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# THYROID PROFILE STATUS IN PATIENTS OF TYPE 2 DIABETES MELLITUS ATTENDING THE TERTIARY CARE HOSPITAL OF NATIONAL MEDICAL COLLEGE AND TEACHING HOSPITAL

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## ABSTRACT

Diabetes mellitus and thyroid disorders are the most common endocrinopathies. Thyroid disorders are pathological states that can adversely affect glycemic control in diabetics and has the potential to affect their health. Hypothyroidism is found commonly in diabetes and is associated with advanced age, particularly in type 2 diabetes. The current study was a Comparative Cross-sectional and hospital-based study which was undertaken in the Outpatients and Inpatient Department of NMCTH, Birgunj, Parsa, Madhesh Province, Nepal. The study variables for the study were Fasting Blood sugar, postprandial blood sugar, HbA1C, fT3, fT4, TSH, Age, and Gender. We had enrolled two hundred and fifty participants, out of which 60% were male and 40% were female participants. In our population the pattern of thyroid status showed that euthyroidism predominated contributing 64.8%, followed by subclinical hypothyroidism (24%) and then primary hypothyroidism (11.2%). There was significant positive correlation with FBS, PPBS, HbA1C and TSH having correlation coefficient (0.23, 0.00), (0.20, 0.00), (0.16, 0.00) and (0.67, 0.00) respectively. There was a significant negative correlation with fT3 and fT4 having correlation coefficients (-0.32, 0.00) and (-0.28, 0.00) respectively. Our study revealed that subclinical and primary hypothyroidism may occur in the diabetic population. Once the diabetes is diagnosed the patients should be screened for the thyroid profile to diagnose the thyroid abnormalities mainly hypothyroidism.

**Index Terms: Diabetes mellitus, Hypothyroidism, Thyroid profile**

# INTRODUCTION

Diabetes mellitus and thyroid disorders are the most common endocrinopathies [1]. Thyroid disorders are pathological states that can adversely affect glycemic control in diabetics and has the potential to affect their health. Hypothyroidism is found commonly in diabetes and is associated with advanced age, particularly in type 2 diabetes [2]. Thyroid hormones play key roles in the metabolism of glucose, and lipids, especially in cholesterol metabolism, and participate in other biochemical processes [3].

Patients with diabetes mellitus are more prone to have thyroid disorders, especially to those with poor glycemic control. Firstly, in diabetic patients, the nocturnal TSH peak is blunted and the TSH response to the hypothalamus is not functional, which leads to hypothyroidism [4]. Secondly, low T3 in diabetes mellitus is due to impairment in the peripheral conversion of T4 to T3 [3].

Many studies reported the association of thyroid dysfunction with type 2 diabetes mellitus [5-7]. It has been shown that thyroid hormones play key roles in carbohydrate metabolism and pancreatic function [8]. The worldwide prevalence of thyroid disorders and diabetes mellitus are 6.6% to 13.4% and 10% to 24% respectively [9,10].

Diabetes and hypothyroidism are present in our population. This study aimed to compare the thyroid hormones (fT3 and fT4) and Thyroid Stimulating Hormone (TSH) levels in the diabetic and healthy populations.

# METHODOLOGY

The current study was a Comparative Cross-sectional and hospital-based study which was undertaken in the Outpatients and Inpatient Department of NMCTH, Birgunj, Parsa, Madhesh Province, Nepal. One hundred thirty-five (135) diabetic and hundred fifteen (115) healthy subjects were enrolled for the study within the study duration period of five months (November 2021 to March 2022). The verbal and written consent was taken from the patients before enrolling into our study. Non-probability purposive sampling technique was used for the sample collection. The study variables for the study were Fasting Blood sugar, Postprandial blood sugar, HbA1C, fT3, fT4, TSH, Age, and Gender.

Chemiluminescence Immunoassay (CLIA) techniques will be used for the estimation of the thyroid profile (fT3, fT4, and TSH). A fully automated clinical chemistry analyzer (Beckmann Coulter) was used to measure the lipid profile and the sugar profile in the patient's serum. The statistical tools MsExcel version 10 and Statistical Package for Social Science (SPSS) version 22 was used for the analysis and interpretation of the data. Ethical clearance was obtained from Institutional Review Committee (IRC), National Medical College and Teaching Hospital, Birgunj, Nepal before starting the research (Ref no: F-NMC/545/078-079).

## *Statistical Analyses*

All the data were entered in Microsoft Excel 2010 and converted to SPSS version 22 accordingly. Frequency and percentage will be calculated for descriptive statistics. The Chi-square test was applied to compare the categorical variables. Student's t-test was used to compare the mean between the two groups. Continuous data were expressed in the mean $\pm$ SD. Pearson correlation was applied for parametric data. P-value $<0.05$ was considered statistically significant.

***Inclusion Criteria:*** Diabetes Mellitus patients who visited the inpatient and outpatient Department of the National Medical College and Teaching Hospital during the study period.

***Exclusion Criteria:*** Those patients who were not willing to participate in our study will be excluded from our study.

# RESULTS

The current study investigated the thyroid profile status in Type 2 Diabetes mellitus patients in a tertiary care hospital at National Medical College, Birgunj, Nepal. We had enrolled two hundred and fifty participants, out of which 60% were male and 40% participants were female as depicted in figure 1.

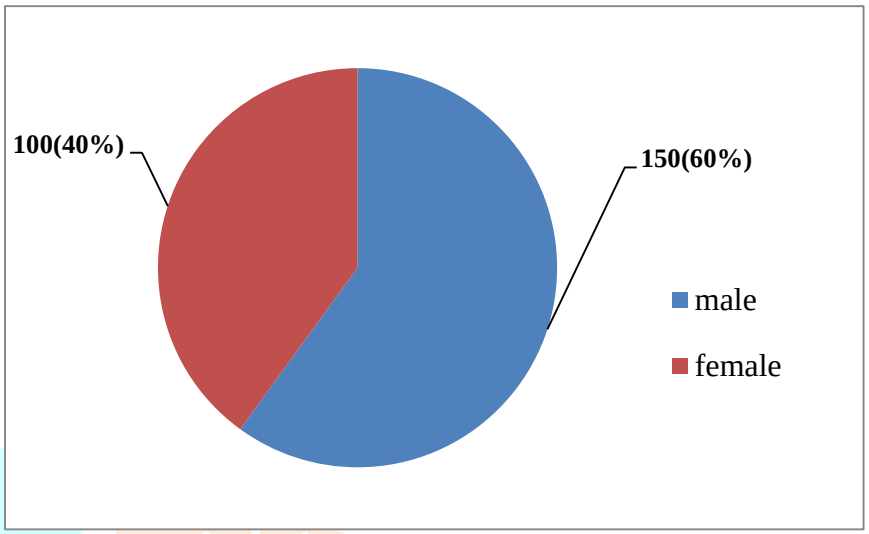


**figure 1: gender wise distribution of the population (n=250)**

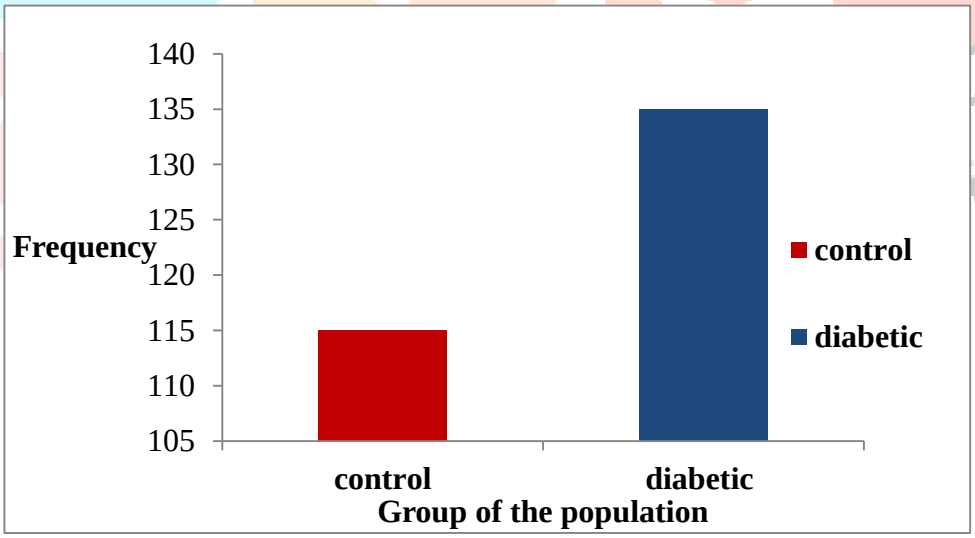


**figure 2: frequency distribution of diabetic and non-diabetic control subjects (n=250)**

Figure 2 reveals the frequency distribution of diabetic and control participants which were respectively 135 (54%) and 115 (46%).

In our population the pattern of thyroid status showed that euthyroidism predominated contributing 64.8%, followed by subclinical hypothyroidism (24%) and then primary hypothyroidism (11.2%), as depicted in figure 3.

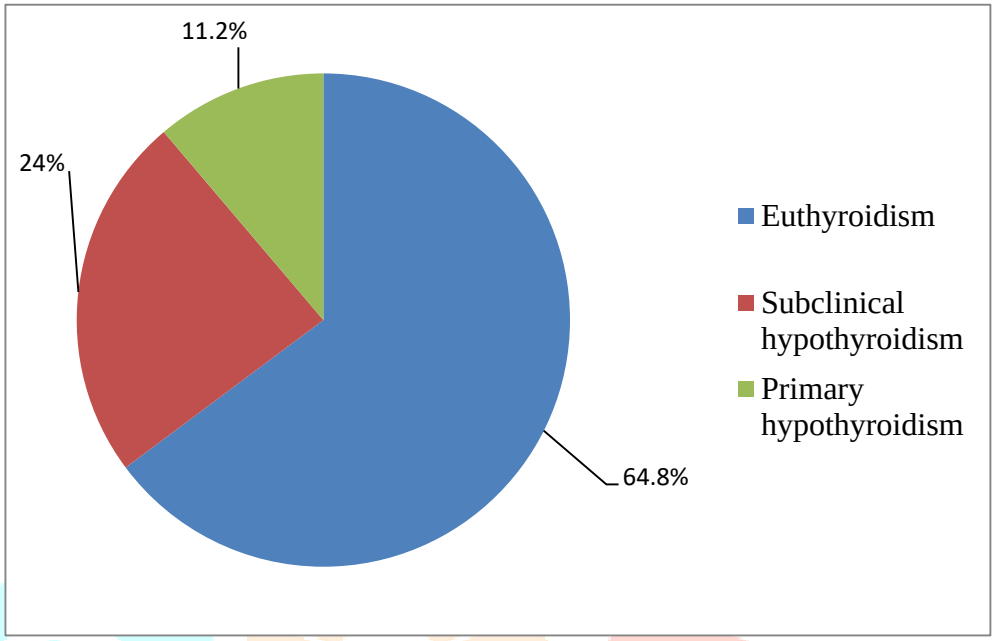


**figure 3: thyroid status in study participants (n=250)**

The mean age groups between the diabetic and control populations were compared. No significant differences were observed. After that, thyroid profiles and diabetic profiles were compared; statistically significant differences in $fT_3$, TSH, FBS, PPBS, and $HbA_1C$ were found. However, no statistically significant difference in $fT_4$ was found between the control and diabetic population, as illustrated in table 1.

**table 1: comparison of study variables between diabetic and control groups**

| S.no | Variables | Diabetic population (n= 135 ) | Control group (n=115 ) | P value * |
|---|---|---|---|---|
| 1. | Age | 53.207 ± 12.00 | 52.504 ± 12.79 | 0.65 |
| 2. | $fT_3$ | 2.75 ± 0.77 | 2.93 ± 0.65 | 0.04* |
| 3. | $fT_4$ | 0.87 ± 0.28 | 0.90 ± 0.22 | 0.36 |
| 4. | TSH | 5.72 ± 3.45 | 4.43 ± 3.28 | 0.00* |
| 5. | FBS | 165.65 ± 60.37 | 102.93 ± 16.79 | 0.00* |
| 6. | PPBS | 285.47 ± 90.64 | 163.99 ± 40.26 | 0.00* |
| 7. | $HbA_1C$ | 8.30 ± 1.91 | 5.38 ± 0.72 | 0.00* |

Table 2 shows the Crosstabulation of diabetes and thyroid status. Our results revealed that the normal thyroid status is euthyroidism was predominant in both diabetic and control participants contributing 52.6% and 79.1% respectively. However, subclinical and primary hypothyroidism were significantly higher percentages in diabetic patients than in control subjects. In row percentage, primary and subclinical hypothyroidism respectively contributes 15.6% and 31.9% in diabetic population.

**table 2: pattern of thyroid status in diabetic and control population (n=250)**

| Diabetic status | Thyroid status | | | P-value* |
|---|---|---|---|---|
| | Euthyroidism | Primary Hypothyroidism | Subclinical Hypothyroidism | |
| Control | 91 (79.1%) | 7(6.1%) | 17 (14.8%) | 0.00* |
| Diabetic | 71 (52.6%) | 21 (15.6%) | 43 (31.9%) | |
| Total | 162(64.8%) | 28(11.2%) | 60 (24.0%) | |

Table 3 illustrates the Pearson correlation analysis of variables with the thyroid status. There was significant positive correlation with FBS, PPBS, HbA1C and TSH having correlation coefficient (0.23, 0.00), (0.20, 0.00), (0.16, 0.00) and (0.67, 0.00) respectively. There was a significant negative correlation with fT3 and fT4 having correlation coefficients (-0.32, 0.00) and (-0.28, 0.00) respectively.

**table 3: correlation of variables with the thyroid status (n=250)**

| Variables | r value | P value* |
|---|---|---|
| FBS | 0.23 | 0.00 |
| PPBS | 0.20 | 0.00 |
| HbA1C | 0.16 | 0.00 |
| fT3 | -0.32 | 0.00 |
| fT4 | -0.28 | 0.00 |
| TSH | 0.67 | 0.00 |

# DISCUSSION

Our study revealed a higher incidence of subclinical and primary hypothyroidism in the diabetic group in comparison to that of the control group. TSH level was significantly higher in diabetic groups, in agreement with the study by Raval R et al. They reported the higher level of TSH and lower level of T3 and T4 level in the diabetic population [11]. It has been reported that in diabetic patients, TSH level is blunted and there is no response of the hypothalamus finally which leads to hypothyroidism [4]. Moreover, the activity of peripheral deiodinase is diminished; this ultimately leads to decreased T3 levels [3].

The current study also revealed that subclinical hypothyroidism was more predominant than primary hypothyroidism in both diabetic and control groups. This supports the study by Nobre et al, as they reported 12.5% of diabetic patients were having hypothyroidism [12]. Another study by Ashok et al also highlighted that subclinical hypothyroidism is the most common thyroid disorder in the diabetic population [13].

On the Pearson correlation analysis, our study revealed that diabetic profiles (FBS, PPBS, and HbA1C) were positively correlated with thyroid status and negatively correlated with fT3 and fT4 levels and which were statistically significant. A study by Bazrafshan et al, also found similar types of findings including a significant correlation between TSH levels with HbA1C [14].

The present study showed a statistically significant difference in fT3 and TSH levels between the diabetic and control groups. However, no significant difference was observed in the fT4 levels between the diabetic and control groups. This may be due to decreased activity of peripheral deiodinase in hypothyroid individuals, as reported by Singh G et al [3]. Some authors reported that in poorly managed diabetes patients it has been found that a low T3 state is characterized by low free T3 levels [14, 15].

# CONCLUSION

Our study revealed that subclinical and primary hypothyroidism may occur in the diabetic population. Once the diabetes is diagnosed the patients should be screened for the thyroid profile to diagnose the cases of thyroid abnormalities mainly hypothyroidism.

# ACKNOWLEDGEMENT

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# DISCLOSURE

The authors declare that there is no conflict of interest with any scientific or financial organization.

# AUTHORS CONTRIBUTION

All the authors had a substantial contribution to the preparation of this manuscript.

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