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Original research article

THYROID DYSFUNCTION IN PATIENTS WITH TYPE 1 DIABETES AT A TERTIARY CARE HOSPITAL

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Abstract: *Individuals with diabetes mellitus (DM) are reporting thyroid dysfunction at an alarming rate, and there's evidence that thyroid dysfunction—whether overt or subclinical—affects overall glycaemic control. 12.3% of individuals with Type 1 DM have overt hypothyroidism, while around 24.8% of patients have abnormal thyroid autoantibody levels.* ***Objective:*** *This study aimed to determine Thyroid dysfunction in patients with type 1 diabetes at a tertiary care hospital.* ***Methods:*** *The present descriptive study was carried out at Hayatabad Medical Complex Peshawar from January 2024 to June 2024 after obtaining permission from the ethical committee of the institute. A total of 110 participants were enrolled in the study. We included all T1DM patients of both genders. All participants with T1DM visiting the OPD were screened. The primary test for assessing thyroid function was TSH, which has an acceptable range from 0.5 to 5 mIU/ml. Triiodothyronine (T3) and free thyroxin (FT4) levels were also measured. On a Cobos 6000 machine (Roche), thyroid function tests (TFTs) were performed. Data was analyzed through SPSS version 22.0.* ***Results:*** *A total of 110 participants of both genders of different age groups were enrolled in this study. 63.63% of them were females and 36.36% were males. 18 individuals (16.36%) had subclinical hypothyroidism, 14 individuals (12.7%) were hypothyroid, and 78 of them (70.90%) were euthyroid. We did not identify any occurrences of hyperthyroidism in current research. In comparison to the rest of the population, individuals with hypothyroidism had significantly different mean Thyroid stimulating hormone, FT4 and FT3 levels ($p < 0.0001$). The mean differences for age, the period of diabetes, randomized blood sugar (RBS), and HbA1c were not statistically significant. When the data was examined for subclinical hypothyroidism, however, there was a substantial variance for mean Thyroid stimulating hormone ($p < 0.0001$) but not for FT4 or FT3. Likewise, there was no difference seen in age ($p = 0.35$) or gender ($p = 0.63$).* ***Conclusion:*** *Type 1 diabetes individuals often suffer from thyroid dysfunctions particularly hypothyroidism (12.7%) and subclinical hypothyroidism (16.36%). The analysis of thyroid-stimulating hormone levels and other hormonal markers for thyroid function is the most crucial approach.*

Keywords: Thyroid dysfunction; Patients: Type 1 diabetes.

Introduction

Individuals with diabetes mellitus (DM) are reporting thyroid dysfunction at an alarming rate, and there's evidence that thyroid dysfunction—whether overt or subclinical—affects overall glycaemic control. (1) 12.3% of individuals with Type 1 (T1) DM have overt hypothyroidism, while around 24.8% of patients have abnormal thyroid autoantibody levels. (2) Out of all T1DM individuals, 60% have thyroid autoimmune diseases, and forty per cent have overt thyroid dysfunction. (3) In comparison to the general population, people with T1DM had a greater incidence of thyroid problems. (4, 5) The frequency of clinical hypothyroidism is considerably larger than found among the general population (15 per cent versus 4.3%). Serum TSH along with other thyroid hormone levels is the preferred screening approach since it is challenging to test all individuals with diabetes, even with regular recommendations for additional indicators such as thyroid peroxidase (TPO) antibodies & thyroglobulin antibodies (TGAbs). The lower accessibility of these tests in outlying regions of our country and the greater expenses borne by the patients are the causes. (6, 7) The frequency of thyroid dysfunction in people with type 1 diabetes varies; studies have found that it can vary from 12–24% in female patients to as high as six per cent in male patients. (4) Others have documented rates as high as 60%, correlating them to several variables (gender, advancing age, and the existence of diabetic ketoacidosis). (3, 8) Up to 80% of people with type 1 diabetes have been found to have positive TPO antibodies during numerous investigations, and it has been demonstrated that these antibodies' levels rise with ageing. (9, 10) It is concerning because autoimmune hypothyroidism is being observed at younger ages than in previous studies. (11) Developing evidence-based screening techniques is also necessary to make an early diagnosis and provide better care. Thirty to fifteen per cent of T1DM patients have thyroid dysfunction, which is closely correlated with the presence of thyroid-stimulating antibodies (TSAbs) and TPO antibodies. Severinski et al. (12) corroborate this, demonstrating a fifteen per cent prevalence of thyroid dysfunction, with a greater incidence in the female population (21%). There is not sufficient data available In Pakistan to identify the association between the two diseases which are predominant worldwide. Therefore the current study was conducted to explore Thyroid dysfunction in patients with type 1 diabetes at a tertiary care hospital.

Methodology

The present descriptive study was carried out at Hayatabad Medical Complex Peshawar from January 2024 to June

2024 after obtaining permission from the ethical committee of the institute. A total of 110 participants were enrolled in the study. Before being included in the study, written consent was requested from each patient. Using clinical characteristics, insulin need, and C-peptide levels as necessary, we included all T1DM patients of both genders. Based on their medical history and physical examination, individuals with systemic diseases, thyroid abnormalities that were identified, and those on medication were excluded. All participants with T1DM visiting the OPD were screened using the consecutive sampling approach. Each individual underwent a thorough physical examination and history. After that 3CC of blood were collected from each individual for thyroid function tests. The primary test for assessing thyroid function was TSH, which has an acceptable range from 0.5 to 5 mIU/ml. Triiodothyronine (T3) and free thyroxin (FT4) levels were also measured. On a Cobos 6000 machine (Roche), thyroid function tests (TFTs) were performed using the electro-chem luminescence immunoassay technique. Participants were classified into to following five groups

i. Individuals with overt hypothyroidism (FT4 <10 pmol/l, FT3 <4.0 pmol/l, and TSH >5.0 mIU/ml);
ii. those with normal FT4 and FT3 and TSH levels of more than 5.0 mIU/ml who have subclinical hypothyroidism
iii. those with overt hyperthyroidism (FT4 >20 pmol/l, FT3 >8 pmol/l, and TSH <0.5 mIU/mL);
iv. Individuals exhibiting subclinical hyperthyroidism (FT4 and FT3 normal, TSH <0.5 mIU/ml)
v. People whose TFT levels are normal

Data was analyzed through SPSS version 22.0. The categorical data were shown as frequencies and percentages, and the descriptive variables as mean ± standard deviations (SD). To compare categorical variables, the Chi-square test was employed. To compare groups, an independent t-test was used.

Results

A total of 110 participants of both genders with an overall mean age of 20.5 ±4.4 years (range being 12-30 years) were enrolled in this study. 70(63.63%) of them were females and 40(36.36%) were males (figure1). The mean body mass index was 24.9 ±1.6 (with a range of 20.4-29), and the mean duration of time with diabetes was 3.7 ±1.4 years (with a range of 1-7 years). Within the range of 6.6 to 10, the mean HBA1c was 7.9 ±0.71%, and the mean Thyroid stimulating hormone was 5.4 ±4.4 mIU/ml (range to 1.3 to 16.3 mIU/ml) (table 1). 18 individuals (16.36%) had subclinical hypothyroidism, 14 individuals (12.7%) were hypothyroid, and 78 of them (70.90%) were euthyroid. We did not identify any occurrences of hyperthyroidism in current research (figure.2). In comparison to the rest of the population, individuals with hypothyroidism had significantly different mean Thyroid stimulating hormone (MD: 7.7 mIU/ml, 95% CI: 5.5 to 9.9, p <0.0001), FT4 (MD: 9.7 pmol/L, 95% CI: 8.7-10.6, p <0.0001), and FT3 levels (MD: 10.8, 95% CI: 9.4 to 12.1, p <0.0001). The mean differences for age, the period of diabetes, randomized blood sugar (RBS), and HbA1c were not statistically significant. When the data was examined for subclinical hypothyroidism, however, there was a substantial variance for mean Thyroid stimulating hormone (MD: 8.3 mIU/ml, 95% CI: 6.6 to 10.1, p <0.0001) but not for FT4 or FT3 as represented in Table 1. Likewise, there was no difference seen in age (p= 0.35) or gender (p= 0.63) according to chi-square analysis.

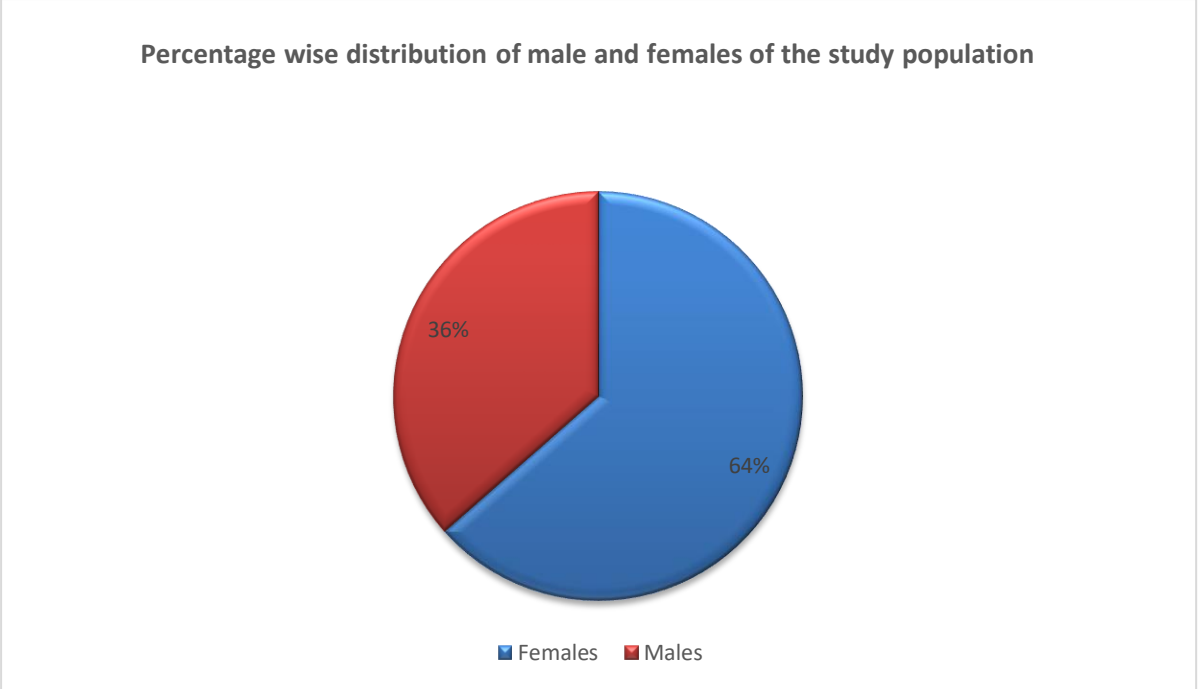

Figure 1: Age distribution of study population

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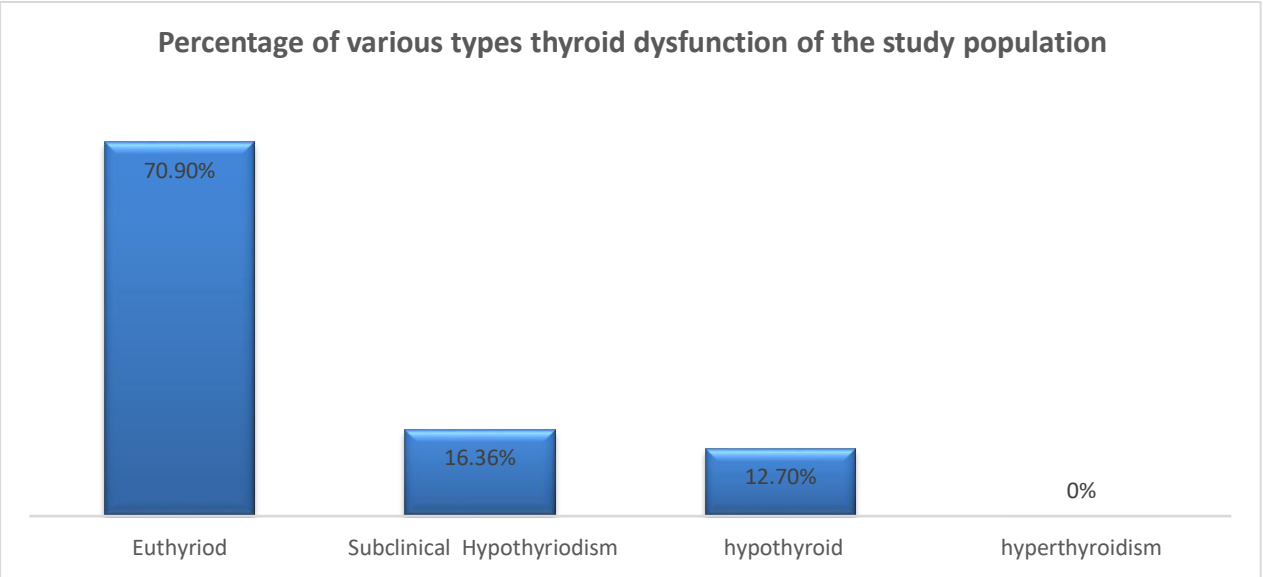

Figure 2. Percentage of various types of thyroid dysfunction of the study population

Table 1. Comparison of several clinical parameters based on thyroid function status for the three groups

Parameter	Hypothyroid (Overt) N=(14)	Subclinical (N= 18)	Euthyroid (N= 78)
Age in years	20.5 ± 3.7	19.7 ± 4.3	20.7 ± 4.5
Duration of diabetes	3.7 ± 0.7	3.6 ± 1.4	3.7 ± 1.4
Body mass index	25.8 ± 1.5	25.5 ± 1.2	24.6 ± 1.6
Thyroid-stimulating hormone	12.4 ± 0.3	12.5 ± 2.1	2.9 ± 0.6
Free thyroxin (FT4)	4.7 ± 0.83	14.4 ± 1.2	14.4± 1.5
Free triiodothyronine (FT3)	2.2 ± 0.89	12.7 ± 1.7	12.9 ± 2.4
HbA1c (%)	7.8 ± 0.63	8.2 ± 1.64	7.9 ± 0.74
Random blood sugar	227.0 ± 27.3	225.6 ± 22.7	219.1 ± 32.9

Discussion

The findings of our study revealed imperative information about the prevalence of thyroid dysfunction in type 1 diabetes mellitus individuals. No association of sex (p= 0.63) was noted as reported in other investigations. (13) In the current study the level of thyroid stimulating hormone, free thyroxin and free triiodothyronine levels were considerably diverse between hypothyroid individuals and the rest of the patients. These findings of our study are similar to the study conducted by Ardestani et al (13) and Umpierrez. (14) In the current research the incidence of subclinical hypothyroidism was 16.36% and hypothyroidism was 12.5% with a cumulative frequency of 28.8% for thyroid-related disorders. With increasing age thyroid dysfunction increases particularly in individuals with positive serum thyroid immunoglobulin. (3) A large-scale survey was conducted in the USA with a sample size contains 17353 individuals who reported a 4.6% prevalence of hypothyroidism. (15) Individuals with thyroid-positive antibodies are at risk of thyroid dysfunction as compared to individuals with negative thyroid antibodies. (14)

The association between thyroid disease and diabetes mellitus type 1 has been reported in numerous researches. However, there are wide variances in the identified rates for its development of. (16-18)

In this study, the percentage of females was 763.63% and 36.36% were males. Compared to men (6%), women (12–24%) are found to be at higher risk reported in some studies. (19, 20) But even though there were more women in this study, we could not find any evidence of a gender association. Research has revealed that people with type 1 diabetes (T1DM) had dominant mutations in human leukocyte antigen, or HLA, linked genes, which increases the risk of autoimmune disorders such as thyroid dysfunction and Addison's disease. (21, 22) Ikegami et al. (23) have demonstrated recently that variation in HLA-associated genes is also linked to autoimmune diseases, and that those with Type 1 diabetes have ten non-HLA-associated genes. Studies have demonstrated that CTLA4 polymorphism is prevalent in people with T1DM as well as in individuals who have autoimmune thyroid dysfunction. (24) According to research by Mohn et al. (19) the introduction of replacement treatment improves hypoglycemia episodes that are linked to subclinical hypothyroidism. Moreover, it is becoming obvious that hypothyroidism is the cause of insulin resistance in diabetic individuals. (24)

Similarly, genetic predisposition may potentially be linked to a greater incidence of Grave's disease in T1DM patients, according to research by Donner et al. (20) However, in our investigation, we did not discover any appreciable variations between random blood sugar measurements and HBA1C results.

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Conclusion

Individuals with type 1 diabetes frequently experience thyroid dysfunctions, with a notable prevalence of hypothyroidism (12.7%) and subclinical hypothyroidism (16.36%). Monitoring thyroid-stimulating hormone (TSH) levels, alongside other hormonal markers of thyroid function, remains a critical component in the assessment and management of these dysfunctions, facilitating early intervention and optimized metabolic control in diabetic patients.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.
Ethics approval and consent to participate.
Approved by the department concerned. (IRBEC-HIBMC-331/23)
Consent for publication
Approved
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Not applicable

Conflict of interest

The authors declared an absence of conflict of interest.

Authors Contribution

TAHIR ZAMAN KHAN (Medical Officer)
Data Analysis, Drafting, Concept & Design of Study
SYED MOHIB ULLAH SHAH (Medical Officer)
Revisiting Critically & Final Approval of version

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