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Original article

Prevalence of thyroid dysfunction among type 2 diabetes mellitus patients

M.V. Jali^{a,*}, Sanjay Kambar^{a,b}, Sujata M. Jali^{a,c}, Nandita Pawar^a, Prachi Nalawade^a

^a KLES Diabetes Centre, KLES Dr. Prabhakar Kore Hospital and Medical Research Centre, Belagavi, 590010, India

^b Department of Community Medicine, KLE University's J. N. Medical College, Belagavi, 590010, India

^c Department of Paediatrics, KLE University's J. N. Medical College, Belagavi, 590010, India

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ABSTRACT

Aims: To determine the prevalence of Thyroid dysfunction among Type 2 Diabetes mellitus.
Methodology: A cross-sectional hospital-based study is conducted to find out the prevalence of thyroid dysfunction. 713 type 2 diabetes mellitus (T2DM) subjects were enrolled in the survey. These subjects were investigated for fasting blood sugar (FBS), glycosylated haemoglobin (HbA1c), total triiodothyronine (T3), total thyroxine (T4), and thyroid-stimulating hormone (TSH).
Results: Prevalence of thyroid dysfunction in T2DM was found in 16.2%. Gender-specific prevalence found higher in females (25%) compared to males (10.1%) ($P < 0.001$). Age-specific prevalence found higher in the age group ≥ 50 yrs. (19%) Compared to other age groups ($P = 0.036$). Subjects with poor glycaemic control demonstrated higher prevalence (27.9%) ($P = 0.012$). Subjects with long-standing T2DM had an increased risk for thyroid dysfunction (19.8%) though findings were not statistically significant. ($P = 0.42$).
Conclusion: The prevalence of thyroid dysfunction with T2DM (16.2%) was high in females compared to males and especially hypothyroidism being more typical. Failure to recognise the presence of thyroid dysfunction among T2DM patients may be a primary cause of poor management of diabetes. We recommend universal screening and regular monitoring of thyroid dysfunction in T2DM patients.

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1. Introduction

Diabetes mellitus and thyroid dysfunction are the two most common endocrine disorders seen in outpatient care with reported global prevalence ranging from 2 to 17%. Thyroid dysfunction is a spectrum of disorders of the thyroid gland which manifests either as hyper or hypothyroidism and is reflected in circulating levels of TSH. There is a deep, fundamental relation between diabetes mellitus and thyroid dysfunction [1]. Studies have found that thyroid dysfunction is much common in diabetic population compared to non-diabetic population, diabetes and thyroid disorders have been shown to influence each other mutually because of intersecting pathology [2,3]. Thyroid hormones cause an increase in the hepatocyte concentration of glucose-6-phosphate, glucose transporter 2 (GLUT 2) thereby leading to increased hepatic glucose output and abnormal glucose

metabolism giving rise to the overproduction of lactate entering Cori's cycle and further promotes hepatic gluconeogenesis [4,5]. Thyroid hormones also cause an increase in gut glucose absorption and increased lipolysis which further promotes hepatic gluconeogenesis [6]. Thus, thyroid dysfunction may lead to the development of insulin resistance. Diabetes mellitus also influences thyroid function at two different sites. Firstly, at the level of hypothalamic control of TSH release and next at the level of peripheral tissue by converting T4 to T3. Hyperglycaemia causes a reduction in the hepatic concentration of T4-T5 deiodinase, low serum concentration of T3, raised, normal or low T4 [7]. A possible genetic interaction has also been noted between the development of thyroid dysfunction and type-2 Diabetes Mellitus. Few genes like protein kinase B, Inhibitory G protein, GLUT2, [8] phosphoenolpyruvate kinase [9] have been identified. Hence, assessment of thyroid function in the uprising diabetic patient number may be helpful in identifying cases of clinical and subclinical thyroid dysfunction thereby assisting in mitigating the harmful effects due to low thyroid hormones.

* Corresponding author at: KLES Diabetes Centre, Medical Director & CEO, Professor of Diabetology (Medicine), KLES Dr. Prabhakar Kore Hospital and Medical Research Centre, KLE University's J. N. Medical College, Belagavi- 590 010, Karnataka, India.

E-mail address: drmvjali@gmail.com (M.V. Jali).

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Table 1
Gender Specific Prevalence of Thyroid Dysfunction in T2DM.

Gender	T2DM with thyroid dysfunction		T2DM without thyroid dysfunction		Total
Males	42 (10.1%)		375		417
Females	74 (25%)		222		296
Total	116(16.2%)		597		713

$\chi^2 = 28.32$, DF = 1, P = 0.001, OR: 0.34, 95% CI = 0.22–0.52.

Table 2
Age-Specific Prevalence.

Age (years)	T2DM with thyroid dysfunction			T2DM without thyroid dysfunction			Total
	Males	Females	Total	Males	Females	Total	
20–30 (7.7%)	00	01	01	07	05	12	13
31–40 (9.7%)	04	13	17	101	56	157	174
41–50 (17%)	05	12	17	50	33	83	100
>50 (19%)	33	48	81	217	128	345	426
Total	42	74	116	375	222	597	713

$\chi^2 = 8.49$, DF = 3, P = 0.036.

Table 3
Prevalence of thyroid dysfunction according to glycemic status.

HbA1c (%)	T2DM with thyroid dysfunction			T2DM without thyroid dysfunction			Total
	Males	Females	Total	Males	Females	Total	
4.7–6.4 (13.7%)	22	38	60	233	143	376	436
6.5–7.0 (14.7%)	05	04	09	36	16	52	61
7.1–8.0 (17.6%)	08	15	23	65	42	107	130
>8.0 (27.9%)	07	17	24	41	21	62	86
Total	42	74	116	375	222	597	713

$\chi^2 = 10.86$, DF = 3, P = 0.012.

2. Methodology

A cross sectional hospital based study was undertaken to find the prevalence of thyroid dysfunction in 713 type 2 diabetes mellitus (T2DM) subjects attending Diabetes Centre, KLES Dr Prabhakar Kore Hospital and Medical Research Centre, KLE University, Belagavi from January 2014 to October 2015. Those diabetic patients with known thyroid disorders, complications of diabetes mellitus, history of other illnesses, and hyperlipidaemia as well as on corticosteroids therapy and medications affecting thyroid function were excluded from the study.

Each subject's demographic data, (age, sex) anthropometric measurements (height, weight, and BMI) including blood pressure (systolic and diastolic), duration of diabetes, family history of diabetes and thyroid disease, smoking habit and alcohol intake were recorded. About five mL overnight fasting venous blood samples were collected at morning time from each patient. Blood glucose glycated haemoglobin (HbA1c), free triiodothyronine (T3), free tetraiodothyronine (T4), and thyroid-stimulating hormone (TSH) were estimated. Blood glucose and HbA1c were determined using the enzymatic method and by High-pressure liquid

chromatography (HPLC) principle, respectively. Serum T3, T4, and TSH were measured by using Chemiluminescence Immuno-assay (CLIA). Thyroid dysfunction was said to occur if patients thyroid hormones fall outside the reference range (serum T3 (0.6–1.8 ng/ml), serum T4 (3.2–12.6 μ gm/dl), and TSH level (0.55–4.78 mciu/ml). The data generated from the study were entered into MS Excel and analysed using SPSS statistical package version 20.0 (Chicago, USA). Continuous variables were expressed as mean \pm SD values and categorical variables were expressed as a percentage (number). ANOVA test was applied for continuous variables, and the chi-square test was used for categorical variables at 95% confidence interval. Categorical variables were expressed as a percentage (number). ANOVA test was applied for continuous variables, and the chi-square test was used for categorical variables at 95% confidence interval.

3. Results

Prevalence of thyroid dysfunction among T2DM patients was found to be 16.2%. Gender-specific prevalence found higher in females (25%) compared to males (10.1%) (P < 0.001). The

Table 4
Prevalence of Thyroid Dysfunction According to Duration of T2DM.

Duration (years)	T2DM with thyroid dysfunction			T2DM without thyroid dysfunction			Total
	Males	Females	Total	Males	Females	Total	
0–4 (13.9%)	15	30	45	162	117	279	324
5–9 (17.1%)	04	09	13	43	20	63	76
10–12(17.7%)	12	22	34	99	59	158	192
>13 (19.8%)	11	13	24	71	26	97	121
Total	42	74	116	375	222	597	713

$\chi^2 = 2.81$, DF = 3, P = 0.422.

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