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RESEARCH ARTICLE

Frequency of Hypothyroidism in Patients of Type 2 Diabetes Mellitus at a Tertiary Care Hospital in Bahawalpur Pakistan

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Abstract:

***Objective*:** To determine frequency of Hypothyroidism in patients of Type 2 Diabetes Mellitus (T2DM) at a Tertiary Care Hospital in Bahawalpur Pakistan.

***Methods*:** This retrospective cross-sectional study was conducted at the Department of Medicine, Bahawal Victoria Hospital, Quaid-e-Azam Medical College Bahawalpur Pakistan. T2DM was identified based on an HbA1c level above 7.0%, two random blood glucose readings of ≥200mg/dL, a prior diabetes diagnosis, or the use of anti-hyperglycemic medications. Hypothyroidism was defined by high TSH and low free T4 levels, or the use of thyroid hormone replacement therapy. Data from medical records of 669 type 2 diabetes patients, collected from January 2024 to December 2024 using a consecutive non-probability sampling method, were included in the analysis. Medical records were excluded if the patients had undergone thyroid surgery, radiation therapy, had end-stage kidney disease, chronic liver disease, or were pregnant. Incomplete records were also excluded. Demographic data such as age, gender, and diabetes duration were recorded, and patient charts were reviewed for diabetes control, HbA1c levels and hypothyroidism status. SPSS version 23 was used for data analysis

***Results*:** Hypothyroidism was seen in 19 (2.8%) patients, with a higher proportion of females affected compared to males (4.3% vs. 0.4%, p-value 0.003). No significant differences were observed between patients with hypothyroidism and those without in terms of age (p-value 0.172), duration of diabetes (p-value 0.638) or diabetes control (p-value 1.000).

***Conclusion*:** Gender significantly impacted the likelihood of hypothyroidism, with females being more likely to have hypothyroidism. However, age, duration of diabetes and diabetes control were not found to significantly affect the odds of hypothyroidism.

Keywords: Hypothyroidism, TSH, Free T4, Thyroxine, Type 2 Diabetes Mellitus, HbA1c.

1. INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) is the leading endocrine disorder, primarily caused by dysfunction of pancreatic beta cells. In 2019, approximately 463 million adults, aged 20–79 years, worldwide were living with diabetes, with 79% residing in low and middle income countries [1,2]. Additionally, the American Diabetes Association (ADA) estimated that 374 million people are at risk for developing T2DM [1].

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Thyroid disorders are the second most prevalent endocrine issue. In the United States, 4.6% of the population has hypothyroidism and 1.3% has hyperthyroidism, while in Europe, these figures are 3.05% and 0.75% respectively [3]. Research has shown that people with diabetes are more vulnerable to thyroid dysfunction, with studies reporting prevalence rates between 4% and 35% [4,5]. Insulin resistance is believed to play a central role in disrupting thyroid function in T2DM patients. This disruption can affect thyroid hormone regulation by influencing TSH levels or impairing the conversion of T4 to T3. In subclinical hypothyroidism, insulin resistance is thought to arise due to reduced glucose transporter function (GLUT-2), which affects glucose transport [6]. A study by Elgazar *et al.* found a higher occurrence of thyroid dysfunction in patients with high HbA1c levels [7]. Moreover, thyroid dysfunction is also associated with elevated cholesterol and triglyceride levels, which can increase the risk of cardiovascular diseases in diabetic patients [7].

While extensive research has been conducted globally, there is a notable gap in data from Pakistan regarding the prevalence of thyroid disorders among diabetic patients [1]. Pakistan, with a rapidly growing diabetic population, is experiencing an increase in the incidence of both T2DM and thyroid dysfunction. This makes it essential to explore the prevalence and possible associations within the local context. By focusing on specific factors such as gender, age and diabetes control, this study can provide insights that are more tailored to the Pakistani population. Furthermore, understanding these relationships in Pakistan can contribute to better clinical practices, improve early diagnosis, and enhance treatment strategies for both diabetes and thyroid disorders. Raising awareness among healthcare professionals, especially primary care providers, is vital to ensuring that thyroid dysfunction is not overlooked in diabetic patients. It can also inform public health policies and interventions aimed at improving overall healthcare outcomes. Thus, the findings of this study are expected to provide valuable data that can help guide future research, improve patient care, and support public health initiatives in Pakistan.

2. METHODS

This retrospective cross-sectional study was conducted at the Department of Medicine, Bahawal Victoria Hospital, Quaid-e-Azam Medical College Bahawalpur Pakistan, to examine the prevalence of hypothyroidism in individuals with T2DM. T2DM was identified based on an HbA1c level above 7.0%, two random blood glucose readings of ≥200mg/dL, a prior diabetes diagnosis, or the use of anti-hyperglycemic medications. Hypothyroidism was defined by high TSH and low free T4 levels, or the use of thyroid hormone replacement therapy. The study adhered to the ethical standards outlined in the 1964 Declaration of Helsinki, with revisions from 2000. Data from medical records of 669 type 2 diabetes patients, collected from January 2024 to December 2024 using a consecutive non-probability sampling method, were included in the analysis.

Medical records were excluded if the patients had undergone thyroid surgery, radiation therapy, had end-stage kidney disease, chronic liver disease, or were pregnant. Incomplete records were also excluded. Demographic data such as age, gender, and diabetes duration were recorded, and patient charts were reviewed for diabetes control, HbA1c levels and hypothyroidism status. SPSS version 23 was used for data analysis, including descriptive statistics (mean, standard deviation, frequency, and percentage). Stratification was performed to control for confounding factors, and Fisher's Exact test and Chi-Square tests were used after stratification, with a significance level of $p < 0.05$. Finally, binary logistic regression analysis was conducted.

3. RESULTS

The present study examined demographic and clinical variables in medical records of 669 patients of T2DM, with a focus on the prevalence of hypothyroidism as shown in Table **1**. Of the participants, 19 (2.8%) patients had hypothyroidism, with a higher proportion of females affected compared to males (4.3% vs. 0.4%, p-value 0.003). No significant differences were observed between patients with hypothyroidism and those without in terms of age (p-value 0.172), duration of diabetes (p-value 0.638) or diabetes control (p-value 1.000) as shown in Table **2**. Logistic regression analysis revealed that gender significantly

impacted the likelihood of hypothyroidism, with females being more likely to have hypothyroidism (p-value 0.020). However, age, duration of diabetes and diabetes control were not found to significantly affect the odds of hypothyroidism as shown in Table **3**.

Table 1. Demographic and clinical variables of the patients (n=669).

Demographic and Clinical Variables	Frequency (n)	Percent (%)
Gender:		
Female	426	62.2
Male	253	37.8
Age (years):		
51 or less	317	47.4
52 or more	352	52.6
Duration of Diabetes (years)		
4 or less	274	41.0
5 or more	395	59.0
Diabetes Control:		
Controlled / Good	153	22.9
Uncontrolled / Poor	516	77.1
Hypothyroidism:		
Present	19	2.8
Absent	650	97.2
Quantitative Variables:		
Mean Age (years)	53.92±0.1	
Mean Duration of Disease (years)	6.5±5.4	
Mean HbA1c (%)	9.8±2.5	

Table 2. Stratification of data with regards to hypothyroidism (n=669).

Clinical Variables	Hypothyroidism		p-value
	Absent	Present	
Gender:			
Female	398 (95.7%)	18 (4.3%)	0.003
Male	252 (99.6%)	01 (0.4%)	
Age (years):			
51 or less	305 (96.2%)	12 (3.8%)	**0.172**
52 or more	345 (98.0%)	07 (2.0%)	
Duration of Diabetes (years):			
4 or less	265 (96.7%)	09 (3.3%)	**0.638**
5 or more	385 (97.5%)	10 (2.5%)	
Diabetes Control:			
Controlled / Good	149 (97.4%)	04 (2.6%)	1.000
Uncontrolled / Poor	501 (97.1%)	15 (2.9%)	

Table 3. Logistic regression analysis assessing the impact of various clinical variables on hypothyroidism.

Variables	Beta Coefficient (B)	S.E.	Wald	df	p-value	Exp(B)	95% C.I. for Exp(B)	
							Lower	Upper
Gender	-2.410	1.033	5.449	1	0.020	0.090	0.012	0.679
Age	0.524	0.494	1.123	1	0.289	1.689	0.641	4.450
Diabetes Duration	0.241	0.482	0.250	1	0.617	1.273	0.495	3.274
Diabetes Control	0.029	0.581	0.002	1	0.960	1.029	0.330	3.215

4. DISCUSSION

The coexistence of T2DM and thyroid disorders is well-established, with both being common endocrine conditions encountered in clinical settings. This study aimed to evaluate the prevalence of thyroid dysfunction in T2DM patients and investigate its relationship with age, gender and diabetes control in the Pakistani population. Our findings revealed a thyroid dysfunction prevalence of 2.8% in T2DM patients, which is markedly lower than the 29%, 31%, and 35% reported in other studies [7,8,9]. This variation may be due to ethnic differences and dietary habits specific to the region [10,11]. A recent study from Pakistan found that 24.6% of diabetic patients had thyroid dysfunction, with a higher prevalence in females (31.32%) compared to males (16.41%), suggesting the need for regular screening in diabetic patients [12]. Ogbonna *et al.* found that females with T2DM are 3.8 times more likely to develop thyroid dysfunction compared to males, likely due to the influence of estrogen on thyroid follicular cells and thyroxine-binding globulin (TBG) [13].

The results of the present study indicate a significant gender difference in the prevalence of hypothyroidism among patients with T2DM, with females being more likely to have hypothyroidism compared to males. This finding is consistent with previous research suggesting that thyroid dysfunction is more common in women, possibly due to hormonal differences that may influence thyroid function [13,14]. However, no significant association was found between age, duration of diabetes, or diabetes control and the presence of hypothyroidism. This suggests that factors such as gender may play a more prominent role in the development of hypothyroidism in diabetic patients, while other clinical variables, such as the duration of diabetes or glycemic control, may not have as direct an impact. The lack of a significant relationship between diabetes control and hypothyroidism is particularly noteworthy, as it contrasts with studies that suggest poor glycemic control may contribute to thyroid dysfunction. These findings highlight the need for further research to explore the underlying mechanisms and risk factors associated with thyroid dysfunction in diabetic patients, particularly focusing on gender and other potential endocrine influences.

The present study has several limitations. Being retrospective and conducted at a single institution, the results may not be applicable to the broader population. We did not investigate the cause of hypothyroidism. Additionally, the study did not account for factors such as cardiovascular disease, hypertension, obesity, dietary iodine supplementation, smoking and alcohol use which could influence the relationship between thyroid dysfunction and T2DM. Therefore, the findings may not fully reflect the general population's experience. Given these limitations, future prospective cohort or case-control studies are recommended to further explore the role of hypothyroidism in T2DM and its complications. These studies could provide more conclusive evidence and strengthen clinical guidelines. In the meantime, regular screening for hypothyroidism and timely treatment should be prioritized in T2DM patients. Ensuring adherence to follow-up care is also essential to mitigate the disease burden and enhance the quality of life for patients. Additionally, raising awareness about lifestyle changes, physical activity, and healthy habits is crucial for better management of T2DM and prevention of complications.

CONCLUSION

Gender significantly impacted the likelihood of hypothyroidism, with females being more likely to have hypothyroidism. However, age, duration of diabetes and diabetes control were not found to signifi-

cantly affect the odds of hypothyroidism. These results emphasize the importance of considering thyroid function in the management of T2DM particularly in females and advocate for regular screening for hypothyroidism in this population. Further research is needed to better understand the mechanisms underlying these associations and to identify other potential risk factors that contribute to thyroid dysfunction in diabetic patients.

AUTHORS' CONTRIBUTION

This study was conceived and designed by NIB and MSAG. NIB, BW and HS did the initial literature research. MSAG and HS did the data collection, assembly and assessment. Data analysis and interpretation were done by NIB, BW and MSAG. NIB, MSAG, HS and BW were involved in manuscript writing, final critical review and corrections. NIB is the corresponding author on behalf of all other authors.

ETHICAL STATEMENT

The present retrospective cross-sectional study was conducted in accordance to the ethical standards laid down in the 1964 Declaration of Helsinki, revised in the year 2000. The present study was based on assessing medical records only with no direct exposure to the patients, and therefore Institutional Review Board Certificate was waived off. Permission for data collection and study approval was obtained from Head of department.

STATEMENT ON DATA AVAILABILITY

Data generated or analysed during this study are available from the corresponding author upon reasonable request.

CONFLICT OF INTEREST

None

FUNDING

None

DISCLAIMER

No part of this manuscript has been published elsewhere in whole or in part. All co-authors take full responsibility for the integrity and accuracy of all aspects of the work.

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