International Journal of Otorhinolaryngology and Head and Neck Surgery
Shilpa R et al. Int J Otorhinolaryngol Head Neck Surg. 2020 Jan;6(1):143-147
http://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937

DOI: http://dx.doi.org/10.18203/issn.2454-5929.ijohns20195705

Original Research Article

Evaluation of serum lipid profile in female patients with hypothyroidism: a rural based study

Shilpa R., K. Mallikarjuna Swamy*

Department of ENT, KIMS, Koppal, Karnataka, India

Received: 23 September 2019
Accepted: 02 December 2019

***Correspondence:**
Dr. K. Mallikarjuna Swamy,
E-mail: itsshilpahere@gmail.com

ABSTRACT

Background: Hypothyroidism is the most common of thyroid disorders in India affecting one in ten adults and more so in women than men by 6 to 8 times with overall prevalence accounting to 11%.
Methods: This hospital based prospective study was conducted in the outpatient ENT Department of district hospital, Koppal Institute Of Medical Sciences, Koppal, Karnataka between January to June 2019 which involved total 60 Female patients out of which 20 patients were euthyroid controls and the remaining 40 patients were having one or more clinical manifestations of hypothyroidism who were divided into group A (n=20, thyroid stimulating hormone (TSH) between 5 and 10 mIU/ml) and group B (n=20, TSH >10 mIU/ml) based on TSH values. All 60 patients were in the age group of 35 to 55 years with a mean age of 42 years. Objective of study were to estimate serum lipids in female patients clinically diagnosed with hypothyroidism, to quantify the effect of lipid lowering drug and L-thyroxine therapy on TSH and serum lipid profiles.
Results: Mean total cholesterol, low-density lipoprotein cholesterol and triglycerides level in cases was higher than controls whereas high-density lipoprotein cholesterol was found significantly decreased in cases compared to controls.
Conclusions: In hypothyroid patients with TSH <10 mIU/ml, Lipid lowering drug seemed to be sufficient to treat dyslipidemia. While in all hypothyroid patients with TSH >10 mIU/ml, it's imperative to institute L-thyroxine therapy for restoration of TSH and altered lipids back to normal levels.

Keywords: Hypothyroidism, Serum lipid profile, High density lipoprotein, Low density lipoprotein

INTRODUCTION

Hypothyroidism is commonly seen during routine ENT practise. It is more prevelant in women than men by 6 to 8 times and increases with age.[1-4] Hypothyroidism is a disorder of endocrine system in which thyroid gland does not produce enough thyroid hormone due to destruction of thyroid gland. It is associated with many biochemical abnormalities including altered lipid levels which increase the cardiovascular risk. The earliest biochemical abnormality in hypothyroidism is an increase in serum thyroid stimulating hormone (TSH) associated with normal serum free T4 and T3 concentrations (subclinical hypothyroidism), followed by decrease in serum free T4 concentration, at which stage most patients have symptoms and benefit from treatment (overt hypothyroidism).[5] It is well known that alterations in thyroid function result in changes in the composition and transport of lipoproteins.[6-8] Many studies have reported significant increase in total cholesterol (TC), low density lipoprotein cholesterol (LDL-C) and triglycerides (TG) in hypothyroid patients.[9-11] Hence, hypothyroidism is known to influence lipid metabolism and is considered a significant cause of secondary dyslipidemia. Dyslipidemia is a well-known risk factor for cardiovascular diseases. Early diagnosis and management

of hypothyroidism can significantly reduce the mortality and morbidity of dyslipidemic cardiovascular diseases.[12] Numerous studies have shown conflicting results concerning the degree of lipid changes in hypothyroidism and the effect of thyroxine substitution therapy.[13-16] The effect of thyroxine replacement on lipid levels are not completely understood and sufficient studies are currently lacking to substantiate this data with appropriate protocol. So, we have designed this study in our female patients clinically diagnosed with hypothyroidism to investigate lipid abnormalities when TSH <10 mIU/ml and >10 mIU/ml and additionally justify if screening of lipid profile needed with such altered TSH values in hypothyroid individual. Our second aim is to quantify the effect of lipid lowering drug and L-thyroxine therapy on TSH and serum lipid profiles.

METHODS

This prospective observational study was conducted in the out-patient ENT department of district hospital, KIMS, Koppal, Karnataka between January to June 2019. Forty female patients in the age group 35 to 55 yrs having one or more clinical manifestations of hypothyroidism (e.g. - fatigue, weakness, weight gain, hair loss, cold intolerance, muscle cramps, constipation, depression, irritability, memory loss, abnormal menstrual cycle) were selected, furthur divided into group A (n= 20, TSH between 5 and 10 mIU/ml) and group B (n=20, TSH > 10 mIU/ml) based on TSH values and categorised as cases. 20 euthyroid subjects in the same age range between 35 to 55 years were grouped as normal controls. Permission for the study was obtained from the College authorities prior to commencement. Written informed consent was taken for inclusion in the study.

Inclusion criteria

40 patients newly detected hypothyroid with dyslipidemia based on clinical history, biochemical blood serum analysis and Adult Treatment Panel (ATP) III National cholesterol Education Program (NCEP) guidelines and 20 eythroid normal controls

Exclusion criteria

Pregnant women, those with goitre, hyperthyroidism, diabetes, hypertension, coronary artery disease, renal and hepatic failure, obesity, patients exposed to thyroid hormone therapy or lipid lowering agent in the past 6 months, patients on statins, oral contraceptive pills and other medications that alter thyroid functions and lipid profile.

After an overnight fast, venous blood sample from each participant sent for lab and analysed for thyroid profile (TSH, fT3 and fT4) and lipid parameters (TC, LDL, high density lipoprotein (HDL), TG).

Lipid parameters obtained was then compared between the cases (n=40) and euthyroid controls (n=20). Lipid lowering drug was reserved for patients with dyslipidemia in group A and L-thyroxine therapy was initiated for patients in group B. These patients were then followed up after 3 months and with incremental doses of L-thyroxine (if needed) with repeat lipid profile and TSH. In the follow up period, effects of thyroxine substitution and lipid lowering drug on altered lipid profile and TSH was noted between both groups.

Upper limit of normal range of TSH was considered between 0.3 and 4.9 mIU/l. Patients with TSH level above 5 mIU/l was considered to be having hypothyroidism. Patients were considered to have dyslipidemia if the serum values for cholesterol greater than 200 mg%, LDL greater than 130 mg%, TG greater than 250 mg% and HDL less than 35 mg%.

Data analysis

Statistical analysis was done using paired t-test to evaluate the changes in lipid parameters before and after the initiation of L-thyroxine therapy and lipid lowering drug. Analysis of variance (ANOVA) test and Unpaired ‘t’ test were done to assess the significance between cases and controls. Pearson correlation coefficient test was done to evaluate the correlation of biochemical parameters with lipid lowering drug and L-thyroxine therapy. P values <0.05 were considered significant.

RESULTS

During January to June 2019, the patients were chosen among those attending the Outpatient Department (OPD) of ENT of KIMS, Koppal, Karnataka, India, and presenting with the clinical manifestations of hypothyroidism. A total of 60 patients, aged 35 to 55 years, were recruited for the study in which 40 cases were newly diagnosed with hypothyroidism with dyslipidemia (ATP III NCEP guidelines) and 20 euthyroid normal controls. Among these, all were female patients belonging to rural population. 40 cases were furthur classified into group A (TSH <10 mIU/ml) and group B (TSH>10 mIU/ml).

Mean total cholesterol (241.56±23.21), LDL cholesterol (151.96±29.60) and triglyceride level (212.28±21.73) in cases were higher than controls. HDL cholesterol was found significantly decreased in cases (49.59±11.69) Compared to controls (55.89±11.70) (Table 1).

Lipid lowering drug was started for group A (n=20; TSH< 10mIU/ml) as their lipid profile was altered and they had borderline TSH increase. None of the patients in this group had any symptom of hypothyroidism and so levothyroxine was not started for this grooup. We observed that there was significant reduction in the mean values of TSH from baseline (6.2±4.07) to (2.60±3.09) 3 month follow-up. Similarly, reduction was noted in the

mean values of TC, LDL and TG from baseline to follow-up. However, a statistically significant increase in the mean values of HDL from baseline (35.5±6.73) to follow-up (46.45±4.64) was noted (Table 2).

Table 1: The comparison of the lipid profile parameters between the cases and the controls.

Parameters	Controls (n=20)	Cases (n=40)	P values
Total cholesterol (mg/dl)	146.94±13.21	241.56± 23.21	<0.001
HDL cholesterol (mg/dl)	55.89±11.70	49.59±11.69	<0.05
LDL cholesterol (mg/dl)	71.43±16.83	151.96±29.60	<0.001
Triglycerides (mg/dl)	98.87±11.69	212.28±21.73	<0.001

Table 2: Correlation between effect of lipid lowering drug on hypothyroidism-induced dyslipidemia.

Lipid lowering drug for group-A (TSH<10 mIU/ml)				
Lipid parameters	**Baseline (mean±SD) (mg/dl)**	**Follow-up (mean±SD)**	**t-value**	**P<0.05**
TC	230±17.84	172±17.42	8.48	0
TG	187±10.72	149±10.72	5.50	0
LDL	114±12.38	98±9.09	7.56	0
HDL	35.5±6.73	46.45±4.64	-6.97	0
TSH	6.2±4.07	2.60±3.09	3.57	0.003

SD: Standard deviation.

Table 3: Correlation between effect of L-thyroxine therapy on hypothyroidism-induced dyslipidemia.

L-thyroxine therapy for group-B (TSH>10 mIU/ml)				
Lipid parameters	**Baseline (mean±SD) (mg/dl)**	**Follow-up (mean±SD)**	**t-value**	**P<0.05**
TC	256±27.84	177.33±23.17	15.80	0
TG	220±10.72	149±29.50	2.74	0.015
LDL	139.07±12.38	104±29.85	4.33	0.001
HDL	35.42±6.73	46.86±8.53	-4.62	0
TSH	68.45±42.07	7.42±9.44	5.56	0

SD: Standard deviation.

Levothyroxine sodium is the hormone of choice for thyroid hormone replacement therapy. The daily replacement dose is usually 1.5 µg/kg (typically 100-150 µg). Based on weight of the patient, dose was titrated before initiation of therapy and given accordingly to patients. For group B (TSH>10 mIU/ml), 12 patients out of 20 had one or the other symptoms of hypothyroidism and also had altered lipid profile. Remaining 8 patients did not have symptoms of hypothyroidism though TSH was > 10mIU/ml but their lipid profile was deranged. So, we started for all 20 patients in group B, levothyroxine therapy by titrating the dose according to their weight. There was statistically significant reduction in the mean values of TSH from baseline (68.45±42.07) to 3 month (7.42±9.44) follow-up. Similarly, a statistically significant reduction in the mean values of TC from baseline (256±27.84) to 3 month (177.33±23.17) follow-up is depicted in Table 3. Moreover, a statistically significant reduction in the mean values of TG and LDL was observed from baseline to follow-up. But, in contrast to the above lipid parameters, HDL showed a statistically significant increase in the mean values from baseline (35.42±6.73) to (46.86±8.53) follow-up (Table 3).

DISCUSSION

Our study involved 60 female patients in the age group ranging from 35-55 years with mean age 42 years. Out of 60 female patients, 40 were cases and 20 were euthyroid controls. 40 cases were furthur divided into group A (TSH<10 mIU/ml) and group B (TSH>10 mIU/ml) based on TSH values.

In our study, mean total cholesterol, LDL cholesterol and triglycerides were found significantly increased whereas HDL cholesterol was found significantly decreased in cases compared to controls. Our findings were consistent with previous studies done by other investigators: Laway et al, Das et al, Saxena et al and Sharma et al.[17-20]

Results of our study suggest the findings of dyslipidemia in hypothyroid patients. Correction of hypothyroidism rectifies the lipid abnormalities thereby decrease the cardiovascular complications.[12] Levothyroxine sodium is the hormone of choice for thyroid hormone replacement therapy. The daily replacement dose is usually 1.5 µg/kg (typically 100-150 µg).

We observed in our study a statistically significant reduction in the mean values of TC, TGs and LDL from baseline to 3 months follow-up following replacement therapy with lipid lowering drug in Group A (TSH<10 mIU/ml) and levothyroxine therapy in group B (TSH>10 mIU/ml). Various other authors (Monzani et al and Akbar et al) also reported significant reduction in the levels of lipid parameters following levothyroxine replacement therapy, thus supporting our observations.[21,22] Ineck et al and Meier et al did not observe any change in TG levels following levothyroxine replacement therapy contrary to our findings.[23,24] The response of HDL-C levels to thyroid substitution remains obscure. Few studies have shown an increase in HDL-C levels, whereas others showed either no change or decreases.[25,26] Our study also depicted a significant increase in mean HDL-C following replacement therapy with lipid lowering drug in group A and levothyroxine therapy in group B. Our finding regarding increase in HDL was supported by Asranna et al, who also observed a mild increase HDL from mean pretreatment levels of 41.14 to 43.43 mg/dl after replacement therapy with levothyroxine.[27] In contrast to our findings, Tanis et al reported that HDL-C levels decreased in few patients where TSH >10 mIU/ml.[28]

CONCLUSION

The study has demonstrated and has furthur proved that hypothyroidism is an important cause of dyslipidemia. Therefore, patients diagnosed with hypothyroidism aged 35 years and above should be screened for dyslipidemia as it is one of the significant cardiovascular risk factor and if not treated at the appropriate time may give rise to life threatening cardiac complications much early in life. It was deduced from our study that, In hypothyroid patients with TSH <10 mIU/ml, Lipid lowering drug seemed to be sufficient to treat dyslipidemia and hence it can also be inferred that there is no role of L-thyroxine therapy in these patients except in symptomatic individuals, while in all hypothyroid patients with TSH >10 mIU/ml, it's imperative to institute L-thyroxine therapy for restoration of TSH and altered lipids back to normal levels. However, as our sample size was small and duration of study was limited, other studies with larger sample size and of longer duration are required.

ACKNOWLEDGEMENTS

I would like to express my profound gratitude to all the participants.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Shekar A, Singh HK, Chandra S, Shaifali I, Mehra D. Effect of Levothyroxine Therapy on Hypothyroidism-induced Dyslipidemia. Int J Adv Integ Med Sci. 2017;2(3):107-10.
2. Ahmad N, Panthari M, Gupta A, Chandra P, Nafees S. Prevelance of hypothyhroidism among patients of Meerut, Uttar Pradesh- a hospital based study. Int J Med Sci Public Health. 2013;2(3):39-49.
3. Surks MI, Ocampo E. Subclinical thyroid disease. Am J Med. 1996;100:217-23.
4. Canaris GJ, Manowitz NR, Mayor G, Ridgway EC. The Colorado thyroid disease prevalence study. Arch Intern Med. 2000;160:526-34.
5. Fauci AS, Kasper DL, Longo DL. Harrison's principles of internal medicine. Chapter: Disorders of thyroid gland. 17th ed. New York: McGraw Hill; 2008: 2224-2247.
6. Duntas LH. Thyroid disease and lipids. Thyroid 2002;12(4):287-93.
7. Friis T, Pedersen LR. Serum lipids in hyper and hypothyroidism before and after treatment. Clin Chim Acta. 1987;162(2):155-63.
8. Canaris GJ, Manowitz NR, Mayor G, Ridgway C. The Colorado thyroid disease prevelance study. Arch Intern Med. 2000;160(4):526-34.
9. Jung CH, Sung KC, Shin HS, Rhee EJ, Lee WY, Kim BS, et al. 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(3):146-53.
10. Walsh JP, Bremner AP, Bulsara MK, O'Leary P, Leedman PJ, Feddema P, et al. Thyroid dysfunction and serum lipids: a community-based study. Clin Endocrinol (Oxf). 2005;63(6):670-5.
11. Iqbal A, Jorde R, Figenschau Y. Serum lipid levels in relation to serum thyroid-stimulating hormone and the effect of thyroxine treatment on serum lipid levels in subjects with subclinical hypothyroidism: the Tromso Study. J Intern Med. 2006;260(1):53-61.
12. Ginsberg HN, Goldberg IJ. Disorder of lipoprotein metabolism. In: Harrison's principles of Internal Medicine. New York: McGraw Hill; 2001: 2252.
13. Singh K, Singh S. Alteration in lipid fractions in subclinical hypothyroidism in North Indian population. Indian J Fundam Appl Life Sci 2011;1(2):127-32.
14. Bandyopadhyay SK, Basu AK, Pal SK, Roy P, Chakrabarti S, Pathak HS, et al. A study on dyslipidemia in subclinical hypothyroidism. J Indian Med Assoc. 2006;104(11):622-6.
15. Efstathiadou Z, Bitsis S, Milionis HJ, Kukuvitis A, Bairaktari ET, Elisaf MS, et al. Lipid profile in subclinical hypothyroidism: is L-thyroxine substitution beneficial. Eur J Endocrinol. 2001;145(6):705-10.
16. Danese MD, Ladenson PW, Meinert CL, Powe NR. Clinical review 115:effect of thyroxine therapy on serum lipoproteins in patients with mild thyroid failure: a quantitative review of the literature. J Clin Endocrinol Metab. 2000;85(9):2993-3001.
17. Laway BA, War FA, Shah S, Misgar RA, Kumar Kotwal S. Alteration of lipid parameter in patients

with subclinical hypothyroidism. Int J Endocrinol Metab Res. 2013;7(2):779-88.
18. Das AK, Ahmad N, Gupta A. Dyslipidemia and hypothyroidism in population of east Medinipur, West Bengal. J Med Sci Clin Res. 2014;2(5):1049-53.
19. Saxena A, Kapoor P, Saxena S, Kapoor AK. Effect of levothyroxine therapy on dyslipidemia in hypothyroid patients. Internet J Med Update. 2013;8(2):39-49.
20. Sharma P, Patgiri D, Goyal S, Sharma G, Pathak MS. Hypithyroidism causing dyslipidemia in both subclinical and overt hypothyroidism. Indian J Basic Appl Med Res. 2013;7(2):779-88.
21. Monzani F, Carracio N, Koza Kowa M, Dardano A, Vittone F, Virdis A, et al. Effect of levothyroxine replacement on lipid profile and intima media thickness in subclinical hypothyroidism : a double blind, placebo-controlled study. J Clin Endocrinol Metab. 2004;89(5):2009-106.
22. Akbar DH, Ahmed MM, Hijazi NA. Subclinical hypothyroidism in elderly women attending an outpatient clinic. Med Sci Monit. 2004;37(5):725-30.
23. Ineck BA, Ng TM. Effects of subclinical hypothyroidism and its treatment on serum lipids. Ann Pharmacother. 2003;37(5):725-30.
24. Meier C, Staub JJ, Roth CB. TSH controlled L-thyroxine therapy reduces cholesterol levels and clinical symptoms in subclinical hypothyroidism : a double blind, placebo controlled trial (Basel Thyroid Study). J Clin Endocrinol Metab. 2001;86(10):4860-6.
25. Caron P, Calazel C, Parra HJ, Hoff M, Louvet JP. Decreased HDL cholesterol in subclinical hypothyroidism: the effect of L- thyroxine therapy. Clin Endocrinol. 1990;33(4):519-23.
26. Miura S, Itaka M, Yoahimura H, Kitahama S, Fukasawa N, Kawakami Y, et al. Disturbed lipid metabolism in patients with subclinical hypothyroidism: effect of L- thyroxine therapy. Intern Med. 1994;33(7):413-7.
27. Arsanna A, Taneja RS, Kulshreshta B. Dyslipidemia in subclinical hypothyroidism and the effect of thyroxine on lipid profile. Indian J Endocrinol Metab. 2012;16(2):347-9.
28. Tanis BC, Westerndrop GJ, Smelt HM. Effect of thyroid substitution on hypercholesterolemia in patients with subclinical hypothyroidism: a reanalysis of intervention studies. Clin Endocrinol (Oxf). 1996;44(6):643-9.

Cite this article as: Shilpa R, Swamy KM. Evaluation of serum lipid profile in female patients with hypothyroidism: a rural based study. Int J Otorhinolaryngol Head Neck Surg 2020;6:143-7.