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Research Article

Thyroid Diseases in Diabetics

Prevalence of Thyroid Diseases in Diabetics Patients at King Fahad General Hospital in Jeddah, Saudi Arabia

Raghad Saud Almatani[1], Asmaa Sulaiman Alsahaf[1], Maram Bakheet Alluhaybi[1], Renad Abdulaziz Refaai[1], Wajdan Ibrahim Alharbi[1] and Yosra Alhindi[2]

[1]*Pharm D candidate, Faculty of Pharmacy, Um Al -Qura University, Makkah, KSA.*

[2]*Department of Pharmacology and Toxicology, Faculty of Medicine, Umm Al-Qura University, Makkah, Saudi Arabia*

Abstract: Progressive disease that is Diabetes is a chronic disorder that is characterized by elevated blood glucose levels. The global prevalence of this disorder has nearly doubled among adults. Diabetes Mellitus (DM) and thyroid diseases are the most common endocrine disorders in clinical practice. Several studies have shown that diabetes mellitus is associated with an increased incidence of thyroid disorders. The main aim of this study was to assess the prevalence of thyroid diseases in patients with Diabetes. Therefore, this information can guide physicians to detect and treat this problem better. This cross-sectional study was conducted at the outpatient clinics in King Fahad General Hospital in Jeddah, Saudi Arabia. The prevalence of thyroid disease among all patients with Diabetes was 31.2%. The frequency of patients without or denied any previous thyroid disease was 27.9%. The most frequent thyroid disorder was subclinical hypothyroidism, occurring in 4.2% of patients with type I DM and 35.9% with type II DM. We concluded that screening for thyroid disease among diabetic patients is essential and should be performed routinely due to the high prevalence of new cases diagnosed and the possibility of developing risk factors, such as hypertension and dyslipidemia, arising from undiagnosed thyroid dysfunction.

Keywords: Thyroid Diseases, Prevalence, Diabetes Mellitus Type I, and Diabetes Mellitus Type II.

***Corresponding Author**

Yosra Alhindi , Department of Pharmacology and Toxicology, Faculty of Medicine, Umm Al-Qura University, Makkah, Saudi Arabia

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1. INTRODUCTION

The most common endocrinopathies are diabetes mellitus and thyroid disorders [1]. Diabetes is described as a chronic disease of gradual high blood sugar levels[2]. The main factors responsible for causing diabetes are a stable and diversified lifestyle, diet, original race, and family genetics[3]. According to the International Diabetes Federation's (IDF) atlas information showed that around 463 million adults are currently living suffering from diabetes [4,5]. Saudi Arabia is considered the seventh of the top ten countries regarding high diabetes prevalence[6]. Thyroid dysfunction includes hypothyroidism, hyperthyroidism, and nodular goiter hypothyroidism[1]. It increases with age and is more common in women than in men[7]. Subclinical thyroid disorders are characterized by a decrease or increase in serum Thyroid stimulating hormone (TSH) with Thyroid hormone (TH) levels in the upper and lower boundaries of their reference range, and they can be asymptomatic[7,8]. Multiple studies showed that subclinical hypothyroidism is the most common thyroid disorder epidemiologically[1]. Data reported that in Saudi Arabia, the prevalence of thyroid dysfunction in diabetic patients is around 16- 28.5%[9]. In type I diabetic patients, the association of thyroid disease and diabetes is attributed to be genetic link [10]. However, type 2 diabetes can change thyroid metabolism, but the underlying mechanism is still unclear[11]. Moreover, multiple studies have demonstrated the link between the two diseases could be caused by genetic and immunological relationships [12]. In diabetic patients, thyroid dysfunction is common and can cause significant metabolic disorders. Therefore, a scheduled thyroid abnormality screening would allow for early intervention with subclinical thyroid dysfunction in all diabetic patients [13]. Thyroid disorders are extraordinarily normal within the diabetic population. However, hypothyroidism amongst the pediatric populace is 0.1 to 2% [14]. The immune-mediated destruction of pancreatic islet cells causes kind I diabetes mellitus. Autoimmune thyroid issues and type I diabetes are usually caused by genetic history and similar pathogenesis; hence, they may arise within identical men, women, or families [15]. The immune-mediated are the maximum normal immunological illnesses in sufferers with type I diabetes [16,17]. Nearly 1/3 of all newly detected type I diabetes sufferers have a co-existent immune-mediated disease and excessive thyroid disorder which is predominantly hypothyroidism.[18] A collaborative observation of the AASGARD-Alpe Adria Study Group of Pediatric Endocrinology and Diabetology confirmed in a cross-sectional observation related to 1419 children with type I diabetes, wherein 3.5% had Hashimoto's thyroiditis [19]. Cross-sectional research has suggested an incidence of hypothyroidism in 12–24% of women and 6% of male sufferers with Type I diabetes [20,21]. The Kingdom of Saudi Arabia (KSA) is the biggest in the Middle East, with over 33 million people, of whom 26% are aged less than 14. Studies indicate, within the current decades, a significant increase in the incidence and occurrence of type I diabetes in special towns of KSA, especially among most youngsters and adolescents [22.23]. Thus, it becomes vital to observe the interrelationship among people with Diabetes. Therefore, the main aim of this study was to estimate the prevalence of thyroid disease in diabetic patients.

2. METHODS

2.1 Study Design and Setting

This is an observational cross-sectional study conducted in the outpatient clinics at King Fahad. General Hospital in Jeddah, Saudi Arabia. Two hundred thirty-four (234) patients with Type I DM and one thousand and twenty-two patients (1022) with type II DM that regularly attended the outpatient clinic of the unit of Diabetes were included in the study.

2.2 Inclusion Criteria

In this study, we included any duration of diabetes longer than 6 months for patients with type II DM or one year for those with type I DM. Patients were diagnosed with type II DM at age 30 years or older, insulin-free within 1 year after diagnosis, and had no history of ketosis or ketonuria. In patients with type I DM, diagnosis is based on typical clinical manifestations, varying degrees of weight loss, polyuria, polydipsia, and polyphagia, and the need for continued insulin use since diagnosis, with at least There is no one-year hiatus and annual follow-up. Data collection for all patients was assessed as follows: sex, age (years), duration of DM (years), body mass index (BMI), and blood pressure (systolic and diastolic). Data were also collected on comorbidities such as hypertension, dyslipidemia, and previous thyroid diseases such as (hyperthyroidism, hypothyroidism, nodules, and cancer). Biochemical outcome data included fasting and 2-hour postprandial blood glucose levels, HbA1c, anti-thyroperoxidase antibodies (anti-TPO), free thyroxine (FT4), and free thyroxine (TSH). Thyroid dysfunction was classified as clinical hypothyroidism if the TSH level was >4.20 μ UI/mL and the FT4 level was <0.93 ng/dL. Asymptomatic hypothyroidism with TSH >4.20 μ UI/ml and FT4 ranging from 0.93 μ UI to 1.7 ng/dL, asymptomatic with TSH <0.27 μ UI/ml and FT4 ranging from 0.93 Hyperthyroidism TSH levels less than 0.27 μ UI/mL and FT4 levels greater than 1.7 ng/dL up to 1.7 ng/dL are clinically hyperthyroid. Autoimmunity was diagnosed when anti-TPO levels exceeded 34 IU/mL.

2.3 Exclusion Criteria

The study excluded patients with no history of type I or type II DM. Patients without all other comorbidities, neonates, and thyroid cancer.

2.4 Sample Size and Data Analysis

A sample size was calculated to estimate a prevalence of 50%. Approximately 1022 patients with type II DM and 234 patients with type I DM estimate the predicted prevalence using 95% confidence intervals with absolute accuracies of ± 3.5% and ± 4.5%, respectively I was able to. Statistical analysis was performed using SPSS version 22. Categorical variables were described as frequencies (percent), and mean ± standard deviation was used for continuous parameters. Student's t-test compared differences between the two groups. For nonparametric variables, data are presented as median (min-max). In this case, the nonparametric Mann-Whitney test was used for statistical comparison. Categorical variables were compared between two or more groups using the chi-square test. The p-value for < 0.05 is considered statistically significant.

2.5 Ethical Approval Statement

Ethical approval was obtained from the Institutional Review Board IRB committee at the College of Medicine, Umm Al-Qura University ethical approval code: (HAPO-02-K-012-2022-09-1174).

3. RESULTS

Overall results included 1256 patients, 234 (18.6%) with type 1 DM and 1022 (81.3%) with type II DM. Data of the patients for type I are shown in Table 1, and for type II, in Table 2. The rate of thyroid diseases in the patients was 31.2%. The autoimmune status, and anti-TPO positive, were present in 10 (4.7%) patients with type 1 DM and 144 (14.9 %) in type II DM patients.

Table 1:Data of Type I study population (n= 234)		
Gender		
Male	57	57%
Female	177	177%
Age		
10-15 years	210	210%
20-30 years	24	24%
40-50 years	0	0%
>50 years	0	0%
Diabetes duration		
< 5 years	7	7%
5- 10 year	23	23%
> 10 years	60	60%
Hypertension	56	56%
Dyslipidemia	33	33%
Anti-TPO Yes	10	10%
Previous thyroid disease Yes	22	22%
No	212	212%
	Mean±SD	
BMI (kg/m2)	23.2± 4.2	
s BP (mmHg)	112± 13.2	
d BP (mmHg)	76±15	
FPG (mg/dl)	145±64.1	
2H-PPG (mg/dl)	213±22.4	
HBA1C %	11.1±2.1	
TSH	2.6±0.43	
FT4	1.5± 0.12	

Data are statistically mean ± SD.
Abbreviations: sBP: systolic blood pressure; dBP: diastolic blood pressure; BMI: body mass index; FPG: fasting blood glucose; 2 h- PPG: 2 h postprandial glucose.

Table 1 illustrate the study population of diabetic patients with type I. Almost 24.36% were male, and 65.64% were female. Around 90.60% have never had previous thyroid diseases.

Table 2: Data of Type II study population (n= 1022)		
Gender		
Male	350	350%
Female	672	672%
Age		
10-15 years	0	0%
20-30 years	0	0%
40-50 years	780	780%
>50 years	242	242%
Diabetes duration		
< 5 years	134	134%
5- 10 year	456	465%
> 10 years	432	432%
Hypertension	710	710%
Dyslipidemia	866	866%
Anti-TPO Yes	144	144%
Previous thyroid disease Yes	120	120%
No	902	902%
	Mean±SD	
BMI (kg/m2)	33.5± 6.2	
s BP (mmHg)	132± 16.5	
d BP (mmHg)	77±11	
FPG (mg/dl)	141±67.2	
2H-PPG (mg/dl)	222±79.2	

HBA1C %	8.1±1.3
TSH	2.7±0.55
FT4	1.1± 0.16

Data are statistically mean ± SD.
Abbreviations: sBP: systolic blood pressure; DBP: diastolic blood pressure; BMI: body mass index; FPG: fasting blood glucose; 2 h- PPG: 2 h postprandial glucose

Table 2 illustrate the study population of diabetic patients with type II. Almost 34.25% were male, and 65.75% were female. Around 88.26% have never had previous thyroid diseases. The prevalence of subclinical hypothyroidism was 4.2 % in type I DM patients without previous thyroid disease and was the only thyroid disease found in this group. In the group of patients with type II DM without last thyroid disease, the prevalence of subclinical hypothyroidism was 35.9 %, clinical hypothyroidism 1.1%, subclinical hyperthyroidism 0.3% and clinical hyperthyroidism 0.6% data presented in Table 3 and 4.

Table 3: The frequencies of thyroid disease in Type I DM patients without prior thyroid disease (n=212)	
Thyroid function without previous Thyroid dysfunction	N=212
Euthyroid	113
Subclinical hypothyroidism	9
clinical hypothyroidism	0
Subclinical hyperthyroidism	0
clinical hyperthyroidism	0

Table 3 illustrates the frequencies of thyroid disease in Type I DM patients without prior thyroid disease in 212 patients, with 113 Euthyroid and 9 patients with subclinical hypothyroid.

Table 4:The frequencies of thyroid disease of Type II DM patients without prior thyroid disease (n=902)	
Thyroid function without previous Thyroid dysfunction	N=902
Euthyroid	342
Subclinical hypothyroidism	324
clinical hypothyroidism	10
Subclinical hyperthyroidism	3
clinical hyperthyroidism	5

Table 4 illustrates the frequencies of thyroid disease of Type II DM patients without prior thyroid disease in 902 patients with 342 patients Euthyroid and 324 patients with subclinical hypothyroid, 10 patients with clinical hypothyroid, 3 patients with subclinical hyperthyroid, and 5 patients with clinical hyperthyroid.

The prevalence of subclinical hypothyroidism was 31.8 % in type I DM patients with previous thyroid disease and 4.6 % for subclinical hyperthyroidism in this group. In the group of patients with type II DM with last thyroid disease, the prevalence of subclinical hypothyroidism was 28.3% and subclinical hyperthyroidism 8.3%, data presented in Tables 5 and 6. Moreover, Figures 1 and 2 demonstrate the frequency of hypothyroid to age and gender. 80 percent prevalent in females and 40% in males. People with diabetes older than 50 had a higher chance of hypothyroidism.

Table 5:The frequencies of thyroid disease of Type I DM patients with previous thyroid disease (n=22)	
Thyroid function without previous Thyroid dysfunction	N=22
Euthyroid	14
Subclinical hypothyroidism	7
clinical hypothyroidism	0
Subclinical hyperthyroidism	1
clinical hyperthyroidism	0

Table 5 illustrate the frequencies of thyroid disease of Type I DM patients with prior thyroid disease in 22 patients with 14 patients with Euthyroid, and 7 patients with subclinical hypothyroid.

Table 6:The frequencies of thyroid disease of Type II DM patients with previous thyroid disease (n=120)	
Thyroid function without previous Thyroid dysfunction	N=120
Euthyroid	76
Subclinical hypothyroidism	34
clinical hypothyroidism	0
Subclinical hyperthyroidism	10
clinical hyperthyroidism	0

Table 6 illustrate the frequencies of thyroid disease of Type I DM patients with prior thyroid disease in 120 patients with 76 patients were Euthyroid and 34 patients with subclinical hypothyroid, and 10 patients with subclinical hyperthyroid.

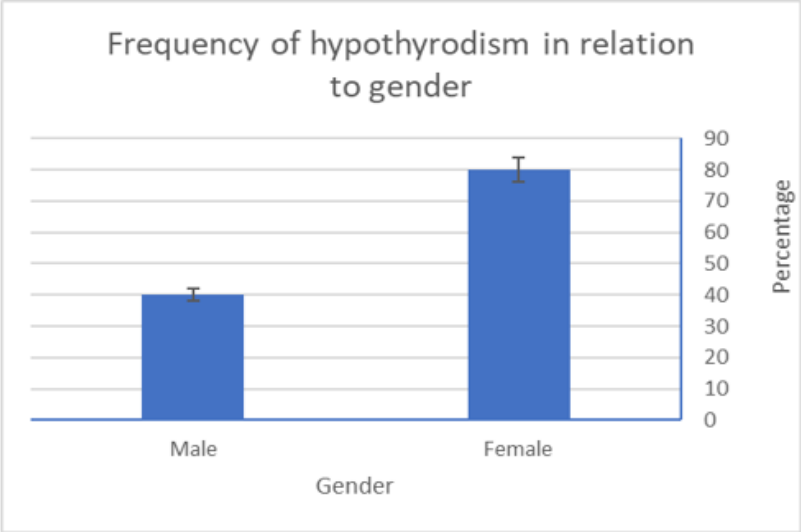

Fig 1: Frequency of hypothyroid in relation to gender

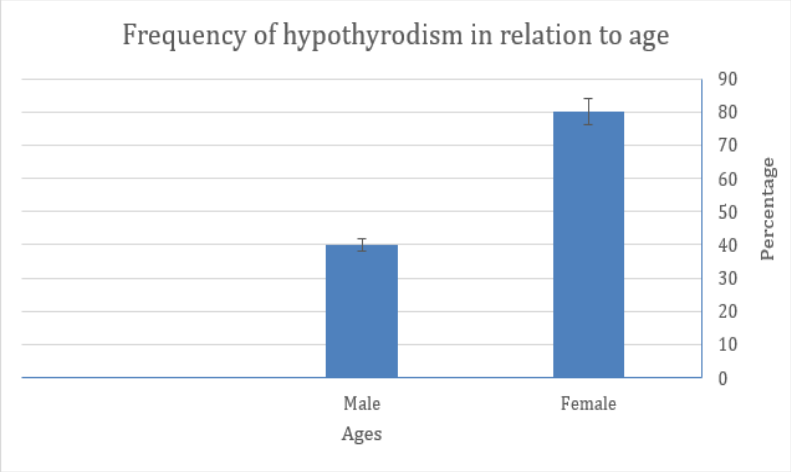

Fig 2: Frequency of hypothyroid in relation to age.

4. DISCUSSION

Our study revealed that the prevalence of thyroid disease in all diabetic patients was 31.2%. In patients who had not or denied any previous thyroid disease the frequency was 27.9%. The most frequent thyroid disorder was subclinical hypothyroidism, in 4.2% of patients with type I DM and in 35.9% of patients with type II DM. These results were like multiple studies done this in their hospitals [24,25,26]. In this current study type I diabetes showed a frequency of thyroid disease was 31% with subclinical hypothyroidism in patients without previous thyroid disorders. Our results were higher than similar studies as in Ramos et al it was 20% and Palma et al., was 13% [27,28]. This can be explained as variabilities in the laboratory data where the blood sample was measured. The new cases of thyroid that occurred can be a reason for non-adherence to medications. This can be due to a variety of factors such as the high number of medications given to the patient, the worry about the side effects, the huge burden of multiple comorbidities to one patient, sometimes no symptoms appear until the disease is complicated and the level of education can affect this vastly [29]. Multiple studies that investigated medication adherence found that the degree of compliance is lower than the desired level [30,31,32]. In the current study also type 2 diabetes were found to be 28% with subclinical hypothyroidism without previous thyroid disorders. This is also higher than other studies that investigated the same idea [16,34,35]. Researchers showed that by increasing in age, the risk of having thyroid disease is also increasing [36]. This is parallel to the results of our study and the others as subclinical hypothyroidism was found in older patients more than the young [16,34,35]. Subclinical hypothyroidism is defined as changes in the laboratory findings of the thyroid function tests without any obvious symptoms [36]. Our results also showed that patients with diabetes and older than 50 years old had a higher frequency to have hypothyroid, moreover, females had a higher chance also to have hypothyroid. This was like a result done in King Fahad Armed hospital in Jeddah they analyzed retrospectively 3632 participants who are between the age 18 to 105 years[21]. In general, diabetic patients with positive family history of thyroid disease have a higher chance of developing thyroid dysfunction, on the other hand family history of diabetes did not increase the risk of thyroid dysfunction[37,38]. However, it is vital to investigate diabetic patients thoroughly.

5. LIMITATIONS

Our study had some limitations as this was only one centered study, not generalized to other hospitals in the area. Another is that we collected blood samples data only once before and after the disorder which can have a little effect on the results accuracy. One of our strengths is the number of the sample. It was a good power to do a good analysis of the data.

6. CONCLUSION

We concluded that screening for thyroid disease among diabetic patients is essential to be performed routinely the resean behind this is the high prevalence of new cases diagnosed with thyroid diseases and the possibility of increasing risk factors such as hypertension and dyslipidemia, arising from an undiagnosed thyroid dysfunction.

7. DATA AVAILABILITY

The datasets generated and/or analysed during the current study are available from the corresponding author on reasonable request.

8. FUNDING

This study was supported by the supervisor of this study, YA.

9. AUTHORS RELATIONSHIPS AND ACTIVITIES

The authors declare that no relationships or activities might bias, or be perceived to bias, their work.

10. AUTHORS CONTRIBUTION STATEMENT

Raghad Saud Almatani, Asmaa Sulaiman Alsahaf, Maram Bakheet Alluhaybi, Renad Abdulaziz Refaai, Wajdan Ibrahim Alharbi and Yosra Alhindi contributed equally to study conception, supervision, project administration, literature review and writing/ manuscript preparation: writing the initial draft, data collection, formal analysis and data presentation, data collection.

11. CONFLICT OF INTEREST

Conflict of interest declared none.

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