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The role of thyroid function tests in Diabetes

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Abstract

Background: The incidence of thyroid disorders is increasing day by day and involvement of multiple systems is its common feature. Autoimmune thyroid disorders are the most prevalent immunological diseases in patients with type 1 diabetes. As the prevalence of diabetes and thyroid both is more in India, correlation of these two diseases was studied in this study.

Methodology: this study was conducted on 185 diabetic (both type I and II) patients attending diabetes OPD. Thyroid tests including TSH, T3 and T4 were measured using enzyme immune assay.

Results: we found that levels of T3 and T4 are lower in control group as compared to the diabetic patients. The levels of TSH are lower in diabetic patients than in control group. Low levels of thyroid hormones were noted in 5.95% male diabetics and 18.92% female diabetics. High levels of thyroid hormones were observed in 7.57% male diabetics and 17.84% female diabetics.

Discussion: Abnormal thyroid hormone levels were observed more commonly in study group than in control group. Hypothyroidism was seen to be more common in females than in males in both the control and study group. Similarly hyperthyroidism also seems to be common in females compared to males in both diabetic and non-diabetic groups.

Keywords: Thyroid function tests, hyperthyroidism, diabetics, enzyme immune assay.

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INTRODUCTION

The occurrence of thyroid diseases is common in general population[1] and its incidence is increasing more and more day by day. As thyroid disorders involve multiple systems in the body, the long term consequences may be very dangerous. Cross-sectional studies have reported that 7.5% of women and 2.8% of men of all ages in United Kingdom had abnormal serum thyroid-stimulating hormone (TSH) levels[1]. Modern investigation processes provide reliable and inexpensive methods of assessing thyroid functions.

Diabetes mellitus, one of the commonest endocrine disorders is again influenced by other endocrine or non endocrine disorders[3]. Sometimes other endocrine disorders such as abnormal thyroid hormones levels are observed in diabetes mellitus[4,5]. The association between type 1 diabetes (T1DM) and autoimmune thyroid disease (AITD) is well established. In many diabetic patients AITD is subclinical and only detected by routine measurements of thyroid auto-antibodies (TA) or serum thyrotrophin (s-TSH) [6]. The prevalence of TA and thyroid dysfunction increases with age and with duration of diabetes[6].

Autoimmune thyroid disorders are the most prevalent immunological diseases in patients with type 1 diabetes[7]. As the prevalence of diabetes and thyroid both is more in India, correlation of these two diseases was studied in this study. Diabetic patients have relatively higher prevalence of thyroid disorders compared with the normal population because patients with one organ-specific autoimmune disease are at risk of developing other autoimmune disorders[8]. The presence of thyroid disorders usually affects diabetes control. There is underlying increased hepatic gluconeogenesis, rapid gastrointestinal glucose absorption, and probably increased insulin resistance. Indeed, thyrotoxicosis may unmask latent diabetes[8]. Diabetes mellitus and thyroid disorders both are metabolic disorders that affect the levels of carbohydrates, proteins and lipids. The present study was carried out with the aim of detecting thyroid function status in the patients of diabetes mellitus.

MATERIAL AND METHODS

The present study was carried out at a tertiary care hospital affiliated to my medical college over a period of one year (from June 2009 to June 2010). Total 185 diabetics patients were selected for this study and samples were collected from them.

An inclusion criterion for diabetes patients was as follows:

- Previous fasting plasma glucose more than 110 mg/dl at two or more occasions
- Who were on treatment with insulin or oral hypoglycaemics
- Who were having diet or physical exercises for high blood sugar.

The criterion for classification into type 1 and 2 diabetes was according to the age of onset of diabetes (35 years) and insulin dependence alone for achieving normoglycaemic levels. Fasting C-peptides levels less than 0.38ng/ml were also classified as type 1 diabetics. Out of 185 patients studied, 22 were type 1 diabetics and remaining 163 were classified as type 2 diabetics. Among 163 type 2 diabetics, 60 were receiving both insulin and oral drugs, 89 were only on oral hypoglycemic and rests 14 were on diet and exercises.

Control was constituted by 112 healthy people without diabetes and whose blood plasma levels were less than 110mg/dl on two different occasions. The physical examination was carried out of both cases and controls to rule out any thyroid diseases. There was no history of thyroid diseases in the past also.

Blood samples were collected from all subjects after minimum 8 hours fasting. Thyroid function tests conducted were TSH, T3 and T4 using enzyme immuno assay. The collected data was tabulated and analyzed using statistical software SPSS.

RESULTS

The characteristics of the cases and controls included in the study are shown in table I.

Particulars of the groups	Study group (n=185)	Controls (n=112)
Sex		
Males	94	57
Females	91	55
Male: Female ratio	1.03: 1	1.04:1
Mean age in years	48.4	49.3
Mean duration of diabetes in years	9.2	Not applicable
Body mass index (Kg/m^2)	19.6	18.2
Mode of Management of type II DM		
Insulin & oral drugs	60	Not applicable
Oral hypoglycemics only	89	Not applicable
Diet & Exercise	14	Not applicable

Table I: characteristics of cases and controls

The male: female ratio of the diabetic patients forming the study group was found to be 1.03:1 which is very similar to that of control group (1.04:1). The mean age of study and control groups was also found to be equally same i.e. 48.4 and 49.3 years. Others parameters like mean duration of diabetes and modes of management of DM are also shown in table 1.

Thyroid hormone levels	Cases	Controls
T3 (mg/dl)	113 ± 88	109 ± 54
T4 (mg/dl)	9.83 ± 1.04	7.23 ± 0.95
TSH (mIU/ml)	1.92 ± 1.48	2.77 ± 2.43

Table 2: Thyroid hormone levels in cases and controls

It is clear from table 2 that levels of T3 and T4 are lower in control group as compared to the diabetic patients. The levels of TSH are lower in diabetic patients than in control group.

	Cases			Controls		
	Total	Male	Female	Total	Male	Female
Total	185 (100%)	94 (50.81%)	91 (49.19%)	112 (100%)	57 (50.89%)	55 (49.11%)
Euthyroids	92 (49.73%)	69 (37.3%)	23 (12.43%)	109 (97.32%)	57 (50.89%)	52 (46.43%)
Low Levels	46 (24.86%)	11 (5.95%)	35 (18.92%)	1 (0.89%)	00	1 (0.89%)
High Level	47 (25.41%)	14 (7.57%)	33 (17.84%)	2 (1.79%)	00	2 (1.79%)

Table 3: showing distribution of cases and controls according to the thyroid hormone levels

Out of 185 diabetic patients included in the study, 49.73% patients were having normal levels of thyroid hormones, 24.86% were having low and 25.41% have high levels of thyroid hormones. Low levels of thyroid hormones were noted in 5.95% male diabetics and 18.92% female diabetics. High levels of thyroid hormones were observed in 7.57% male diabetics and 17.84% female diabetics. All this data is shown in table 3.

DISCUSSION

Both the endocrine disorders- diabetes and thyroid dysfunction are becoming more and more common in our country. The association between diabetes and thyroid dysfunction is known since a long time. Various studies have shown the association between these diseases [7-10]. Most of these studies have reported high prevalence of thyroid dysfunction in diabetics than in normal population.

We observed high body mass index (19.6) in study group i.e. diabetic group as compared to control group (18.2). Diabetic patients are usually obese and report high BMI than the normal population. This is well correlated with other authors[6, 7, 11].

Abnormal thyroid hormone levels were observed more commonly in study group than in control group (Table II). Similar results were observed by Udiong CEJ *et al*[3], Celani *et al*[12], Suzuki *et al*[13], etc. Udiong *et al*[13] proposed that abnormal thyroid hormones levels may be the outcome of the various medications the diabetics were receiving. Hypothyroidism was seen to be more common in females than in males in both the control and study group. Similarly hyperthyroidism also seems to be common in females compared to males in both diabetic and non-diabetic groups. T3 and T4 acts like insulin antagonists and potentiate the action of insulin indirectly[3,14]. TRH synthesis decreases in diabetes mellitus. These facts could be responsible for the occurrences of low thyroid hormone levels in some diabetics3. Females are more prone to develop thyroid disorders unlike males. So we can conclude that thyroid disorders are more likely to develop in diabetics.

Abdel-Rahman M. Radaideh *et al*[15] stated that the association of thyroid diseases and diabetes is unexplained in type II diabetes mellitus. Rae *et al*[16] explained that higher age of type II diabetics patients may also be a causative factor. The thyroid disorders should be identified at an early stage, because overt thyroid diseases are usually associated with high morbidity and adverse effects on lipid and bone metabolism[15].

CONCLUSION

The diabetics are usually at high risk of developing thyroid dysfunction. So screening of all patients of diabetes for thyroid disorders should be a routine procedure. It will detect development of thyroid disorders at an early stage and will help in retarding its progression.

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