

PREVALENCE OF HYPOTHYROIDISM DISORDER AMONG TYPE 2 DIABETES PATIENT AT DIABETES AND ENDOCRINE SPECIALIST CENTER, PRINCE MANSOUR MILITARY HOSPITAL FOR COMMUNITY IN TAIF, SAUDI ARABIA

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ABSTRACT

Objectives: To provide a current estimate of the prevalence of hypothyroidism disorder among Type 2 Diabetics patients and the complications of Type 2 Diabetes associated with hypothyroidism disorder among patients attending diabetes and endocrine specialist center, Prince Mansour military hospital for community in Taif, Saudi Arabia. **Methods:** An observation cross-sectional study, was conducted on 199 (... male and ... female type 2 diabetic patient) using a questionnaire filled by interviewing them. They are attending diabetes and endocrine specialist center, in Taif, Saudi Arabia, between December 2021 – February 2022. **Results:** Approximately 24.83% of Type 2 Diabetics patients were having hypothyroidism disorder. 21.60% of female gender were having hypothyroidism which consider as a significant risk factor for hypothyroidism. Neuropathy, Eye Disease, Foot Disease, Renal Disease, Cardiac or Vascular Disease and Hyperlipidemia were complications of Type 2 Diabetes associated with hypothyroidism. **Conclusions:** Health professionals need to be aware of high prevalence of hypothyroidism among Type 2 diabetics patients and its associated complications. A new recommendation should be carried out for hypothyroidism screening among Type 2 diabetics patients.

1-INTRODUCTION

One of the important health problems that affecting population is diabetes and it consider as the strongest risk factors for Coronary Heart Disease. The problem of diabetes is old and the prevalence increases dramatically worldwide especially in the gulf area. According to the statistics of International Diabetic Federation (IDF) in 2015, 415 million have diabetes and will reach 642 million in 2040.^[1] IDF stats that "there is a global diabetes epidemic". According to Al-Nozha study in the age group of 30-70 years over a 5 years period between 1995 and 2000 the overall prevalence of Diabetes Mellitus in adults in Kingdom of Saudi Arabia (KSA) is 23.7%.^[2] We have two types of diabetes; Type 1 Diabetes (DM1) and Type 2 Diabetes (DM2). DM1 characterize by autoimmune destruction of B cell of islet of Langerhans in the pancreas which lead to sever insulin deficiency and DM2 characterize by relative insulin deficiency, insulin resistance or both.^[3] According to the National Health and Nutrition Examination Survey (NHANES) III study, 4.6% of the US population have hypothyroidism disorder (Hypothyroidism or Subclinical Hypothyroidism) in which Subclinical Hypothyroidism

(SCH) (4.3%) followed by hypothyroidism (0.3%).^[4] The most prevalent thyroid disorder (Hypothyroidism disorder or hyperthyroidism disorder) is SCH and more common in female and elderly patients.^[5] Screening for hypothyroidism disorder have been recommended only in children and adolescents with type 1 diabetes.^[6] The association between diabetes and hypothyroidism disorder is common because both illness are an autoimmune in origin and in most of cases diabetes is come first.^[7] Moreover, the metabolic functions is decreased in diabetic patients with hypothyroidism disorder. Accordingly, insulin half life is prolonged and lead to reduce insulin requirements in the body. For that if the patient continue to have same medication dose without correction of his thyroid status he will suffer from repeated attacks of hypoglycemia and disturbed diabetic control.^[8] The importance of this topic that many of the studies showed that, diabetes patients with hypothyroidism have the highest mortality from heart attack because they have a high prevalence of 3-vessel or 4-vessel Coronary Artery Disease (CAD) and high level of blood cholesterol.^[9,10] Furthermore, a Cross-Sectional Study in SCH patients with DM2 showed that,

"increased risk of nephropathy and cardiovascular events".^[11] While early intervention in diabetic patients with hypothyroidism disorder can lead to "improve quality of life and reduce the morbidity rate".^[12] In the National Center for Diabetes, Endocrinology and Genetics, Jordan University Hospital, Amman, Jordan in (2000), hypothyroidism diseases among (908) DM2 patients was (10.2%). The most common was hypothyroidism (6.2%) followed by SCH (4%). Female patient have the higher prevalence (7.4%) followed by (2.8%) for male.^[13] In Australia a cross sectional study (2005) showed that, the prevalence of SCH in 420 adult females with DM2 was 8.6% and not associated with either hyperlipidaemia or CAD.^[14] In Jeddah; Saudi Arabia a case control study (2006) showed that, hypothyroidism diseases among (74) type 2 diabetic patients was (6.7%). The most common was hypothyroidism (4%) followed by SCH (2.7%).^[15] In Greek from January 2008 to June 2009, the prevalence of Thyroid disorder among 1,092 Greek diabetic patients is 12.3% in which woman more affected than men and its more associated with lower LDL level. The main limitation of this study is that it's done in referral tertiary center of diabetes.^[16] In New Zealand 2010, a retrospective study of case records of 400 patients with DM2. The prevalence of Hypothyroidism Diseases was (13%) in which Hypothyroidism (8%) followed by SCH (5%).^[17] In Kuwait 2010, the prevalence of thyroid disorder among 1,580 DM2 patients is 12.9% in which female gender, personal history of autoimmune disease and smoking is significant risk factors.^[18] Researches raised the issue that difficult to reach a control in diabetic patients who developed hypothyroidism disorder^[8] and Increased risk of complications.^[9,10,11] Moreover, correction of hypothyroidism disorder in diabetic patients reduce morbidity and improved quality of life.^[12] Furthermore, only a small number of studies were found in my country have explored the prevalence and clinical implications of hypothyroidism disorder among DM2 patients. This study was carried out to provide a current estimate of the prevalence of hypothyroidism disorder among Type 2 Diabetes patients and the complications of Type 2 Diabetes associated with hypothyroidism disorder among patients attending University Diabetes Center (UDC) in Riyadh Saudi Arabia.

2-METHODS

The diabetes and endocrine specialist center at Prince Mansour military hospital for community is the ideal diabetes care center in Taif City in the Kingdom of Saudi Arabia. It is a well developed center with a total of 10 general diabetes clinics and 5 short visit clinics per week. It serves a population of 15,000 diabetic patients. Male and female Saudi DM2 patients, more than 25 years old who follow at diabetes and endocrine specialist center at Prince Mansour military hospital for community from December 2021 – February 2022 were included. Non Saudi patients, those less than 25 years of age, pregnant woman and DM1 were excluded. was performed. The sample size calculated is 199 subjects. From the tables of

sample size determination: if the population is more than 1000 subjects, the sample size which we need = 400 with error 5% or formula: $n = N/1+N(e)^2$, where n is the sample, N is the population and e the % of error. Data were collected using a pre-designed questionnaire that included the following items: Socio-Demographic Data (for example, age, gender, marital status,), Medical History and Relevant Investigations. Moreover, Validity were established based on thorough review of literature,^[16,18,20] opinion of two consultants (Family Medicine and Community Medicine) and expert opinion (Endocrinologist). Furthermore, reliability were established through test-retest technique and correlation was high. American Diabetes Association (ADA) 2017 Criteria were established for the diagnosis of diabetes (A1C \geq 6.5%, Fasting plasma glucose (FPG) \geq 126 mg/dL (7.0 mmol/l), 2-h Plasma glucose \geq 200 mg/dL (11.1mmol/l) during an oral glucose tolerance test (OGTT) and In a patient with classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose \geq 200 mg/dL (11.1 mmol/l)). Hypothyroidism was diagnosed if the level of (T4 low and TSH high) while SCH was diagnosed if (T4 normal and TSH high). The local ethics committee of CMRC from King Saud University was approved the study. All official permissions were obtained before data collection from the Director of the UDC, King Saud University. Confidentiality and anonymity were preserved and noted all the way through the different steps of the study. The questionnaire was filled by interviewing the patient. The files were selected randomly from diabetic clinics by using the systematic randomization technique, every third file was enter the study. A pilot study was conducted after getting the CMRC approval (40 files) which is 10% of the whole sample size and the questionnaire was modified accordingly. The data were collected and verified by hand then coded before entry; proper statistical analysis was carried out to. It entered into SPSS software version 13 by double entry method to decrease data entry error. After the data entry is completed, the data were analyze by using X2 (Chi square), for non-continuous variables and t test for continuous variables. Differences considered as statistically significant when the p-value is less than 0.05, 95% confidence interval (CI) is appropriate.

3- RESULTS

The total number of files which selected and reviews were 400. Two hundred and twenty (55.1%) were female and one hundred and seventy nine (44.9%) were male and most of them (93.7%) were married. Three hundred sixteen (79.8%) were having hyperlipidemia, (31.2%) were having eye disease, (12.6%) were having foot disease, (11.6%) were having cardiac and vascular disease, (7.6%) were having neuropathy and (4.3%) were having renal disease. Among them (1.3%) were having family history of thyroid disease, (0.8%) were having previous thyroid surgery and (0.5%) were having previous thyroid treatment (Table 1).

Table 1: Patients baseline characteristics.

variable	N	%
Gender:		
male	179	44.9%
female	220	55.1%
Marital status		
Married	371	93.7%
Single	11	2.8%
Divorced	5	1.3%
widowed	9	2.3%
have cardiac/vascular disease	46	11.6%
renal disease	17	4.3%
eye disease	124	31.2%
foot disease	50	12.6%
neuropathy	29	7.6%
hyperlipidemia	316	79.8%
previous thyroid ttt	2	0.5%
previous thyroid surgery	3	0.8%
FHx of thyroid disease	5	1.3%

The mean age of patients was 55.55 years (+-11.31). Among them duration of diabetes, hyperlipidemia and hypothyroidism were 14.80 years (+-8.27), 5.67 years (+-7.26) and 2.50 years (+-0.71) consecutively. HbA1C was

8.64% (+-1.65), while Total Cholesterol, Triglycerides level, HDL level and LDL level were 4.45 mmol/L (+-1.01), 1.77 mmol/L (+-1.14), 1.16 mmol/L (+-0.36) and 2.52 mmol/L (+-0.82) consecutively (Table 2).

Table 2: Descriptive Statistics.

Variable	No. of Subjects	Mean	Std. Deviation
Age	396	55.55 years	11.31
Duration of diabetes	388	14.80 years	8.27
Duration of hyperlipidemia	6	5.67 years	7.26
Duration of Hypothyroidism	2	2.50 years	0.71
HbA1c	400	8.64%	1.65
Total Cholesterol	400	4.45 mmol/L	1.01
Triglycerides level	399	1.77 mmol/L	1.14
HDL level	399	1.16 mmol/L	0.36
LDL level	398	2.52 mmol/L	0.82

Prevalence of thyroid disorder among type 2 diabetic patients was 26.58% while 24.83% of them were having hypothyroidism disorder. Prevalence of hypothyroidism among type 2 diabetic patients was 16.83% which, 16.58% were known to have hypothyroidism while

0.25% were discovered during the study. Moreover, prevalence of discovered SCH was 8%. Prevalence of known hyperthyroidism among type 2 diabetic patients was 0.25%, while 1.5% were discovered to have Subclinical Hyperthyroidism (Table 3) (Figure 1).

Table 3: Prevalence of Thyroid Disorder among Type2 Diabetic patients.

Type of Thyroid Disease	Prevalence		
	Known	screened	Total
Hypothyroidism	16.58%	0.25%	16.83%
Subclinical Hypothyroidism	none	8%	8%
Hyperthyroidism	0.25%	none	0.25%
Subclinical Hyperthyroidism	none	1.5%	1.5%

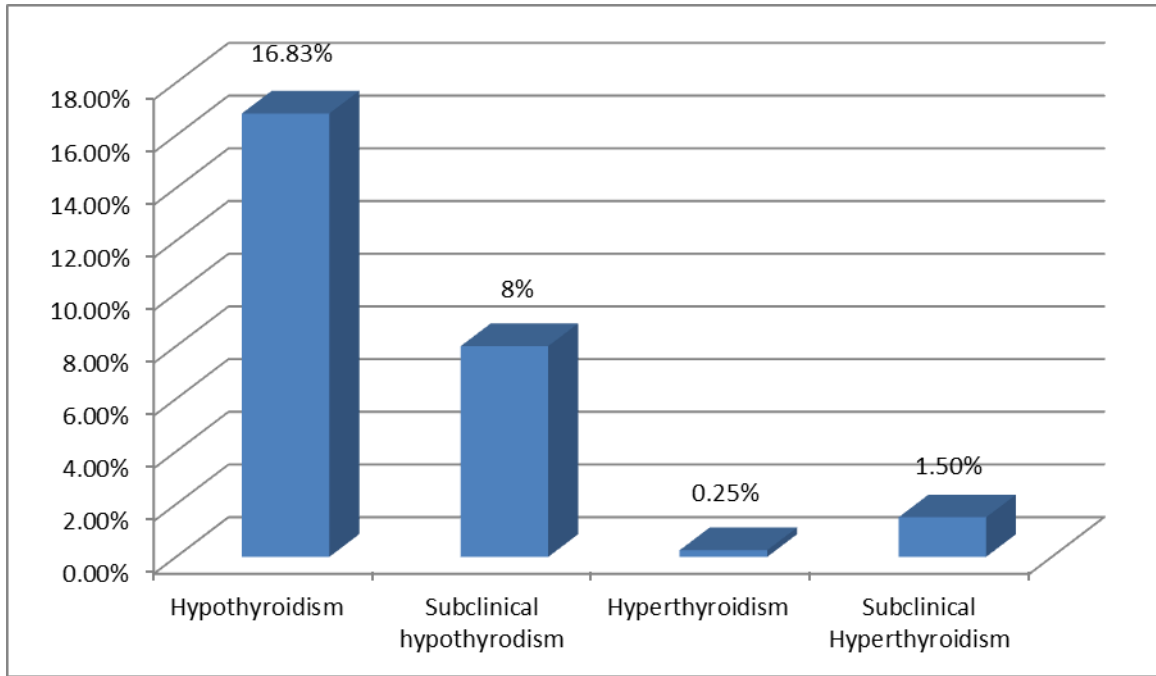
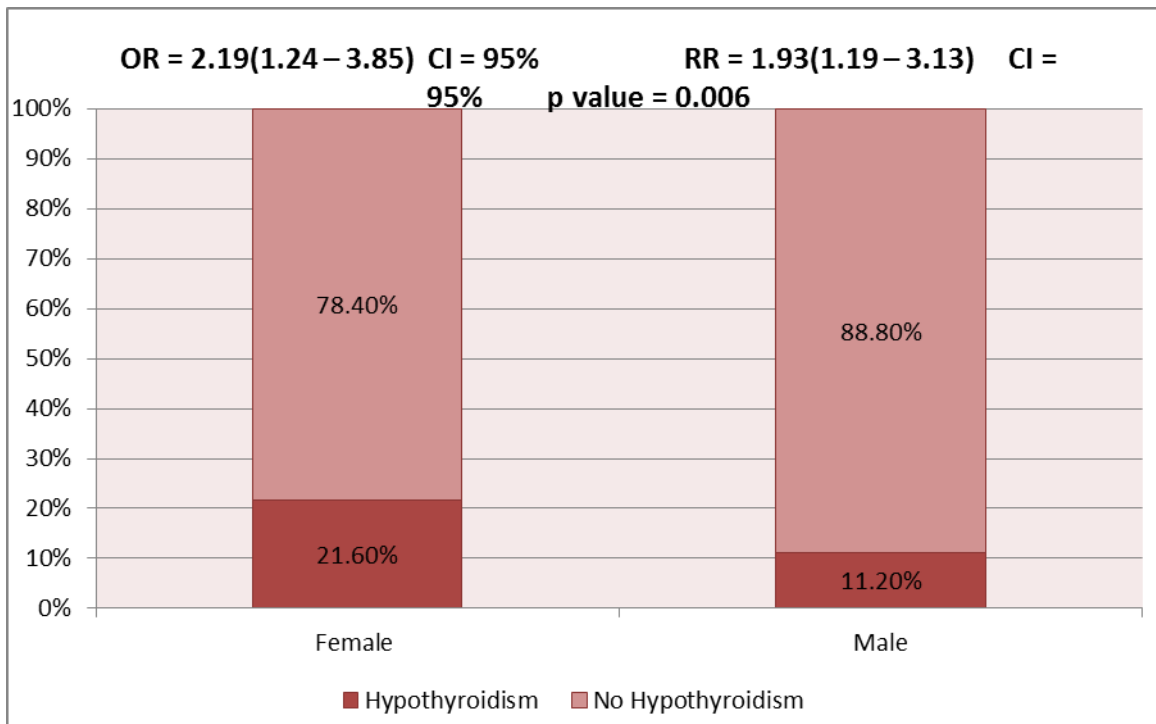


Figure 1 - Prevalence of Thyroid Disorder among Type2 Diabetic patients.

Female Gender is a significant risk factor for Hypothyroidism where 21.60% of female gender were having hypothyroidism while, 11.20% of male gender

were having hypothyroidism (p value = 0.006, OR = 2.19(1.24 – 3.85), RR = 1.93(1.19 – 3.13)) (Table 4).

Table 4: Female Gender as a risk factor for Hypothyroidism.



Complications of Type2 DM Associated with hypothyroidism were Neuropathy 20.7%, Eye Disease 18.7%, Foot Disease 18%, Renal Disease 17.6%, Cardiac or Vascular Disease 17.4% and hyperlipidemia 15.3% (Table 5).

Table 5: Complications of type2 DM Associated with Hypothyroidism.

Type of DM complication	Prevalence
Cardiac or Vascular Disease	17.4%
Renal Disease	17.6%
Eye Disease	18.7%
Foot Disease	18%
Neuropathy	20.7%
Hyperlipidemia	15.3%

4- DISCUSSION

The current study showed that (26.58%) of Saudi type 2 diabetic patients attending University Diabetes Center (UDC) in the Riyadh region are having Thyroid Disorder. This figure is consistent with the previous studies that showed the higher prevalence of hypothyroidism among type 2 diabetic patients. Moreover, this figure is higher compared to other studies conducted among similar age group in Greek (12.3%),^[16] Kuwait (12.9%).^[18] Furthermore, 24.83% having hypothyroidism disorder, however this prevalence is higher than those in Jordan (10.2%),^[13] Saudi Arabia (Jeddah) (6.7%),^[15] New Zealand (13%).^[17] Also, (16.83%) having hypothyroidism, however this prevalence is higher than those in Jordan (6.2%),^[13] Saudi Arabia (Jeddah) (4%),^[15] New Zealand (8%).^[17] In addition, (8%) having SCH, however this prevalence is higher than those in Jordan (4%),^[13] Saudi Arabia (Jeddah) (2.7%),^[15] New Zealand (5%)^[17] but lower than those in Australia (8.6%).^[14] This higher prevalence of hypothyroidism disorder among Saudi type 2 diabetic patients attending University Diabetes Center (UDC) in the Riyadh region than other studies conducted in Jordan,^[13] Saudi Arabia (Jeddah),^[15] Greek^[16], New Zealand^[17] and Kuwait^[18] may be attributed to the characteristics of the studied place which is a referral tertiary hospital. Furthermore, screening for hypothyroidism has been done every three years for every patients as a policy in this center.

Female patients have the higher prevalence of hypothyroidism, followed by male patients, which is consider as a significant risk factor for hypothyroidism. This figure is consistent with the previous studies that always showed similar result like USA,^[5] Jordan,^[13] Greek^[16] and Kuwait^[18] were female patients having the significant and higher prevalence of hypothyroidism.

In the present study, type 2 diabetic patients with hypothyroidism had associated with many complications such as Neuropathy, Eye Disease, Foot Disease, Renal Disease, Cardiac or Vascular Disease and hyperlipidemia. This figure is consistent with the other studies that showed the higher prevalence of 3-vessel or 4-vessel CAD and high level of blood cholesterol.^[9,10]

Moreover, another study showed an increased risk of nephropathy and cardiovascular events.^[11] This figure is opposite to the study in Australia, which was not associated with either dyslipidaemia or CAD.^[14] Furthermore, in Greek it showed the lower LDL level.^[16] This may be due to patients were already on hypothyroidism treatment.

Some of the limitation of our study include that other risk factors of hypothyroidism may interfere with the study result. Moreover, the most important limitation with this type of study is differentiating cause and effect from simple association. Furthermore, the current finding may not represent the general population in Saudi Arabia because it was done in tertiary and referral center. Some data were missing for this type of study where some files was not completed.

However, this study is conducted to explore the prevalence of hypothyroidism disorder among type 2 diabetics patients and its associated complications in Diabetic Center, Riyadh Saudi Arabia. It revealed that more studies should be conducted either locally or internationally in general practice and specialized centers to explore the prevalence, risk factors and associated complications of hypothyroidism among type 2 diabetics patients. Health professionals need to be aware of high prevalence of hypothyroidism among type 2 diabetics patients, its associated complications and difficulties to reach a diabetic control in those patients. Moreover, they should take responsibility for early diagnosis and appropriate action in managing similar conditions. While Screening for hypothyroidism disorders have been recommended only in children and adolescents with type 1 diabetes,^[6] a new recommendation should be carried out for a screening of hypothyroidism disorder among type 2 diabetics patients.

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