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ASSESSMENT OF THYROID DYSFUNCTION IN TYPE 2 DIABETES IN PATIENTS OF AL- NAJAF GOVERNORATE

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Abstract:

Thyroid dysfunction is increasing globally, and diabetes mellitus remains one of the most prevalent endocrine disorders. Thyroid hormones directly regulate insulin production and clearance, while thyroid dysfunction can affect both the hypothalamic regulation of TSH release and the peripheral conversion of T4 to T3, especially in diabetic patients. This study focuses on assessing thyroid dysfunction in individuals with type 2 diabetes mellitus in Al-Najaf province. Eighty participants were included in the study. Their levels of thyroid-stimulating hormone (TSH), total thyroxine (T4), and total triiodothyronine (T3) were measured to evaluate thyroid dysfunction. Plasma glucose levels were quantified using the GOD-POD method, and thyroid profiles were determined using chemiluminescence immunoassay (CLIA) technology. Statistical analysis was performed using SPSS version 20, employing unpaired T-tests and Pearson's correlation. The study found that among the type 2 diabetes patients, there were 4 cases of hypothyroidism (10.0%), 6 cases of subclinical hypothyroidism (15.0%), 0 cases of subclinical hyperthyroidism (0.0%), and 1 case of hyperthyroidism (2.5%). In contrast, among healthy individuals without diabetes, the prevalence of hypothyroidism was 1 (2.5%), subclinical hypothyroidism was 3 (7.5%), while hyperthyroidism and subclinical hyperthyroidism were both 0 (0.0%). The findings indicate that thyroid dysfunction is more common in individuals with type 2 diabetes mellitus than in those without the disease.

Key Words: Thyroid Dysfunction, Type 2 Diabetes, Patients, Al- Najaf Province, Thyroid Hormones

1. Introduction:

Because of this, it is essential that the comorbidity of thyroid problem and type 2 diabetes mellitus be subjected to appropriate evaluation and treatment. Both of these ailments are recognized to be endocrine abnormalities that have a significant impact on metabolic processes. Furthermore, owing to the interactions between the two, they have the potential to have an impact on the health of the patients. High blood sugar levels are a common symptom of type 2 diabetes, which is a chronic condition that is caused by insulin resistance and inadequate insulin production. Patients with type 2 diabetes inevitably have high blood sugar levels. [1]

This disorder is characterized by consequences such as cardiovascular diseases, neuropathy, nephropathy, and retinopathy, all of which would have a significant influence on the quality of life of those who are afflicted as well as the total expenses of health care. On the other hand, thyroid diseases, whether they be hypothyroidism or hyperthyroidism, are a divergence from the usual pattern of metabolism and energy expenditure, as well as the normal physiological function. There is a strong connection between thyroid dysfunction and type 2 diabetes, both in terms of their commencement and future advancement, and this connection goes in both directions. [2]

As a result of the fact that T3/T4 also plays an important part in the metabolism of carbohydrates, variations in their concentrations have the potential to make glycemic management in diabetic persons more uncomfortable. [3] Hypothyroidism is a disorder that is characterized by low levels of thyroid hormone, which has been reported to exacerbate insulin resistance, hence leading to inadequate control of diabetes and the development of complications. On the other hand, hyperthyroidism, which is characterized by an overabundance of thyroid hormones, can lead to a high glycemic level, which might raise the likelihood of developing complications related to diabetes. [4]

Diabetes mellitus (DM) is the leading cause of death in countries that are still considered to be relatively poor, such as India. The prevalence of diabetic complications and the disease itself continues to climb, despite the fact that we have made considerable strides in both our understanding of the condition and our capacity to treat it. [5] Problems with the cardiovascular system are the root cause of high mortality and morbidity rates. The addition of thyroid dysfunction to this list is a new topic to consider. [6]

Diabetes and hypothyroidism both present clinically as weight gain, lethargy, and fatigue. Hyperthyroidism, on the other hand, is typically associated with poorer glycogenic control and higher insulin requirements. [7] Furthermore, the diagnosis of thyroid disease is not given much attention because only about half of diabetic patients have been diagnosed with thyroid disease. To assess whether or whether diabetes mellitus and thyroid dysfunction are disorders that occur together, this study set was designed to investigate the possibility. [8]

Comprehensive literature studies have been carried out on the subject of the impact of thyroid hormones on glucose metabolism in both normal and diabetic situations. Because of this, the scope of this investigation will be narrowed down to a few important areas within a more general issue. [9] To throw light on the reality that people with diabetes and the general population both have thyroid issues to varied degrees, the objective of this study is to reveal this truth. There is a continuum of symptoms and indications that are connected with hypothyroidism and hyperthyroidism. [10] These indicators and symptoms range from mild cases, in which there are no symptoms or proof of excess or deficiency of the thyroid, to severe cases, in which thyrotoxicosis occurs. Five to fifteen percent of instances of subclinical hypothyroidism might eventually progress to overt hypothyroidism. [11] The hormones produced by the thyroid play a significant part in the process of ensuring that blood sugar levels remain stable. [12] Among these effects are modifications to the levels of insulin and counter-regulatory hormones in the blood, modifications to the

uptake of glucose by peripheral tissues, modifications to the production of hepatic enzymes, and modifications to the absorption within the intestinal tract. [13]

In response to the actions of insulin, thyroid hormones stimulate the creation of glucose and the breakdown of glycogen molecule. There is a correlation between the age of a woman and the incidence of hypothyroidism, which is the most common thyroid ailment in children and adults. [14, 15] The immune system is the root cause of both primary atrophic hypothyroidism and Hashimoto's thyroiditis, which are the two most frequent types of thyroid disorders. Hypothyroidism and other autoimmune disorders are more prevalent among diabetic patients.

This is due to the fact that persons who suffer from autoimmune diseases that affect just one organ are more prone to develop other autoimmune disorders. [16, 17]

In addition, a number of studies have demonstrated that people who have type II diabetes are more likely to have thyroid abnormalities, with hypothyroidism being the most common, representing a frequency that ranges from 0.2 percent to 6 percent. It is possible that the presence of thyroid illness will have an effect on that of diabetes treatment. [18,19] The treatment of thyrotoxicosis may be beneficial for hyperglycemia in patients who have hyperthyroidism. It is important for diabetic patients to seek treatment for hyperthyroidism if their hyperglycemia continues to worsen. When treating diabetic patients who also have hyperthyroidism, it is essential to take into consideration the increased risk of hypoglycemia that is associated with the condition. [20]

2. Review of Literature:

Ghazali (2020) [21] Therefore, in order to avoid the development of diabetes problems, it is crucial to identify hypothyroidism in diabetic patients and treat it. An easily accessible and straightforward blood test may detect hypothyroidism. Anyone seeing patients with diabetes for primary care may do this. Patients with diabetes may normalize their glycemic status and lipid profile with early therapy of thyroid dysfunction.

Chen (2017) [22] Patients with diabetes who also have sub-clinical hypothyroidism are more likely to develop nephropathy and cardiovascular disease. When hypothyroidism owing to dyslipidemia is present, it might exacerbate micro-angiopathic consequences of diabetes such as retinopathy and neuropathy. Diabetic patients may benefit from early detection and treatment of subclinical and overt thyroid dysfunction by screening for thyroid abnormalities.

3. Objectives:

- To find out how often thyroid dysfunction is among Al-Najaf province patients who have type 2 diabetes.
- To assess the relationship between glycemic management and thyroid hormone levels in individuals with type 2 diabetes.
- To evaluate how thyroid dysfunction affects the onset and course of complications from diabetes.
- To determine the risk factors for thyroid dysfunction in individuals with type 2 diabetes in the province of Al-Najaf.

4. Statement of the Problem:

The disorder that affects the endocrine system Diabetes type 2 and thyroid disease are two of the most common diseases that can be found all over the globe, and they commonly arise together under the same circumstances. Since this is the case, it is possible to say that the link between these two disorders is complicated, but it does have major ramifications for the patients' general health and welfare. Although it is extremely possible that thyroid dysfunction might be another troublesome co-factor in Al-Najaf province, there is a clear need to evaluate the burden of this co-morbidity in both illnesses. This is because there is a strong probability that thyroid dysfunction could be an issue.

It is important to note that thyroid hormones have a role in the regulation of a wide variety of metabolic processes, one of the most important of which is glucose metabolism. Furthermore, it is important to note that a disruption in glycemic control may be made worse in diabetic patients who are experiencing diseases that are associated with dysfunctional thyroid hormones. According to the author, thyroid diseases that are not properly recognized or treated might impede the provision of appropriate diabetes treatment, which in turn increases the likelihood of complications associated with diabetes, including neuropathy, nephropathy, and cardiovascular illnesses. Additionally, the presence of comorbidities between various disorders makes the total medication regimens more complicated and becomes a worry for the medical experts in order to achieve the most effective type of therapy for the disease.

5. Significance of the Study:

To put it simply, this study is a significant contribution to the filling of the research gap that exists in the area of describing the healthcare requirements of the people in the province of Al-Najaf. This manner, by analyzing the records of thyroid dysfunction among patients with type 2 diabetes, it will be possible to develop a measurement of how widespread the problem is. This will allow health professionals to address the problem with the appropriate resources and strategy to screening and treatment methods. In order to discover the link between thyroid dysfunction and type 2 diabetes mellitus in the specific region of Al-Najaf province, the findings of this research would be helpful in tightening the current literature. This study was suggested with the purpose of identifying the association. below is the localized data, which would be helpful for physicians to adopt unique methods for such situations and also to build region-wise guideline procedures in the therapy of patients with these linked ailments. These data are presented below.

In addition to this, it will give insights into the effects of thyroid dysfunction, as well as risk factors, for patients who have type 2 diabetes. This will enable prescribing professionals and healthcare workers to identify patients who are at a high risk of developing problems and to take preventive steps. In order to catch this group, early detection and therapy of thyroid abnormalities may have a good influence on the glycemic control of diabetes, a reduction in the number of complications that occur, and a positive impact on patient care. By promoting partnerships between researchers, healthcare centres, and governments that aim to design new approaches to managing the situation of type 2 diabetes and thyroid disorders in Al-Najaf province and other regions, the current study may also help in bringing attention to this area of study, which may lead to additional research being conducted in relation to this topic.

6. Research Methodology:

Evaluating thyroid dysfunction in type 2 diabetes patients was the topic of the current case control research. It was carried out in Al-Najaf, Iraq, at the medical university and city hospital of Jabir ibn Hayyan.

There were a total of 80 participants, with 20 each representing healthy individuals without diabetes and those with type 2 diabetes mellitus. Those without clinical signs of illness were chosen as controls, and their ages and sexes were matched.

- **Qualifications for Inclusion:**
  - One confirmed instance of type 2 diabetes.
  - Instance of type 2 diabetes mellitus that was just diagnosed.

The American Diabetes Association's criteria for type 2 Diabetes Mellitus were used for the diagnosis of Diabetes Mellitus:

  - A blood glucose level more than 126 mg/dl after fasting 1.
  - Two hours after doing the 75 g oral glucose tolerance test, the plasma glucose level is more than 200 mg/dl.
  - Symptom is a random plasma glucose level more than 200 mg/dl, which is indicative of diabetes.
  - A hemoglobin A1C level greater than 6.5%.

- **Criteria for Exclusion:**
  - Those whose medication regimens affect thyroid function.
  - Women who have just given birth.
  - A sudden sickness that changes the state of thyroid hormones.
  - Patients described as having a viral infection, fever, and neck ache (subacute thyroiditis) come to the clinic.

- **Instruments of Evaluation:**

The GOD-POD technique is used to measure plasma glucose using semi-automatic analyzers (BTS-350) or fully-automatic analyzers (BIOSYSTEM A-25). Chemistry-Based Immunoassay for Thyroid Function.

- **Lab Information:**

A venous blood sample was taken and tested for glycemic state (FPG) and thyroid function (T3, T4, and TSH). The following recommendations for diagnosing thyroid dysfunction were taken into account: -

  - If T3, T4, and TSH levels are normal, we may say that everything is normal.
  - Primary hypothyroidism occurs when the TSH level is more than 5.5 µIU/L and the T3 and T4 levels are below the normal range.
  - In cases of primary hyperthyroidism, symptoms include a TSH level below 0.2 µIU/L and elevated T3 and T4 levels above the normal range.
  - Hidden hypothyroidism - when the TSH level is over 5.5 µIU/L and the T3, T4 levels are within the normal range.
  - In the case of subclinical hyperthyroidism, the TSH level is below 0.2 µIU/L and the T3, T4 levels are within the normal range.

- **Analytical Statistics:**

We used SPSS version 20, an unpaired T test, and Pearson's correlation to conduct our statistical study. At the 95% confidence level, a p-value of less than 0.05 was deemed statistically significant.

7. Results and Discussion:

The table displays the gender and age breakdown of the participants with and without diabetes. There was a total of 40 participants with type 2 diabetes, 20 men ranging in age from 31.9 to 56.5 years old (mean age: 44.2 ± 12.3 years) and 20 females ranging in age from 32.5 to 52.8 years (mean age: 42.7±10.12 years). Another set of healthy individuals who did not have diabetes consisted of 20 men ranging in age from 34.6 to 57.6 years, with an average age of 46.1± 11.5 years, and 20 females ranging in age from 33.0 to 54.6 years, with an average age of 43.8±10.8 years.

Table 1: Subjects with and without diabetes broken down by age and sex.

Group	Sex	No	Age Range and Mean Age in Years
Type 2 DM subjects	Male	20	31.9-56.5 (44.2±12.3)
	Female	20	32.5-52.8 (42.7±10.12)
Non-diabetic subjects	Male	20	34.6-57.6 (46.1±11.5)
	Female	20	33.0-54.6 (43.8±10.8)

The levels of FPG and thyroid parameters were compared in healthy persons without diabetes mellitus and in individuals with type 2 diabetes mellitus, as shown in the table. Individuals with type 2 diabetes mellitus had much greater FPG than those without the disease. Participants with type 2 diabetes mellitus had considerably greater levels of serum TSH compared to non-diabetic healthy participants, while people without type 2 diabetes mellitus had substantially lower levels of total T3 and total T4.

Table 2: Evaluation of FPG and thyroid parameter values in healthy individuals without diabetes and those with type 2 diabetes.

Parameters Measured	Normal Value	Type 2 DM-Subjects	Non-Diabetics Healthy Subjects	p-value
FPG (mg/dl)	70-100	158.95±30.0	87.45±7.39	<0.001
T3 total (ng/dl)	0.60-1.81	0.87±0.34	1.61±0.44	<0.001
T4total(µg/dl)	5.01-12.45	7.29±2.14	8.35±0.73	<0.004
TSH mIU/L	0.35-5.50	6.91±3.08	3.93±1.82	<0.001

Figure below shows the gender-specific thyroid abnormalities in the type 2 diabetes mellitus group and in the healthy control group that does not have diabetes.

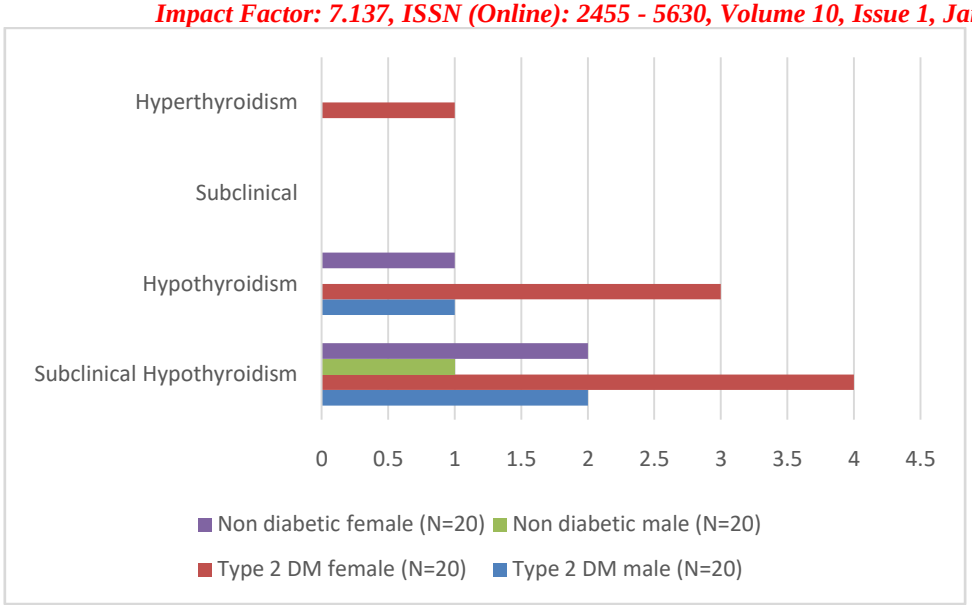

Figure 1: Gender differences in thyroid disease types in people with type 2 diabetes mellitus and a healthy control group that does not have diabetes.

- People with type 2 diabetes were the participants of the study.
- Four cases of hypothyroidism (10.00%) and six cases of subclinical hypothyroidism (15.00%) were identified.
- There was one case of hyperthyroidism (2.5%) and zero cases of subclinical hyperthyroidism (0.0%).

Of the 40 healthy, non-diabetic participants in the study

- One case of hypothyroidism (2.5%) and three cases of subclinical hypothyroidism (7.5%) were identified.
- The prevalence of hyperthyroidism was determined to be 0(0.0%), whereas the prevalence of subclinical hyperthyroidism was 0(0.0%).

Hypothyroidism was more prevalent in females (7 out of 15) than in males (15 out of 10) according to the table. Additionally, the data reveals that hyperthyroidism was more prevalent in females (1.5% vs. 0.00%).

The Pearson's correlation between FPG and Thyroid profile is shown in the table. This research demonstrated a strong relationship between FPG and the levels of total thyroxine and thyroid stimulating hormone. However, FPG failed to find a statistically significant relationship between Total

Table 3: Finding the Pearson's association between free phosphorus and thyroid blood tests**.**

Relationship Between	r-Values	p-Value	Significance
FPG vs T3	0.54	0.02	S
FPG vs T4	−0.156	0.17	NS
FPG vs TSH	0.417	<0.01	S
HS- highly significant (p<0.001), S- significant (p<0.05), NS- not significant (p>0.05)			

Discussion:

There were a total of 80 participants, with 20 each representing healthy individuals without diabetes and those with type 2 diabetes mellitus. The controls were chosen based on their age and sex, and they were all healthy.

In addition to indirectly increasing insulin's effect, thyroid hormones are insulin antagonists. In diabetes mellitus, there is a reduction in TRH synthesis. These factors may explain why some diabetics have low thyroid hormone levels. In our research, participants with type 2 diabetes mellitus had significantly higher TSH levels compared to healthy individuals who did not have diabetes. [23] The current study's results demonstrate that hypothyroidism is common in type 2 diabetes mellitus. This study's findings corroborated those of previous research that demonstrated an altered thyroid profile in a diabetic patient, including studies. [24]

Additional research is needed to validate the substantial link discovered between FPG and T3 and TSH in the present study. The failure to identify these aberrant thyroid hormone levels in diabetics might be a major reason why some treated diabetics still have poor management. [25] Consequently, the purpose of this research was to examine the relationship between hypothyroidism and diabetes, as well as the hyperglycemic impact, by comparing fasting blood sugar levels with thyroid profile variables. [26, 27] The clinical suspicion of thyroid dysfunction, together with unexplained changes in the metabolic management of diabetes, serum cholesterol, or weight gain, warrants the ordering of thyroid function testing in all patients. [28] Better management of various co-morbidities is one benefit of treating hypothyroidism. Improving these individuals' quality of life could be as simple as diagnosing and treating subclinical hypothyroidism. Therefore, it is important to identify instances when hypothyroidism causes concomitant illnesses to be poorly managed and leads to morbidity. [29, 30]

8. Conclusion:

The following are the findings of the current investigation:

- Participants with type 2 diabetes mellitus had much lower blood levels of total T3 and total T4, and greater serum TSH, compared to healthy non-diabetic participants.
- Hypothyroidism and subclinical hypothyroidism were more common in those with type 2 diabetes mellitus than in those without the disease.
- In participants with type 2 diabetes mellitus, the prevalence of hyperthyroidism was greater than in non-diabetic

subjects. However, there was no significant difference in the prevalence of subclinical hyperthyroidism.

- Females, not men, were determined to have a higher incidence of hypothyroidism and hyperthyroidism.
- FPG was shown to be significantly correlated with Total T3 and TSH levels in the present research. However, FPG failed to show a statistically meaningful relationship with Total T4.

Our findings support the idea that diabetic people should undergo thyroid monitoring on a regular basis, especially those with other health issues that are challenging to control. When hypothyroidism is treated, other related health issues may be better managed. Improving these individuals' quality of life could be as simple as diagnosing and treating hypothyroidism. Therefore, it is important to identify instances when hypothyroidism causes concomitant illnesses to be poorly managed and leads to morbidity.

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