International Journal of Psychosocial Rehabilitation, Vol. 23, Issue 04, 2019
ISSN: 1475-7192

Prevalence of Thyroid Dysfunction among Patients with Type 2 Diabetes Mellitus in Diabetic Center in Prince Mansour Hospital and Diabetic Clinic in Primary Health Care in Iskan- Taif City, Saudi Arabia 2018

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Abstract--- Background: *Patients with DM are at an increased risk of thyroid disease (5). The frequency of thyroid dysfunction in diabetic patients is higher than that of the general population.*

Objectives: *The present study aimed to assess the prevalence of thyroid dysfunction among diabetic in Taif city, Saudi Arabia.*

Methods: *this study was conducted in the Diabetic Center in Prince Mansour hospital and Diabetic Clinic in Primary Health Care in Taif city. The sample size was 492 medical records of patients who attended the Diabetes clinic. a checklist was prepared for every medical records to collect data about age, gender, body mass index (BMI), and the presence of eye, kidney or neurological complications. The level of HbA1C, TSH, T4, T3 were reported for every patient.*

Results: *67.1% of the participants were females and 79.5% of them were suffering from eye disorders, 18.1% were suffering from kidney disorders, and 7.5% were suffering from neurological disorders. Of the participants, 58.9% had an euthyroid status, 31.1% had hypothyroidism, and 10% had hyperthyroidism. Female patients had a significant higher prevalence of thyroid disorders compared to male patients. A significant positive correlation was found between the mean level of HbA1C and the mean levels of T4, and a significant negative correlation was found between HbA1C and the mean levels of T3.*

Conclusion: *The present study showed that thyroid disorders are more frequently diabetic patients especially females. Routine screening of all diabetic patients for thyroid function should be done to avoid the double burden of both diseases.*

Keywords--- *Prevalence, Thyroid, Dysfunction, Type 2 Diabetes, Center Taif.*

I. INTRODUCTION

Diabetes Mellitus (DM) and thyroid dysfunction (TD) were found to be the most common endocrine disorders in

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Received: 19 Sept 2019 | Revised: 20 Oct 2019 | Accepted: 20 Nov 2019

hospitals (1). Both disorders often co-exist and mutually influence each other, and a lot of researches have reported that there is relationship between DM and TD (2,3,4). Patients with DM are at an increased risk of thyroid disease (5). The frequency of thyroid dysfunction in diabetic patients is higher than that of the general population (5). There are two major types of diabetes mellitus; the first is called insulin-dependent diabetes or type 1 diabetes (T1DM), and the second type of diabetes is called insulin non-dependent diabetes or type 2 diabetes (T2DM) which is common form of DM (90-95% of all diabetic cases) (6).

Among the major types of thyroid dysfunction is one called hypothyroidism, which is the most common form of TD in adulthood; in which there is insufficient production of thyroid hormones (T3 & T4). The other less-common type is called hyperthyroidism, where the thyroid gland releases high amounts of both hormones (7,8).

Previous studies were done in the kingdom of Saudi Arabia (KSA) to assess the prevalence of thyroid disorders among type-2 diabetic patients (9,10,11). Of these study is one study done in 2017 where two hundred (100 type 1 & 100 type 2) diabetic patients were retrospectively investigated and among them, 69% had normal thyroid profile (euthyroid) and 31% showed thyroid dysfunction (25% had subclinical hypothyroidism, 3.5% had clinical hypothyroidism, and 2.5% had clinical hyperthyroidism). The study concluded that subclinical hypothyroidism was the most prevalent thyroid dysfunction.

The aim of the present study was to find out the prevalence of thyroid dysfunction among diabetic patients attending the Diabetic Center in Prince Mansour hospital and Diabetic Clinic in Primary Health Care in Iskan, Taif city, Saudi Arabia.

II. MATERIALS AND METHODS

Study design: the present study was a retrospective study.

Study setting and time frame: this study was conducted in the Diabetic Center in Prince Mansour hospital and Diabetic Clinic in Primary Health Care in Iskan, for a routine check-up from the first till the end of October 2018.

Sampling methodology: The sample was randomly chosen, and the sample size was 492 medical records based on the population size of 1735 patients who attended the Diabetes clinic in October.

The inclusion criteria were all patients with type 2 Diabetes mellitus of both genders above the age of 18 years. The exclusion criteria were all patients with type 1 Diabetes mellitus, or under the age of 18 years. The number of medical records of patients who met the inclusion criteria during the period of the study was 492 records.

Study instrument: a checklist was prepared for every medical records to collect data about age, gender, body mass index (BMI), and the presence of eye, kidney or neurological complications. The level of HbA1C, TSH, T4, T3 were reported for every patient.

Normal value according to the lab were as follows:

HgA1c: from 5.7-<6.5 (borderline), ≥6.5 (high).

TSH: 0.340 - 5.600 uU/L.

T3: 3.80 - 6.00 pmol/dL.

T4: 7.90 - 14.40 pmol/dL.

Received: 19 Sept 2019 | Revised: 20 Oct 2019 | Accepted: 20 Nov 2019

Statistical analysis: Data analysis was performed using the SPSS version 22.0. Numbers and percentages were used for expressing the qualitative data, and the Chi-square ($\chi 2$) test was applied to test the relationship between variables. Mean and Standard deviation (Mean ± SD) were used for expressing the quantitative variables, and Kruskal-Wallis, Mann-Whitney, and spearman correlation tests were used to assess the relationships between the non-parametric variables. The statistical significance was considered with a p-value of <0.05.

III. RESULTS

The mean age of the participant was (58.18 ± 11.04) years, and the mean values of the BMI, HbA1C, TSH, T4, T3 and FBS were (31.4± 6.58 kg/m^2, 9.15 ± 2.67, 3.04 ± 2.73 uU/L, 12.4 ± 2.96 pmol/dL, 4.25 ± 8.21 pmol/dL, 10.10± 4.89 mg/dl respectively).

Table 1: Description of the Studied Participants According to their Age and Presence of Eye, Kidney and Neurological Disorders (No.: 492)

Variable	*No. (%)*
Gender	
- Male	162 (32.9)
- Female	330 (67.1)
Presence of eye disorders	
- Present	101 (20.5)
- Absent	391 (79.5)
Presence of kidney disorders	
- Present	89 (18.1)
- Absent	403 (81.9)
Presence of neurological disorders	
- Present	37 (7.5)
- Absent	455 (92.5)

(Table 1) shows that 67.1% of the participants were females and 79.5% of them were suffering from eye disorders, 18.1% were suffering from kidney disorders, and 7.5% were suffering from neurological disorders.

Table 2: Distribution of the Studied Participants According to the Types of Eye, Kidney and Neurological Disorders Present

Variable	*No. (%)*
Type of the eye disorders present (No.:101)	
- Glaucoma	16 (15.8)
- Retinopathy	31 (16.7)
- Cataract	23 (22.8)
- blurred vision	12 (11.9)
- phacoemulsification with lens implant	1 (1)
- conjunctivitis	6 (5.9)
- nystagmus	1 (1)
- more than one disorder	11 (10.9)
Type of the kidney disorders present (N0.:89)	
- diabetic nephropathy	46 (51.7)
- albuminuria	14 (15.7)
- chronic kidney disease	26 (29.2)
- renal stone	2 (2.2)
- more than one disorder	1 (1.1)
Type of the neurological disorders present: (No.: 37)	
- vertigo	1 (2.7)
- preferably neuropathy	24 (64.9)
- headache	1 (2.7)
- disc disorder with radiculopathy	2 (5.4)
- foot ulcer due to multiple causes	1 (2.7)
- cervical disc disorder	2 (5.4)
- cerebrovascular disease	1 (2.7)
- numbness	3 (8.1)
- carpal tunnel syndrome	1 (2.7)
- more than one disorder	1 (2.7)

(Table 2) shows that the most common eye disorders among the studied patient was cataract (22.8%) followed by retinopathy (16.7%), and glaucoma (15.8%). In the same time, 10.9% of patients suffered more than one eye disorder. According to the kidney disorders, the present disorders among the studied patients were diabetic nephropathy (51.7%), chronic kidney diseases (29.2%), albuminuria (15.7%), and renal stones (2.2%), while only 1.1% of patients suffered more than one kidney disorder. Regarding the neurological disorders, the most common disorder was the preferably neuropathy (64.9%).

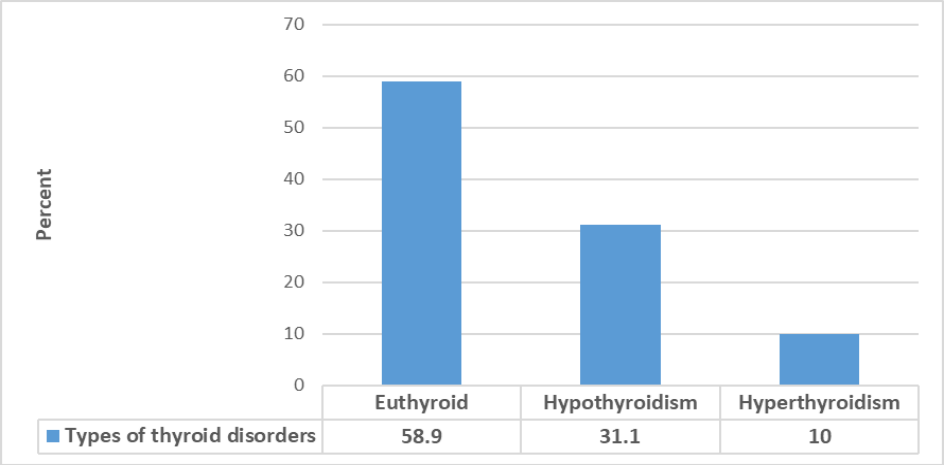
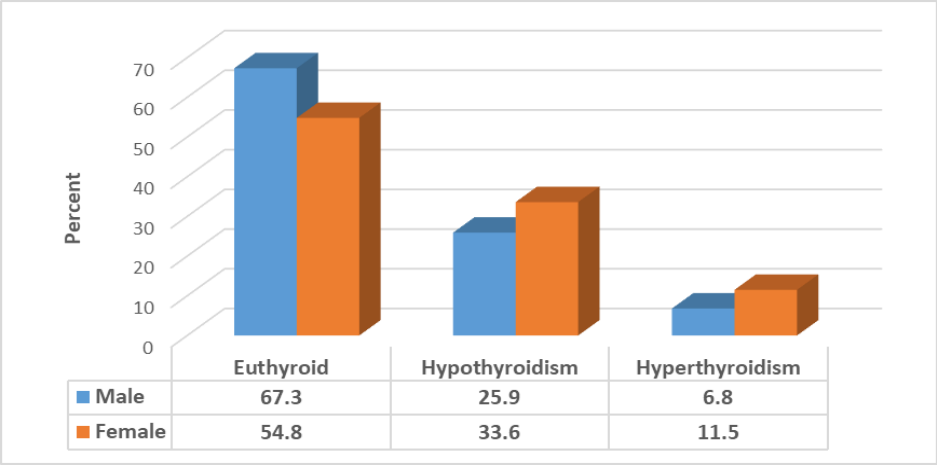


Figure 1: Prevalence of Thyroid Disorders among the Studies Participants

(Figure 1) shows that according to the thyroid status of the participants, 58.9% had an euthyroid status, 31.1% had hypothyroidism, and 10% had hyperthyroidism.

In comparison of the thyroid status of the studied patients according to their gender, female patients had a significant higher prevalence of thyroid disorders compared to male patients. As 33.6% of females had hypothyroidism compared to a prevalence of 25.9% among males, and 11.5% of females had hyperthyroidism compared to a prevalence of 6.8% among males (p= 0.25) (Figure 2).



N.B.: ($\chi 2 = 7.36$, p= 0.025)

Figure 2: Gender difference According to Prevalence of Thyroid Disorders

Received: 19 Sept 2019 | Revised: 20 Oct 2019 | Accepted: 20 Nov 2019

A significant difference was found between the mean level of HbA1C according to the types of thyroid disorders, as patients with an euthyroid status showed a significant lower level of HbA1C compared to the other two thyroid disorders (hypo- and hyperthyroidism) (p=0.036) (Table 3).

Table 3: Relationship between HbA1C Level and Types of Thyroid Disorders among the Studied Patients

Parameter	***HbA1C (Mean ± SD)***	***Test***	***p-value***
Types of thyroid disorders			
- Euthyroid	8.87 ± 2.5	6.62*	0.036
- Hypothyroidism	9.51 ± 2.7		
- Hyperthyroidism	9.72 ± 3.2		
Gender			
- Male	9.05 ± 2.55	0.62**	0.53
- Female	9.21± 2.72		

N.B.: * Kruskal-Wallis Test **Mann-Whitney Test

Table 4: Spearman Correlation between the Mean Level of HbA1C and the Mean Levels of TSH, T4 and T3

Variable	***HbA1c***	
	r	***p-value***
TSH	-0.008	0.861
T4	0.099	0.02
T3	-0.17	< 0.001

(Table 4) shows that a significant positive correlation was found between the mean level of HbA1C and the mean levels of T4 (p=0.02), on the other hand a significant negative correlation was found between HbA1C and the mean levels of T3 (p=< 0.001). However, a non-significant positive correlation was found between the mean level of HbA1C and the mean levels of TSH (P=0.861).

IV. DISCUSSION

In the present study, 58.9% had an euthyroid status, 31.1% had hypothyroidism, and 10% had hyperthyroidism. The same result was present in a previous study done in KSA, where 3760 participants were analyzed retrospectively. All patients were from the population of the Primary health center at King Fahad Armed Forces Hospital, Jeddah, Saudi Arabia. In this study among cases of T2DM, there were 467 (30.7%) had hypothyroidism (12).

Previous studies showed that the prevalence of thyroid dysfunction among Saudi diabetic patients ranged from 16-28.5% of which 25.3% had hypothyroidism (13, 14).

The present study showed that female patients had a significant higher prevalence of thyroid disorders compared to male patients. The same result was observed in the previous Saudi studies where hypothyroidism was significantly more prevalent in females between the third to the seventh decades as compared to males (12,15). The same result was reported in previous studies (16,17,18,19,20).

In the present study, a significant difference was found between the mean level of HbA1C according to the types of thyroid disorders, as patients with an euthyroid status showed a significant lower level of HbA1C compared to the other two thyroid disorders (hypo- and hyperthyroidism). The same result was present in another study where Patients with primary hypothyroid were statistically significant have higher HbA1c compared to subclinical

hypothyroidism, hyperthyroidism and subclinical hyperthyroidism (12).

The present study showed that a significant positive correlation was found between the mean level of HbA1C and the mean levels of T4, and a non-significant positive correlation was found between the mean level of HbA1C and the mean levels of TSH. Previous studies showed that the increased TSH level in diabetic patients may be a result of medications they receive which suppress the level of fT4 and T4, while raise levels of TSH (21), another cause is insulin which raises T4 level while suppresses T3 level by inhibiting hepatic conversion of T4 to T3 (22), a third reason may be autoimmune diseases (23).

V. LIMITATIONS

The limitation of this study was the relative non-cooperation from the administrative clerks of the study setting.

VI. CONCLUSION

The present study showed that thyroid disorders are more frequently diabetic patients especially females. The study calls for routine screening of all diabetic patients for thyroid function to avoid the double burden of both diseases.

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