International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Original Article

A Comparative Study of Thyroid Function in Patients of Type 2 Diabetes Mellitus without Nephropathy and Type 2 Diabetes Mellitus with Nephropathy

Dr. Rama Meena[1], Dr. Kusum Bala Jain[2], Dr. Gulab Kanwar[3], Dr. Shiv Kumar Rathod[4], Dr. Sunil Kumar Bairwa[5]

[1,2,3,4,5] Department of Biochemistry, Government Medical College, Kota (Rajasthan) – 324010

OPEN ACCESS

Corresponding Author:

Dr. Rama Meena
Department of Biochemistry,
Government Medical College, Kota
(Rajasthan) – 324010

Received: 28-09-2025
Accepted: 13-11-2025
Available online: 28-11-2025

Copyright © *International Journal of Medical and Pharmaceutical Research*

ABSTRACT

Background: Thyroid dysfunction is very closely related to Type 2 Diabetes Mellitus and may even exacerbate the complications associated with diabetes, such as nephropathy. A proper understanding of thyroid abnormalities in diabetic nephropathy is essential for the better management of the disease. **Objective:** The study aims to compare the thyroid hormone profile Triiodothyronine (T3), Thyroxine (T4), and Thyroid-Stimulating Hormone (TSH)in T2DM patients with and without nephropathy and also to study the spectrum of thyroid dysfunction in these two groups. **Methods**: This is an analytical cross-sectional study that included 100 T2DM patients without nephropathy and 100 T2DM patients with diagnosed diabetic nephropathy. Fasting plasma glucose (FPG), serum urea, creatinine, T3, T4, and TSH were measured. Standard biochemical methods and reference ranges were used. Statistical significance was evaluated using $p<0.05$. **Results:** The mean serum urea and creatinine levels were significantly higher in T2DM patients with nephropathy than in diabetics without nephropathy. Thyroid dysfunction, predominantly subclinical hypothyroidism, was more common in DN patients. Serum T3 and T4 levels were lower, while TSH levels were higher in both diabetic groups, but the alterations were more marked in DN cases. **Conclusion:** Thyroid abnormalities, particularly subclinical hypothyroidism, are highly prevalent in T2DM and still more so in DN. Routine screening for thyroid dysfunction in diabetics, especially in those with nephropathy, is thus advisable to avoid metabolic deterioration.

Keywords*: Thyroid dysfunction, Diabetes Mellitus type 2, Diabetic Nephropathy.*

INTRODUCTION

One of the most common endocrine diseases is diabetes mellitus. It involves multiple organ systems and results in significant morbidity from complications that are influenced by lifestyle, environmental, and genetic factors. Dyslipidemia, cardiovascular disease, hypothyroidism, and an increased risk for infections are some conditions that are influenced by poor glycemic control.**[1] [2]**

The most prevalent form of diabetes, type 2 diabetes mellitus, results from impaired beta-cell function and insulin resistance. Thyroid hormones play a crucial role in metabolic regulation, affecting carbohydrate, lipid, and energy balance. Thyroid dysfunction—especially hypothyroidism and subclinical hypothyroidism—is more common in diabetics and can worsen glucose control by altering hepatic glucose production and peripheral utilization.**[3,4]**

Hyperthyroidism can also deteriorate glycemic control by increasing gluconeogenesis and insulin resistance. Due to these interactions, the ADA recommends regular thyroid screening in diabetics. Chronic kidney disease (CKD), particularly diabetic kidney disease (DKD), is a major complication of diabetes and is strongly associated with thyroid abnormalities. Subclinical hypothyroidism is considered an independent risk factor for diabetic nephropathy.**[5]**

This study aims to evaluate thyroid disorders in patients with uncomplicated T2DM and those with diabetic nephropathy.

MATERIAL AND METHODS

The present study included 300 subjects divided into three groups: Group A, patients with Uncomplicated Type 2 Diabetes Mellitus (T2DM); Group B – T2DM patients with Diabetic Nephropathy.Group C, age- and gender-matched healthy controls. Type 2 Diabetes Mellitus was defined according to the American Diabetes Association (ADA) criteria, whereas diabetic nephropathy was diagnosed based on increased urinary albumin excretion. History of patients was taken and clinical examination was done. Exclusion criteria: 1. Patients on drugs that alter thyroid hormones. 2. Patients with chronic illnesses, such as heart failure, hepatic or renal disease, or malignancy. 3. Pregnant females. 4. Type 1 diabetes mellitus. Collection of sample: 5 ml of venous blood was collected under aseptic precautions and distributed into different vials for various biochemical tests.

Following parameters were estimated: •Fasting Blood Glucose •Serum Urea •Serum Creatinine •Serum T3, T4 and TSH

The tests were performed on automated analyzers using standard kits and procedures. Statistical Method: The data obtained were compiled and analyzed using appropriate statistical tests. A p-value < 0.05 was considered statistically significant.

RESULT

Among 200 diabetic patients recruited in the study, out of which 100 were without diabetic nephropathy and 100 with diabetic nephropathy. Mean age of patient with and without nephropathy was 51.50 ± 7.95 and 60 ± 4.51 years respectively. The mean value of T3 was 1.26 ± 0.41 in group 1 and 1.00 ± 0.32 in group 2. So T3 was decreased in group 2 as compared to group 1. The mean value of TSH was 3.45 ± 3.87 in group 1 and 5.01 ± 5.09 in group 2. So TSH was increased in group 2 as compared to group 1. TSH was found to be increasing trend with increased values of serum creatinine in diabetic nephropathy.

Association of thyroid dysfunction with prevalence of diabetic nephropathy:

To investigate the association of thyroid dysfunction with diabetic nephropathy, the prevalence of thyroid dysfunction in group 1 was compared with that of group 2. In group 1 there were 86% euthyroid patients, 10% subclinical hypothyroidism and 4% overt hypothyroidism patients. In group 2 there were 65% euthyroid patients, 26% subclinical hypothyroidism and 9% overt hypothyroidism patients respectively.

TSH levels were positively correlated and T3-T4 negatively correlated with serum creatinine and FBS levels with p value statistically significant ($p<0.05$).

P value was significant, so the prevalence of thyroid disorder was found to be higher in group 2. The prevalence of thyroid dysfunction was found to be more in females as compared to males in both the groups.

Table 1 presents the Pearson correlation coefficients between thyroid function tests, serum creatinine, and fasting blood sugar (FBS) in Type 2 Diabetes Mellitus (T2DM) patients without nephropathy. It indicates a statistically significant positive correlation between Thyroid Stimulating Hormone (TSH) and both serum creatinine and FBS. Conversely, a negative correlation exists between Triiodothyronine (T3)/Thyroxine (T4) levels with serum creatinine and FBS, though this correlation is not statistically significant. The significance level is indicated by p=<0.05. Table 2 showcases similar findings in T2DM patients with nephropathy, highlighting a statistically significant positive correlation for TSH with serum creatinine and FBS. It also notes a negative correlation of FBS with T4, which is statistically significant, whilst maintaining a negative correlation for T3/T4 with serum creatinine and FBS that is not statistically significant.

Table 1: Correlation between thyroid function test variables, FBS and serum creatinine in T2DM patients without nephropathy

Parameter	TSH		T3		T4	
	r value	p value	r value	p value	r value	p value
FBS	0.23	<0.05	-0.008	0.937	-0.029	0.774
S. Creatinine	0.37	<0.05	0.006	0.952	-0.014	0.89

Table 2: Correlation between thyroid function test variables, FBS and serum creatinine in T2DM patients with nephropathy

Parameter	TSH		T3		T4	
	r value	p value	r value	p value	r value	p value
FBS	0.29	<0.05	-0.19	0.583	-0.21	<0.05
S. Creatinine	0.42	<0.05	-0.119	0.238	-0.189	0.596

DISCUSSION

This study evaluated serum **T3, T4, TSH, creatinine, urea, and fasting blood sugar** in 200 Type 2 Diabetes Mellitus (T2DM) patients divided into two groups: those without nephropathy (Group 1, n=100) and those with nephropathy (Group 2, n=100). Only patients on conservative management were included to avoid confounding effects from dialysis.

Key Findings:

- **Demographics:** The majority of subjects in both groups were in the **51-60 years** age range, with a higher prevalence in **males** (approx. 63% in Group 1, 62% in Group 2). Group 2 (with nephropathy) had a slightly older mean age (60 ± 4.51) than Group 1 (51.50 ± 7.95).
- **Duration of Diabetes:** Diabetic Nephropathy (DN) was strongly associated with a longer duration of diabetes. The majority of patients in Group 1 had diabetes for **1-5 years (72%)**, while the majority in Group 2 had diabetes for **6-10 years (56%)**, supporting that DN is a long-term complication.

  This observation is also similar to **Kapur et al**., who reported that maximum number of cases were diagnosed between 40 and 59 years of age. **[6]**

  Similar study done by **Furukawa et al** in 2014 found that mean age of patients in group 1 was 61.6±10.7 years and 60% were male. In group 2 mean age of patients was 61±11.5 years and 72.4% were male. **[7]**
- **Prevalence of Hypothyroidism:**
  - **Overt Hypothyroidism:** Found in **4%** of Group 1 and **9%** of Group 2, suggesting a higher risk in DN patients.
  - This is supported by similar studies showing higher rates of subclinical hypothyroidism in DN patients (e.g., 20.7% in DN vs. 8.7% in non-DN diabetics by Furukawa et al.).**[7]**
- **Thyroid Profile vs. Age/Gender:**
  - **Age:** All patients in the 41-50 years age group were euthyroid. Among those with an abnormal thyroid profile, **71.5%** were in the **61-70 years** age group. These findings contradict with that of **Chubb et al. [8]** who in their study found that age and anti-TPO status correlates with altered thyroid profile in diabetic patients.
  - **Gender:** An abnormal thyroid profile was significantly more prevalent in **females** in both groups (Group 1: 85.7% female; Group 2: 71.5% female), aligning with other studies. Furthermore, **Vondra et al.** and **Cardoso et al.** found a significant correlation between female gender and altered thyroid profile. **[9]**
- **Thyroid Profile vs. Duration:** Patients with abnormal thyroid profiles in Group 1 were primarily in the **6-10 years** duration category (57.1%).

Abnormal Thyroid Profile

In present study, mean value of T3 in group 1 was 1.26±0.41 ng/ml as compare to 1.00 ±0.32 ng/ml in group 2. The mean value of T4 in group 1 was 10.04 ± 2.44 µg/dl and 9.00 ± 2.87 µg/dl in group 2 indicating decreasing trend of T3 and T4 in group 2 which was comparable to study done by **Srinidhi et al. [10]** and **Sharma RK et al. [11]**

In this study found a higher prevalence of overt hypothyroidism in T2DM patients with nephropathy and confirmed that DN is associated with a longer duration of diabetes. Thyroid dysfunction was more common in older, female patients with longer-standing T2DM.

CONCLUSION

In the present study, we have observed abnormal thyroid hormone levels among type 2 diabetics without nephropathy and type 2 diabetics with nephropathy. The results may improve our understanding about the relationship between thyroid function and DN and thus may imply the necessity of regular monitoring of thyroid function in DN patients. Meanwhile, these results may provide evidence for new therapeutic strategies on DN in the future. Failure to recognize the presence of abnormal thyroid function may be a primary cause of poor management of diabetes mellitus. Therefore, there is need for the routine assay of thyroid hormones in type 2 diabetics and diabetic nephropathy in order to improve the quality of life and reduce the morbidity.

REFERENCES

1. Shekhar Chandra Yadav, Alwin Saldhana, Biswajit Majumdar. Status of Thyroid profile In Type-2 Diabetes Mellitus. Journal of Nobel Medical College. 2012; 2:64
2. Banarasidas Bhanot, Park K. Textbook of preventive and social medicine. 19th ed. Jabalpur: India; 2007; 327-32.
3. Patlak M. New weapons to combat an ancient disease: treating diabetes.FASEB J 2002 Dec;16(14):1853.
4. Maitra A, Abbas AK. Endocrine system. In: Kumar V, Fausto N, Abbas AK (eds). Robbins and Cotran Pathologic basis of disease (7th ed) 2005. Philadelphia, Saunders; 1156-1226
5. WHO 1985. Diabetes mellitus. Tech. Rep. Ser.No.646.

6. Sreelatha M. Study of Thyroid Profile in Patients with Type 2 Diabetes Mellitus. Int J Sci Stud 2017;5(2):211-220.
7. Furukawa S, Yamamoto S, Todo Y, Maruyama K, Miyake T, Ueda T, et al. Association between subclinical hypothyroidism and diabetic nephropathy in patients with type 2 diabetes mellitus. Endocr J. 2014; 61(10): 1011-8.
8. Chubba A, Davis A, Inman Z, Davis M. Prevalence and progression of subclinical hypothyroidism in women with type 2 diabetes. The Fremantle Diabetes Study Cli Endocrinol (oxf). 2005; 62(4): 480-486.
9. Sreelatha M. Study of Thyroid Profile in Patients with Type 2 Diabetes Mellitus. Int J Sci Stud 2017;5(2):211-220.
10. Srinidhi Rai et al., Thyroid Function in Type 2 Diabetes Mellitus and in Diabetic Nephropathy, Journal of Clinical and Diagnostic Research. 2013 Aug, Vol-7(8): 1583-1585
11. Sharma RK, Sharma AK, Puri S, Singh B, Sharma R, Neki NS, Aloona S, Chavan V, Puri N, Garg S. A Comparative Study of Thyroid Function in Patients of Type 2 Diabetes Mellitus without Int. Med. Den. Res. 2017; 3(2):ME11-ME15.