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# A Study of Lipid Profile Inpatients of Hypothyroidism

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**Abstract:** ***Hypothyroidism is the most commonly encountered endocrine abnormalities in recent years.. Thyroid hormones regulate the basal energy expenditure directly or indirectly through their effect on protein, carbohydrate and lipid metabolism. Thyroid hormones have multiple effects on the regulation of lipid digestion, absorption, synthesis and catabolism. Thyroid hormones regulate the expression of enzymes involved in all steps of lipid metabolism leading to the development of qualitative and quantitative changes of lipids in thyroid dysfunction. Dyslipidaemia elevated total or low-density lipoprotein (LDL) cholesterol levels, or low levels of high-density lipoprotein (HDL) cholesterol. Most of the patients with dyslipidaemia have primary or genetic cause and some patients have secondary factors that contribute to dyslipidemia. Thyroid dysfunction can have an important effect on lipid profile. The American Thyroid Association recommends that adults must be screened for thyroid dysfunction by the measurement of serum TSH, beginning at the age of 35 and every 5 years thereafter. Thyroid dysfunction is associated with increased risk of cardiovascular diseases preferentially due to altered lipid profile. As thyroid hormones affect the lipid metabolism at multiple levels we want to study the association of hypothyroidism on the lipid profiles. The present study was designed to evaluate the lipid profile levels in patients of hypothyroidism. The objectives of the study were: 1) To evaluate alteration in lipid profile in patients of hypothyroidism. 2) To evaluate complications occurring due to dyslipidemia in patients of hypothyroidism. Method: After written consent, all patients of hypothyroidism outpatient and admitted to Sir T. Hospital were subjected to detailed history (including risk factors and co morbidities) and thorough clinical examination. Confirm diagnosis of hypothyroidism has been made on the basis of serum TSH, T3, T4 level. The blood samples were collected after overnight fasting. With the help of enzymatic colorimetric method using chemistry auto-analyzer, the sera were analyzed for serum lipid profile that included total cholesterol, triglyceride, LDL-cholesterol, HDL-cholesterol and VLDL-cholesterol respectively. All the data was collected and statistical analysis was done. Result: a) In this study, 100 cases of hypothyroidism studied at Sir T Hospital, Bhavnagar for study period of 6 months. B) In this study, out of 100 patients, 80 were females while 20 were males, with high prevalence in female with sex ratio of 1:4. c) Mean age of the patients of Hypothyroidism in or study was 36.10+ 10.76. d) Out of 100 patients of hypothyroidism, 60 patients develop dyslipidemia. e) In our study, 60% patients having dyslipidemia, 30% patients having high total cholesterol level with 10% and 27% of patients were having high serum triglycerides level and high LDL levels respectively, low serum HDL level was 35% of patients. In our study, Mean total cholesterol level was 213+ 51.19, mean serum triglycerides level 147.75+ 52.74, mean serum LDL level was 132.64+ 47.46, mean serum VLDL-C was 29.86+ 10.43 and mean serum HDL level was 49.28+ 16.72. Conclusion: a) Increased prevalence of hypothyroidism among females. b) Increased prevalence of hypothyroidism in middle aged of female . (30-45 years) c) 23% of patients have TSH level between 10 to 20m IU/l. d) hypothyroidism e) Association of TSH with total cholesterol, serum LDL, serum triglycerides elevation f) Association of TSH with HDL elevation among newly diagnosed hypothyroidism cases.***

**Keywords:** Hypothyroidism, Dyslipidemia, Serum TSH, LDL, TG, HDL

## 1. Introduction

Hypothyroidism is a clinical syndrome resulting from a deficiency of thyroid hormones, which in turn results in a generalized slowing down of metabolic processes.[1]It is a common metabolic disorder in general population.[2] The thyroid dysfunction increases with age, especially in women.[3] Hypothyroidism is associated with many biochemical abnormalities. Levels of total cholesterol and low density lipoprotein cholesterol tend to increase as thyroid function declines.[2] Thus hypothyroidism constitutes a significant cause of secondary dyslipidemia.[4] In hypothyroid patients, despite the reduced activity of HMG CoA reductase, there is often an increase in the serum total cholesterol concentration, mainly due to raised levels of serum LDL cholesterol and intermediate density lipoprotein (IDL) cholesterol.[5] Decreased mainly due to increased concentration of HDL2 particles.[9] In some studies we find confronting results regarding high density lipoprotein cholesterol levels in hypothyroidism. In thyroidectomized rats there was 25.9% decrease in HDL-C level, suggesting a defect in HDL metabolism.[10] HDL cholesterol level was found reduced in some other studies on hypothyroid patients.[9] Decreased thyroid secretion greatly increases the plasma concentration of triglycerides . Nikkilia& Kekki[11] have stated that lipoprotein lipase (LPL), which results in decreased clearance of triglyceride-rich lipoproteins. Dyslipidemia is a well-known risk factor for cardiovascular diseases. The risk of coronary heart disease and other forms of atherosclerotic vascular disease rises with rising plasma cholesterol concentration and in particular with rising ratio of total cholesterol to high density lipoprotein (HDL) cholesterol. A weak positive correlation of coronary heart disease also exists with plasma triglyceride concentration.[12]

Early diagnosis and proper management can significantly reduce the mortality and morbidity of dyslipidemic cardiovascular diseases. Extensive large-scale randomized trials have shown that lowering total cholesterol and LDL cholesterol reduces the risk of cardiovascular events like angina, myocardial infraction and stroke and also reduces the need of revascularisation.[12]

## 2. Aim and Objectives

**Aim**
To evaluate lipid profile in patients of hypothyroidism.

**Objectives**
- To evaluate alteration in lipid profile in patients of hypothyroidism
- To evaluate complications occurring due to dyslipidemia in patients of hypothyroidism.

## 3. Materials and Method

Study was conducted on patients of hypothyroidism diagnosed biochemically and clinically outpatients and admitted in the medical wards at Sir Takhtasinhji General Hospital, Bhavnagar.

**Sample Size:** 100 cases

**Sample procedure:** Observational cross-sectional study

**Duration:** 2019-2020

**Inclusion criteria**
- All newly diagnosed patients with hypothyroidism with Age above 18 years
- Patients who are giving written and informed consent

**Exclusion criteria:**
- Patients on drugs affecting dyslipidemia like Diurectic, Beta blocker, anti-lipedmic drugs.
- Patients of Diabetes Mellitus.
- Patients under treatment for hypothyroidism.

**Collaborating Department**
Department of Medicine, Government Medical College & Sir Takhtasinhji General Hospital, Bhavnagar.
Statistical analysis was done.

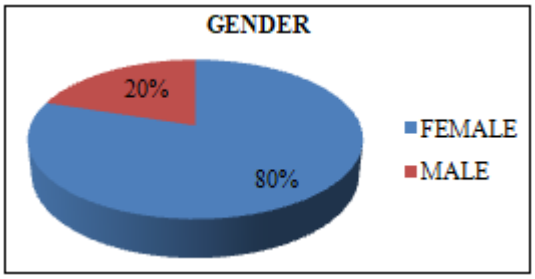
### 3.1 Method

After written consent, all patients of hypothyroidism outpatient and admitted to Sir T. Hospital were subjected to detailed history (including risk factors and co morbidities) and thorough clinical examination. Confirm diagnosis of hypothyroidism has been made on the basis of serum TSH, T3, T4 level .On the next morning after admission; samples of serum were obtained after 12 hours of overnight fasting. The blood samples were collected into plain tubes after which the samples were centrifuged at 4ºC for 15 minutes after incubation of 20 minutes for extraction of serum. With the help of enzymatic colorimetric method using chemistry auto-analyzer, the sera were analyzed for serum lipid profile that included total cholesterol, triglyceride, LDL-cholesterol, HDL-cholesterol and VLDL-cholesterol respectively. All the data was collected and statistical analysis was done.

## 4. Observations and Result

**Table 1:** Sex Distribution

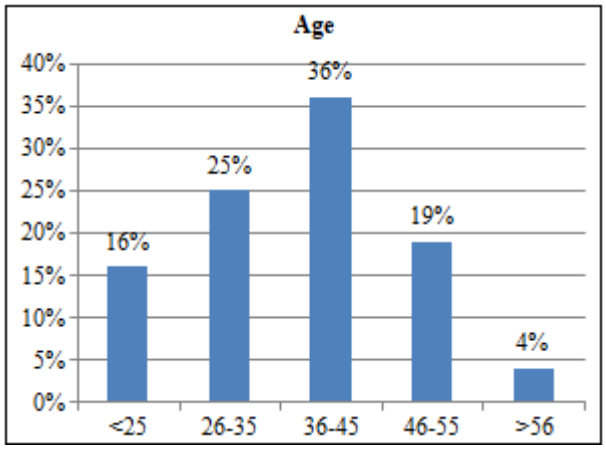
| Sex | | Frequency | Percent |
|---|---|---|---|
| | F | 80 | 80.0 |
| | M | 20 | 20.0 |
| | Total | 100 | 100.0 |




Of the100 cases, 80 cases (80%) were females and 20 cases (20%) were males.

**Table 2:** Age Distribution

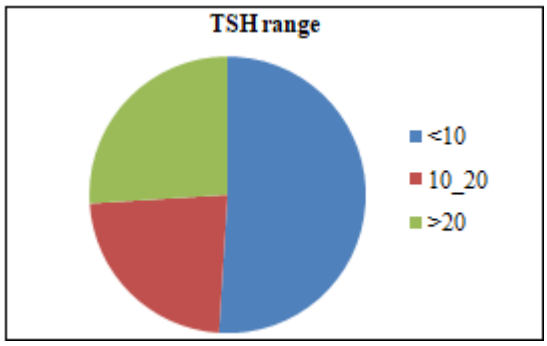
| Age Group | | Frequency | Percent |
|---|---|---|---|
| | <25 | 16 | 16.0 |
| | 26-35 | 25 | 25.0 |
| | 36-45 | 36 | 36.0 |
| | 46-55 | 19 | 19.0 |
| | >56 | 4 | 4.0 |
| | Total | 100 | 100.0 |




Among the 100 patients ranging from 18 years to 60 years with maximum 36% were between 36 to 45 years .The mean age was 38.10 years.

**Table 3:** TSH Distribution

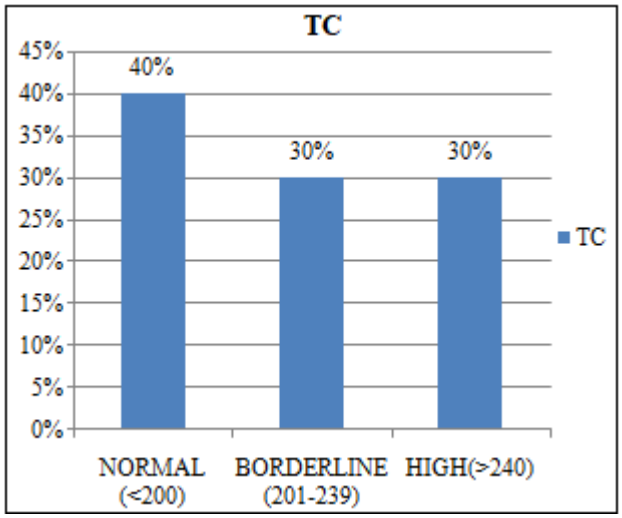
| TSH | | Frequency | Percent |
|---|---|---|---|
| | <10 | 51 | 51.0 |
| | 10-20 | 23 | 23.0 |
| | >20 | 26 | 26.0 |
| | Total | 100 | 100.0 |




Among the 100 cases the mean TSH value was 23.54m IU/l. ranging between 5.3 and 50m IU/l. 51% of cases were having TSH between 5.3 and 10m IU/l .and 23% were having TSH between 10 to 20 m IU/l.

**Table 4:** Total Cholesterol Distribution

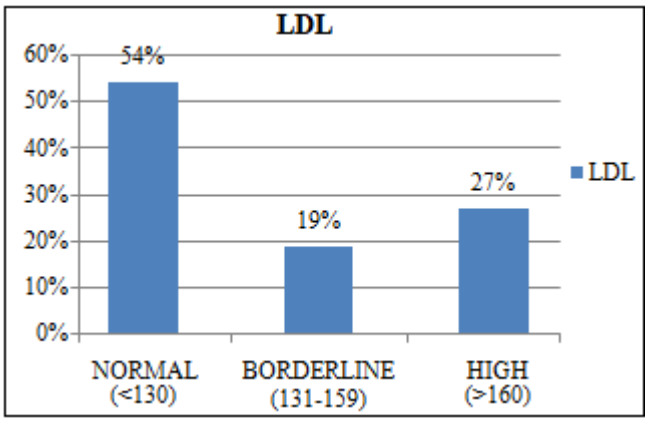
| Total Cholesterol | | Frequency | Percent |
|---|---|---|---|
| | Normal (<200) | 40 | 40.0 |
| | Borderline (201-239) | 30 | 30.0 |
| | High (>240) | 30 | 30.0 |
| | Total | 100 | 100.0 |




Hypercholesterolmia was found in 60% of patients. Among 100 patients, 30 cases had high cholesterol values .Borderline high values were found in 30% of patients .Mean cholesterol value of 213 mg/dl ranging from minimum of 117 to 359 mg/dl.

**Table 5:** LDL Distribution

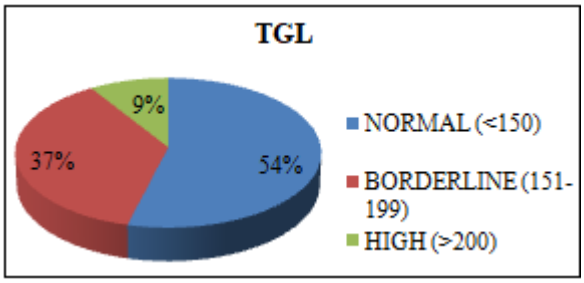
| LDL | | Frequency | Percent |
|---|---|---|---|
| | Normal (<130) | 54 | 54.0 |
| | Borderline (131-159) | 19 | 19.0 |
| | High (>160) | 27 | 27.0 |
| | Total | 100 | 100.0 |




LDL was elevated in 46% of cases .Among 100 cases, 27 patients had elevated LDL level more than 160mg/dl .Borderline high LDL values were found in 19%. The mean LDL value was 246.20 mg/dl ranging from minimum 36 to 246.20 mg/dl.

**Table 6:** Triglyceride Distribution

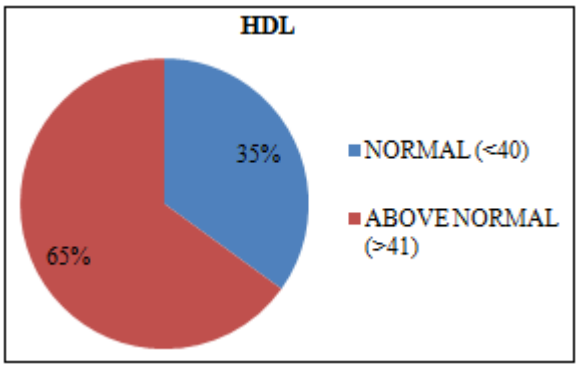
| Triglyceride | | Frequency | Percent |
|---|---|---|---|
| | Normal (<150) | 54 | 54.0 |
| | Borderline (151-199) | 37 | 37.0 |
| | High (>200) | 9 | 9.0 |
| | Total | 100 | 100.0 |




Triglyceride was elevated in 49%. Among 100 cases, 9 cases had high triglyceride values.Mean triglycerides value of 147.75 mg/dl ranging from minimum 50 to 354 mg/dl.

**Table 7:** HDL Distribution

| HDL | | Frequency | Percent |
|---|---|---|---|
| | Normal (<40) | 35 | 35.0 |
| | Above Normal (>41) | 65 | 65.0 |
| | Total | 100 | 100.0 |




HDL values were found to normal in 35% of cases, the mean HDL was 49.28 mg/dl ranging from minimum of 30 to 130 mg/dl.

## 5. Discussion

Hypothyroidism, a common endocrine disorder affecting adults of all ages, is due to relative deficiency in thyroid hormones. It is the most common pathologic hormone deficiency among the endocrine disorders. Thyroid hormones (T4 and T3) regulate the rate of metabolism, affect growth, and modulate energy utiliza- tion by increasing the basal metabolic rate, increasing oxygen consumption, and facilitating heat production. Thyroid hormones have significant effects on synthe- sis, mobilization and metabolism of lipids. This study was carried out to understand the effect of hypothyroidism on lipid profile.

The prevalence of primary hypothyroidism is 1:100, but it may be5:100 if patients with subclinical hypothyroidism (normal T4, raised TSH) are included. According to a study done by Sawin, hypothyroidism is a common disorder with a prevalence rate up to 20%. In another cross-sectional study on twelve hundred and twelve subjects of both sexes and age 20-60 years, the incidence of subclinical hypothyroidism was 19.7%..

Meanageofpresentationinourstudyis38.10±10.76. Maximum numbers of patients belong to the age group of 30–45years. This study shows female predominance with 80% of total patients. 68% patients belong to subclinical verses 32% of overt hypothyroidism.

Mean cholesterol, HDL, LDL and triglyceride levels are higher in overt hypothy- roidism when compared to subclinical hypothyroidism.

In our study, mean total cholesterol, LDL cholesterol and triglycerides were found significantly increased whereas. Present study shows similar results with the Keyes WG, Heimberg M. and Laker ME which indicate elevated triglyceride level in hypothyroid patients[13, 14, 15].

Archana et al. in her study concluded that hypo- thyroidism results in a small increase in serum LDL, total s. cholesterol.[16]

Thompson and Abrams & Grundy[16] have stated decreased activity of LDL receptors as the main cause of hypercholesterolemia in hypothyroidism.

Serum concentrations of high density lipo protein cholesterol was reported to be higher among newly diagnosed hypothyroid patients (subclinical or clinical) whereas serum concentrations of HDL cholesterol were significantly lower among euthyroid and previously reported hypothyroid cases who were on thyroxine replacement therapy[17]

Studies done by Michalopoulou, [18]Diekman, [19]Tsmihodimos[20] and olukoga[21] showed average serum concentration of HDL higher in subclinical or clinical hypothyroidism.

But, on the other hand, in a study on thyroidectomized rats, HDL showed a 25.9% decrease. In another study on thyroidectomized rats, there was 25% decrease in HDL cholesterol.

Increase in HDL cholesterol concentration is mainly due to increased concentration of $HDL_2$ particles. Dullaart 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 have stated that in hypothyroid patients decreased activity of hepatic lipase leads to the decreased catabolism of $HDL_2$ particles leading to increased HDL. So, decrease in HDL cholesterol level in our study might be due to increased activity of CETP and lipoprotein lipase in hypothyroid patients.

Hypothyroidism is associated with many biochemical abnormalities. In hypothyroid patients, there is reduced activity of HMG CoA reductase. Still, there is an increase in the serum total cholesterol concentration, mainly due to raised levels of serum LDL cholesterol and intermediate density lipoprotein (IDL) cholesterol. Decreased thyroid secretion and decreased activity of lipoprotein lipase, decreased rate of cholesterol secretion in the bile and consequent diminished loss in the faeces due to decreased number of LDL receptors on liver cells lead to hypercholesterolemia. Hypothyroidism affects the cardiovascu- lar, pulmonary, renal, neuromuscular, nervous and the reproductive systems. Most of the cardiovascular signs and symptoms are associated with a lipid profile abnormality.

## 6. Conclusion

- Increased prevalence of hypothyroidism among females.
- Increased prevalence of hypothyroidism in middle aged of female. (30-45 years)
- 23% of patients have TSH level between 10 to 20m IU/l.
- Significant elevations in total cholesterol, serum LDL, serum triglycerides in hypothyroidism
- Association of TSH with total cholesterol, serum LDL, serum triglycerides elevation
- Association of TSH with HDL elevation among newly diagnosed hypothyroidism cases.

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