Barind Medical College Journal
Abbreviated Key Title: BMCJ
ISSN: 2518-3249 (Print)
https://bmcj.org/index.php/bmcj
Volume-10 | Issue-1 | Jan-Jun, 2024 | DOI: https://doi.org/10.70818/bmcj.2024.v010i01.029

OPEN ACCESS

Original Research Article

Thyroid Dysfunction in Patient with Type 2 Diabetes Mellitus: An Observational Study

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Article History
Received: 29.03.2024
Accepted: 18.04.2024
Published: 30.06.2024

Abstract: ***Background*:** Thyroid dysfunction is a common comorbidity in type 2 diabetes mellitus (T2DM), significantly impacting glycemic control and metabolic health. Understanding its prevalence and patterns is crucial for optimizing patient management. This study aimed to evaluate the spectrum of thyroid dysfunction in adult patients with T2DM. ***Methods:*** This cross-sectional observational study was conducted in the Department of Medicine, Comilla Medical College, Cumilla, Bangladesh, involving 87 adult patients aged ≥30 years with diagnosed T2DM. Participants were selected through purposive sampling. Data on clinical characteristics and thyroid function tests were analyzed using MS Office tools. ***Results:*** Among 87 adult T2DM patients, 13% exhibited thyroid dysfunction. Subclinical hypothyroidism was most common (8.0%), followed by subclinical hyperthyroidism (3.4%) and overt hypothyroidism (1.2%). Dyslipidemia was prevalent, with 71.3% having elevated LDL-C, 65.5% reduced HDL-C, and 50.6% hypertriglyceridemia. Poor glycemic control (HbA1C ≥7%) was noted in 85% of cases. ***Conclusion:*** Thyroid dysfunction, particularly subclinical hypothyroidism, was prevalent in T2DM patients. Dyslipidemia and poor glycemic control were also common. Regular thyroid screening and lipid profile management are essential for better diabetes management and patient outcomes.

Keywords: Dyslipidemia, Glycemic Control, Subclinical Hypothyroidism, Thyroid Dysfunction, Thyroid Function Tests, Type 2 Diabetes Mellitus.

Cite this as: Rahman HM, Ahammad M, Uddin MJ, Nafe SY, Faruk R. Thyroid Dysfunction in Patient with Type 2 Diabetes Mellitus: An Observational Study. BMCJ. 2024;10(1):66-71.

Introduction

Type 2 diabetes mellitus (T2DM) is a global health concern, characterized by insulin resistance and a relative insulin deficiency that leads to hyperglycemia and multiple organ complications. The prevalence of T2DM has increased significantly, with developing countries like Bangladesh experiencing a rapid rise in cases due to urbanization, lifestyle changes, and genetic predisposition.[1] T2DM is associated with various complications, including cardiovascular disease, nephropathy, neuropathy, and thyroid dysfunction.[2] Thyroid dysfunction is a frequently reported endocrine abnormality in patients with T2DM, with prevalence rates varying between 10% and 25% in different populations.[3] The thyroid gland plays a vital role in energy metabolism, thermogenesis, and the regulation of glucose and

lipid homeostasis.[4] Dysfunction of the thyroid gland in T2DM patients can exacerbate metabolic disturbances and impair glycemic control. Conversely, poorly controlled diabetes can alter the peripheral metabolism of thyroid hormones, leading to potential misdiagnoses or overlooked cases of thyroid dysfunction.[5] The spectrum of thyroid dysfunction in T2DM includes subclinical hypothyroidism, overt hypothyroidism, and, less commonly, hyperthyroidism. Subclinical hypothyroidism is the most prevalent form and has been associated with increased cardiovascular risk and poor glycemic outcomes.[6]

Thyroid hormone abnormalities may also worsen insulin resistance and promote dyslipidemia, further complicating diabetes management.[7] These interconnected pathways highlight the bidirectional relationship between thyroid and glucose metabolism, emphasizing the importance of thyroid function monitoring in T2DM patients.[8] Despite the growing body of evidence highlighting the interrelationship between thyroid dysfunction and T2DM, routine screening for thyroid disorders is often overlooked, particularly in resource-limited settings like Bangladesh. This gap in diagnosis and treatment may lead to delayed management of thyroid abnormalities, compounding the morbidity associated with T2DM.[9, 10] Addressing these challenges requires a comprehensive understanding of the patterns and implications of thyroid dysfunction in T2DM patients. This study was conducted to assess the prevalence and patterns of thyroid dysfunction among adult patients with T2DM in a tertiary care hospital in Bangladesh. By evaluating the clinical and laboratory features of thyroid dysfunction in this population, the findings aim to guide clinicians in the early diagnosis and management of this significant comorbidity, ultimately improving patient outcomes.

Methodology

This cross-sectional study included 87 adult patients aged ≥30 years with diagnosed type 2 diabetes mellitus (T2DM) who attended the Department of Medicine, Comilla Medical College, Cumilla, Bangladesh. A purposive sampling technique was used for sample selection.

Inclusion and Exclusion Criteria

Participants were selected based on predefined inclusion and exclusion criteria. Inclusion criteria comprised known and newly diagnosed T2DM patients who provided informed consent to participate in the study. Exclusion criteria included patients with type 1 diabetes mellitus, known thyroid disease, chronic renal failure, diabetic nephropathy, acute illness, hepatic dysfunction, psychiatric illness, pregnancy, or those undergoing treatment with drugs known to interfere with thyroid function. Patients unwilling to participate were also excluded.

Data Collection and Evaluation

All participants were thoroughly evaluated for thyroid dysfunction using thyroid profile tests, including serum triiodothyronine (T3), thyroxine (T4), and thyroid-stimulating hormone (TSH). Additional data were collected through a structured questionnaire, which included demographic information, medical history, and lifestyle factors. Physical examinations included body mass index (BMI) calculation and blood pressure measurement. Laboratory investigations performed for each participant included fasting blood sugar (FBS), postprandial blood sugar (PPBS), blood urea, serum creatinine, fasting lipid profile, hemoglobin A1C (HbA1C), and urinalysis. Urine spot protein-creatinine ratio, electrocardiogram (ECG), chest X-ray, and liver function tests were also conducted as part of the comprehensive evaluation.

Data Analysis

All collected data were analyzed using MS Office tools, ensuring accurate and systematic interpretation of clinical and laboratory findings to identify patterns and prevalence of thyroid dysfunction among the study population.

Result

In this study, the highest proportion of participants (39.1%) were in the 41–50 years age group, followed by 36.8% in the 51–60 years age group, 12.6% in the 61–70 years age group, and 11.5% in the 30–40 years age group. Regarding gender distribution, 64% of the participants were male, while 36% were female. Body mass index (BMI) analysis revealed that 58.6% of participants were overweight or obese, while 41.3% had a normal BMI. The duration of

diabetes mellitus (DM) among the participants showed that 58.6% had a disease duration of ≤5 years, 21.8% had a duration of 6–10 years, and 9.2% had a duration exceeding 10 years. In terms of treatment, 16.1% of participants were on insulin therapy, 65.5% were on oral hypoglycemic agents (OHA), and 18.4% were receiving a combination of OHA and insulin. A family history of DM was present in 44% of participants, while 56% had no such history. Among the participants, 49% had systemic hypertension, while 51% were normotensive. Glycemic control analysis revealed that 85% of participants had an HbA1C level of ≥7%, indicating poor control, whereas 15% had HbA1C <7%. Dyslipidemia was prevalent, with 50% of participants having elevated total cholesterol (TC), 71.3% with elevated low-density lipoprotein cholesterol (LDL-C), 65.5% with reduced high-density lipoprotein cholesterol (HDL-C), and 50.6% with hypertriglyceridemia. Thyroid function analysis showed that 13% of participants had abnormal thyroid profiles. Among these, 8.0% had subclinical hypothyroidism, 3.4% had subclinical hyperthyroidism, and 1.2% had overt hypothyroidism. The findings highlight a notable prevalence of thyroid dysfunction and dyslipidemia among T2DM patients.

Table 1: Age distribution

Age (Years)	n	%
30-40	10	11.5%
41-50	34	39.1%
51-60	32	36.8%
61-70	11	12.6%

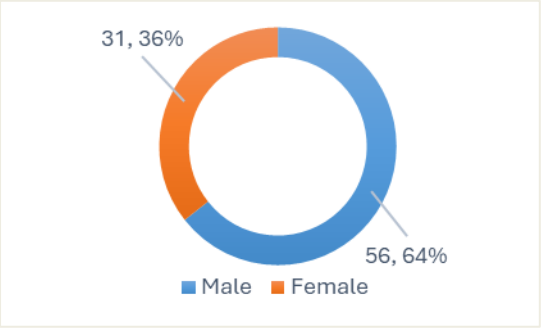

Figure 1: Distribution of gender

Table 2: Distribution of BMI

BMI (kg/m²)	n	%
<18.5	2	2.3%
18.5-22.9	34	39.1%
23-29.9	40	46.0%
≥30	11	12.6%

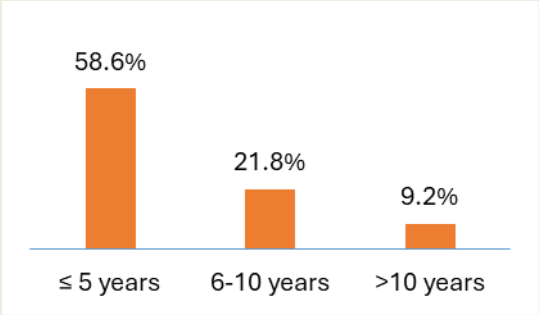

Figure 2: Distribution of DM duration

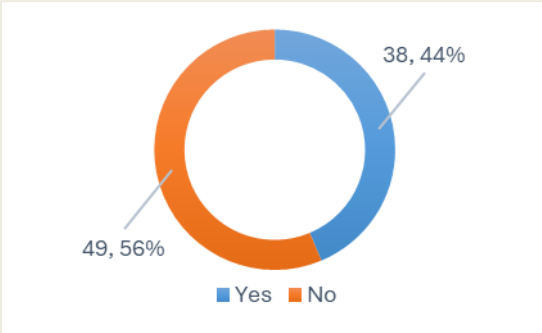

Figure 3: Distribution of family history of DM

Table 3: Type of treatment distribution

Type	n	%
Insulin	14	16.1%
OHA	57	65.5%
OHA/Insulin	16	18.4%

OHA: Oral hypoglycemic agent

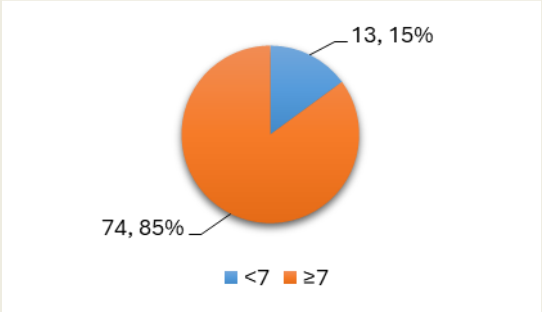

Figure 4: Distribution of HbA1C level

Table 4: Distribution of lipide profile

Characteristics	n	%
HDL		
Normal	57	65.5%
Abnormal	29	33.3%
Total cholesterol		
Normal	44	50.6%
Abnormal	43	49.4%
TG		
Normal	44	50.6%
Abnormal	43	49.4%
LDL		
Normal	25	28.7%
Abnormal	62	71.3%

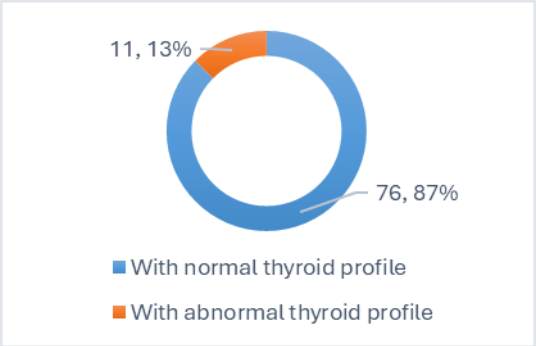

Table 5: Diabetic cases with abnormal thyroid profile

Table 5: Distribution of thyroid disease

Thyroid profile	n	%
Normal	76	87.4%
Overt hypothyroidism	1	1.2%
Subclinical hypothyroidism	7	8.0%
Subclinical hyperthyroidism	3	3.4%

Discussion

In this study, the demographic characteristics of the 33 participants revealed that the highest proportion (39.1%) were in the 41–50 years age group, followed by 36.8% in the 51–60 years age group, 12.6% in the 61–70 years age group, and 11.5% in the 30–40 years age group. The age distribution aligns with similar studies that show type 2 diabetes (T2DM) to be prevalent in middle-aged adults, especially between the ages of 40 and 60 years.[11, 12] Regarding gender, 64% of the participants were male, while 36% were female. This male predominance has been reported in several studies on T2DM, possibly due to differences in lifestyle factors, physical activity, and adiposity between the genders.[13] Body mass index (BMI) analysis indicated that 58.6% of participants were either overweight or obese, with a BMI of ≥25 kg/m², while 41.3% had a normal BMI. This high prevalence of overweight and obesity in T2DM patients is well-documented and reflects the strong association between obesity and the development of insulin resistance, a major contributor to T2DM pathogenesis.[14, 15] The association between obesity and metabolic complications in T2DM is supported by previous findings that highlight how central adiposity worsens glycemic control and increases cardiovascular risks.[16] Regarding the duration of diabetes, 58.6% of participants had a disease duration of ≤5 years, while 21.8% had diabetes for 6–10 years, and 9.2% had diabetes for over 10 years. Studies indicate that the risk of complications, including cardiovascular disease and neuropathy, increases with a longer duration of diabetes, emphasizing the importance of early diagnosis and effective management to prevent long-term complications.[17]

The duration of diabetes also influences the likelihood of comorbidities such as hypertension and dyslipidemia, both of which were highly prevalent in the present cohort. In terms of treatment, 16.1% of participants were on insulin therapy, 65.5% were on oral hypoglycemic agents (OHAs), and 18.4% received a combination of both. These figures align with current treatment guidelines, which suggest that a combination of OHAs and insulin is often necessary to achieve optimal glycemic control in patients with poorly controlled T2DM.[18] Insulin therapy is particularly indicated in patients with significant β-cell dysfunction or those who do not achieve adequate control with OHAs alone. Hypertension was present in 49% of the participants, while 51% were normotensive. This prevalence is consistent with other studies that report hypertension as a common comorbidity in T2DM, with blood pressure control being crucial to minimize cardiovascular risks in these patients.[19] Furthermore, glycemic control, as measured by HbA1c levels, showed that 85% of participants had an HbA1c level of ≥7%, indicating poor control. This highlights a significant challenge in managing blood glucose levels in T2DM patients, as achieving optimal glycemic control is often difficult despite various treatment options.[20] Dyslipidemia was found to be prevalent among the

study participants, with 50% exhibiting elevated total cholesterol (TC), 71.3% showing elevated low-density lipoprotein cholesterol (LDL-C), 65.5% having reduced high-density lipoprotein cholesterol (HDL-C), and 50.6% experiencing hypertriglyceridemia. These lipid abnormalities are a hallmark of T2DM and are strongly associated with increased cardiovascular risk in diabetic patients. The management of dyslipidemia is, therefore, crucial for preventing cardiovascular events in this population.[21-23] Thyroid dysfunction was present in 13% of the participants. Subclinical hypothyroidism was the most common form, affecting 8% of participants. This finding corroborates several studies that have reported a higher prevalence of thyroid dysfunction, especially subclinical hypothyroidism, in T2DM patients. Hypothyroidism may contribute to poor glycemic control and lipid abnormalities, further complicating the management of T2DM.[24, 25] Interestingly, no cases of overt hypothyroidism or hyperthyroidism were observed, which is in contrast to other studies where thyroid disorders in diabetic patients are more common.[26]

Conclusion & Recommendation

This study highlights a significant prevalence of thyroid dysfunction in adult patients with T2DM, with subclinical hypothyroidism being the most common form. The high incidence of dyslipidemia and poor glycemic control further emphasizes the complexity of managing T2DM in these patients. Given the association between thyroid dysfunction and metabolic disturbances, regular thyroid screening and comprehensive management of lipid profiles are crucial in optimizing care for individuals with T2DM.

Funding: No funding sources.

Conflict of interest: None declared.

REFERENCES

1. Atlas ID, 10th Edition Committee. International Diabetes Federation: Brussels. Belgium,. 2015.
2. Powers AC, Stafford JM, Rickels MR. Diabetes mellitus: complicaciones. InHarrison, principios de medicina interna 2018 (pp. 2875-2883). McGraw Hill Education México.
3. Wu Y, Ding Y, Tanaka Y, Zhang W. Risk factors contributing to type 2 diabetes and recent advances in the treatment and prevention. International journal of medical sciences. 2014;11(11):1185.
4. Brent GA. Mechanisms of thyroid hormone action. The Journal of clinical investigation. 2012 Sep 4;122(9):3035-43.
5. Leung KC, Johannsson G, Leong GM, Ho KK. Estrogen regulation of growth hormone action. Endocrine reviews. 2004 Oct 1;25(5):693-721.
6. Liatis S, Marinou K, Tentolouris N, Pagoni S, Katsilambros N. Usefulness of a new indicator test for the diagnosis of peripheral and autonomic neuropathy in patients with diabetes mellitus. Diabetic Medicine. 2007 Dec;24(12):1375-80.
7. Duntas LH, Orgiazzi J, Brabant G. The interface between thyroid and diabetes mellitus. Clinical endocrinology. 2011 Jul;75(1):1-9.
8. Asmat U, Abad K, Ismail K. Diabetes mellitus and oxidative stress—A concise review. Saudi pharmaceutical journal. 2016 Sep 1;24(5):547-53.
9. Johansson K, Stenman A, Paulsson JO, Wang N, Ihre-Lundgren C, Zedenius J, Juhlin CC. Development of metastatic poorly differentiated thyroid cancer from a sub-centimeter papillary thyroid carcinoma in a young patient with a germline MET mutation–association or random chance?. Thyroid Research. 2021 Dec;14:1-0.
10. Han C, He X, Xia X, Li Y, Shi X, Shan Z, Teng W. Subclinical hypothyroidism and type 2 diabetes: a systematic review and meta-analysis. PloS one. 2015 Aug 13;10(8):e0135233.
11. Ang SH, Lim LL, Mustapha FI, Ahmad E, Rampal S. Association between sex, age, temporal trends, and glycemic control of 221,769 adults with type 2 diabetes in a multi-ethnic middle-income Asian country. Diabetes Research and Clinical Practice. 2025 Feb 1;220:111976.
12. Khandelwal R, Meshram RJ, Patel A, Reddy S, Manek YB, Khandelwal Jr R. Maternal Weight and Gestational Diabetes Impacts on Child Health: A Narrative Review. Cureus. 2024 Sep 25;16(9).
13. Yadav U, Kumar N, Sarvottam K. Role of obesity related inflammation in pathogenesis of peripheral artery disease in patients of type 2 diabetes mellitus. Journal of Diabetes & Metabolic Disorders. 2023 Jun;22(1):175-88.

14. Saha D, Sharma R, Sinha L, Ali A, Chaudhary S, Maheshwari A, Geelani MA. Implication of preoperative glycosylated hemoglobin level on short term outcomes in diabetic patients undergoing coronary artery bypass grafting. International Surgery Journal. 2020 Oct 23;7(11):3590-3.
15. Li C, Gao C, Zhang X, Zhang L, Shi H, Jia X. Comparison of the effectiveness and safety of insulin and oral hypoglycemic drugs in the treatment of gestational diabetes mellitus: A meta-analysis of 26 randomized controlled trials. Gynecological Endocrinology. 2022 Apr 3;38(4):303-9.
16. Gupta S, Sharma N, Arora S, Verma S. Diabetes: a review of its pathophysiology, and advanced methods of mitigation. Current Medical Research and Opinion. 2024 May 3;40(5):773-80.
17. Jialal I, Singh G. Management of diabetic dyslipidemia: An update. World journal of diabetes. 2019 May 5;10(5):280.
18. Patel M, Acharya S, Kumar S. Prevalence of Nonalcoholic Fatty Liver Disease in Hypothyroid Subjects: A Cross-sectional Comparative Study. Indian Journal of Medical Specialities. 2023 Jul 1;14(3):145-51.
19. Bode H, Ivens B, Bschor T, Schwarzer G, Henssler J, Baethge C. Association of hypothyroidism and clinical depression: a systematic review and meta-analysis. JAMA psychiatry. 2021 Dec 1;78(12):1375-83.
20. TODAY Study Group. Long-term outcomes among young adults with type 2 diabetes based on durability of glycemic control: results from the TODAY cohort study. Diabetes Care. 2022 Nov 1;45(11):2689-97.
21. Huh JH, Han KD, Cho YK, Roh E, Kang JG, Lee SJ, Ihm SH. Remnant cholesterol and the risk of cardiovascular disease in type 2 diabetes: a nationwide longitudinal cohort study. Cardiovascular Diabetology. 2022 Nov 2;21(1):228.
22. Sarker KK, Rashed MR, Kamal AH, Baset MA, Hafiz FB. Relationship Between Hypertension and Diabetes Understanding Their Co Morbidity and Clinical Management. IAR Journal of Medicine and Surgery Research. 2024 Nov 22;5(6):83-91.
23. Rahman A, Ahmed AT, Biswas S. Postoperative Effect of Diabetes Among Pancreatic Calculi Patient Treated by Puestow Procedure A Study of 25 Cases. IAR Journal of Medicine and Surgery Research. 2024 Nov 14;5(6):50-8.
24. Pramanik S, Ghosh S, Mukhopadhyay P, Bhattacharjee R, Mukherjee B, Mondal SA, Ghosh I, Bari R, Chowdhury S. Thyroid status in patients with type 2 diabetes attending a tertiary care hospital in Eastern India. Indian journal of endocrinology and metabolism. 2018 Jan 1;22(1):112-5.
25. Chauhan A, Patel SS. Thyroid Hormone and Diabetes Mellitus Interplay: Making Management of Comorbid Disorders Complicated. Hormone and Metabolic Research. 2024 Aug 19.
26. Shrestha S, Sharma KL, Shrestha B, Bajracharya S. Cardiovascular Manifestations of Primary Hypothyroidism. Journal of National Medical College. 2022 Feb 17;6(2):44-8.