Original Article

Prevalence of Type 2 Diabetes Mellitus Among Patients with Hypothyroidism Compared to Non-Hypothyroid Individuals: A Cross-Sectional Analytical Study

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Abstract

Background: Hypothyroidism and diabetes mellitus are two common endocrine disorders that frequently coexist and share complex metabolic interrelationships. Understanding the prevalence of diabetes in patients with hypothyroidism and the factors associated with it can improve early screening and preventive strategies. The objective is to determine the prevalence of type 2 diabetes mellitus (T2DM) in patients with hypothyroidism compared with non-hypothyroid individuals and to identify factors associated with its occurrence. **Material and Methods:** A cross-sectional comparative study was conducted among 500 adults attending the Department of General Medicine at Christian Fellowship Hospital, Tamil Nadu, from May to November 2019. Two groups—250 hypothyroid and 250 age- and sex-matched non-hypothyroid participants—were evaluated using a structured proforma. Demographic, socioeconomic, clinical, and lifestyle data were analyzed. HbA1c and thyroid function tests were assessed. Statistical analyses were performed using SPSS 20, employing the chi-square test and independent t-tests; $p < 0.05$ was considered statistically significant. **Results:** The mean age was 45.6 ± 11.3 years in both groups, with female predominance (≈ 92%). Newly detected diabetes was significantly higher in non-hypothyroid individuals (31.2%) than in hypothyroid participants (21.2%; $p = 0.02$). Mean HbA1c values were comparable (7.94 ± 2.30 vs 8.13 ± 2.10; $p = 0.37$). Co-morbidities were more frequent among hypothyroid subjects ($p = 0.01$), whereas regular brisk walking and vigorous physical activity were significantly greater in non-hypothyroid participants ($p = 0.04$ and 0.01). **Conclusion:** Type 2 diabetes was more prevalent among non-hypothyroid individuals, while hypothyroid patients exhibited greater co-morbidities and sedentary behavior. Routine metabolic screening in both groups is essential for early detection and prevention of dual endocrine dysfunctions.

Keywords: Hypothyroidism, Type 2 Diabetes Mellitus, HbA1c, Co-morbidities, Physical Activity.

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Introduction

Hypothyroidism represents a reduction in thyroid gland activity, leading to inadequate secretion of thyroid hormones. It may manifest as overt hypothyroidism, presenting with systemic metabolic slowing, or as a subclinical form characterized by normal thyroxine and triiodothyronine levels with mildly elevated serum thyroid-stimulating hormone (TSH).[1] The global prevalence of hypothyroidism is estimated to be 4–5%, while in India, nearly one in ten adults is affected, underscoring its status as one of the most prevalent endocrine disorders.[2,3]

Diabetes mellitus (DM) is another major endocrine disease with rapidly increasing prevalence worldwide. According to the International Diabetes Federation, the global burden of diabetes among adults aged 20–79 years was 463 million in 2019 and is projected to reach 700 million by 2045.[4] Thyroid disorders rank second only to diabetes in frequency among endocrine diseases, and both often coexist in clinical practice.[5] In India alone, more than 42 million individuals are estimated to have thyroid dysfunction, with hypothyroidism being the predominant abnormality.[1,3]

Several studies have demonstrated an increased prevalence of thyroid abnormalities in patients with type 2 diabetes mellitus (T2DM), indicating a bidirectional relationship between the two conditions.[1,2,6] Thyroid hormones exert multiple influences on glucose metabolism, including modulation of insulin secretion, hepatic gluconeogenesis, and peripheral glucose uptake.[4] Hypothyroidism may reduce glucose-induced insulin secretion, whereas hyperthyroidism can induce insulin resistance through catecholamine-mediated pathways.[5,6] Conversely, insulin and thyroid hormones share several regulatory mechanisms; disturbance in one system often leads to metabolic alterations in the other.[3,4]

Given these complex metabolic interrelationships, recognizing the coexistence of hypothyroidism and diabetes is of significant clinical relevance. Both hypothyroidism and type 2 diabetes

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mellitus (T2DM) are chronic endocrine disorders that require lifelong management, and their concurrence can adversely influence glycemic control, lipid metabolism, and cardiovascular outcomes.[1–6] Understanding their combined prevalence and metabolic impact is therefore crucial for early detection and the development of integrated therapeutic plans. However, data on the prevalence of diabetes among hypothyroid individuals remain scarce, particularly within South Indian populations. Hence, the present study was undertaken to determine the prevalence of diabetes mellitus in patients with hypothyroidism compared to non-hypothyroid individuals and to evaluate the demographic, socioeconomic, and lifestyle factors associated with its occurrence.

Materials and Methods

Study Design and Setting: A cross-sectional analytical study was conducted at the Christian Fellowship Hospital, Oddanchatram, Tamil Nadu—a 299-bed secondary-level rural healthcare facility catering primarily to lower- and middle-income populations, with an average daily outpatient attendance of 1,200–1,500 patients. The study was conducted over a period of seven months, from May 2019 to November 2019.

Sample Size: Based on the study by Ashrafuzzaman et al (2012),[7] which reported a 7.01% prevalence of newly detected diabetes among hypothyroid subjects versus 4.8% in the general population, the expected prevalence of diabetes among hypothyroid individuals was assumed to be twice that of the general rural prevalence (7%). With an anticipated prevalence of 15% in hypothyroid subjects, 80% study power, and 95% confidence interval, the minimum required sample size was calculated as 235 subjects per group using the formula:

Sample Size Calculation Formula

The sample size was calculated using the formula:

$n = [2 \times \bar{p} \times \bar{q} \times (Z\alpha/2 + Z\beta)^2] / d^2$

where,

$\bar{p} = (p_1 + p_2) / 2$

$\bar{q} = 1 - \bar{p}$

$Z\alpha/2 = 1.96$

$Z\beta = 0.84$

$d = (p_2 - p_1) = 0.08$

Thus, the calculated sample size was n = 240 per group, and considering equal allocation, a total of 500 participants (250 hypothyroid and 250 non-hypothyroid) were included in the study.

Inclusion Criteria:

Adults aged 25–65 years diagnosed with hypothyroidism based on clinical and hormonal criteria and registered in the hospital's thyroid registry.

For each hypothyroid participant, an age- and sex-matched non-hypothyroid individual (±3 years) was selected as a control.

Participants are willing to provide written informed consent.

Exclusion Criteria:

Individuals with chronic renal failure, hepatic dysfunction, pregnancy, thyroid malignancy, or acute systemic illness (sepsis, acute myocardial infarction, severe heart failure, or ICU admission).

Subjects receiving drugs known to interfere with thyroid or glucose metabolism (NSAIDs, estrogens, antiepileptics, corticosteroids).

Data Collection: Eligible participants were recruited consecutively. A pretested, structured pro forma was used to collect demographic details, medical history (including diabetes, hypertension, and cardiac disease), lifestyle habits (diet, physical activity, smoking, and alcohol consumption), and family history. Each subject underwent a detailed general and systemic examination.

Investigations: All participants were tested for serum TSH and HbA1c. The diagnosis of diabetes mellitus was based on the 2019 American Diabetes Association Standards of Medical Care in Diabetes criteria (HbA1c ≥ 6.5%).

Outcome Measures: Primary outcome: prevalence of type 2 diabetes mellitus among hypothyroid and non-hypothyroid groups.Secondary outcomes: associations between diabetes prevalence and demographic, socioeconomic, and behavioral factors, including gender, BMI, family history, income, diet, sedentary lifestyle, and substance use.

Ethical Considerations: Ethical approval was obtained from the Institutional Ethics and Research Committee of Christian Fellowship Hospital. Written informed consent was obtained from all participants before enrollment.

Statistical Analysis: Data were coded and entered into Microsoft Excel and analyzed using SPSS version 20.0 (IBM Corp., Armonk, NY). Continuous variables were expressed as mean ± standard deviation (SD) and compared using the independent sample t-test. Categorical variables were summarized as frequencies and percentages, and associations were tested using the chi-square test. A p-value ≤ 0.05 was considered statistically significant.

Results

A total of 500 participants were enrolled in the study, comprising 250 individuals with hypothyroidism and 250 individuals without hypothyroidism. The mean age of the study population was comparable between the two groups (45.63 ± 11.21 years vs 45.63 ± 11.39 years; p = 0.97), indicating adequate age matching. Females constituted the majority in both cohorts (92.4% and 91.2%, respectively), and most participants were married (98.0% vs 97.2%), with no statistically significant difference between the groups (p > 0.05) [Table 1].

A socio-economic assessment revealed that the largest proportion of hypothyroid subjects (41.6%) and non-hypothyroid controls (35.6%) belonged to the monthly income category of ₹5,001–₹ 10,000. A statistically significant difference was noted in income distribution between the two groups (p = 0.001). Co-morbid illnesses were present in 40.4% of the hypothyroid cohort and 30.4% of the non-hypothyroid group, demonstrating a significant association (p = 0.01). The major co-morbid conditions observed were hypertension, ischaemic heart disease, chronic kidney disease, and bronchial asthma [Table 2].

Table 1: Baseline Demographic Characteristics of the Study Population (n = 500)

Parameter	Hypothyroid (n=250)	Non-Hypothyroid (n=250)	Statistical Test	p-Value	Significance
Mean Age (years)	45.63 ± 11.21	45.63 ± 11.39	Independent t-test	0.97	NS
Gender: Female (%)	231 (92.4)	228 (91.2)	$\chi^2 = 0.23$	0.37	NS
Male (%)	19 (7.6)	22 (8.8)	–	–	–
Marital Status: Married (%)	245 (98.0)	243 (97.2)	$\chi^2 = 0.34$	0.38	NS
Unmarried (%)	5 (2.0)	7 (2.8)	–	–	–

NS – Not Significant (p > 0.05)

Table 2: Socioeconomic Distribution and Co-morbidities

Parameter	Hypothyroid (n=250)	Non-Hypothyroid (n=250)	χ^2 / t-Value	p-Value	Inference
Monthly Income ₹ 5001–10,000	104 (41.6%)	89 (35.6%)	$\chi^2 = 30.11$	0.001	Significant
< ₹ 5000	70 (28.0%)	32 (12.8%)	–	–	–
≥ ₹ 15,001	38 (15.2%)	61 (24.4%)	–	–	–
Co-morbidities present	101 (40.4%)	76 (30.4%)	$\chi^2 = 5.46$	0.01	Significant
Co-morbidities absent	149 (59.6%)	174 (69.6%)	–	–	–
Major Co-morbidities	Hypertension (22%), IHD (10%), CKD (4%), Asthma (4%)	Hypertension (16%), IHD (8%), CKD (3%), Asthma (3%)	–	–	–

The overall prevalence of newly detected diabetes mellitus was 21.2% among hypothyroid participants compared with 31.2% in non-hypothyroid individuals, and this difference was statistically significant (p = 0.02). Mean HbA1c values did not differ significantly between the groups (7.94 ± 2.30 vs 8.13 ± 2.10; p = 0.37). A positive family history of diabetes was recorded in 32% of the hypothyroid and 27.6% of the non-hypothyroid subjects (p = 0.28). All non-hypothyroid subjects were clinically euthyroid, whereas 88% of hypothyroid patients achieved euthyroid status under treatment, a highly significant difference (p < 0.001) [Table 3].

Table 3: Prevalence of Diabetes and Related Factors

Variable	Hypothyroid (n=250)	Non-Hypothyroid (n=250)	Statistical Test	p-Value	Interpretation
Newly Detected Diabetes (%)	53 (21.2%)	78 (31.2%)	$\chi^2 = 5.52$	0.02	Significant
Known Diabetes (%)	197 (78.8%)	172 (68.8%)	–	–	–
Mean HbA1c (%)	7.94 ± 2.30	8.13 ± 2.10	t = 0.89	0.37	NS
Family History of DM (%)	80 (32.0%)	69 (27.6%)	$\chi^2 = 1.16$	0.28	NS
Clinically Euthyroid Status	220 (88.0%)	250 (100%)	–	< 0.001	Significant

Evaluation of lifestyle characteristics revealed that 45.2% of participants with hypothyroidism and 48.8% of those without hypothyroidism reported daily fruit intake. Current smoking and alcohol consumption were comparable between groups (p > 0.05). A sedentary lifestyle was slightly more common among hypothyroid patients (34.8%) than non-hypothyroid controls (27.6%), though the difference did not reach statistical significance (p = 0.07). Notably, regular brisk walking (≥ 30 minutes/day) and vigorous physical activity were significantly higher among non-hypothyroid individuals (p = 0.04 and p = 0.01, respectively) [Table 4, Figure 1].

Table 4: Lifestyle and Behavioral Factors Associated with Diabetes

Lifestyle Variable	Hypothyroid (n=250)	Non-Hypothyroid (n=250)	χ^2 / t-Value	p-Value	Remark
Daily Fruit Intake	113 (45.2%)	122 (48.8%)	0.53	0.46	NS
Smoking (current)	38 (15.2%)	52 (20.8%)	2.47	0.11	NS
Alcohol Use	41 (16.4%)	46 (18.4%)	0.32	0.57	NS
Sedentary Lifestyle	87 (34.8%)	69 (27.6%)	3.12	0.07	NS
Brisk Walk ≥ 30 min/day	58 (23.2%)	79 (31.6%)	4.32	0.04	Significant
Vigorous Physical Activity	22 (8.8%)	41 (16.4%)	6.45	0.01	Significant

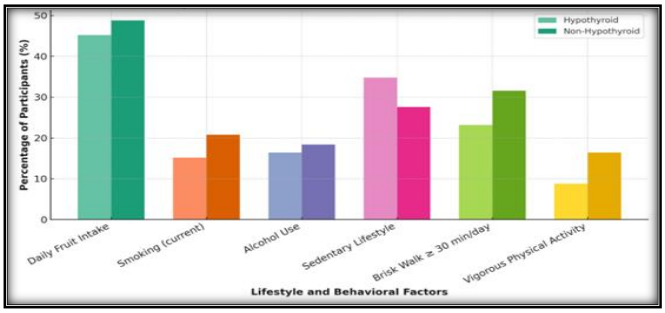

Figure 1: Lifestyle and Behavioral Factors Associated with Diabetes

Discussion

The present cross-sectional study compared the prevalence of type 2 diabetes mellitus (T2DM) among individuals with hypothyroidism and those without thyroid dysfunction, while also exploring factors influencing diabetes risk. The overall prevalence of newly detected diabetes was 21.2% among hypothyroid subjects and 31.2% among non-hypothyroid individuals, a statistically significant difference (p = 0.02). These findings suggest that diabetes remains highly prevalent in both groups, though relatively higher among non-hypothyroid individuals in this South Indian rural cohort.

Comparison with Previous Studies: Previous research has

demonstrated variable prevalence rates of thyroid dysfunction in diabetic populations, as well as vice versa. Prasad and Singh (2017) observed that 16.5% of diabetic patients had coexistent thyroid disorders, with hypothyroidism being the most frequent abnormality.[8] Similarly, Subekti et al. (2017) reported a 12.6% prevalence of thyroid dysfunction among T2DM patients, supporting the notion of an interdependent metabolic relationship.[9] Jain and Patel (2016) found that hypothyroidism occurred in 18% of diabetics, highlighting the shared endocrine pathways influencing both conditions.[10] Khurana et al. (2016) also noted a 13% prevalence of thyroid disorders among people with diabetes, attributing this to autoimmune overlap and metabolic stress.[11]

While most studies examined thyroid dysfunction in diabetics, our research focused on the reverse association—diabetes occurrence in hypothyroid individuals—and demonstrated a comparably high disease burden. Similar findings have been reported by Mukherjee et al. (2015), who observed a 14% prevalence of primary hypothyroidism among newly diagnosed diabetics, reinforcing the bidirectional link between glucose and thyroid metabolism.[12] Another study by Mukherjee (2015) in Eastern India found that even young patients with type 2 diabetes mellitus (T2DM) showed a 10% prevalence of thyroid dysfunction, emphasizing the early metabolic interaction.[13] Aljabri et al. (2019) further demonstrated in a Saudi population that hypothyroidism coexisted with T2DM in 16.3% of cases, indicating this pattern extends beyond regional and ethnic boundaries.[14]

Pathophysiological Insights: Thyroid hormones influence multiple aspects of carbohydrate metabolism, including hepatic gluconeogenesis, intestinal glucose absorption, and peripheral insulin sensitivity.[9,10] In hypothyroidism, a reduced basal metabolic rate and impaired insulin-mediated glucose uptake can result in subtle insulin resistance. However, pancreatic β-cell secretory response may also decline, potentially explaining the relatively lower rate of overt diabetes observed in hypothyroid individuals.[11] Conversely, non-hypothyroid individuals—especially in rural South Indian communities—may experience higher diabetes prevalence due to sedentary lifestyles, dietary imbalances, and central obesity, independent of thyroid function.[8,9,15]

Clinical and Sociodemographic Correlates

In this study, co-morbidities such as hypertension, ischemic heart disease, and chronic kidney disease were significantly more prevalent among hypothyroid participants ($p = 0.01$). Similar clustering of metabolic risk factors has been highlighted by Mukherjee et al. (2015) and Kalra et al. (2019), who underscored that coexistent thyroid dysfunction aggravates cardiovascular and lipid derangements in people with diabetes.[12,15] The marked female predominance (≈ 92%) in our sample aligns with established data attributing higher autoimmune susceptibility to women.[13] Furthermore, lifestyle analysis revealed that physical inactivity and lack of regular exercise correlated significantly with diabetes prevalence, reaffirming observations by Subekti et al. (2017) and Kalra et al. (2019) that behavioral modification is essential to mitigate endocrine comorbidity.[9,15]

Biochemical and Metabolic Correlations

In our study, the mean HbA1c values were comparable between hypothyroid and non-hypothyroid groups (7.94 ± 2.30 vs. 8.13 ± 2.10; $p = 0.37$), suggesting similar glycemic control across thyroid status. Comparable findings were reported by Jain and Patel (2016) and Khurana et al. (2016), who found no significant difference in glycemic parameters among diabetic subgroups with or without thyroid dysfunction.[10,11] Nonetheless, the presence of hypothyroidism may exacerbate dyslipidemia, hypertension, and obesity, as indicated by Mukherjee et al. (2015) and Kalra et al. (2019), underscoring the importance of integrated endocrine management.[12,15]

Public Health Implications

The coexistence of two chronic endocrine disorders—diabetes and hypothyroidism—poses substantial clinical and economic challenges, particularly in rural healthcare settings with limited diagnostic capacity.[8,14,15] Incorporating bidirectional screening for thyroid dysfunction in diabetic patients and diabetes in individuals with hypothyroidism can facilitate early detection, optimize metabolic control, and prevent cardiovascular complications. Strengthening lifestyle interventions, including physical activity and dietary modification, remains crucial for improving long-term outcomes.[9,15]

Limitations:

The present study was hospital-based and cross-sectional; thus, causal relationships cannot be established. Thyroid antibody status and lipid parameters were not assessed, which could have provided further mechanistic insights. Despite these limitations, the large sample size, careful age- and sex-matching, and standardized diagnostic criteria strengthen the reliability of findings.

Conclusion

The present study revealed a high prevalence of diabetes mellitus among both hypothyroid and non-hypothyroid individuals, with a significantly greater occurrence in the non-hypothyroid group. Although glycemic indices were similar, hypothyroid participants exhibited higher rates of co-morbid conditions and sedentary lifestyle patterns. These findings highlight the intricate metabolic interplay between thyroid and pancreatic functions. Regular screening for diabetes in patients with hypothyroidism, as well as thyroid evaluation in diabetics, is strongly recommended for early detection and integrated management. Emphasis on physical activity, dietary regulation, and periodic biochemical monitoring can substantially reduce the dual burden of endocrine disorders in the community.

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Conflicts of interest

There are no conflicts of interest.

References

1. Afrin G, Rathore B, Kumar V, Singh K, Shukla V, Misra A. Study of prevalence of hypothyroidism in type 2 diabetes mellitus patients of Lucknow and surrounding areas. EJMR. 2018;5(2):122–127.
2. Nair A, Jayakumari C, Jabbar PK, Jayakumar RV, Raizada N, Gopi A, et al. Prevalence and Associations of Hypothyroidism in Indian Patients with Type 2 Diabetes Mellitus. J Thyroid Res. 2018 Aug 9;2018:5386129. Doi: 10.1155/2018/5386129. PMID: 30174822; PMCID: PMC6106958.
3. Kamendu A, Aslami AN. Prevalence of hypothyroidism in patients with type 2 diabetes mellitus attending a tertiary care hospital in a rural area of Bihar, India. Int J Res Med Sci [Internet]. 2018 Oct. 25 [cited 2025 Oct. 20];6(11):3721-5.
4. Ramulu P, Rao UR, Shaik RS. A study of the prevalence of subclinical hypothyroidism in patients with type 2 diabetes mellitus. Int J Contemp Med Res. 2016;3(10):3114–3117.
5. Gronich N, Deftereos SN, Lavi I, Persidis AS, Abernethy DR, Rennert G. Hypothyroidism is a Risk Factor for New-Onset Diabetes: A Cohort Study. Diabetes Care. 2015 Sep;38(9):1657-64. doi: 10.2337/dc14-2515. Epub 2015 Jun 12. PMID: 26070591.
6. Ozair M, Noor S, Raghav A, Siddiqi SS, Chugtai AM, Ahmad J. Prevalence of thyroid disorders in North Indian Type 2 diabetic subjects: A cross-sectional study. Diabetes Metab Syndr. 2018 May;12(3):301-304. doi: 10.1016/j.dsx.2017.12.016. Epub 2017 Dec 20. PMID: 29279270.
7. Ashrafuzzaman SM, Taib AN, Rahman R, Latif ZA. Prevalence of diabetes among hypothyroid subjects. Mymensingh Med J. 2012 Jan;21(1):129-32. PMID: 22314468.
8. Prasad K, Singh S. Prevalence of thyroid disorders amongst diabetic patients: a hospital-based study. Int J Contemp Med Res. 2017;4(7):1497–9.
9. Subekti I, Pramono LA, Dewiasty E, Harbuwono DS. Thyroid Dysfunction in Type 2 Diabetes Mellitus Patients. Acta Med Indones. 2017 Oct;49(4):314-323. PMID: 29348381.
10. Jain A, Patel RP. A study of thyroid disorder in type 2 diabetes mellitus. Sch J App Med Sci. 2016;4(12):4318–4320.
11. Khurana A, Dhoat P, Jain G. Prevalence of thyroid disorders in patients of type 2 diabetes mellitus. J Indian Acad Clin Med. 2016;17(1):12–15.
12. Mukherjee S, Datta S, Datta P, Mukherjee AK, Maisnam I. A study of the prevalence of primary hypothyroidism in recently diagnosed type 2 diabetes mellitus in a tertiary care hospital. Int J Sci Rep [Internet]. 2015 Jun. 28 [cited 2025 Oct. 20];1(2):105-12
13. Mukherjee S. Prevalence of Thyroid Dysfunction in Young Patients with Type 2 Diabetes Mellitus in Eastern India, Study of 120 Cases from a Tertiary Care Hospital. J ASEAN Fed Endocr Soc [Internet]. 2015 Nov. 30 [cited 2025 Oct. 20];30(2):154.
14. Aljabri KS, Bokhari SA, Alshareef MA, Khan PM, Mallosho AM, AbuElsaoud HM, et al. The Prevalence of Hypothyroidism in Patients with Type 2 Diabetes Mellitus in a Saudi Community-based Hospital: A Retrospective Single-Centre Study. Archives of Diabetes & Obesity 2(1)- 2019. ADO.MS.ID.000126. DOI: 10.32474/ADO.2019.02.000126.
15. Kalra S, Aggarwal S, Khandelwal D. Thyroid Dysfunction and Type 2 Diabetes Mellitus: Screening Strategies and Implications for Management. Diabetes Ther. 2019 Dec;10(6):2035-2044. doi: 10.1007/s13300-019-00700-4. Epub 2019 Oct 3. PMID: 31583645; PMCID: PMC6848627.