STUDY OF PREVALENCE OF HYPOTHYROIDISM IN TYPE 2 DIABETES MELLITUS PATIENTS OF LUCKNOW AND SURROUNDING AREAS

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ABSTRACT

Diabetes mellitus and thyroid hormone dysfunction are two common endocrinopathies seen in adult population. Insulin and thyroid hormones are intimately involved in cellular metabolism, so excess or deficit of any of them can derange the function of another.

To see the prevalence of hypothyroidism in type 2 Diabetes Mellitus patients.

A total of 235 patients with diagnosed Type 2 Diabetes Mellitus of either sex, aged >20 years were included in the study. Analysis of serum TSH by ELISA was done in all patients of the study.

A total of 235(107 males and 128 females) Type 2 Diabetes Mellitus patients were included in the study. Hypothyroidism was seen in 48(20.4%) patients. Hyperthyroidism was seen in 17(7.2%) patients. Euthyroid patients were 170(72.3%). Out of 128 females 27(11.4%) had hypothyroidism whereas out of 107 males 21(8.9%) had hypothyroidism.

We conclude that prevalence of hypothyroidism was 20.4% and seen more in female Type 2 Diabetic patients as compared with male patients.

KEYWORDS: Diabetes mellitus, Hyperthyroidism, Hypothyroidism

INTRODUCTION

Diabetes mellitus and thyroid hormone dysfunction are two common endocrinopathies seen in adult population.Diabetes is a chronic, progressive disease characterized by elevated levels of blood glucose. Globally, an estimated 422 million adults were living with diabetes in 2014, compared to 108 million in 1980. The global prevalence (age-standardized) of diabetes has nearly doubled since 1980, rising from 4.7% to 8.5% in the adult population.

According to World Health Organization (WHO), the worldwide prevalence of diabetes in 2002 was 170 million and the number projected to grow up to 366 million or more by 2030. Sedentary lifestyle, various diet patterns, ethnicity and a genetic predisposition are the major factors responsible for the causes of the epidemic. Like diabetes, diseases of the thyroid gland are also amongst the most abundant endocrine disorders in the world, second only to diabetes. Thyroid dysfunction is a disorders of the thyroid gland which manifests either as hyper - or hypothyroidism and is reflected in the levels of thyroid stimulating hormone (TSH).

The American Association of Clinical Endocrinologists (AACE) estimated that in the United States approximately 13 million people, or 4.78% of the population, have undiagnosed thyroid dysfunction. Thyroid dysfunctions represents around 30% to 40% of the patients seen in an endocrine practice. Endocrine disorders are common among Indian population out of which thyroid disorders represents an important subset of these endocrine disorders as per projections from various studies on thyroid disease, it has been estimated that about 42 million people in India suffer from thyroid diseases. Prevalence of thyroid dysfunction in type 2 diabetes had been found to be higher as compared to general population.

Insulin and thyroid hormones are intimately involved in cellular metabolism, so excess or deficit of any of them can derange the function of another 1. Unrecognized thyroid dysfunction may impair metabolic control i.e. glycemic control and lipid profile, by causing hypoglycemia or hyperglycemia and it can cause an additional cardiovascular disease risk in patients with Diabetes.

The association between DM and TD is widely known, with the first studies published in 1979. According to American Thyroid Association guidelines, type 2 diabetes patients should frequently be tested for thyroid hormone dysfunction. Several workers suggested that testing for thyroid dysfunction in type 2 diabetes patient is necessary and should be carried out annually[12].

The present study therefore is designed to know the prevalence of thyroid dysfunctions in type 2 DM patients.

AIM AND OBJECTIVES

AIM

To study the prevalence of hypothyroidism in type 2 Diabetes Mellitus patients.

OBJECTIVES

To asses serum TSH in type 2 diabetes mellitus patients.

To determine correlation between age, sex and duration of diabetes with hypothyroidism.

MATERIAL AND METHOD

The study was conducted at Era's Lucknow Medical College and Hospital, Lucknow.235 diagnosed type 2 Diabetes Mellitus patients were screened for hypothyroidism. Patients' serum TSH was estimated with CALBIOTECH kit (using ELISA method).

INCLUSION CRITERIA

All new and old patients of Type 2 diabetes mellitus, aged ≥ 20 years, diagnosed according to ADA criteria.

EXCLUSION CRITERIA

Diagnosed Diabetes Mellitus type 1 patient

Patients below age of 20 years

All sick euthyroid syndrome patients who are critically ill.

Patients with:

a) Gestational diabetes mellitus

b) Other secondary causes of diabetes mellitus like pancreatitis, fibrocalculus pancreatitis etc.

DATA ANALYSIS

The statistical analysis was done using SPSS (Statistical Package for Social Sciences) Version 21.0 statistical Analysis Software. The values were represented in Number (%).

RESULT

A total of 235(107 males and 128 females) Type 2 Diabetes Mellitus patients were included in the study. Hypothyroidism was seen in 48(20.4%) patients. Hyperthyroidism was seen in 17(7.2%) patients. Euthyroid patients were 170(72.3%).Out of 128 females 27(11.4%) had hypothyroidism whereas out of 107 males 21(8.9%) had hypothyroidism.

- (A1= Hypothyroid, A2= Hyperthyroid,B= Euthyroid)

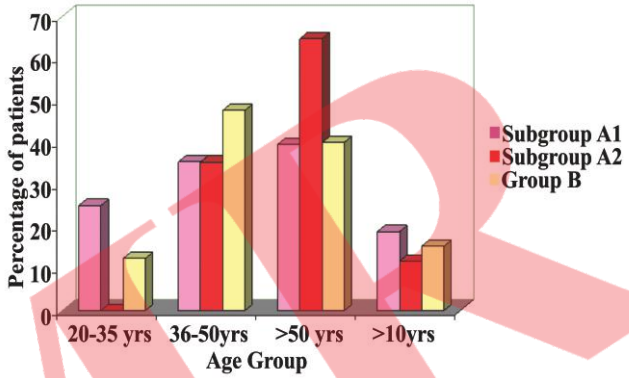

Fig 2: Distribution Of Thyroid Dysfunction With Age Groups

Age of patients enrolled in the study ranged between 21 & 86 years, mean age was 49.57±12.12 years. Proportion of patients of Subgroup A2 (hyperthyroid) was higher as compared to Subgroup A1 (hypothyroid) and Group B (Euthyroid) age group >50 years (64.7% vs. 39.6% & 40.0%). This association was found to be statistically significant.

SN	Variable	Subgroup A1 (n=48)		Subgroup A2 (n=17)		Group B (n=170)		Total	
		No.	%	No.	%	No.	%	No.	%
	Gender								
1.	Female	27	56.3	10	58.8	91	53.5	128	54.5
2.	Male	21	43.8	7	41.2	79	46.5	107	45.5
		χ^2=0.252(df=2); p=0.882							

Table 2: Sex Distribution Of Thyroid Dysfunction

SN	Variable	Subgroup A1 (n=48)		Subgroup A2 (n=17)		Group B (n=170)		Total	
		No.	%	No.	%	No.	%	No.	%
1-	Age Group								
	20-35 yrs	12	25.0	0	0.0	21	12.4	33	14.0
	36-50 yrs	17	35.4	6	35.3	81	47.6	104	44.3
	>50 yrs	19	39.6	11	64.7	68	40.0	98	41.7
		χ^2=10.762(df=4); p=0.029							

Table 1: Distribution Of Thyroid Dysfunction With Age Groups

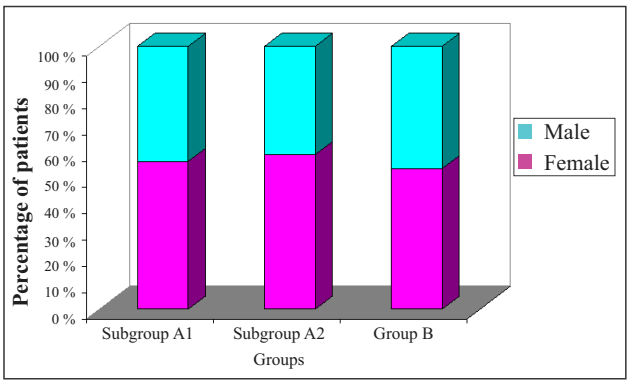

Fig 3: Association Of Gender With Thyroid Disorders In Study.

POPULATION

Preponderance of females was observed in overall study population. Though proportion of females was higher in Subgroup A1 & Subgroup A2 as compared to Group B (56.3% & 58.8% vs. 53.5%) but this difference was not found to be statistically significant.

SN	Duration of diabetes	Subgroup A1 (n=48)		Subgroup A2 (n=17)		Group B (n=170)		Total (n=235)	
		No.	%	No.	%	No.	%	No.	%
1-	Newly diagnosed	5	10.4	2	11.8	17	10.0	24	10.2
2-	<5 yrs	25	52.1	9	52.9	86	50.6	120	51.1
3-	5-10 yrs	9	18.8	4	23.5	41	24.1	54	23.0
4-	>10 yrs	9	18.8	2	11.8	26	15.3	37	15.7
		χ^2=1.019(df=6); p=0.985							

Table 3: Association of duration of diabetes with Thyroid disorders in Study Population

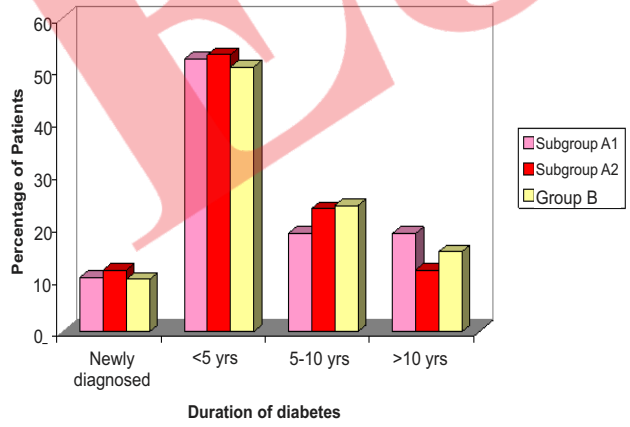

Fig 4: Thyroid dysfunction in relation to duration of diabetes

No significant association of duration of diabetes/thyroid disorder among patients of Subgroup A1, Subgroup A2 and Group B had been found.

DISCUSSION

Diabetes is now one of the most common non-communicable diseases globally. It is the fourth or fifth leading cause of death in most high-income countries and there is substantial evidence that it is epidemic in many low- and middle-income countries. Complications from diabetes, such as coronary artery and peripheral vascular disease, stroke, diabetic neuropathy, amputations, renal failure and blindness are resulting in increasing disability, reduced life expectancy and enormous health costs for virtually every society. Diabetes is certain to be one of the most challenging health problems in the 21st century. Type 2 diabetes is now a common and serious global health problem, which, for most countries, has evolved in association with rapid cultural and social changes, ageing populations, increasing urbanization, dietary changes, reduced physical activity and other unhealthy lifestyle and behavioural patterns. Unfortunately, the prevalence of diabetes mellitus, parituclarly type 2 DM, is increasing rapidly in India, so much so that India is often termed as the diabetic capital of the world. Diabetes is marked by presence of insulin resistance, which has also been identified to be associated with thyroid dysfunction. Both hyper- and hypothyroidism have been associated with insulin resistance which has been reported to be the major cause of impaired glucose metabolism in T2DM. The state-of-art evidence suggests a pivotal role of insulin resistance in underlining the relation between T2DM and thyroid dysfunction. A plethora of preclinical, molecular, and clinical studies have evidenced an undeniable role of thyroid malfunctioning as a comorbid disorder of T2DM. Considering these possible links between thyroid disorder and diabetes mellitus, the present study was planned with an aim to study the prevalence of thyroid hormone dysfunction in type 2 Diabetes mellitus patients. A total of 235 diabetic patients (107 males, 238 females) aged 21 to 86 years (Mean age 49.57±12.12 years) were enrolled in the study and were evaluated for expression of different thyroid hormones to assess the prevalence of thyroid disorders.

Prevalence of hypothyroidism was 20.4%(n=48) and hyperthyroidism 7.3%(n=17). A number of previous studies have also assessed the prevalence of thyroid dysfunction in type 2 diabetes mellitus patients and have reported variable spectrum depending upon the study characteristics. Table D1 below compares the findings of previous studies and compares them with present study:

SN	Author (Year)	Sample size and Characteristic	Thyroid dysfunction
1.	Demitrost and Ranabir (2012)[16], Manipur, India	202 type 2 DM, 69.8% females,	Thyroid dys. 32.2%; Hypothyroidism-2.7%
2.	Jain et al. (2013)[17], Punjab, India	200 T2DM, 40-70 Yrs, 55% females	Thy. Disorder-16%; Hypo-12%
3.	Palma et al. (2013)[18], Brazil	304 T2DM, 67% Females, Mean age 60.7 years (267 without prior thyroid dysfunction)	In cases without prior thyroid dysfunction Thy. Dysf.-13.1%; Hypo-12.4%
4.	Ravishankaret al. (2013)19, Bangalore, India	100 T2DM, 32% > 60 yrs, 50% females	Thyroid dysf. –29%; Hypo. –16%
5.	Singh et al. (2013)20, Nepal	100; 50% females, mean age 48.05 yrs males, 47.76 yrs females	Thy. Dysfunction -29%; Hypo –24%
6.	Uppalet al. (2013)21, New Delhi, India	120 T2DM, Mean age 55.75 yrs,	Thyroid dysf. 24.2%; Hypo-16.7%
7.	Mukherjee et al. (2015)22, Kolkata, India	60, T2DM, 80% <45 yrs, 61.7% males	Thyroid dysf. 75%; Hypo-48.3%
8.	Mukherjee et al. (2015)23, Kolkata, India	120, <40 years, 67.5% males	Thyroid dysf. –65.8%; Hypo-52.5%
9.	Zengiet al. (2015)24, Turkey	131 T2DM, 55.7 % females, Mean age 55 yrs –females, 59 yrs males	Thyroid dysf. –18.3%; Hypo –6.9%
10.	Chandelet al. (2016)25, Jhansi, India	160 T2DM, Mean age 52.45 yrs,	Thyroid dysf. –30.6%; Hypo –29.4%
11.	Jain and Patel (2016)26, Indore, India	908 T2DM, Mean age 50.4 years, 52.9% females	Thyroid dysf. –13.7%; Hypo –12.9%
12.	Khuranaet al. (2016)27, Amritsar, Punjab	200 T2DM, Majority (61.5%) <60 years, 55% females	Thyroid dysfunction –16%; Hypo –12%
13.	Prasad & Singh (2017)28, Lucknow, India	60 T2DM, 46.7% females, Mean age – Males 53.7 yrs, Females 48.9 yrs	Thyroid dysfunction-33.3%, Hypo -23.3%
14.	Subektiet al. (2017)29, Indonesia	299 T2DM, 57.2% Females, Median age 60 years	Thyroid dysf. –9.9%; Hypo –7.6%
15.	Ozairet al. (2018)30, Aligarh, India	250, 72.0% females, Mean age 51.1-52 years	Thyroid dysfunction-28%; Hypo -26.8%
16.	Present study (2018), Lucknow, India	235, Mean age 49.57 years, 54.5% Females	Thyroid dysfunction –27.7%; Hypo –20.4%

Table D1: Prevalence And Spectrum Of Thyroid Dysfunction In Type 2 Diabetes Mellitus In Different Contemporary Studies And Their Comparison With Present Study

An overview of Table D1 shows the prevalence of thyroid dysfunction among type 2 diabetes mellitus patients ranging from 13.7% (Jain and Patel, 2016)27 to 75% (Mukherjee et al., 2015)23. In present study, this prevalence was 27.7%, a number of workers reported prevalence close to this, viz. Demitrost and Ranabir (2012)89 – 32.2%, Ravishankaret al. (2013) 20– 29%, Singh et al. (2013) 21 – 29%, Uppalet al. (2013) 22 – 24.2%, Chandelet al. (2016)26– 30.6%, Prasad & Singh (2017) 29– 33.3% and Ozairet al. (2018)31– 28%. As far as type of thyroid disorder is concerned, similar to present study, all the other studies have shown a dominance of hypothyroidism. In present study, it was present in 20.4% cases. A number of other researchers also reported prevalence of hypothyroidism close to 20% or above 17, 21, 23, 24, 26, 31.

A significantly higher risk of thyroid dysfunction has often been reported in females as compared to males in some studies (31, 28, 30, 32) while some other studies report age >50 years to be associated with an increased prevalence of thyroid dysfunction (28, 31), however, these are not the universal findings. In a recent study, Ozairet al. (31) similar to our study did not find a significant association of thyroid dysfunction with age and gender of diabetic patients.

In present study, no significant association between duration of diabetes and thyroid disorder. These observations are in agreement with the observations of Ravishankaret al.20 who also did not find a significant association between duration of diabetes and thyroid disorder. However, Telwaniet al.33 in their study reported thyroid disorders to be significantly higher among patients with duration of diabetes ≥5 years. Ozairet al.31 too in their study reported longer duration of diabetes to be significantly associated with thyroid dysfunction.

Absence of a relationship between duration of diabetes and thyroid dysfunction could have been justified with a better glycemic control profile of patients. , however, one of the limitation of our study was absence of data related with glycemic control. Although, some previous studies have reported the glycemic control data with evaluation of HbA_{1c} levels, however, we did not include it as a variable owing to the fact that even HbA_{1c} at best can provide information about two-to-three months' glycemic control status. In fact, continued insulin resistance might progress towards thyroid disorder, however, this progression cannot be justified with data of two-to-three months' glycemic control status. Despite this limitation, the present study showed a high prevalence of thyroid dysfunction in our study population. In order to understand this relationship further, prospective studies that include newly diagnosed cases of type 2 diabetes mellitus are recommended with a continuous vigil on glycemic control and thyroid function assessment.

CONCLUSION

The findings of present study thus showed a high prevalence of thyroid dysfunction among diabetic patients. Age >50 years was a significant predictor of hypothyroidism. High prevalence of thyroid dysfunction in general and hypothyroidism in particular is of high concern, however, coexistence of diabetes and thyroid dysfunction might in turn lead to poorer outcomes. Further longitudinal studies to evaluate the impact of coexisting thyroid dysfunction and diabetes mellitus are recommended.

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