipid profile in hypothyroid patients and compare it with that of controls. It was carried out in TMMC&RC, Moradabad. Cross sectional study consisting of 60 subjects out of which 30 patients suffering from hypothyroidism and 30 normal healthy controls were selected.

In the present study it was found that parameters [total cholesterol (195.80 ±49.838mg/dl), triglycerides (163.24±91.64mg/dl), HDL cholesterol (53.47±13.70mg/dl) and VLDL cholesterol (32.64±18.33mg/dl)] of lipid profile were significantly increased whereas LDL cholesterol (109.68±44.22mg/dl) showed comparable values in hypothyroid patients and controls.

These results suggest that the effect of hypothyroidism in the lipid metabolism is more marked in patients with higher serum TSH levels. Even mild elevations of TSH are associated with changes in lipid profile significant enough to raise the cardiovascular risk. Hypothyroidism has also emerged as an independent risk factor for aortic atherosclerosis and myocardial infarction.

Studies done by Michalopoulou G et al [7], Diekman T et al [8], Tsmihodimoset V et al [9] and Olukoga AO et al [10] had shown that average serum concentration of HDL higher in subclinical or clinical hypothyroidism.

To investigate the effect of thyroid dysfunction on high-density lipoprotein (HDL) metabolism, we measured HDL subfractions, apolipoprotein A-I containing particles (LpA-I and LpA-I:A-II), and the activities of enzymes involved in the remodeling and metabolism of HDL [namely hepatic lipase (HL), lipoprotein lipase, and cholesteryl ester transfer protein (CETP)] in 18 hyperthyroid and 17 hypothyroid patients [11].

Increase in HDL cholesterol concentration can be attributed to increased concentration of HDL_2 particles [12]. Dullaart et al [13] have stated that decreased activity of CETP (cholesteryl ester transport protein) results in reduced transfer of cholesteryl esters from HDL to VLDL, thus increasing HDL cholesterol levels. Lam et al have stated that in hypothyroid patients, decreased activity of hepatic lipase leads to the decreased catabolism of HDL_2 particles leading to increased HDL.

Some studies found that the activity of hepatic lipase (HL) is generally reported to be decreased in patients as well as in rats with hypothyroidism [14]. As HL catalyzes the interconversion of HDL-subclasses, hypothyroidism influences the catabolism of HDL2- to HDL3-particles. Hypothyroidism with decreased HL-activity HDL3 is little affected in amount and cholesterol content, while HDL2 fluctuates inversely with thyroid hormone concentration
Therefore, it is suggested that any patient with thyroid dysfunction especially hypothyroidism should be screened for lipid abnormalities and treated at the earliest to avoid antecedent complications

Conclusion:-

Hypothyroidism is a clinical syndrome resulting from a deficiency of thyroid hormones, which results from reduced secretion of both T_4 (thyroxine) and T_3 (triiodothyronine), irrespective of cause which results in a generalized slowing down of metabolic processes.

Hypothyroid patients usually exhibit elevated levels of high density lipoprotein (HDL) cholesterol mainly because of the thyroid hormones which can influence HDL metabolism by increasing cholesteryl ester transfer protein (CETP) activity, which exchanges cholesteryl esters from HDL2 to the very low density lipoproteins (VLDL) and TGs to the opposite direction [15]. In addition, thyroid hormones stimulate the lipoprotein lipase (LPL), which catabolizes the TG-rich lipoproteins, and the hepatic lipase (HL), which hydrolyzesHDL2 to HDL3 and contributes to the conversion of intermediate-density lipoproteins (IDL) to LDL and in turn LDL to small dense LDL (sdLDL) [16, 17].

In hypothyroid patients, due to an increased concentration of low density lipoproteins (LDL), decreased activity of the lipoprotein lipase and increased fatty acid esterification, certain lipid derangements may be expected [5]. Many studies have reported varied types of dyslipidemias in hypothyroid patients viz; hypercholesterolemia, elevation of very low density lipoprotein (VLDL), hypertriglyceridemia etc. Jung et al found mean plasma total cholesterol and LDL cholesterol levels elevated in hypothyroid cases than in normal controls (202.1 mg/dl and 121.8 mg/dl versus 197.1 mg/dl and 120.1 mg/dl, respectively) [18]. In another study, average serum total cholesterol level was found elevated in primary and secondary hypothyroidism [19].

Increased LDL concentration increases the risk for CVD. The composition and the transport of lipoproteins are seriously disturbed in thyroid diseases. Overt hypothyroidism is characterized by hypercholesterolemia and a marked increase in low-density lipoproteins (LDL) and apolipoprotein B (apo A) because of a decreased fractional clearance of LDL by a reduced number of LDL receptors in the liver.

Studies in humans as well as *in vitro* experiments indicate that the reduced fractional catabolic rate of LDL results from a modulation of the expression of the LDL receptor in the liver. This organ possesses over seventy percent of the body's LDL-receptor. In rats, replacement therapy with thyroxin increases LDL-receptor activity, in parallel with an increase in LDL-receptor mRNA

Thompson GR et al [20] and Abrams JJ et al [21] et al have stated decreased activity of LDL receptors as the main cause of hypercholesterolemia in hypothyroidism. So, finding of this studies were found to be consistent with the previous studies done by other investigators.

In our study we found that parameters [total cholesterol (195.80 ±49.838mg/dl), triglycerides (163.24±91.64mg/dl), HDL cholesterol (53.47±13.70mg/dl) and VLDL cholesterol (32.64±18.33mg/dl)] of lipid profile were significantly increased whereas LDL cholesterol (109.68±44.22mg/dl) was comparable in the two groups.

These findings suggest that hypothyroidism was associated with hyperlipidemia which enhances the risk for development of atherosclerosis and coronary artery disease. Hence, routine monitoring of lipid profile must be done in hypothyroid patients in order to improve their prognosis.

Bibliography:-

1. Greenspan FS. The thyroid gland. In: Greenspan FS & Gardner DG (eds). Basi*c* & Cli. Endocrinology. 7th edn. New York: The McGraw- Hill Companies, **2004: 215-94.**
2. Galesanu, C, Lisnic, N, Teslaru, R, Apostu L, Zbranca E. Lipid profile in a group of hypothyroid patients Vs treated hypothyroid patients. Rev. Med.Chir.Soc. Med. Nat. Iasi. 2004:**108(3), 554-60.**
3. Schimke RN. Hyperthyroidism. The clinical spectrum. Postgrd Med J, **1992; 915: 229-36.**
4. Fitzgerald PA, Endocrine disorder, In Mcphee SJ, Papadakis MA, CMDT: Mc:Graw Hill **2009:1079-151**.
5. Vela, B.S. (2001) Endocrinology and the Heart. In: MickaelH Crawford, John P Di Marco ed. Cardiology 1st edition .Mosby; London: **8.4.1-8.4.13.**
6. Tietz N, (Ed) Fundamentals of Clin. Chem, W. B. Saunders, Philadelphia, PA, **1998**
7. Michalopoulou G, Alevizaki M, Piperingos G, Mitsibounas D, Mantzos E, Adampoulos P et al. High serum cholesterol levels in persons with 'high normal' TSH levels: should one extend the definition of subclinical hypothyroidism? Eur J Endocrinol **1998; 138:141-45**.
8. Diekman T, Lansberg PJ, Kastelein JJP, Wiersinga WM. Prevalence and correction of hypothyroidism in a large cohort of patients referred for dyslipidemia. Arch Intern Med **1995; 155:1490-95.**
9. Tsimihodimos V, Bairaktari E, Tzallas C, Miltiadus G, Liberopoulos E, Elisaf M. The incidence of thyroid function abnormalities in patients attending an outpatient lipid clinic. Thyroid **1999; 9:365-68.**
10. Olukago AO, Crowly VEF, Lawal A, Kleinkov C. Hyperlipidemia and hypothyroidism: screening patients for hypothyroidism before treatment. Br Med **1994; 308:918.**
11. Tan KC[1], Shiu SW, Kung AW :Effect of thyroid dysfunction on high-density lipoprotein subfraction metabolism: J Clin Endocrinol Metab. 1998 Aug;83(8):2921-4
12. Heimberg M, Olubadewo JO, Wilcox HG. Plasma lipoproteins and regulation of hepatic metabolism of fatty acids in altered thyroid states. Endocrine Rev **1985; 6:590-07.**
13. Dullaart RP, Hoogenberg K, Groener JE, Dikkeschei LD, Erkelens DW, Doorenbos H. The activity of cholesteryl ester transfer protein is decreased in hypothyroidism: a possible contribution to alterations in high-density lipoproteins. Eur J Clin Invest **1990; 20:581-7**.
14. Nicoline Hoogerbrugge. - [SJ. S.N.J (Meppel: Krips). - Ill. Proefschift Rotterdam.- Mer lit. opg. X Trefw.: vetstofwisseling *f* schildklierziekten *f* groeihormonen. ISBN **90-9005538**
15. Lagrost L. Regulation of cholesteryl ester transfer protein (CETP) activity: review of *in vitro* and *in vivo* studies. Biochim Biophys Acta **1994; 1215: 209-36**
16. Kuusi T, Saarinen P, Nikkila EA. Evidence for the role of hepatic endothelial lipase in the metabolism of plasma high densitylipoprotein2 in man. Atherosclerosis **1980; 36: 589-93.**
17. Santamarina-Fojo S, Gonzalez-Navarro H, Freeman L, Wagner E, Nong Z. Hepatic lipase, lipoprotein metabolism, and atherogenesis .Arterioscler Thromb Vasc Biol **2004; 24: 1750-4.**
18. Jung CH, Sung KC, Shin HS, Rhee EJ, Lee WY, Kim BS, Kang JH, Kim H, Kim SW, Lee MH, Park JR, Kim SW. Thyroid dysfunction and their relation to cardiovascular risk factors such as lipid profile, hsCRP and waist hip ratio in Korea. Korean J Intern Med **2003; 18:146-53**.
19. Skanse B. On the difference in serum cho between hypothyroidism of pituitary and of thyroid origin. In: Pitt-Rivers R, Green R, Tata JR, McCartney W, Taylor S, Pochin EE, Trotter WR (eds). The fourth inter. goitre conference. London: Pergaman Press, **1961:108-18.**
20. Thompson GR, Soutar AK, Spengel F A, Jadhav A, Gavigan S, Myant NB. Defects of the receptor mediated low density lipoprotein metabolism in homozygous familiar hypecholesterolemia and hypothyroidism in vivo. Proct Natl Acad Sci USA1981; **78:2591-95.**
21. Abrams JJ, Grundy SM. Cholesterol metabolism in hypothyroidsm and hyperthyroidism in man. J Lipid Res **1981; 82:323-38.**