ORIGINAL ARTICLE

Thyroid Dysfunction in Type 2 Diabetes Mellitus

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ABSTRACT

Background: Thyroid problems have the tendency to co-occur in the diabetic patients. In the subjects of diabetes type 2 the frequency of thyroid problems is 2-3 times greater as compared to non diabetic individuals. This study was aimed to see the serum levels of triiodothronine, thyroxine and thyroid stimulating hormone in type 2 diabetic persons.

Methods: It is across sectional analytical study which is done in Post Graduate medical Institute, Lahore General Hospital and Sir Ganga Ram Hospital, Lahore from September 2013 to March 2014.Antecubital venous blood samples were taken during morning hours (0800-1000), after an overnight fast. Serum was obtained for the thyroid profile and blood glucose.

Results: There were total 84 males, 72 patients and 12 controls, and 100 females, 88 patients and 12 controls, enrolled in the study. Male age ranges 45-60 years (mean51.03±6.62) and female age ranges 40-60 years (mean 48.58±6.05). A highly significant increase was seen in serum T3 and fasting blood glucose levels in male patients. In case of females a highly significant rise was seen in the serum T3 and T4 and fasting blood glucose levels. There was no significant change seen in serum thyroid stimulating hormone levels in both male and female subjects.

Conclusion: Present study shows increased incidence of deranged levels of thyroid hormone in the patients of diabetes type 2.If deranged levels of thyroid hormones remain unidentified in diabetic patients it can become a principal reason of poor control often come across in patients of type 2 diabetes which are under treatment..

Keywords: Thyroid dysfunction, Diabetes mellitus, Thyroid hormones, Blood glucose.

INTRODUCTION

Diabetes mellitus (DM) is a disease that consists of elevated blood glucose levels occurring from various interactions of heritable and ecological elements as a result of absence of release of insulin, action of insulin or both of them. Noteworthy deficiencies are chronic hyperglycemia, deranged lipid levels and resistance to insulin.[1] The defects in the metabolism of lipids, protein and carbohydrates present in diabetes are caused by poor action of insulin on target tissues[2].

Thyroid problems are very frequent in the common people[3]. When the thyroid is excessively active it produces more thyroid hormones than is required in body.[4] Hypothyroidism is a disease that is caused by the lack of thyroid hormones. Primary hypothyroidism is a type of hypothyroidism in which thyroid gland fails to respond correctly to TSH that is released from the hypophysial gland. Secondary hypothyroidism is very uncommon and it is due to some problem in hypophysial gland, in it the hypophysial gland does not respond correctly to the decreasing levels of thyroxine and releases inadequate amounts of TSH[5].

The characteristic findings of Graves disease is low serum TSH and high T3 and T4 levels, generally level of T4 is lower as compared to T3[6]. An elevated level of TSH and a decrease in T4 level is usually seen in patients of primary hypothyroidism. When thyroid stimulating hormone level is raised and free T4 levels are normal it shows subclinical hypothyroidism[5]. The concurrent detection of decrease total or free T4 level accompanied by a decrease or normal TSH level makes the diagnosis of central hypothyroidism[7].

Diabetes mellitus and thyroid dysfunction are strongly associated with each other[8]. In subjects of diabetes the occurrence of thyroid problems is 2-3 times greater than in non diabetic individuals[9]. By far, patients of type 2 diabetes are more susceptible to thyroid dysfunction[10].

Diabetes mellitus influences the functions of thyroid at two places; first is the control of hypothalamus over discharge of thyrotropin and second at the conversion of T4 to T3 in peripheral tissues. This may be due to decrease concentration of T4-5-deiodinase which may result in dysfunction of T4 and decrease serum concentration of T3 due to severe hyperglycemia.[11]The peak of TSH is less intense or abolished at the time of night and the reaction of TSH to TRH is lessened in subjects of diabetes[12].

Considering above facts we conducted a study to look into important cause of bad control, commonly occurring in some treated patients type 2 diabetes. It can be due to the inability to recognize the presence of deranged levels of thyroid hormones in these persons. Therefore the periodic assessment of these hormones in patients of diabetes is needed especially in the subjects in whom the illnesses is managed with difficulty.[13]In type 2 diabetics especially in patients aged between 45-54 years, checking for thyroid illness should be carefully considered[14].

MATERIALS AND METHODS

This cross sectional analytical study was done in Post Graduate Medical Institute, Lahore in collaboration with Lahore General Hospital and Sir Ganga Ram Hospital, Lahore from September 2013 to March 2014.A total of 160 type 2 diabetics and 24 healthy controls were included in the study. Well diagnosed established cases of diabetes for the last 5-6 years with age ranges from 40 – 60 years of

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both sexes and with no clinical history or clinical findings of thyroid dysfunction ever noted were included. Diabetics with hypertension or any other disease and pregnant women were not involved in the study.The cause and process of study was described to the patients and formal consent was received from every patient.A questionnaire was given to every patient for filling before the sample collection of blood.

The volunteers avoided food and drink altogether for eight hours before the sample collection. The blood was obtained with the help of disposable syringes, by clean venipuncture, with minimal arm stasis. The samples of blood were taken in the vaccutainer tubes. No anticoagulant was added in it. Incubation of tubes was done at room temperature for 30-45 min to allow blood to clot. Centrifugation of tubes was done for 15 min at 1000-2000 RCF and then theabove clear liquid was set apart at room temperature. It was saved. Quantitative analysis of serum thyroid hormones (T3, T4, TSH) and blood glucose was carried out.

The data was evaluated using SPSS 17 (Statistical Package For Social Sciences). Variables were presented in tabulated form. Mean ± SD (standard deviation) was given for quantitative variables. Student 't' test was used.

RESULTS

There were total 160 patients and 24 controlsin the study and among them there were 84 (45.6%) males and 100 (54.34%) females.Male age ranges 45-60 years (mean51.03±6.62) and female age ranges 40-60 years (mean 48.58±6.05). Serum T3, T4, TSH and glucose levels in diabetic male patients and their controls were tabulated (Table 1). Mean levels of thyroid hormones T3, T4 and TSH were higher in diabetic male patients (T3= 1.21±0.31 ng/ml, T4= 10.77±2.15 µg/dl and TSH = 1.63±1.42 µIU/ml) as compared to the level of these hormones in controls (T3= 0.62±0.21ng/ml, T4= 9.89±1.09 µg/dl and TSH = 1.29±0.76 µIU/ml), highly significant difference (P<0.001) was detected in T3 and significant difference was found in T4 (P<0.05). Mean level of blood glucose fasting was higher in patients (214.58±94.05 mg/dl) in comparison to their controls and highly significant difference (P<0.001) was observed (Figure 1).

Serum T3, T4, TSH and glucose levels in diabetic female patients and their controls were tabulated (Table 2). Mean levels of thyroid hormones T3, T4 and TSH were higher in diabetic female patients (T3= 1.23±0.32 ng/ml, T4= 11.92±2.92 µg/dl and TSH = 1.48±1.14 µIU/ml) as compared to the level of these hormones in controls (T3= 0.6±0.16 ng/ml, T4= 7.46±1.52 µg/dl and TSH = 1.260.71 µIU/ml) but highly significant difference (P<0.001) was observed in case of T3 and T4. Mean level of blood glucose fasting was higher in patients (blood glucose fasting= 212.06±84.05 mg/dl) in comparison to their controls and highly significant difference (P<0.001) was observed in case of fasting blood glucose (Fig. 2)

Fig.1: Serum T3, T4, TSH and Glucose levels in male patients and controls

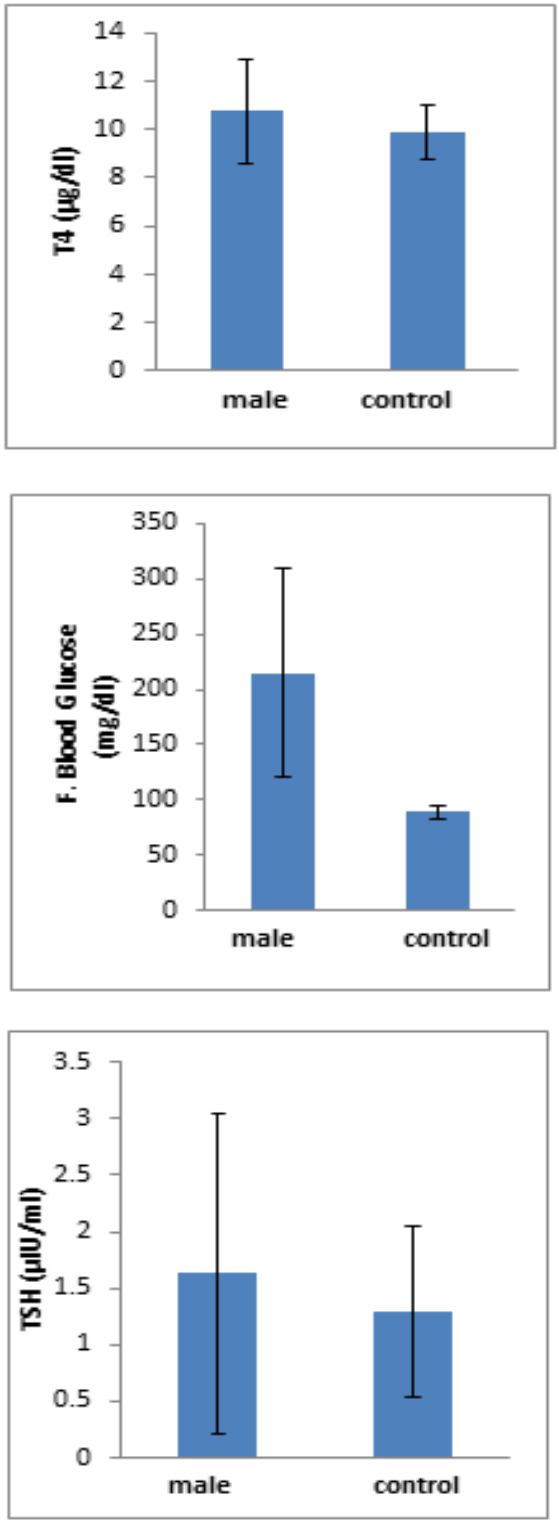
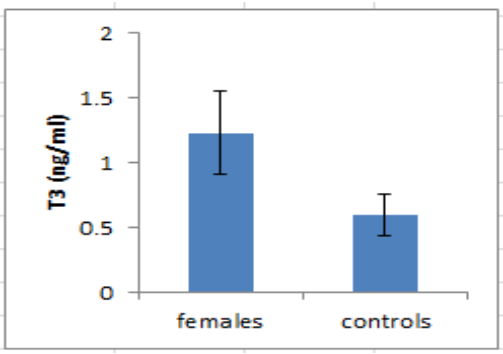
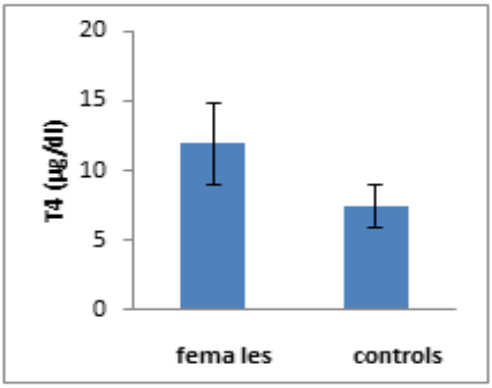
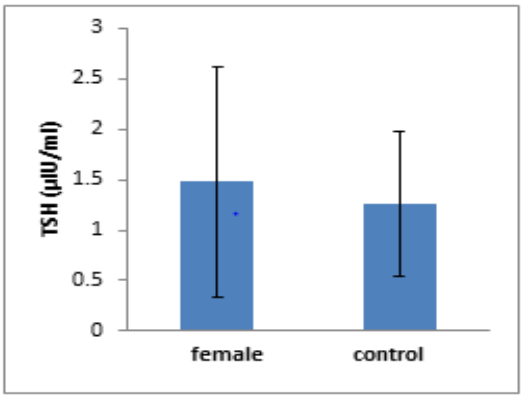


Fig.2: Serum T3, T4, TSH and Glucose levels in fe male patients and controls







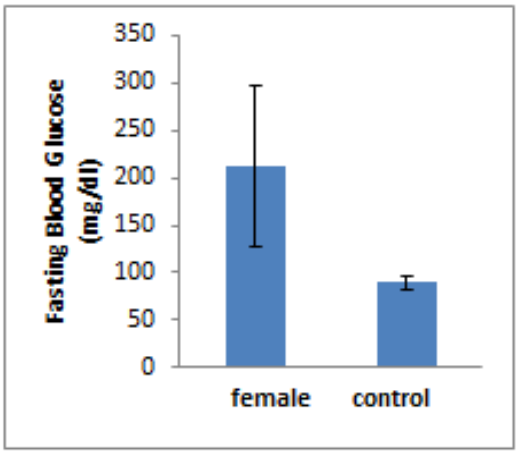


Table 1: Serum T3, T4, TSH and Glucose levels in male patients and controls

Parameters	Male (n=72)	Control (n=12)	T test	P value
Age (years)	51.03±6.62	48.67±4.79	1.49	0.1401
T3(ng/ml)	1.21±0.31	0.62±0.21	8.18	<0.0001***
T4(µg/dl)	10.77±2.15	9.89±1.09	2.21	0.0299*
TSH(µIU/ml)	1.63±1.42	1.29±0.76	1.22	0.2260
Fasting blood glucose (mg/dl)	214.58±94.05	89.08±6.39	11.17	<0.0001***

*<0.05=significant difference ***P<0.001= highly significant difference

Table 2: Serum T3, T4, TSH and Glucose levels in female patients and controls

Parameters	Female (n=72)	Control (n=12)	T test	P value
Age (years)	48.58±6.05	49.92±6.47	0.68	0.4981
T3(ng/ml)	1.23±0.32	0.6±0.16	10.80	<0.0001***
T4(µg/dl)	11.92±2.92	7.46±1.52	8.29	<0.0001***
TSH(µIU/ml)	1.48±1.14	1.26±0.71	0.91	0.3651
Fasting blood glucose (mg/dl)	212.06±84.05	89.33±6.14	13.38	<0.0001***

***P<0.001= highly significant difference

DISCUSSION

Studies have established that thyroid problems have the tendency to occur in diabetic subjects. Glucose control is largely influenced by the thyroid hormones and the treatment of diabetes is affected by the untreated thyroid disorders. Subsequently, an organized approach is suggested to test the thyroid hormones in diabetics[12].
Current study indicated significantly higher levels of fasting blood glucose in both male and female diabetic patients. This was in accordance to the studies in which fasting glucose levels were significantly high in diabetic men and women[1,15]. The blood sugar level rises in diabetic patients because of absence of release of insulin, action of insulin or both of them[1].

This study presented significant difference in the T3 and T4 levels in diabetic individualsand decrease in TSH levels. It was in agreement with the study of Guney et al[16] that showed increased incidence of hyperthyroidism in diabetic patients. It was also in agreement to the studies that reported reduction in T3 and T4 whereas the TSH levels were significantly raised in diabetic persons[13,17]. A study showed that increased levels of insulin in the circulation related with insulin resistance have a proliferative effect on thyroid tissue that causes increase in the size of thyroid with the development of increased number of nodules.[18] Insulin resistance, generally linked to more synthesis of glucose in the liver from the non carbohydrates sources, is an important feature of surplus amount of thyroid hormones in the body and clarifies why the control of glucose worsens when diabetic patients develop thyroid dysfunction.[19] Another study stated that the presence of thyroid hormone binding inhibitor and dysfunction of hypothalamo- hypophysial -thyroid axis may cause derangement in hormone levels of thyroid[20].

If thyroid dysfunction is confirmed it is important to inform clinician or diabetic centers to treat not only the diabetic problems but also treat the thyroid problems.The periodic assessment of thyroid hormones in patients of diabetes is needed especially in the subjects in whom the ailment is managed with difficulty[13]. Therefore, with regular evaluation of thyroid even subclinical thyroid dysfunction can be cured beforehand[3].

T he current study presenrted that in patients of type 2 diabetes there is high frequency of deranged levels of thyroid hormone. Our finding was in supported by the reports of Celani et al,[20]Suzuki et al,[21]Sathish and Mohan[22] Udiong et al,[23] Al - Shibani,[24] Vij et al[25] Bharat et al[26] Devi et al[27]and Rai et al,[28] who in their studies discovered the deranged thyroid hormone levels in diabetic patients.

CONCLUSION

It has been concluded from the study that diabetic patients are at an increased risk of thyroid dysfunction. Inability to identify the presence of deranged thyroid hormone level in type 2 diabetes can be a main reason of poor management often come across in some patients of type 2 diabetes who are under treatment.

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