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# Thyroid functions and glycemic status: A hospital based epidemiologic study

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**Abstract**
**Introduction:** The two common endocrinopathies, namely, diabetes mellitus and thyroid dysfunction may remain unrecognised for a long duration. Their co-existence is expected to enhance the burden and the severity of complications associated with diabetes that is compounded by delayed recognition and treatment. We undertook this study to assess the thyroid functions in patients with hyperglycaemia who did not have any clinical feature of thyroid dysfunction.
**Methods:** This cross–sectional observational study was conducted over a period of 12 months in a tertiary referral center of Uttarakhand after institutional ethical clearance. Thyroid functions and parameters of glycemic status were assessed in patients with diabetes (whether or not on treatment) after obtaining a written informed consent. All those included were categorized as euthyroid, subclinical or overtly hypothyroid and hyperthyroid.
**Results:** Thyroid dysfunction was observed in 24.5% of the 110 cases included for the study. Subclinical hypothyroidism was the most prevalent disorder (n=17; 15.4%), followed by overt hypothyroidism (n=7; 6.3%), and hyperthyroidism (n=3; 2.7%) in patients with hyperglycaemia. Significant association was not observed between the degrees of glycemic control and type of thyroid dysfunction (p 0.381) Higher BMI was significantly associated with thyroid dysfunction and more than half of our subjects with thyroid dysfunction had a positive family history of thyroid dysfunction.
**Conclusions:** Thyroid functions should be assessed in all diabetics given the high prevalence of thyroid disorders, especially in the overweight and a positive family history of thyroid dysfunction.

**Keywords:** diabetes, thyroid dysfunction, subclinical hypothyroidism

## Introduction
Diabetes mellitus (DM) and thyroid dysfunction are the main endocrine disorders encountered in clinical practice. Major complications, such as defect in vision, kidney function derangement and cardiovascular complications, are the outcomes of diabetes mellitus [1]. With increased life expectancy, prevalence of diabetes is expected to increase, especially the obese. It has been estimated that the global prevalence of diabetes will rise to 11.1% in 2033, affecting 600 million people [2]. The clinical presentation of SCH is non-specific and symptoms are usually subtle as compared to overt hypothyroidism, making it essentially a laboratory diagnosis. Unrecognized thyroid disorders in a patient with type 2 diabetes mellitus had adverse metabolic consequences. The association of hyperglycemia and thyroid dysfunction dates back to 1970s and is characterized by a complex interaction of interdependence. Undiagnosed thyroid dysfunction can have a negative impact on diabetes and its complications [3]. As most of the patients with SCH are asymptomatic, the need of the hour is to formulate guidelines to assess thyroid hormone levels in all patients with type 2 diabetes mellitus. The aim of this study is to investigate the prevalence of thyroid dysfunction in patients with hyperglycemia given the high prevalence of diabetes in our country and particularly high burden of thyroid disorders in the sub-Himalayan belt. We undertook this study to study this association and the ramifications, if any, in the Himalayan state of Uttarakhand, endemic for thyroid dysfunction, and witnessing an epidemic of diabetes like the other Indian states.

## Materials and Methods
This cross–sectional observational study was conducted over a period of 12 months in a tertiary referral center of Uttarakhand after institutional ethical clearance. Thyroid functions and parameters of glycemic status were assessed in patients with diabetes (whether or not on treatment) after obtaining a written informed consent. All those included were categorized as euthyroid, subclinical or overtly hypothyroid and hyperthyroid. The data thus obtained was subjected to statistical analysis for determining association between thyroid dysfunction and glycemic status using SPSS software version (22.0).

## Results
A total of 110 patients with hyperglycemia were included in the study. The age of our study subjects ranged from 18 to 80 years. Most (83/110; 75.4%) patients were euthyroid; thyroid dysfunction was observed in 24.5% of the total number of cases. Subclinical hypothyroidism was the most prevalent disorder (n=17; 15.4%), followed by hypothyroidism (n=7; 6.3%), and hyperthyroidism (n=3; 2.7%) in patients with hyperglycaemia; 12/27 (44.4%) patients with hyperglycemia

and thyroid dysfunction were aged less than 50 years. Equal number of hyperglycemic males and females had thyroid dysfunction (13:14). 20/27 (74.07%) patients with thyroid dysfunction had a body mass index (BMI >30); BMI ranged between 25-30 in 4/27 (14.81%), and < 25 in 3 (11.11%). 15/27 (55.55%) patients with thyroid dysfunction had a positive family history of hypothyroidism. Out of 27 patients with thyroid dysfunction, 3 (11.1%) had diabetes <1 yr duration, 11 (40.74%) had duration of diabetes for 1 - 5 years, 13 (48.14%) had diabetes for 6 - 10 years. However, the association of duration of diabetes and thyroid dysfunction was not statistically significant (p value > 0.05). Good glycemic control was observed in 17/27 (62.96%) patients with thyroid dysfunction (HbA1C < 7%); the remaining 10/27 (37.03%) had HbA1C >7%. There was no significant association between the degrees of glycemic control and type of thyroid dysfunction (p 0.381). Mean cholesterol levels were higher in subclinical and overt hypothyroidism (171.65 mg/dl and 181.57 mg/dl respectively) as compared to 149.70 mg/dl in euthyroid diabetic patients. Table 1 compares the clinical, hematological and biochemical parameters of the selected subjects based on thyroid status.

**Table 1:** Comparison of demographic, clinical, hematological and biochemical parameters of subjects based on their glycemic status

| | **Hyperthyroidism (n=3)** | **Normal thyroid function (n=83)** | **Subclinical hypothyroidism (n=17)** | **Hypothyroidism (n=7)** | **p-value (ANOVA, Bonferroni modification)** |
|---|---|---|---|---|---|
| Height (cms) | 165.1±4.4 | 165.3±9.8 | 166.3±6.5 | 164±6.7 | 0.956 |
| Weight (kg) | 71.6±16.0 | 74.5±13.9 | 76.2±13.3 | 67.5±13.4 | 0.549 |
| BMI (kg/m$^2$) | 25.2±4 | 26.2±3.4 | 26.4±3.3 | 24.1±3.1 | 0.401 |
| Pulse rate(beats/min) | 76.6±1.1 | 88.5±15.3 | 94.2±12.5 | 86.7±13.6 | 0.221 |
| BP (S)(mmHg) | 126±6 | 130.2±10.7 | 131.5±10.7 | 133.7±9.7 | 0.701 |
| BP (D)(mmHg) | 82.6±8.0 | 80.2±8.8 | 80.4±9.5 | 85.1±9.2 | 0.555 |
| MAPI(mmHg) | 97.1±6.4 | 96.9±8.2 | 97.4±8.9 | 101.3±8.4 | 0.608 |
| Hb (mg/dl) | 12.4±2.0 | 12.2±2.5 | 13.6±1.8 | 12±1.8 | 0.162 |
| Platelet Count (x10$^3$/cumm) | 3.4±2.2 | 4.2±1.4 | 5±1.7 | 3.9±1.7 | 0.128 |
| FBS (mg/dl) | 145.3±28.3 | 167.1±63.6 | 168.4±80.4 | 165.5±68.2 | 0.953 |
| PPBS (mg/dl) | 211.3±35.1 | 246.9±85.4 | 234.4±78.4 | 212.7±66.6 | 0.625 |
| S. Creatinine (mg/dl) | 1.6±1.5 | 1.2±1.0 | 1.1±0.5 | 1±0.5 | 0.696 |
| BUN(mg/dl) | 13.1±1.1 | 19.9±15.4 | 16.4±11.1 | 20.6±11.9 | 0.712 |
| HDL(mg/dl) | 33.6±2.0 | 36.6 ± 8.2 | 37.4±10.9 | 37.4±9.1 | 0.958 |
| LDL(mg/dl) | 66.6±1.1 | 74.6±39.1 | 93.2±60.9 | 90.6±56.5 | 0.357 |
| VLDL(mg/dl) | 42.3±9.4 | 31.9±11.2 | 34±20.1 | 38±18.4 | 0.339 |
| Cholesterol(mg/dl) | 120.3±4.0 | 149.7±49.9 | 171.6±74.1 | 181.5±83.3 | 0.215 |
| Triglycerides(mg/dl) | 43.3±10.9 | 70.9±46.5 | 99.1±103.6 | 82.5±84.5 | 0.235 |
| HbA1c (%) | 5.4± 0.7 | 7.3± 2.2 | 7.3± 2.8 | 7.2 ± 2.3 | 0.589 |

## Discussion

Thyroid dysfunction was present in nearly one-fourth of all the diabetics and the glycemic status had no impact on thyroid functions. Complex interaction exists between thyroid disorders and diabetes mellitus. Some studies have shown that thyroid dysfunctions are more prevalent in people with diabetes and particularly Type 1 diabetes. Undiagnosed thyroid dysfunction could negatively impact glycemic control; burden and severity of retinopathy and nephropathy is higher in diabetic patients with subclinical hypothyroidism [3]. Hence, detection and management of subclinical hypothyroidism in patients with diabetes maybe beneficial.

Other studies from different parts of the world report the prevalence of thyroid dysfunction in 14.7% (4), 16.2% (5), 16% [6] and 12.3% [7] in type 2 diabetes. High prevalence of thyroid dysfunction in our study probably is because the study population belongs to the traditional iodine deficient sub-Himalayan belt. Almost equal numbers with thyroid dysfunction were males and females in contrast to earlier studies with 71.4% [5] and 71.8% [6] females. The difference from other studies could be due to culture and gender-based differential health seeking behaviour in this part of the world that is largely patriarchal. A large fraction of these diabetics are economically productive age group of < 50 years as observed in other studies [4-6] as well. With increasing life expectancy, delayed diagnosis may predispose the diabetics to increased morbidity of the complications, poor quality of life and the associated financial implications.

Subclinical hypothyroidism was the most prevalent disorder in our study (15.4%) similar to 12% [4] and 16.3% [8] in other studies. The corresponding figures for overt hypothyroidism were 6.36%, 2.5%, and 11.4%. Hypothyroidism, subclinical and clinical, is usually present in maximum number of patients with diabetes with thyroid dysfunction and maybe asymptomatic and hence unrecognized.

While other studies found an association between thyroid dysfunction and dyslipidemia in diabetes [6, 9, 10], we failed to demonstrate a significant difference in relation to glycemic control. Higher BMI was significantly associated with thyroid dysfunction concordant with findings of Papazafiropoulou *et al*. [9]. Hence, thyroid function should be assessed in all diabetics with a high BMI. More than half of our subjects with thyroid dysfunction had a positive history of thyroid dysfunction in the family. Schroner *et al*. [6] and Pimenta *et al*. [11] also reported a positive family history in majority of their study subjects with thyroid dysfunction. In contrast, another study from India reported a positive family history in 21.8%. [6] Although the association was not statistically significant.

Ardekani *et al*. [10] reported significantly higher HbA1c levels in diabetics with thyroid disorders as compared to euthyroid patients (8.9 ± 1.9 vs. 7.1 ± 1.0). Other studies [7, 12] also reported association between poor glycemic control and thyroid dysfunction. In contrast, only 37% of our patients had HbA1c >7%, remaining (62.9%) had a tight control similar to another study (81%) from India [6]. The different genetic, racial and environmental factors are apparently responsible for this difference. The association of the duration of diabetes and thyroid dysfunction was not statistically significant in concordance with the results of other studies [6, 13].

The limitation of our study was the small sample size and the non-evaluation of complications of diabetes in all subjects. Nevertheless, the study holds importance as it studied a population traditionally at risk for thyroid disorders due to geographical reasons. Also, this small study can be the nidus of future studies in this regard from a state where literature on this important aspect is virtually non-existent. We wish to put forth our suggestion that thyroid functions should be assessed in all diabetics given the high prevalence of thyroid disorders, especially in the overweight and a positive family history of thyroid dysfunction.

**References**


1. Klein R, Klein BE, Moss SE. Visual impairment in diabetes. Ophthalmology. 1984; 91(1):1-9.
2. Surks MI, Ortiz E, Daniels GH, Sawin CT, Col NF, Cobin RH, *et al*. Subclinical thyroid disease: scientific review and guidelines for diagnosis and management. JAMA. 2004; 291(2):228-38.
3. Hage M, Zantout MS, Azar ST. Thyroid disorders and diabetes mellitus. J Thyroid Res. 2011; 2011:11-9.
4. Palma CC, Pavesi M, Nogueira VG, Clemente EL, Vasconcellos Mde F, Pereira LC, *et al*. Prevalence of thyroid dysfunction in patients with diabetes mellitus. Diabetol Metab Syndr. 2013; 5(1):58-64.
5. Jali MV, Kambar S, Jali SM, Pawar N, Nalawade P. Prevalance of thyroid dysfunction in type 2 diabetes mellitus patients Diabetes Metab Syndr. 2017; 1:105-8.
6. Jain G, Marwaha TS, Khurana A, Dhoat PS. Prevalence of Thyroid disorders in Patients of type 2 Diabetes Mellitus. International Journal of Medical and Dental Sciences. 2013; 2(2):153-61.
7. Schlienger JL, Anceau A, Chabrier G. Effect of diabetic control on the level of circulating thyroid hormones. Diabetologia. 1982; 22:486-8.
8. Demitrost L, Ranabir S. Thyroid dysfunction in type 2 diabetes mellitus: A retrospective study. Indian Journal of Endocrinology and Metabolism. 2012; 16:334-41.
9. Cooper DS. Subclinical hypothyroidism. N Engl J Med 2001; 345:260-5.
10. Afkhami-Ardekani M, Rashidi M, Shojaoddiny A. Effect of thyroid dysfunction on metabolic response in type 2 diabetic patients. Iranian J Diab Obes. 2010; 2(1):20-6.
11. Pimenta WP, Mazeto GM, Callegaro CF. Thyroid disorders in diabetic patients. Arq Bras Endocrinol Metab. 2005; 49(2):22-7.
12. Bazrafshan HR, Ramezani A, Salehi A. Thyroid dysfunction and its relation with diabetes mellitus (NIDDM). J Gorgan Univ Medical Sciences. 2000; 2(5):5-11.
13. Diez JJ, Sanchez P, Iglesias P. Prevalence of thyroid dysfunction in patients with type 2 diabetes. Exp Clin Endocrinol Diabetes. 2011; 119(4):201-7.