Section: General Medicine

Original Research Article

HYPOTHYROIDISM IN PATIENTS WITH TYPE 2 DIABETES MELLITUS ATTENDING OPD OF GOVERNMENT GENERAL HOSPITAL, ONGOLE IN PRAKASAM DISTRICT OF ANDHRA PRADESH, INDIA

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Abstract

Background: Diabetes mellitus (DM) is the most common endocrine disorder followed by thyroid disorders and it is common for a person to be affected by both. So we planned this study to assess the incidence of hypothyroidism in T2DM patients. **Materials and Methods:** The present study was an observational, cross-sectional study conducted at the government general hospital, Ongole in the Prakasam district of Andhra Pradesh, India over a period of 3 months from 10th March 2023 to 10th June 2023 comprising study and control group each having 120 participants. After having informed consent from the participants fulfilling inclusion criteria, their diabetic and thyroid profile was analysed using an auto analyser. **Result:** Serum TSH levels were significantly increased in study group and T3 and T4 levels significantly decreased in study group than the control group. Thyroid dysfunctions were significantly high in study group than control group with significantly higher prevalence of sub clinical hypothyroidism followed by hypothyroidism in study group. **Conclusion:** Our study showed a predominance of hypothyroidism in T2DM patients, so we conclude that thyroid profile of diabetic patients must be regularly screened for early management of hypothyroidism to ultimately mend the quality of life of the patients with morbidity.

INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a prolonged metabolic ailment disturbing metabolism of carbohydrates, lipids and proteins. Internationally, India is budding as a front-runner in diabetes mellitus, with maximum figure of diabetics following China.[1,2] The global incidence is 9.1 percent, likening to 415 million people having diabetes.[3] Conferring to the 2021 data, documented by the International Diabetes Federation (IDF), worldwide there existed 537 million people affected by diabetes and by 2030 and 2045 year they are predicted to rise to 643 million and 783 million respectively.[4] Diabetes mellitus (DM), due to its complications is globally considered as a chief cause of death and is the most common endocrine disorder,[5] being followed by thyroid disorders holding second position. As a consequence, it is common for a person to be affected by both diseases.[6] Scientists have followed the relationship between diabetes and thyroid dysfunction and observed hypothyroidism to be common in diabetics, with incidence of 4.8 percent to 31.4 percent.[7] DM seems to impact the thyroid functioning at 2 spots; primarily, at the site of thyroid stimulating hormone (TSH) released by hypothalamic control and secondly at the level of peripheral tissues for conversion of thyroxine (T4) to triiodothyronine (T3). Hyperglycemia grounds the reversible decrease of the action and concentration of T4-5-deiodinase in liver, decrease in serum T3, upsurge in r-T3 and also difference in T4 concentration.[8] The likely explanations claimed for the relationship between DM and hypothyroidism might have hormonal, genomic or biochemical basis. Numerous reports have indicated increased occurrence of thyroid disorders (TD) in T2DM patients,[9-11] as uncontrolled T2DM disturbs serum T3 as well as T4 levels,[12] with hypothyroidism as the most common finding.[13] However, the connection between thyroid levels and T2DM is still challenged as studies have revealed contradictory conclusions. Some studies have put forward a bidirectional impact of diabetes and thyroid dysfunction upon each other and few reports suggested a positive outcome of increased TSH and decreased free T4 on hyperglycemia and insulin resistance.[14-17] But on the other hand certain studies claimed no connection between them.[18] Hence, it turned out to be ostensible that a broad assessment of

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the association between thyroid levels and T2DM is required. Therefore we planned this study so that our findings can contribute in building an association between thyroid dysfunction and T2DM.

MATERIALS AND METHODS

The present study was an observational, cross-sectional study conducted at the government general hospital, Ongole in the Prakasam district of Andhra Pradesh, India over a period of 3 months from 10th March 2023 to 10th June 2023. The study included 120 T2DM patients of both gender with age group of 18 years and above who visited to the outpatient clinic of the government general hospital as study group and 120 age and sex matched normal population without diabetes as control group. The approval of the study was given by the institutional ethical committee and informed consent was taken from all the participants. The participants on drugs affecting thyroid functioning, pregnant females, patients having T1DM or any other metabolic syndrome, patients not willing to participate and age group less than 18 years were excluded from the study. Diabetes in the participants was diagnosed on the basis of American Diabetes Association (ADA) 2014 criteria for diabetes along with clinical observations made by the clinician. The blood samples from the participants were collected after 12 hours fasting and were estimated for fasting blood sugar (FBS) and then patients were asked to have meal and again blood samples were collected after 2 hours for estimation of post prandial blood sugar (PPBS), glycosylated haemoglobin (HbA1c), T4, T3 and TSH levels. All the samples were analysed using an autoanalyzer available in the hospital. The demographical and biochemical data was recorded and statistically analysed using SPSS 20 (IBM) and the p-value of ≤0.05 was reflected as statistically significant.

RESULTS

The present study included two groups i.e. study (diabetic) group and a control (non-diabetic) group with each having 120 participants. Both the groups had almost equal distribution of the mean age i.e. 59.18 ± 11.96 years and 58.57 ± 13.06 years in diabetic and non-diabetic group respectively and the mean difference was observed to be non-significant. The gender distribution among both the groups is depicted in figure no. 1. The study group was comprised of 69 (57.50%) males and 51 (42.50%) females. And on the other hand control group had 61 (50.83%) males and 59 (49.16%) females.

[Table 1] shows the biochemical profile of both the groups. The diabetic profile and thyroid profile of both the groups was assessed. FBS of the study group was observed to be 157.8 ± 67.45 mg/dl and in control group 91.34 ± 19.33 mg/dl with the mean difference to be statistically significant (p-value less than 0.05). The difference in mean value of PPBS of both the groups was also found to be statistically significant with mean as 236.3±96.63 mg/dl and 168.58 ± 23.45 mg/dl in diabetic and non-diabetic group respectively. As far as HbA1c is concerned, it was observed as 8.8±2.02 % and 4.2±1.23 % in study and control group with mean difference between them to be significant. In thyroid profile, T3 of the study group was observed to be 0.61±0.24 ng/mL and in control group 1.91±0.21 ng/mL with the mean difference to be statistically significant. The difference in mean value of T4 of both the groups was also found to be statistically significant with mean as 4.05±0.53 ug/dL and 10.02±4.01 ug/dL in diabetic and non-diabetic group respectively. As long as TSH is concerned in both the groups, it was observed as 4.43±4.32 ulU/mL and 2.88±1.22 ulU/mL in study and control group with mean difference between them to be significant with p-value less than 0.05.

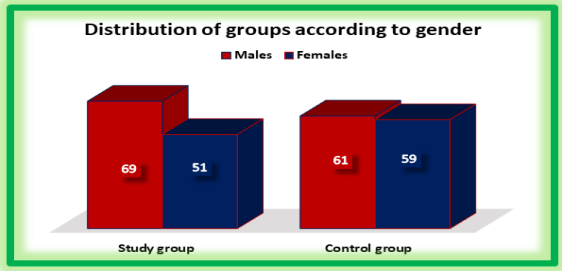

Figure 1: Distribution of groups according to gender

Table 1: Biochemical profile of study and control group

Parameter	Group (Mean ± SD)		p-value
	Study (n=120)	Control (n=120)	
Age (years)	59.18 ± 11.96	58.57 ± 13.06	0.7063
FBS (mg/dl)	157.8 ± 67.45	91.34 ± 19.33	0.0001
PPBS (mg/dl)	236.3±96.63	168.58 ± 23.45	0.0001
HbA1c (%)	8.8±2.02	4.2±1.23	0.0001
T3 (ng/mL)	0.61±0.24	1.91±0.21	0.0001
T4 (ug/dL)	4.05±0.53	10.02±4.01	0.0001
TSH (ulU/mL)	4.43±4.32	2.88±1.22	0.0002

Table 2: Thyroid dysfunction among study and control group

Thyroid dysfunction		Group		p-value
		Study (n=120)	Control (n=120)	
Type of thyroid dysfunction	Sub clinical hypothyroidism	21 (17.50%)	7 (5.83%)	0.032
	Hypothyroidism	13 (10.83%)	3 (2.50%)	0.044
	Sub clinical hyperthyroidism	2 (1.66%)	1 (0.83%)	2.11

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	Hyperthyroidism	2 (1.66%)	0 (0.00%)	0.99
Total no. of thyroid dysfunction		38 (31.66%)	11 (9.16%)	0.001

As clearly visible from [Table 2], the thyroid dysfunctions were higher in study (diabetic) group i.e. 38 (31.66%) than the control (non-diabetic) group i.e. 11 (9.16%) and was statistically significant with p-value <0.05. In the present study, the most common thyroid dysfunction in both the groups was observed to be subclinical hypothyroidism which was higher in study group i.e. 21 (17.50%) when compared to control group i.e. 7 (5.83%). Second most common thyroid dysfunction found in the participants was hypothyroidism which was again higher in study group i.e. 13 (10.83%) than the control group i.e. 3 (2.50%) with significant p-value. Hyperthyroidism and subclinical hyperthyroidism were found to be equally distributed among study group i.e. 2 (1.66%) and on the other hand in control group, subclinical hyperthyroidism was 1 (0.83%) and none of them having hyperthyroidism. In diabetic group, subclinical hyperthyroidism and hyperthyroidism was observed to be higher than control group but it was not significant.

DISCUSSION

Globally, diabetes is turning out to be the foremost reason of morbidity and mortality so it is considered as a risk to public health and the co-existence of thyroid disorders in diabetics further worsens the condition. So we conducted a study to assess the occurrence of thyroid dysfunctions mainly hypothyroidism in T2DM patients. Our study included a total of 240 participants with 120 diabetic patients in study group and 120 non-diabetics as control group. Both the groups had predominance of males with higher number in study group than control group in contrast to few studies,[19-21] which documented more females participants in both groups. The mean age of both the groups was observed to be almost equally distributed. We found no significant difference among the groups with respect to mean age and sex distribution. This finding was in accordance with the study by Telwani AA et al,[22] and Jalal MJ et al.[23] They also perceived both the groups to be comparable.

In our study, T3 and T4 were significantly lower in diabetics than non-diabetics. This could be the result of reduced thyrotrophin releasing hormone (TRH) in diabetics and moreover insulin and thyroid hormones are antagonists. TSH in our study was observed to be significantly higher in study group. This outcome is supported by Udiong study in Calabar, Nigeria as they also found TSH levels to be higher in diabetic subjects than non-diabetic though it was not significant.[24] In present study, significantly higher thyroid disorders were seen in diabetics than non-diabetics which is supported by Jalal MJ et al,[22] and Telwani AA et al.[23] The other studies which observed thyroid dysfunction in T2DM patients to be more prevalent are done by Raghuwanshi et al. in 2015,[25] Huang et al. in 2020,[26] Khassawneh et al. in 2020,[27] and Vamshidhar et al. in 2020.[28] Our study constituted 31.66% of diabetics and 9.16% of non-diabetics to have thyroid dysfunction and this finding is in harmony with the results stated by Gurjeet et al[29] and Chutia H et al,[30] as they observed thyroid disorders to be 31.2% and 30% respectively in diabetics. In contrast to our study, much lesser prevalence was seen among greek, saudi and jordan T2DM patients with 12.3%, 16% and 12.5% respectively.[31-33] The reason behind this variability in occurrence rate could be the sample size and different geographical area of the various studies.

Our study perceived the degree of variations in T3, T4 and TSH levels of T2DM patients which is backed by results found by many other studies,[34-36] and the range of thyroid dysfunction included subclinical hypothyroid, hypothyroid, subclinical hyperthyroid and hyperthyroid status. In current study, the dominant thyroid dysfunction seen in T2DM patients was subclinical hypothyroidism with 17.50% trailed by hypothyroidism in 10.83% and the subclinical hyperthyroidism and hyperthyroidism were seen equally distributed with 1.66% and the outcome is supported by Nobre et al. A study by Walia et al,[37] in 2022 strongly supported our study as they documented that T2DM patients are at upsurged risk of having subclinical hypothyroidism. Our study clearly states that the hypothyroidism (subclinical and clinical form) is prevalent in T2DM patients and the findings of our study are strongly in concordance with study done by Tamez-Pérez et al in 2012,[38] Distiller et al. in 2013,[39] Alsolami et al,[40] in 2018 and Al-Rubaye in 2019.[41] In T2DM patients, the higher prevalence of hypothyroidism could be attributed to higher mean glycemic status. Previous reports have revealed that T3, TSH levels and TSH response to thyrotropin releasing hormone are sturdily subjective to glycemic control.[42] A study by Al-Rubaye in 2019,[41] also proved that the diabetics with low glycemic control have greater risk of having hypothyroidism.

CONCLUSION

Our study showed a predominance of hypothyroidism in T2DM patients and is characterized by a multifaceted mutually dependent interaction. In diabetic patients, the unidentified thyroid issues may alter their metabolic controls. Henceforward, we conclude that thyroid profile of diabetic patients must be regularly done, as timely screening not only leads to early management of hypothyroidism but it may also aid in better treatment of the complications in diabetes by hypothyroidism. This will ultimately mend the quality of life and general well-being of the patients with decrease in morbidity rate.

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