PREVALENCE OF THYROID DYSFUNCTION AND ITS MANAGEMENT IN DIABETIC PATIENTS ATTENDING OUTPATIENT CLINIC OF KIMS HOSPITAL

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Article Received on: 18/08/13 Revised on: 07/09/13 Approved for publication: 13/09/13

DOI: 10.7897/2230-8407.04928

IRJP is an official publication of Moksha Publishing House. Website: www.mokshaph.com

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ABSTRACT

Thyroid dysfunction is one of the parameter for poor glycemic control. In hypothyroidism, the synthesis and release of insulin is decreased, while in hyperthyroidism, there could be masking of increase in insulin secretion due to increased degradation of insulin. We did our study in the prevalence of thyroid dysfunction and its treatment management in Type 2 Diabetes Mellitus (DM) patients. The study was conducted for period of 6 months from January to June 2012. During the study we recruited Type 2 DM patients attended the clinic who were receiving insulin's, antidiabetic drugs more than 5 years and confirming with fasting plasma glucose levels of > 110 mg/dl at more than two occasions, visited the medicine outpatient department at KIMS Hospital, Bangalore, India who were screened and included into the study after explaining about the study followed by taking the informed consent from the participants. The total of 223, Type 2 DM patients data were recorded in a well-designed data collection form. Blood sample was drawn for thyroid stimulating hormone (TSH) analysis and the obtained value was recorded. We found that the percentage of female's 18 (8.07 %) patients suffering from hypothyroidism was higher than men six (2.69 %) patients. We also found that the percentage of female's 17 (7.62 %) patients suffering from hyperthyroidism was also higher than men 13 (7.62 %) patients. Out of 223 patient's recruited Type DM patients, 169 (75.78 %) patients were found to have normal TSH values and remaining 54 (24.21 %) patients were diagnosed to have thyroid dysfunction, out of which 30 (13.45 %) patients had hyperthyroidism and 24 (10.76 %) patients had hypothyroidism. Thyroid dysfunction is one the reason for poor glycemic control in diabetic patients. Under or inadequate treatment of thyroid dysfunction can negatively impact on the diabetics control.

Keywords: Diabetes Mellitus, Autoimmune Disease, Iodothyronines, Diabetogenic, Hyperthyroidism.

INTRODUCTION

Diabetes mellitus is the most common endocrine metabolic disorder. It is a chronic condition, characterized by hyperglycemia due to impaired insulin secretion with or without insulin resistance¹. The thyroid disease is common in general population and the prevalence increases with age. Hypothyroidism is by far the most common thyroid disorder in the adult population. It is usually autoimmune in origin, presenting as either primary atrophic hypothyroidism or Hashimoto's thyroiditis. Thyroid diseases affect approximately 10 – 15 % of the patients with diabetes, whereas in non-diabetics, the prevalence is approximately 6 % because patients with one organ-specific autoimmune disease are at risk of developing other autoimmune disorders. Both have been shown to mutually influence each other and associations between both conditions have long been reported. On one hand, thyroid hormones contribute to the regulation of carbohydrate metabolism and pancreatic function, and on the other hand, diabetes affects thyroid function tests to variable extents.²

Thyroid disease negatively affects diabetes control and has the tendency to affect patient treatment and the diagnosis of thyroid dysfunction in diabetic patients can be difficult. Poor glycemic control can produce features similar to hyperthyroidism, such as weight loss despite increased fatigued and appetite. On the other hand, severe diabetic nephropathy can be mistaken for hypothyroidism because patients with this condition may have edema, pallor, weight gain. Thyroid disease is found in most forms of diabetes especially in Type 2 DM and underlying autoimmune disease in Type 1 DM. The physiological and biochemical inter relationship between Insulin and the influence of both Insulin and Iodothyronines on the metabolism of carbohydrates, proteins and lipid are recorded. Such records indicate that iodothyronines are insulin antagonist with high levels being

diabetogenic, while the absence of the hormone inhibits the development of DM and hyperthyroidism which are metabolic disorders that affect the levels of carbohydrates, proteins and lipids.³ Thyroid gland secretes 2 iodine containing hormones: thyroxine (T_4) and triiodothyronine (T_3). The iodine necessary for the synthesis of these molecules comes from food or iodide supplements. Iodide ion is actively taken up by and highly concentrated in the thyroid gland, where it is converted to elemental iodine by thyroidal peroxidase. The protein thyroglobulin serves as a scaffold for thyroid hormone synthesis. Tyrosine residues in thyroglobulin are iodinated to form monoiodotyrosine (MIT) or diiodotyrosine (DIT) in a process known as iodine organification within thyroglobulin, 2 molecules of DIT combine to form T_4 while 1 molecule each of MIT and DIT combine to form T_3 . Proteolysis of thyroglobulin liberates the T_4 and T_3 , which are then released from the thyroid, after release T_4 and T_3 are transported in the blood by thyroxine-binding globulin, a protein synthesized in the liver. Thyroid function is controlled by the pituitary through the release of TSH. The ratio $T_4 : T_3$ secreted by the thyroid gland is approximately 10 : 1 consequently the gland secretes approximately 80 - 100 mcg of T_4 and 10 mcg of T_3 per day. However, only 10 % of circulating T_3 is derived from direct thyroidal secretion, the remaining 90 % being produced by peripheral conversion from T_4 . T_4 can therefore be considered a pro-hormone that is converted in peripheral tissues (liver, kidney, brain) either to the active hormone T_3 or to the biologically inactive reserve T_3 in the circulation the hormones exist in both the active free and inactive protein bound forms. T_4 is 99.98 % bound, with only 0.02 % circulating free. T_3 is slightly less protein bound (99.8 %), resulting in a considerably higher circulating free fraction (0.2 %). The T_4 and T_3 are also eliminated by biliary secretion of their glucuronide and sulfate conjugates (15 – 20

%). The half-life of T_4 in plasma is about 6 - 7 days and that of T_3 24-36 h in euthyroid adults. The apparent volume of distribution for T_4 is about 10 liters and for T_3 about 40 liters⁴. Hence, we made an attempt to find the prevalence of thyroid dysfunction in type 2 DM patients which can help the medical practitioner to treat the patients with high glucose value.

MATERIALS AND METHODS

An Institutional Ethical committee clearance was obtained to conduct the study. We recruited Type 2 DM who were receiving insulin's, anti diabetic drugs with more than 5 years of history of DM, and confirming with fasting plasma glucose levels of > 110 mg/dl on more than two occasions, who visited the medicine outpatient department at KIMS Hospital, Bangalore, India were screened and taken into the study after explaining about the study followed by taking the informed consent from the participants. The recruited Type 2 DM patient's data were recorded in a well-designed data collection form. Blood sample was drawn with the help of nurse at outpatient department for TSH analysis and the same obtained value was recorded. Type 2 DM patient's aged between 40 to 65 years with duration of more than 5 years of diabetes and on treatment with or without co-morbid complications were included in the study. Patients who were unable to give the informed consent, drug induced DM, very ill patients, known history of thyroid dysfunction and on treatment or had undergone thyroidectomy were excluded from the study.

Preparation of Data Collection Form

Well-designed data collection form was prepared and the required Information was extracted from outpatient's information sheet which includes all the detail of the patients like demographic data such as age, gender, weight, Blood pressure (B.P), personal history, family history, and medication history. Habits like smoking, alcohol consumption, food habits and menopausal status, if required. Past medical history, regarding the age at which patients was diagnosed of diabetes, the presence of cardiovascular disease, the presence of diabetic complications were recorded. Body Mass Index (BMI), have been calculated by obtaining the height (cm) (without shoes), body weight (kg) of the patients. Family history was also taken to know their prevalence of thyroid dysfunction, if any.

Collection of Blood Samples

After screening the type 2 DM patients by the medical practitioner the study was explained in their understandable language and informed consent was obtained to participate in the study. Blood samples for TSH were drawn after minimum of 8 - 10 h of fasting with the help of nurses from nursing station in outpatient department. The blood samples were sent to the NABL accredited laboratory for measuring the TSH value and the same was recorded into the data collection form.

RESULTS

Figure 1: Age and Sex Distribution in Hyperthyroidism

As we have shown in Figure 1, we found that out of 30 hyperthyroid patients, 14 (6.27 %) female patient were in the age group of 40 - 60 years and only three (1.28 %) female patients were in the age group more than 60 years. We also found that in our study population, only 12 (5.38 %) male patients aged between 40 - 60 years and only one (0.44 %) male patient in the age group more than 60 years had Hyperthyroidism.

Figure 2: Age and Sex Distribution in Hypothyroidism

As we have shown in Figure 2, it was found that 17 (7.62 %) female patient were in the age group of 40 - 60 years and only one (0.44 %) female patients were in the age group more than 60 years. We also found that in our study population only five (2.24 %) male patient aged between 40 - 60 years and one (0.44 %) male patient in the age group more than 60 years had Hypothyroidism.

Figure 3: TSH Value Distribution

As we have shown in Figure 3, it was found that out of 223 patients recruited for the study, 169 (75.78 %) patients were found to have normal TSH values and the remaining 54 (24.21 %) patients were diagnosed to have thyroid dysfunction. Among which 30 patients (13.45 %) had

Hyperthyroidism and 24 patients (10.76 %) had Hypothyroidism, according to the obtained value.

Figure 4: Treatment Pattern for Hypothyroidism in Type 2 Diabetes Mellitus Patients in both genders

As we have shown in Figure 4, it was found that out of 24 patients suffering from Hypothyroidism, 14 (58.33 %) patients were treated with Levothyroxine and six (25 %) patients with Tri-iodothyronine and the remaining four (16.66 %) patients with the combination of Levothyroxine and Tri-iodothyronine.

Figure 5: Treatment Pattern for Hyperthyroidism in Type 2 Diabetes Mellitus Patients in both genders

As we have shown in Figure 5, it was found that out of 30 patients suffering from Hyperthyroidism, nine (30 %) patients were treated with Propyl Thiouracil (PTU), 14 (46.66 %) patients with Carbimazole and the rest seven (23.33 %) patients with the combination of Propyl Thiouracil (PTU) and Carbimazole.

DISCUSSION

Study was done to get an overview of the current trends in thyroid dysfunction in patient with Type 2 DM that have been recruited at outpatient department of Medicine, KIMS Hospital Bangalore, India. In our study the prevalence of thyroid dysfunction in female population was more than male population and this was correlated with other studies conducted by Gurjeet Singh, *et al*; Saiful Islam, *et al*; Athanasia Papazafiropoulou, *et al*; Radaideh AR, *et al*; Mirella Hage *et al*; In these studies they found that diabetic patients had a high prevalence of thyroid disorders when compared with the general population, with female being more dominant than male. Our study included 223 diabetic patients among whom 124 (55.60 %) patient were found to be male and 99 (13.2 %) patients were female. Majority of patient 192 (86.09 %) were in the age group of 40 - 60 years, followed by 31 (13.2 %) patients of more than 60 years. Hypothyroidism was found to be more in female than males

with the distribution of 18 (8.07 %) in female patients compared with six (2.69 %) in male patients, which is in agreement with the study conducted by Athanasia Papazafiropoulou, *et al*. In this study it was found out that the prevalence of subclinical hypothyroidism was 5.2 % in male and 8.4 % in female with Type 2 DM which is more dominant in female population. Our study population had the average Body Mass Index of 24.44 with average systolic of 124 mm/Hg and diastolic of 85 mm/Hg. It was found that out of 24 patients suffering from Hypothyroidism, 14 patients were treated with Levothyroxine, six patients with Triiodothyronine and four patients with combination of Levothyroxine and Tri-iodothyronine. In case of patient suffering from Hyperthyroidism, it was found that out of 30 patients, nine patients were treated with Propyl-thiouracil, 14 patients with Carbimazole and seven patients with combination of Propyl thiouracil and Carbimazole. Our study showed that 17 (7.62 %) female patient suffering from hypothyroidism were in the age group of 40 - 60 years and only one (0.44 %) female patients were in the age group of more than 60 years. We also found that only five (2.24 %) male patients aged between 40 - 60 years and one (0.44 %) male patient in the age group of more than 60 years, which is in accordance with the study conducted by Mohammad Afkhami-Ardakani, *et al*. the prevalence of thyroid dysfunction is more in the age group of 45 - 55 years. Hyperthyroidism was also found to be more in female than in male with the gender distribution of 17 (7.62 %) in female patients when compared with 13 (5.82 %) in male patients which is in accordance with the result obtained from studies conducted by the Dr. P. Pasupathi, *et al*. in the report of underlying study, it has been mentioned that female has higher prevalence of hyperthyroidism in comparison with male. Out of 223 Type 2 DM patients recruited 169 (75.78 %) patients were found to have normal TSH values and the remaining 54 (24.21 %) patients were diagnosed to have thyroid dysfunction. Among which 30 patients (13.45 %) had hyperthyroidism and 24 patients (10.76 %) had hypothyroidism that is in accordance with the study conducted by Engin Guney, *et al*., where they also showed a higher incidence of hyperthyroidism (1.5 %) compared to hypothyroidism (1.1 %).¹³ We also collected the data related to the duration of Type 2 DM in the patient recruited and found that average duration of Type 2 DM was found to be about 7.45 years, which is in agreement with the reports of Engin Güney, *et al*., in his study found that thyroid dysfunction has higher incidence rate in patient having 8.9 years of DM.

Limitation

Diabetic control was not assessed by the percentage of glycosylated Hemoglobin (HbA_{1c}) in our study; thereby we could not show any correlation between diabetes control and thyroid hormone level after the resume of anti thyroid drugs. It was a short duration of study and the study population was comparably less to conclude any prevalence study. We could not also assess the medication adherence for anti thyroid drugs in recruited type 2 DM patients, because of the less duration of study.

CONCLUSION

Thyroid dysfunction is one of the reasons for poor glycemic control in diabetic patients. Under or inadequate treatment of thyroid dysfunction can negatively impact on the diabetes control. Hence, with these type of prevalence studies will

help for better treatment of Type 2 DM with thyroid dysfunction. Therefore, regular screening for thyroid abnormalities in all diabetic patients will allow early treatment of subclinical thyroid dysfunction.

ACKNOWLEDGMENT

We express our sincere thanks to Dr. Harish Kumar D.H., Principal of Visveswarapura Institute of Pharmaceutical Sciences Bangalore, India all the faculties of medicine department, the staff of medical record department, all teaching staff of department of pharmacy practice, Bangalore, India for their co-operation during research work.

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Cite this article as:

Kiran Nagaraju, Amin Pirouz, Tayebbeh Sadeghi, Pegah Esmaeili. Prevalence of thyroid dysfunction and its management in diabetic patients attending outpatient clinic of KIMS hospital. *Int. Res. J. Pharm.* 2013; 4(9):132-135 <http://dx.doi.org/10.7897/2230-8407.04928>

Source of support: Nil, Conflict of interest: None Declared