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Prevalence of Thyroid Dysfunction and Non-Alcoholic Fatty Liver Diseases (NAFLD) In Patients with Type 2 Diabetes Mellitus

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Abstract

Background-Patients with type 2 diabetes mellitus are more prone to thyroid disorders. Hypothyroidism in them leads to an aggravation of microvascular complications. Diabetic patients with hypothyroidism also are at an increased risk of cardiovascular disease. Screening for thyroid dysfunction in diabetic patients will allow early treatment of hypothyroidism. Type 2 diabetes mellitus (T2DM) and nonalcoholic fatty liver disease (NAFLD) commonly exist together. It has been regarded as a manifestation of the metabolic syndrome. The aim of this study was to assess the level of thyroid dysfunction and non-alcoholic fatty liver disease in patients with type 2 diabetes mellitus

Methods- A Hospital based study from January 2019 to June 2020 at Mahatma Gandhi Medical College & Hospital, Jaipur. All patients were evaluated for thyroid status; assessment of T3, T4 and TSH levels, LFT and USG of the whole abdomen and Blood glucose levels and HbA1c.

Results- In present study, 22.00% patients were present with subclinical hypothyroidism, 17.33% patients were present with hypothyroidism and 3.33% patients present with hyperthyroidism. 28.67 % patients were present with grade 1fatty liver disease finding and 20.00% patients were present with grade II fatty liver disease in USG. 49.67% patients were present with NAFLD

Conclusion- Screening for thyroid disease and liver disease among patients with diabetes mellitus should be routinely performed for early detection and treatment of thyroid dysfunction and liver dysfunction to delay the complications of diabetes.

Keywords: Thyroid, Type-2DM, Complication, NAFLD

Introduction

One of the oldest diseases known to man is Diabetes mellitus (DM). It's first case was reported in the Egyptian manuscript dating to about 3000 years ago. In 1936, Type 1 and Type 2 DM were clearly distincted.[1]Diabetes mellitus is a collection of common

metabolic disorder mainly considered by hyperglycaemia which results, commencing from defective insulin secretion or insulin action or both together.[2]

Patients with type 2 diabetes mellitus are more prone to develop thyroid disorders. Many diabetic patients show features of thyroid dysfunction over a period of time.[3] Insulin resistance plays an important role in the development of hypothyroidism in patients with type 2 diabetes mellitus. Hypothyroidism in diabetic patients leads to an aggravation of dyslipidemia, hypertension and cardiovascular disease.[3] Thus, it is necessary to recognize and treat hypothyroidism in diabetic patients to prevent worsening of diabetic complications.[4] Hypothyroidism can be diagnosed with the help of a simple blood test which is readily and easily available. This can be performed by the primary care physician involved in treating diabetic patients. Early treatment of thyroid dysfunction in diabetic patients will help in normalizing their glycemic status and lipid profile.

Nonalcoholic fatty liver disease (NAFLD) and type 2 diabetes (T2DM) often coexist. The prevalence of NAFLD is 59.67% in T2DM patients. This results in adverse outcomes such as higher rates of mortality due to cirrhosis. NAFLD includes a spectrum of pathological conditions, which range from simple steatosis (NAFL), nonalcoholic steatohepatitis (NASH), cirrhosis and hepatocellular carcinoma.[5]

The aim of this study was to assess the level of thyroid dysfunction and non-alcoholic fatty liver disease in patients with type 2 diabetes mellitus

Materials and Methods

- Type of Study: A Hospital based study
- Period of Study: January 2019 to June 2020
- Place of Study: Mahatma Gandhi Medical College & Hospital, Jaipur

Inclusion criteria: All patients with Type 2 diabetes Mellitus.

Exclusion criteria

- Patients with history of alcohol consumption for any duration of time were excluded.
- Persons with previous history of jaundice, ascites and signs of liver cell failure will be excluded.
- Patients with history of intake of Methotrexate, Amiodarone, Glucocorticoids, Synthetic estrogens, Nucleoside Analogues (ddI, AZI) or any other hepatotoxic drug will be excluded.
- Patients with history of Chronic Renal Failure and Ischemic Heart Disease.
- Pancreatitis.
- Steroid induced Diabetes, will be excluded from the study.

Methodology

1. A detailed history and examination was conducted as per the proforma.
2. All patients were undergo evaluation for diabetes.
3. All patients will be evaluated for thyroid status; assessment of T3, T4 and TSH levels, LFT and USG of the whole abdomen and Blood glucose levels and HbA1c.
4. The laboratory evaluation of thyroid functions will be conducted by estimation of serum T3, T4 and TSH levels by chemi-lumiscence assay method. 2 ml of blood would be drawn and will be centrifuged and the serum (500microml) collected from that and will be incubated with the reagent (separate for T3, T4 and TSH) for about 1 hour at room temperature.
5. In LFT, Total, direct and indirect bilirubin levels with ALT, AST and ALP levels will be evaluated.

6. USG of the whole abdomen will be conducted to know the status of the liver parenchyma in patients with Diabetes mellitus.
7. HbA1c and FBS levels will be checked.

Results

In our study, maximum patients (56.00%) were from less than 46-60 Yrs followed by 22.67% patients were less than 45 yrs and 21.33% patients were more than 60 yrs age. 54.00% patients were female and 36.00% patients were male.

Table 1: Blood sugar wise distribution

Variable	Mean	SD
FBS(mg/dl)	152.70	79.06
PPBS(mg/dl)	239.71	114.08
Hb1Ac(%)	7.00	1.61

In present study, FBS was 152.70±79.06 mg/dl, PPBS was 239.71±114.08 mg/dl and Hb1Ac was 7.00±1.61%.

Table 2: Thyroid profile wise distribution.

Variable	Mean	SD
Free T3 (pg/ml)	2.38	0.88
Free T4 (ng/ml)	1.35	0.49
TSH (µU/L)	4.39	6.46

In present study, free T3 was 2.38±0.88 pg/ml, free T4 was 1.35±0.49 ng/ml and TSH was 4.39±6.46 **µU/L.**

Table 3: Distribution of various thyroid parameters

Thyroid biochemical parameters		No of cases	Percentage
Free T3 (pg/ml)	Low (<1.4)	7	4.67
	Normal (1.4 to 4.2)	142	96.67
	High (>4.2)	1	0.67
Free T4 (ng/ml)	Low (<0.8)	15	10.00
	Normal (0.8 to 2)	133	88.67
	High (>2)	2	1.33
TSH (µU/L)	Low (<0.3)	6	4.00
	Normal (0.3 to 4)	107	71.33
	High (>4.00)	37	24.67

4.67 % patients had low free T3 and 0.67 % patients had low free T3. 10.00% patients had low free T4 and 1.33% patients had high free T4. 4.00% patients had low TSH and 24.67% patients had high TSH.

Table 4: Distribution of thyroid dysfunction

Classification	No of cases	Percentage
Normal	86	57.33
Hypothyroidism	26	17.33
Hyperthyroidism	5	3.33
Subclinical Hypothyroidism	33	22.00
Total	150	100.0

In present study, 22.00% patients were present with subclinical hypothyroidism, 17.33% patients were present with hypothyroidism and 3.33% patients present with hyperthyroidism.

Table 5: Distribution of patients according to USG finding

USG grade	No of cases	Percentage
Normal	77	51.33
Grade 1	43	28.67
Grade 2	30	20.00
Total	150	100.0

28.67 % patients were present with grade 1fatty liver disease finding and 20.00% patients were present with grade II fatty liver disease in USG.

Table 6: NAFLD prevalence

NAFLD	No of Cases	Percentage
Absent	77	51.33
Present	73	49.67
Total	150	100.0

In present study, 49.67% patients were present with NAFLD.

Table 7: Association between liver maker and NAFLD

Variable	NAFLD present	NAFLD absent	p-value
ALT (IU/l)	62.34±20.35	34.81±5.53	0.01
AST (IU/l)	36.27±3.21	27.30±6.24	0.01

Mean ALT level in NAFLD patients (62.34±20.35 IU/l) was significantly higher as compare to non NAFLD patients (34.81±5.53).

Mean AST level in NAFLD patients (36.27±3.21IU/l) was significantly higher as compare to non NAFLD patients (27.30±6.24).

Discussion

Diabetes mellitus is one of the most important health problems in the population worldwide and in spite of advances in treatment, a huge number of patients present with complications owing to poor glycaemic control. One of the vital factors that contribute to deprived glycaemic control is thyroid dysfunction, which tends to happen with diabetes mellitus. This study tries to find out the prevalence of thyroid dysfunction in people with type 2 diabetes mellitus in our region. There is a complex interaction between DM and thyroid disorder. Because of a closely involved relation between insulin and thyroid hormone cellular metabolism, any abnormal levels of either of them may result in a functional derangement of the other.

In present study, 22.00% patients were present with subclinical hypothyroidism, 17.33% patients were present with hypothyroidism and 3.33% patients present with hyperthyroidism.

DM and thyroid diseases are the two endocrine diseases seen commonly in the population. There is inter-dependence between insulin and thyroid hormones for normal cellular metabolism so that DM and thyroid diseases can mutually influence the other disease process.[6]

On one hand, thyroid hormones contribute to the regulation of carbohydrate metabolism and pancreatic function, and on the other hand, diabetes affects TFT to variable extents. Studies have found that diabetes and thyroid disorders tend to coexist in the majority of the patients.

Thyroid disorders can have a major impact on glycaemic control and untreated thyroid disorders affects the management of patients with diabetes. Consequently, a systematic approach to thyroid testing in patients with diabetes is recommended earlier which will prevent the occurrence of cardiovascular complications and other diabetic complications such as nephropathy and retinopathy.[7]

Thus, the detection of abnormal hormone levels in addition to other biochemical variables in the early stage of diabetes will help patients to improve their health and reduce the mortality and morbidity.

Vaghasiya K et al [8] was found that 50 diabetic patients (cases) and 50 non-diabetic patients (control) were screened for thyroid dysfunction by thyroid function tests (TFT). Abnormal thyroid function was found in 14 (28%) DM cases and 50 control had normal thyroid function, which is statistically significant. They have found that there is variation in the TSH, T3 and T4 levels, found in diabetics and diabetics with thyroid disorders. Patients with thyroid disorders had a higher level of TSH compared to those without thyroid diseases whereas there was not much of a difference in T4 and T3 levels.

The prevalence of thyroid disorder was 45% in Type 2 diabetics, among them 28% had hypothyroidism, and 17% had hyperthyroidism in a study conducted by Pasupthi et al.[9]

Similar type of study was done by Udiong from Nigeria which showed 46.5% prevalence of thyroid disorder out of which hypothyroidism was seen in 26.6% and 19.9% had hyperthyroidism.[10]

In present study, 49.67% patients were present with NAFLD. Wenjie Dai et al [11]conducted a meta-analysis and their meta-analysis provides the first quantitatively pooled prevalence of NAFLD in T2DM patients. Twenty-four eligible studies were done in which a total of 35,599 type 2 DM patients were included, out of which 20,264 were identified with NAFLD. The reported prevalence of NAFLD in Type 2 DM patients ranged from 29.6% [12] to 87.1% [13] among the studies, and this meta-analysis done indicated that pooled prevalence of NAFLD.

The most common cause of liver disease in the preadolescent and adolescent age groups is NAFLD; studies done in India have also revealed that the mean age of general Indian NAFLD patients was found to be between 35 and 50years.[14,15]

However previous studies have also shown that the prevalence of NAFLD increases with age,[16] with the majority of cases occurring.

There is an important and a well-established clinical association found between NAFLD with element of metastasis, including hypertension, dyslipidaemias and obesity. Several studies have suggested relationship of disease with these features of the Mets.[17,18] Since majority of patients in study NAFLD cohort were obese (53.6%), haddyslipidaemia (59.6%) or had hypertension (64.4%), which makes it possible to arrive at a conclusion that Type 2DM patients with these co-morbidities is a common finding.

In our study, the mean ALT levels were found to be higher than that of AST levels in identified Type 2 DM patients, NAFLD cohort as a whole, and also ALT appears to have an important role in the process gluconeogenesis[19]and seems to be more related to accumulation of fat in liver than AST.[20]

Conclusion

Screening for thyroid disease and liver disease among patients with diabetes mellitus should be routinely performed for early detection and treatment of thyroid dysfunction and liver dysfunction to delay the complications of diabetes.

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