RESEARCH ARTICLE

A Prospective Observational Study on the Prevalence of Dyslipidemia and Cardiovascular Complications in Hypothyroid Patients

SKM Mobin[1*], MN Priya[2], Raghavendra K Gunda[3], JNS Kumar[3], A Rajesh[1], J Tejaswini[1], P Radhika[1], Sk Azaruddin[1]
[1]Department of Pharmacy Practice, Narasaraopeta Institute of Pharmaceutical Sciences, Palnadu, Andhra Pradesh, India.
[2]Department of Endocrinology, SPS Endocrine Centre, Palnadu, Andhra Pradesh, India.
[3]Department of Pharmaceutics, Narasaraopeta Institute of Pharmaceutical Sciences, Palnadu, Andhra Pradesh, India.
Corresponding Author Email ID: shaikmullamobin1996@gmail.com

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Abstract

Objective: The main objective of the current study was to assess the prevalence of dyslipidemia and cardiovascular complications in Hypothyroid patients.

Methods: In this prospective observational study, 110 subjects have been participated. ASCVD scale is used which assess the next 10 years of cardiovacular risk of a patient. ASCVD score is categorized into low, intermediate, borderline and high. Hypothyroid patients are assessed with lipid profile followed by ASCVD scale.

Results: ASCVD risk category distribution highlights a higher percentage in the low-risk category (71.82%). The study also reveals a strong association between hypothyroidism and hyperlipidemia, with the majority of patients having ideal hyperlipidemia levels (89%). Comorbidities such as hypertension and type 2 diabetes mellitus are prevalent, with a significant portion having no comorbidities (50.9%). Family history analysis shows a majority without a family history of hypothyroidism (84.5%).

Conclusion: From our study we concluded that despite the high prevalence of comorbidities, a substantial proportion of patients exhibited ideal lipid profiles, emphasizing the need for targeted interventions addressing modifiable risk factors. Family history and ASCVD risk assessment provide valuable insights into risk stratification and personalized treatment approaches. Overall, these findings underscore the importance of multidisciplinary approaches integrating endocrinology, cardiology, and lifestyle interventions in optimizing outcomes for hypothyroid patients at risk of cardiovascular complications.

Keywords: Hypothyroidism, Dyslipidemia, ASCVD Risk score, Cardiovascular complications, levothyroxine.
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Introduction

Hypothyroidism is an underactive thyroid gland. Hypothyroidism means that the thyroid gland can't make enough thyroid hormone to keep the body running normally.[1]

Complications of hypothyroidism include myxedema coma, adverse effects on pregnancy and fertility, psychological problems such as depression and cognitive decline, heart disease, renal complications, and nerve damage.[2] The dyslipidemia cut-point is based on the AACE guideline, this includes a total cholesterol desirable less than 200 mg/dl, a borderline level high between 200 to 239, high level greater than 239 mg/dl.

HDL Cholesterol

Dyslipidemic lower than 40 mg/dl in men and lower than 50 mg/dl in women.

LDL cholesterol

Optimal lower than 100 mg/dl, near-optimal between 100 to 129 mg/dl, borderline high between 130 to 159 mg/dl, high between 160 to 189 mg/dl, very high if greater than 189 mg/dl.

The Triglycerides Level

Normal if less than 150 mg/dl, high if between 150 to 199 mg/dl, Hypertriglyceridemia when the levels are between 200 to 499 mg/dl, very high if greater than 499 mg/dl.[3] Cardiovascular disease is the primary complication, increasing the risk of heart attacks, strokes, and sudden cardiac death. However, appropriate treatment can significantly reduce these risk.[4]

Relation with Hypothyroidism

Hypothyroidism affects blood lipid levels, particularly increasing total cholesterol and LDL cholesterol while possibly decreasing HDL cholesterol. The mechanism involves thyroid hormone and TSH regulation of cholesterol metabolism. Hypothyroidism treatment with levothyroxine can reverse lipid alterations in most cases.[5]

Materials and Methods

Study design

A hospital-based prospective observational study.

Study Site

This study was conducted at SPS Endocrine Hospital, Narasaraopet. The patients who visit this hospital are usually from in and around the districts of Palnadu.

Study Period

The study was conducted over six months.

Sample Size

A total of 110 subjects who were diagnosed with hypothyroidism and on regular checkups were included in the study. Those who fulfilled the exclusion and inclusion criteria were selected for the study.

Study criteria

The study will be carried out by considering the following criteria:

Inclusive Criteria

- Patients found to be suffering from hypothyroidism were included.
- Consider the people aged 20 to 79 years.
- Consider both male and female.
- Consider patients suffering from diabetes and hypertension

Exclusive criteria

- People below 20 and above 79 years are excluded.
- People with known cardiac problems were excluded.
- People who are on statins and aspirin therapy were excluded from the study.

Results and Discussion

Gender Wise Distribution

Table 1 shows that, in this study, 110 cases were assessed for the association of dyslipidemia and cardiovascular complications in hypothyroidism. Among them 24% (n = 26) were male and 76% (n = 84) were female. Demographic data reveals that females are more when compared to males.

Table 1: Gender wise distribution of patients (n=110)

S. No.	*Gender*	*No. of patients (n=110)*	*Percentage (%)*
1	Males	26	24
2	Females	84	76

Table 2: Age wise distribution of patients (n=110)

S. No.	*Age group (years)*	*No. of patients (n=110)*	*Percentage (%)*
1	20-29	25	24.75
2	30-39	25	24.75
3	40-49	36	35.64
4	50-59	15	14.85
5	60-70	9	24.75

Age-wise Distribution

Table 2 shows the age group analysis, no. of cases in the age group of 20 to 29 were 25, 30 to 39 were 25, 40 to 49 were 36, 50 to 59 were 15, 60 to 70 were 9. This data reveals that the patients aging between 40 to 49 were found to be high, followed by 20 to 29, 30 to 39 age groups.

Body Mass Index Wise Distribution

Table 3 shows the Body mass index analysis, among 110 patients, five patients were underweight, 30 patients were normal weight, 45 patients were overweight and 30 patients were obese. This data reveals that the more patients were overweight (40.91%) and least patients are underweight (4.55%)

Diet Wise Distribution

Table 4 shows the diet intake analysis. Among 110 patients, seven patients are taking a vegetarian diet and 103 patients are taking both vegetarian and non-vegetarian diets. This data reveals that the number of patients consuming both vegetarian and non-vegetarian diet are more number which is 103 (93.6%), when compared to only vegetarians which is 7 (6.4%).

Comorbidities wise distribution

Table 5 shows the comorbidities analysis, among 110 patients, 11 patients are suffering from hypertension alone, 17 patients are suffering with type 2 diabetes mellitus alone, 26 patients are suffering with both hypertension and type 2 diabetes mellitus and 56 patients don't have any comorbidities. This data reveals that the greater number of patients, i.e., 56

Table 3: BMI wise distribution of patients (n=110)

S. No.	*Body mass index*	*N. of patients(n=110)*	*Percentage (%)*
1	Underweight	5	4.55
2	Normal	30	27.27
3	Overweight	45	40.91
4	Obesity	30	27.27

Table 4: Diet wise distribution of patients (n=110)

S. No.	*Diet Category*	*No. of Patients (n=110)*	*Percentage (%)*
1.	Veg	7	6.4
2.	Veg+Non-Veg	103	93.6

Table 5: Comorbidities wise distribution of patients (n=110)

S. No.	*Comorbidities*	*No. of patients (n=110)*	*Percentage (%)*
1	Hypertension	11	10
2	Type 2 Diabetes Mellitus	17	15.4
3	Hypertension + Type 2 Diabetes Mellitus	26	24
4	No Comorbidities	56	50.9

(50.9%), followed by both hypertension and type 2 diabetes mellitus patients i.e., 26 (24%), type 2 diabetes mellitus alone patients, i.e., 17 (15.4%), and hypertension alone patients i.e., 11(10%).

Family History Wise Distribution

Table 6 shows the Family history analysis, among 110 patients 93 patients (84.5%) don't have any family history. About 11 patients (10%) had a history of hypothyroidism for their mother, two patients (1.8%) had a history of hypothyroidism for their grandmother. Some of the patients had a history of hypothyroidism for their father, daughter, and sister, with a total of 1 patient each (0.90%). One patient (0.90%) had a history of hypothyroidism for their mother, father and brother.

ASCVD Risk Category-Wise Distribution

Table 7 shows the ASCVD risk category analysis, among 110 patients, 79 patients were at low risk, 11 patients were in intermediate-risk, 15 patients were in borderline risk and five patients were in high risk. This data reveals that the low-risk patients are more with 71.82% when compared to high-risk patients with 4.55%

Relation between Hypothyroidism and Hyperlipidemia

Table 8 shows the relation between hypothyroidism and Hyperlipidemia analysis, among 110 patients, 98 patients have Ideal hyperlipidemia levels, 5 patients have borderline hyperlipiemia levels, 7 patients have High Hyperlipidemia levels. This data reveals that the highest percentage of patients have ideal hyperlipidemia levels (89%) and the lowest percentage of patients have least hyperlipiemia levels (6%)

Table 6: Family history wise distribution of patients (n=110)

S. No.	*Family Relation*	*No. of patients (n=110)*	*Percentage (%)*
1	Nil	93	84.5
2	Mother	11	10
3	Grandmother	2	1.8
4	Daughter	1	0.90
5	Father	1	0.90
6	Mother, Father, Brother	1	0.90
7	Sister	1	0.90

Table 7: ASCVD Risk Category Wise Distribution of patients (n=110)

S. No.	*Risk category*	*No. of patients (n=110)*	*Percentage (%)*
1	Borderline	15	13.64
2	High	5	4.55
3	Intermediate	11	10.00
4	Low	79	71.82

Relation between the duration of Hypothyroidism and ASCVD score

Table 9 and 10 shows the relation between onset of Hypothyroidism and ASCVD score analysis, among 110 patients five patients are at higher risk for cardiovascular complications. The highest number of patients that are at higher risk for cardiovascular risk are in less than five years of onset of hypothyroidism, followed by between the years of 10 to 15 of onset of hypothyroidism.

Relation between duration of hypothyroidism and lipid levels

Table 11 shows that as the duration of hypothyroidism increases, there is a slight upward trend in average lipid levels. For individuals with less than 5 years of hypothyroidism, the average lipid level is 152.89, which increases to 157.70 for those with 5 to 10 years, then to 161.67 for 10 to 15

Table 8: Relation between Hypothyroidism and Hyperlipidemia

S. No.	*Total Cholesterol (mg/dL)*	*No. of patients(n=110)*	*Percentage (%)*	*Category*
1	<200	98	89	Ideal
2	200-240	5	5	Borderline
3	>240	7	6	High

Table 9: Relation between the duration of Hypothyroidism and ASCVD

S. No.	*Duration of Hypothyroidism (years)*	*No of patients(n=110)*
1.	<5	72
2.	5-10	27
3.	10-15	6
4.	15-20	5

Table 10: Relation between the duration of Hypothyroidism and ASCVD score

Duration of Hypothyroidism (years)	*Risk category*	*No. of patients(n=110)*
<5	Low	56
	Intermediate	5
	Borderline	9
	High	2

Table 11: Relation between duration of hypothyroidism and lipid levels(n=110)

S. No.	*Duration of Hypothyroidism(years)*	*Average of lipid levels(mg/dL)*
1	<5	152.88
2	5-10	157.70
3	10-15	161.66
4	15-20	158.60

years, and slightly decreases to 158.6 for 15 to 20 years. This suggests a potential correlation between the duration of hypothyroidism and lipid profile, indicating a need for further investigation into how prolonged hypothyroidism might influence lipid metabolism and related health outcomes.

Discussion

This is a prospective observational study conducted for a period of 6 months in department of endocrinology at a private clinic in Narasaraopet. A total of 110 cases were collected who are diagnosed with hypothyroidism and their lipid levels were evaluated to check for cardiovascular complications.

Firstly, the gender-wise distribution revealed a significant predominance of females (76%) compared to males (24%) among the 110 cases studied. This finding is consistent with existing literature indicating a higher prevalence of hypothyroidism among women. The higher prevalence among women could be attributed to hormonal factors, as oestrogen levels often influence thyroid disorders.

The age-wise distribution showcased that patient aged 40 to 49 formed the largest group (36 cases), followed by the 20 to 29 and 30 to 39 age groups. This pattern suggests that middle-aged individuals are more susceptible to developing hypothyroidism-associated dyslipidemia and cardiovascular complications.

Body mass index (BMI) distribution indicated a substantial number of patients classified as overweight (40.91%) and obese (27.27%). This highlights the strong association between hypothyroidism and weight gain, emphasizing the importance of weight management strategies in these patients to prevent further cardiovascular risks.

Regarding diet, the majority of patients (93.6%) reported consuming both vegetarian and non-vegetarian diets. This diversity in dietary habits could play a role in the variation of lipid profiles observed among the patients.

The prevalence of comorbidities among the studied population was noteworthy, with a significant number of patients having both hypertension and type 2 diabetes mellitus (24%). This finding underscores the clustering of metabolic disorders in patients with hypothyroidism, necessitating comprehensive management approaches.

Family history analysis revealed that the majority of patients (84.5%) did not have a family history of hypothyroidism. However, a notable portion reported a history of hypothyroidism among immediate family members, suggesting a potential genetic predisposition.

Regarding the ASCVD risk categories, most patients were classified as low risk (71.82%), indicating a relatively favorable cardiovascular risk profile among the study population. However, the presence of intermediate and high-risk categories underscores the importance of vigilant monitoring and preventive measures.

The association between hypothyroidism and hyperlipidemia revealed that the majority of patients (89%) had ideal lipid levels. This suggests that while dyslipidemia is a common concern, it may not always manifest as high cholesterol levels, necessitating a nuanced approach to diagnosis and management.

Lastly, the duration of hypothyroidism appeared to have a slight influence on lipid levels, with a trend towards increasing levels with longer duration. This finding suggests the need for ongoing monitoring of lipid profiles in patients with longstanding hypothyroidism.

Conclusion

In conclusion, this prospective observational study on the prevalence of dyslipidemia and cardiovascular complications in hypothyroid patients has provided valuable insights into the complex interplay between these conditions. The predominance of females in our study population suggests a gender-specific susceptibility to hypothyroid-related cardiovascular risks, warranting gender-tailored approaches in clinical management. The main reasons for the predominance of females in this study were autoimmune conditions and genetics. The identification of middle-aged individuals, particularly those in the 40 to 49 age group, as a high-risk demographic underscores the importance of targeted screening and early intervention strategies in this age category. Elevated BMI levels, coupled with prevalent comorbidities such as hypertension and type 2 diabetes mellitus, highlight the multifactorial nature of cardiovascular risk factors in hypothyroid patients, necessitating comprehensive risk assessment and management protocols. Additionally, insights into dietary patterns and family history provide valuable avenues for personalized intervention strategies. Despite the presence of comorbidities, a notable proportion of patients exhibited favorable lipid profiles, suggesting potential opportunities for targeted interventions to mitigate cardiovascular risks. Lastly, the duration of hypothyroidism appeared to have a slight influence on lipid levels, with a trend towards increasing levels with longer duration. This finding suggests the need for ongoing monitoring of lipid profiles in patients with longstanding hypothyroidism.

Overall, these findings emphasize the importance of multidisciplinary approaches encompassing endocrinological, cardiological, and lifestyle interventions to optimize clinical outcomes and reduce cardiovascular morbidity in hypothyroid patients. Patients are educated about lifestyle modifications to prevent further complications and also a risk of developing cardiovascular diseases. Further research is warranted to elucidate underlying mechanisms and validate the effectiveness of tailored management strategies in improving patient outcomes.

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