ORIGINAL ARTICLE

# Prevalence of Thyroid Disorders in Type 2 Diabetes Mellitus Patients in Nepalgunj Medical College

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**ABSTRACT**

**Introduction:** Thyroid dysfunction is defined as the altered serum thyroid stimulation hormone level with normal or altered thyroid hormones. It is a common endocrine disorder affecting around 300 million people worldwide. Hypothyroidism is a common thyroid disorder in diabetic patients, impacting diabetes control. Both thyroid dysfunction and diabetes are significant public health concerns in Nepal. Addressing thyroid dysfunction in diabetic patients is crucial for optimal disease management as untreated thyroid dysfunction can invariably affect glycemic control and contributes to cardiovascular complications. **Aims:** To assess the prevalence of thyroid disorders amongst Type 2 diabetic patients in Nepalgunj Medical College. **Methods:** This is a cross-sectional, hospital-based study conducted at the Diabetes Endocrine Outpatient Department, department of Medicine, and among indoor patients of these units at Nepalgunj Medical College. The study utilized a non-probability consecutive sampling technique. **Results:** Among the 100 participants, 37% had abnormal thyroid function whereas 63% of the participants had normal thyroid function. Among participants with diabetes over 13 years of duration 36.2% had thyroid dysfunction and with duration of diabetes 10-12 years 50% had thyroid dysfunction. The most common thyroid disorder present was subclinical hypothyroidism noted in 17% of the total participants. **Conclusion:** A high prevalence of thyroid dysfunction was seen in Type 2 Diabetes Mellitus patients. Screening for hypothyroidism, appropriate management and control of diabetes may lower the risk of thyroid dysfunction.

***Keywords**:* Diabetes Mellitus, Hypothyroidism, Thyroid dysfunction, Thyroid stimulation hormone

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## INTRODUCTION

Thyroid dysfunction is defined as the altered serum thyroid stimulation hormone (TSH) level with normal or altered thyroid hormones (free tri-iodothyronine- fT3 and free thyroxine- fT4). It is a common endocrine disorder affecting around 300 million people worldwide, with nearly 30% population affected in eastern Nepal alone.[1,2] Hypothyroidism is more prevalent than hyperthyroidism, and women are disproportionately affected.[1] Diabetic patients, especially those with Type 1 diabetes, are at higher risk for thyroid disorders, with up to 30% of female Type 1 diabetics developing thyroid disease.[3] Hypothyroidism is a common thyroid disorder in diabetic patients, impacting diabetes control.[4] In Type 2 diabetes, glycemic control issues further influence thyroid function, affecting TSH release and the conversion of T4 to T3.[5] Both thyroid dysfunction and diabetes are significant public health concerns in Nepal worsened by iodine deficiency, and urban lifestyle changes contributing to obesity and metabolic syndrome.[6-8] Studies have revealed that there is high prevalence in thyroid function profiles in diabetic subjects with overall prevalence of hypothyroidism as high as 25% in some geographical areas.[9,10] Addressing thyroid dysfunction in diabetic patients is crucial for optimal disease management as untreated thyroid dysfunction can invariably affect glycemic control and contributes to cardiovascular complications.[11] On this account, this research study aims to assess the prevalence of thyroid disorders amongst Type 2 diabetic patients in western Nepal. The findings can also open the door to future studies to evaluate whether regular screening of Thy-

roid function would be beneficial in Type 2 DM patient.

## METHODS

This was an observational hospital-based study conducted at the Diabetes Endocrine Outpatient Department (OPD), Medicine OPD, and among indoor patients of these units at Nepalgunj Medical College, Nepalgunj with a cross-sectional design. The study was carried out at Diabetic endocrine outpatient department (OPD), Medicine OPD and among patients in in-patient department (IPD) at Nepalgunj Medical College, Nepalgunj from April 2021 to December 2021. The study utilized a non-probability consecutive sampling technique, where all eligible patients who met the inclusion criteria and provided consent during the study period were included. A total of 100 patients with T2DM were enrolled in the study. Data were collected using a structured proforma that included demographic details, clinical history, and relevant investigations. After obtaining informed consent, each patient underwent a thorough clinical examination, including height, weight, and blood pressure measurements. Laboratory investigations included fasting blood glucose, HbA1c, and thyroid function tests (T3, T4, and TSH levels). The participant's demographic information, duration of diabetes, glycemic control (HbA1c), and any history of medication use were recorded. Thyroid dysfunction was diagnosed based on the results of thyroid function tests. Subclinical hypothyroidism, clinical hypothyroidism, subclinical hyperthyroidism, and clinical hyperthyroidism were identified and categorized as per standard diagnostic criteria. The research was started after receiving ethical approval letter from Institutional review committee of Nepalgunj Medical College. (Date: 11 April 2021, Ref no: 558/077-078). Informed consent was obtained from all participants before their inclusion in the study. Patient diagnosed with Type 2 Diabetes Mellitus (T2DM) for more than 6 months under anti-diabetic medication in between 15 and 75 years were included in the study while patients with known thyroid disorders prior to the study, pregnant women, those with significant comorbidities or recent thyroid surgery or those who had the use of pulse corticosteroids, or radioiodine treatment, amiodarone or other medications that interfere with thyroid function were excluded from the study. The data collected in the course of the study was analyzed depending on factors such as gender, age, HbA1c values, duration of diabetes, and types of thyroid disorder. The collected data were entered into a Microsoft Excel sheet and analyzed using SPSS version 25. Descriptive statistics like frequencies and percentages were used to summarize the data. The prevalence of thyroid dysfunction was presented as percentages. No tests for statistical significance were applied in this study as the aim was to describe the prevalence and distribution of thyroid disorders among the study population rather than infer associations or causality. This methodological approach enabled a clear presentation of the prevalence of thyroid dysfunction in T2DM patients, reflecting patterns related to age, gender, glycemic control, and duration of diabetes.

**Study Related definitions of thyroid disorders.[12]**

| Thyroid Disorders | TSH | T3 | T4 |
|---|---|---|---|
| Hypothyroidism | elevated | decreased | decreased |
| Subclinical hypothyroidism | elevated | normal | normal |
| Hyperthyroidism | decreased | elevated | elevated |
| Subclinical Hyperthyroidism | decreased | normal | normal |

**A. Operational Definition of Diabetes according to ADA**

**Criteria for diagnosis of diabetes**

Fasting plasma glucose ≥126 mg/dL (7.0 mmol/L)*

Or

Two-hour post glucose ≥200 mg/dL (11.1 mmol/L) during an OGTT*

Or

HbA1C ≥6.5%*

Or

In a patient with classic symptoms of hyperglycemia or hyperglycemia crisis, a random plasma glucose ≥200 mg/dL (11.1 mmol/L)

In the absence of unequivocal hyperglycemia, results should be confirmed by repeat testing.

Fasting is defined as no caloric intake for at least 8 hours

OGTT (oral glucose tolerance test) should be performed using a glucose load equivalent of 75 g anhydrous glucose dissolved in water.[13]

## RESULTS

### 1. Thyroid Status and Gender Distribution

Among the 100 participants, 37% had abnormal thyroid function whereas 63% of the participants had normal thyroid function. Of the entire male participants, 34.8% (16 out of 46) patients were diagnosed with thyroid dysfunction, and 6.52% (30 out of 46) participants had normal thyroid hormone levels. In contrast, 38.9% (21 out of 54) of the female participants had thyroid disorder, while 61.1% (33 out of 54) of the female participants had normal thyroid function.

| Sex | Thyroid Status | | Total |
|---|---|---|---|
| | Normal | Thyroid Dysfunction | |
| Male | 30 (65.2%) | 16 (34.8%) | 46 |
| Female | 33 61.1% | 21 (38.9%) | 54 |

***Table I: Gender Distribution of Thyroid Status of the Participants***

**2. Thyroid Status and Age Distribution**

The occurrence of thyroid dysfunction was however more common in certain age groups. Participants over 50 years of age had the high prevalence of thyroid dysfunction with 22 out of 56 (39.3%) of the participants being affected. Between the age group 41-50 years, 11 (42.3%) participant developed thyroid dysfunction. The patients of age group 31-40 years had 3 (23. 1%) participants having thyroid dysfunction whereas the age group 20-30 had only 1 (20%) participant with thyroid dysfunction (Table II)

| Age Group | Thyroid Status | | Total |
|---|---|---|---|
| | Normal | Thyroid Dysfunction | |
| 20-30 | 4 | 1 | 5 |
| 31-40 | 10 | 3 | 13 |
| 41-50 | 15 | 11 | 26 |
| >50 | 34 | 22 | 56 |
| Total | 63 | 37 | 100 |

***Table: II Thyroid Status among participants of Different Age groups***

**3. Thyroid Status and HbA1c Levels**

Our study showed that increased level of HbA1c is associated with an increased risk of thyroid dysfunction. Of the participants with HbA1c ranging from 6.5-7.0%, 25% (2 of 8) had thyroid dysfunction. In the HbA1c range of 7.1-8.0%, 39.1% (9 out of 23) had thyroid dysfunction, while in participants with HbA1c levels >8.0%, 37.7% (26 out of 69) had thyroid dysfunction (Table III).

| HBA1C | Thyroid Status | | Total |
|---|---|---|---|
| | Normal | Thyroid Dysfunction | |
| 6.5-7.0 | 6 | 2 | 8 |
| 7.1-8.0 | 14 | 9 | 23 |
| >8.0 | 43 | 26 | 69 |
| Total | 63 | 37 | 100 |

***Table III: Thyroid Status among the Participants according to their HBA1C level***

**4. Thyroid status and duration of Diabetes**

The prevalence of thyroid dysfunction was significantly higher among the Diabetic patients and the highest prevalence of the thyroid dysfunction was depicted among the patients who had the longer duration of diabetes. Among participants with diabetes over 13 years of duration, 36.2% (17 out of 47) had thyroid dysfunction. The thyroid dysfunction was seen in 50% of the participants (13 out of 26) with duration of diabetes 10-12 years. In participants with diabetes for 5-9 years, 23.8% (5 out of 21) had thyroid dysfunction, while those with diabetes for less than 4 years showed prevalence of thyroid dysfunction of 33.3% (2 out of 6) which is higher compared to those with 5-9 years duration of diabetes (Table IV)

| Duration of DM in Years | Thyroid Status | | Total |
|---|---|---|---|
| | Normal | Thyroid Dysfunction | |
| 0-4 | 4 | 2 | 6 |
| 5-9 | 16 | 5 | 21 |
| 10-12 | 13 | 13 | 26 |
| >13 | 30 | 17 | 47 |
| Total | 63 | 37 | 100 |

***Table IV: Thyroid status of Participants based on their duration of Diabetes Mellitus***

**5. Types of Thyroid Disorders**

Out of the total participants, the most common thyroid disorder present was subclinical hypothyroidism present in 17% of the total participants. We also identified clinical hypothyroidism in 13% patients, subclinical hyperthyroidism in 3% patients and clinical hyperthyroidism in 4% patients. There were more female patients that had subclinical hypothyroidism in the study with prevalence being 20.4% in female and 13.04% in male (Table V).

| | Thyroid Status | | | | | Total |
|---|---|---|---|---|---|---|
| | Normal | Subclinical hypothyroidism | Clinical hypothyroidism | Subclinical hyperthyroidism | Clinical hyperthyroidism | |
| Male | 30 | 6 | 5 | 2 | 3 | 46 |
| Female | 33 | 11 | 8 | 1 | 1 | 54 |
| Total | 63 | 17 | 13 | 3 | 4 | 100 |

***Table V: Types of thyroid Disorder among various genders***

Overall, the results presented here show that thyroid pathology is highly prevalent in Type 2 Diabetes Mellitus patients with proportional differences in male and female, increasing age, elevated HbA1c level, and duration of diabetes.

**DISCUSSION**

The present study done in the Western part of Nepal highlights about the thyroid dysfunctions in T2DM patients. The result demonstrated that 37% of the T2DM patients had thyroid dysfunction where 38.9% of the female patients had thyroid dysfunction as compared to only 34.8% of the male patients. These results are consistent with other studies that report a higher prevalence of thyroid dysfunction among the people with diabetes.[14, 15]

Abnormalities of thyroid function are often observed in diabetics especially in patients with poor glycemic control. HbA1c level was significantly associated with the prevalence of thyroid dysfunction, people with higher HbA1c had more tendency to have thyroid dysfunction. In particular, thyroid disorder was found in 37.7% of patients with HbA1c >8%, the finding that

is consistent with the previous studies wherein poor glycemic control is associated with higher risk of thyroid disease.[16] This aligns line with the view that both insulin resistance and thyroid dysfunction share common metabolic pathways, including dysregulation of lipid metabolism and increased inflammatory markers.[17]

We found out that the rate of thyroid dysfunction was significantly higher in elderly patients comprising patients who are more than 50 years of age (22%). This finding agrees with the general decrease in thyroid hormone concentrations that is associated with ageing as described in the literature.[18] A more prolonged diabetes duration also has amplified thyroid dysfunction with patients having diabetes for >13 years having a thyroid dysfunction prevalence of 36.2%.[19] This depicts the importance of early thyroid screening in diabetic individuals especially in those with long-standing diabetes.[20]

Our study also found that hypothyroidism, both subclinical and clinical, was the most common form of thyroid disease, accounting for 30% of thyroid dysfunction cases. Female preponderance was noted in subclinical hypothyroidism, there being elevated female to male ratio similar to other studies done in the global context which depicts that woman are more vulnerable to thyroid ailments especially hypothyroidism.[21]

These results, therefore, have major clinical implications. Thyroid dysfunction in diabetic patients can exacerbate metabolic issues, complicating glycemic control and increasing the risk of cardiovascular complications.[22] It is advocated that screening for thyroid disorders should be carried routinely in T2DM patients, especially in those with the poor glycemic control and long duration of disease, and among the elderly population.[23] It is likely that early diagnosis of hypothyroidism or hyperthyroidism might have a positive impact on the patient's overall metabolic profile and decrease the possibility of developing complications in diabetic patients.

## LIMITATION

The major limitation of this study was the sample size.

## CONCLUSION

This study reveals a notable prevalence f thyroid dysfunction among Type 2 Diabetes Mellitus (T2DM) patients. The results highlight that thyroid dysfunction is more common in female patients and tends to increase with age, poor glycemic control (higher HbA1c levels), and longer duration of diabetes. It was further detected that subclinical hypothyroidism was the most common type of thyroid disorder, more common in the female patients. The relationship between thyroid dysfunction and poor glycemic control further stresses the regular screening of thyroid abnormalities among T2DM patients, especially those with poor blood glucose profile and of long duration of the disease. Early detection and management of thyroid disorders in diabetic patients could lead to better glycemic control and reduce the risk of cardiovascular and metabolic complications. Therefore, the results of this study favor the implementation of thyroid screening as an essential element in the care of T2DM patients to enhance the patient's overall status. To enhance the knowledge about associated outcomes of thyroid dysfunction based on diabetes further large scale and longitudinal studies are advised.

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