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Original Research Article

FREQUENCY OF THYROID DYSFUNCTION AMONG TYPE 2 DIABETES MELLITUS PATIENTS PRESENTING TO SAIDU GROUP OF TEACHING HOSPITAL

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ABSTRACT

Background: *Thyroid dysfunction is a common comorbidity in patients with type 2 diabetes mellitus (T2DM), potentially exacerbating metabolic imbalance and complicating disease management. Early identification of thyroid abnormalities can help optimize clinical outcomes in diabetic patients.* ***Objective:*** *To evaluate the frequency of thyroid dysfunction among patients with T2DM presenting to Saidu Teaching Hospital, Swat, and to assess its association with demographic and clinical factors such as age, gender, body mass index (BMI), and hypertension.* ***Study Design:*** *Cross-sectional study.* ***Setting:*** *Saidu Teaching Hospital, Swat, Pakistan.* ***Duration of Study:*** *09 April 2023 to 09 October 2023.* ***Methods:*** *222 patients aged 18–70 with type 2 diabetes mellitus (HbA1c >6.5%) were enrolled. Thyroid dysfunction was assessed via thyroid-stimulating hormone (TSH) levels, with hypothyroidism defined as TSH >4.5 mU/L and hyperthyroidism as TSH <0.4 mU/L. Demographic and clinical variables, including age, gender, BMI, and hypertension status, were recorded. Statistical analysis was performed using SPSS version 26, with chi-square tests used to assess associations. A p-value <0.05 was considered statistically significant.* ***Results:*** *The mean age of participants was 46.60 ± 14.03 years, with a majority being male (55.9%). Thyroid dysfunction was observed in 11.7% of patients. A significantly higher frequency of dysfunction was found in patients aged >50 years (73.1%, p=0.001), females (61.5%, p=0.05), and those with elevated BMI >24.9 kg/m² (76.9%, p=0.001). No significant association was found with hypertension.* ***Conclusion:*** *The frequency of thyroid dysfunction in patients with T2DM was 11.7%, with significant associations observed with older age, female gender, and elevated BMI. Routine screening for thyroid dysfunction in diabetic patients, especially those with these risk factors, is recommended to improve clinical management.*

Keywords: Type 2 Diabetes Mellitus, Hyperthyroidism, Hypothyroidism, Prevalence, Risk Factors, Thyroid Dysfunction

INTRODUCTION

Diabetes mellitus represents a chronic metabolic disorder characterized by persistently high blood sugar levels. This condition develops when the body fails to produce sufficient insulin, becomes resistant to insulin's effects, or experiences both these issues simultaneously. According to global health statistics from 2015, approximately 415 million individuals in the 20–79-year age group worldwide were living with diagnosed diabetes, as documented by the International Diabetes Federation (1). Diabetes mellitus has become known as a significant global public health challenge, with projections indicating an increase of an additional 200 million cases by the end of 2040(1-3). Diabetes represents a global epidemic. The global prevalence of diabetes mellitus has risen considerably due to evolving lifestyles as well as the growing rates of obesity. In 2017, the prevalence of diabetes mellitus was 425 million around the globe. In 2015, approximately 10% of the population of the United States was reported to have diabetes. Among these, 7 million individuals remained undiagnosed. The prevalence of diabetes mellitus rises with advancing age. Approximately 25% of individuals aged 65 and older have been impacted by diabetes (4).

The thyroid gland is responsible for producing two primary hormones: thyroxine (T4) and triiodothyronine (T3). These hormones play a crucial role in many different processes within the body, such as regulating body temperature, digestion, and essential functions like respiration and heart rate (5). The symptoms arising from inadequate hormone production can significantly impact the body and may vary in severity, contingent upon the root cause of dysfunction. Hyperthyroidism as well as hypothyroidism may manifest in both severe and subclinical forms (6, 7).

Diabetes mellitus and thyroid disease are interrelated conditions. A study indicated a greater prevalence of thyroid dysfunction among people with diabetes, in contrast to those without diabetes, especially among patients exhibiting positive anti-thyroperoxidase antibodies (8). A study observed that the frequency of thyroid dysfunction was 17.5%9 % in type 2 diabetes mellitus patients (9).

Insulin resistance is commonly observed in patients with type 2 diabetes mellitus, which plays a key role in the progression of thyroid dysfunction in such patients. This study aims to determine the occurrence of thyroid dysfunction in our health system with type 2 diabetes mellitus. The outcome of this study will be helpful in the early diagnosis of the disease and patient care.

METHODOLOGY

This cross-sectional study was conducted in the Medicine Department of Saidu Teaching Hospital, Swat, from 09 April 2023 to 09 October 2023, after the hospital gave ethical approval. We enrolled 222 patients using non-probability consecutive sampling, taking the prior frequency of thyroid dysfunction to be 17.5% in T2DM patients, 95% confidence level, and 5% margin of error.

Our patients were aged 18 to 70 years and were diagnosed with T2DM (defined as HbA1c >6.5%). Chronic liver disease patients and pre-existing thyroid disorders or pregnancy were not included. Before participation, consent was obtained from all subjects.

Demographic details were noted. Laboratory investigations were performed to evaluate thyroid function, with serum thyroid-stimulating hormone (TSH) levels as the primary diagnostic marker. Hypothyroidism was defined as TSH >4.5 mU/L, while hyperthyroidism was classified as TSH <0.4 mU/L. All the

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assessments were conducted under the supervision of a consultant with a minimum of three years of post-fellowship experience.

SPSS 21 was deployed for analysis. Age, along with BMI, was calculated using mean ± standard deviation, while gender, hypertension, socioeconomic background, and thyroid dysfunction were calculated using frequencies and percentages. Stratification was performed to assess the influence of various factors on thyroid dysfunction using the chi-square test, and the P value was significant at ≤ 0.05.

RESULTS

Participants had a mean age of 46.60±14.032 years. Their body mass index (BMI) was 24.8128±1.55131 kg/m². We found that the male patients were 55.9% (124) while female were 98 (44.1%). Hypertension was 70 (31.5%) (Table 1).

Thyroid dysfunction was found in 26 (11.7%) (Table 2). We observed that patients aged > 50 had higher frequency (73.1%) of thyroid dysfunction (P = 0.001). Gender, wise we observed that female was more effected with thyroid dysfunction (61.5%) (P = 0.05). Hypertension and socioeconomic status did not yield a significant link with thyroid dysfunction. BMI showed that those with > 24.9 kg had higher frequency of thyroid dysfunction (76.9%) (P = 0.001) (Table 3).

Table 1: Demographics

Demographics		N	%
Gender	Male	124	55.9%
	Female	98	44.1%
Socioeconomic status	Low (> 50K)	53	23.9%
	Middle (50K to 100K)	136	61.3%
	HIgh (> 100K)	33	14.9%
Hypertension	Yes	70	31.5%
	No	152	68.5%

Table 2: Frequency of thyroid dysfunction

Thyroid dysfunction	N	%
Yes	26	11.7%
No	196	88.3%

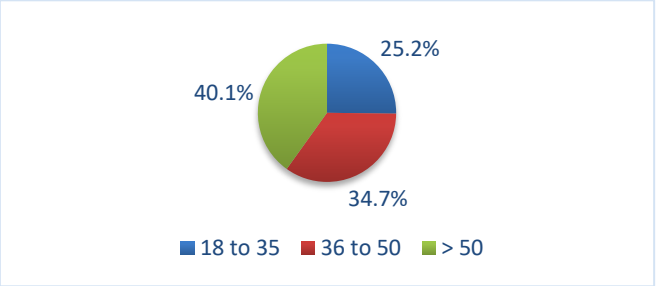

Figure 1: Age distribution (Years)

Table 3: Stratification of thyroid dysfunction with various parameters

Parameters		Thyroid dysfunction				P value
		Yes		No		
		N	%	N	%	
Age distribution (Years)	18 to 35	3	11.5%	53	27.0%	0.001
	36 to 50	4	15.4%	73	37.2%	
	> 50	19	73.1%	70	35.7%	
Gender	Male	10	38.5%	114	58.2%	0.05
	Female	16	61.5%	82	41.8%	
Hypertension	Yes	7	26.9%	63	32.1%	0.59
	No	19	73.1%	133	67.9%	
Socioeconomic status	Low (> 50K)	7	26.9%	46	23.5%	0.68
	Middle (50K to 100K)	14	53.8%	122	62.2%	
	High (> 100K)	5	19.2%	28	14.3%	
BMI (Kg/m2)	18 to 24.9	6	23.1%	114	58.2%	0.001
	> 24.9	20	76.9%	82	41.8%	

DISCUSSION

The overall prevalence of thyroid dysfunction in our study was 11.7% which is lower than the 26.7% reported by Khassawneh et al. (10) Ogbonna et al. showed prevalence of 12.4% which sits well with our findings and Jali et al. reported 16.2% (11, 12). The variation may stem from differences in diagnostic criteria, iodine status or may be genetic predisposition across the samples. Notably it was found that subclinical hypothyroidism was the most common thyroid disorder in all referenced studies emphasizing the need for routine TSH screening in T2DM patients even in the absence of overt symptoms.

The mean age of participants in our study was 46.60 ± 14.032 years, our mean age was younger than the cohorts in other published studies like the one by Khassawneh et al. where they documented the mean age 60.14 ± 12.21 years and Ogbonna et al. mentioned 57.5 ± 9.3 years (10, 11). Although our age bracket mostly consisted of younger patients but we observed that patients aged who were above 50 years had a notably higher frequency of thyroid dysfunction reinforcing the well-documented theory that increasing age is a critical factor of thyroid abnormalities in T2DM. This aligns well with the findings from Khassawneh et al. they showed that the prevalence peaked at 49.8% in those >60 years (10). Jali et al. also reported that 19% of patients >50 years had thyroid dysfunction.[12] The biological plausibility behind this association includes age-related alterations in thyroid hormone metabolism increased autoimmunity and prolonged exposure to metabolic disturbances in diabetes.

Gender distribution in our study revealed that 55.9% were male and 44.1% were female, still females exhibited a higher frequency of thyroid dysfunction (61.5%, P = 0.05). This finding is also supported by multiple studies. Jali et al. reported that 25% of females with T2DM had thyroid dysfunction compared to only 10.1% of males (12). Khassawneh et al. demonstrated that 62.4% of thyroid dysfunction cases were female (adjusted OR: 1.76 P = 0.013) (10). The higher susceptibility in women can be attributed to many factors such as hormonal influences, autoimmune predisposition or differences in body composition affecting the thyroid hormone regulation.

Our study found that BMI was notably associated with thyroid dysfunction with 76.9% of cases occurring in patients with BMI >24.9

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kg/m² (P = 0.001). This resonates with Ogbonna et al. who identified central obesity (waist circumference >94 cm in men and >80 cm in women) as a notable risk factor (OR: 2.5 P = 0.001) (11). Conversely, Khassawneh et al. noted that although T2DM patients had a higher mean BMI, they found that the obesity alone was not a noteworthy predictor after adjusting for other variables (10). The discrepancy may be due to differences in population characteristics or the fact that central adiposity rather than BMI alone plays a more critical role in thyroid dysfunction.

We found no notable link between hypertension and thyroid dysfunction in our study (P > 0.05), although it was present in 31.5% of participants. Khassawneh et al. also reported that in T2DM patients, hypertension was not a notable predictor of thyroid dysfunction (10).

CONCLUSION

In conclusion, we found that in T2DM patients the frequency of thyroid dysfunction was 11.75% and it was notably associated with increasing age years, female gender and higher BMI. We recommend repetitive thyroid function tests for T2DM patients especially for women, older aged patients and those with elevated BMI for early intervention and to mitigate metabolic complications. Future studies with larger multi-center cohorts could further validate these associations and explore underlying mechanisms.

DECLARATIONS

Data Availability Statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned. (13-ERB/023)

Consent for publication

Approved

Funding

Not applicable

CONFLICT OF INTEREST

The authors declared an absence of conflict of interest.

AUTHOR CONTRIBUTION

SADAM HUSSAIN (Postgraduate Resident)
Conception of Study, Data Collection, Development of Research Methodology Design, Study Design, Review of manuscript, final approval of manuscript.
Manuscript drafting.
WASIL KHAN (Professor)
Manuscript revisions, critical input.
ABDUL JABBAR (Associate Professor)
Review of Literature
ABDUL AHAD (Professor)
Review of Literature.
ZIAULLAH (Associate Professor)
Literature Search
IRSHAD ALI (Assistant Professor)
Critical Input
MUHAMMAD SHAFIQ (Senior Registrar)
Critical Input

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