

Prevalence of Thyroid Disorders in Type 2 Diabetes Mellitus.

Bajrang Lal¹, Manju Pandey¹, Sirisa Rao², S. Mathur³, J.P.Rishi⁴

¹Assistant Professor, Department of Medicine, NIMS, Jaipur, India.

²Senior Resident, , Department of Medicine, NIMS, Jaipur, India.

³Professor, Department of Medicine, NIMS, Jaipur, India

⁴Professor & HOD, Department of Medicine, NIMS, Jaipur, India.

ABSTRACT

Background: Diabetes mellitus and thyroid diseases are the two common endocrine diseases. Thyroid disorder is found commonly in most forms of diabetes and is associated with advanced age particularly in type 2 diabetes. The aim of the study is to know the prevalence and profile of thyroid disorders as assessed by thyroid hormone assay in hospital based cross section study in patients of type 2 diabetes mellitus and to know the prevalence of sub clinical hypothyroidism in type 2 diabetes mellitus and its effect on dyslipidemia in a rural setting. **Methods:** This is an observational, cross-sectional study done during the period from February 2013 to July 2014. Study population consists of 100 diabetic patients. Blood samples from all patients were collected in a standardized manner and were subjected for routine and special investigations including FBS, PP2BS, TSH, T3, T4. Fisher exact test was used for analysis of nominal variables presented in two (2x2) tables and chi-square test was used for distributions are presented in two by two tables. P-value<0.05 was taken as significant. **Results:** The prevalence of hypothyroidism was high in individuals with type 2 diabetes mellitus. It was 13% in this study and it was statistically significant. It was also concluded that subclinical hypothyroidism was more common in diabetics. **Conclusion:** Diabetes and thyroid disorders are co-related with each other. In patients of diabetes, subclinical hypothyroidism is commonly found.

Keywords: Diabetes, Hypothyroidism, Prevalence, T3, T4, TSH.

INTRODUCTION

Diabetes mellitus and thyroid diseases are the two common endocrine diseases. 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. The association between diabetes mellitus and thyroid disorders is widely known, with the first studies published in 1979.^[1]

The Diabetes Atlas^[2] compiled by international diabetic federation (IDF) and WHO released in 2009 estimated that by 2010, 285 million people worldwide will have diabetes, of these 5million people are in India.

Diabetic patients have a 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, and thyroid disorders are more common in females, it is not surprising that up to 30% of female type 1 diabetic patients have thyroid disease.^[3]

the 10-31% range, with the annual incidence of clinically significant thyroid dysfunction being twice that seen in the general population in women, and eight times that seen in men, as compared to the UK Whickham survey.^[4,5]

The most common form of thyroid dysfunction in type 2 diabetes is subclinical hypothyroidism.^[6] There is inter-dependence between insulin and thyroid hormones for normal cellular metabolism so that diabetes mellitus and thyroid diseases can mutually influence the other disease process.^[7]

Thyroid disorder is found commonly in most forms of diabetes and is associated with advanced age particularly in type 2 diabetes. This study defines the prevalence of thyroid disease in diabetes, discusses normal physiology and screening recommendations for thyroid disease and justifies the view that all diabetic patients should be screened for hypothyroidism. The aim of the study is to know the prevalence and profile of thyroid disorders as assessed by thyroid hormone assay in hospital based cross section study in patients of type 2 diabetes mellitus and to know the prevalence of sub clinical hypothyroidism in type 2 diabetes mellitus and its effect on dyslipidemia in a rural setting at NIMS Medical College and Hospital.

MATERIALS AND METHODS

This is an observational, cross-sectional study done during the period from February 2013 to July 2014. Study population consists of diabetic patients attending OPD of Medicine Department at NIMS Medical College during the study period. The

Name & Address of Corresponding Author

Dr. Bajrang Lal
Assistant Professor,
Department of Medicine,
NIMS, Jaipur, India.
E mail: doc.banthia@gmail.com

The prevalence of thyroid dysfunction in patients with type 2 diabetes also appears to be higher than in the general population, with figures typically in

diabetic patients were on oral hypoglycemic agents, Tab Glimiperide and Tab Metformin. After obtaining their informed consent, detailed history about symptoms of hypothyroidism and hyperthyroidism, duration of diabetes and hypertension were taken and general and systemic examination were done.

Blood samples from all patients were collected in a standardized manner and were subjected for routine and special investigations including FBS, PP2BS, TSH, T3, T4. T3, T4, TSH were measured from serum of subjects by chemi-illuminometric assay (CLIA). The study was conducted on 100 subjects. The normal values of thyroid hormones used in this study are:

TSH - 0.34-4.25 mIU/L

T₄ - 5.4- 11.7 µg/dl

T₃ - 77- 135 ng/dl

All data was entered in excel sheet to prepare master chart and was subjected to statistical analysis.

Continuous variables were converted into categorical variables and nominal & categorical variables were summarized as proportions (%). Fisher exact test was used for analysis of nominal variables presented in two (2x2) tables and chi-square test was used for distributions are presented in two by two tables. P-value<0.05 was taken as significant. Med calc 14.2.1.0 version software was used for all statistical calculations.

RESULTS

Of the 100 type 2 diabetics studied, a total of 13 (13%) were found have thyroid dysfunction. All of the 13 with thyroid dysfunction were hypothyroid. Of the 13 hypothyroid subjects, 3 (23.08%) were male and 10 (76.92%) were females [Table 1].

Table 1: Prevalence of Thyroid Dysfunction

Thyroid disorder	Males (N=55)	Females (N=45)
Hypothyroid	3	10
Hyperthyroid	NIL	NIL

Fisher Exact Test P = 0.017 Significant

Of the 13 hypothyroid subjects, 4 (4%) had clinical hypothyroidism where in TSH was elevated and T3, T4 were decreased. The clinical features of hypothyroidism seen this patients were subtle. 3 of the 4 patients had generalized weakness and lethargy, 2 of them had dry coarse skin. 9 of the 13 hypothyroid subjects were having subclinical hypothyroidism with raised TSH levels but normal T3,T4 with no clinical features of hypothyroidism [Table 2, Figure 1].

On taking duration of diabetes into account, it was observed that 7.14% of the subjects with duration of diabetes <5yrs were hypothyroid; whereas it was 11.42% in the 6-10yrs group, 19.04% in the 11-15yrs group and 18.75% in the > 15yrs group. It was observed that with increasing duration of diabetes, the % of diabetics with hypothyroidism were more. However, statistically it was non-significant (p>0.05) [Table 3, Figure 2].

In relation to glyceimic control, it was observed that of the 13 subjects with hypothyroidism, 6 (46.15%) had good glyceimic control whereas 7(53.85%) had poor glyceimic control. In the 87 subjects without hypothyroidism 40 (45.97%) had good glyceimic control whereas 47 (54.03%) had poor glyceimic control which was similar to hypothyroid group. So there is no difference in glyceimic control in diabetics with hypothyroidism and without hypothyroidism and statistically also it was non-significant (p>0.05).

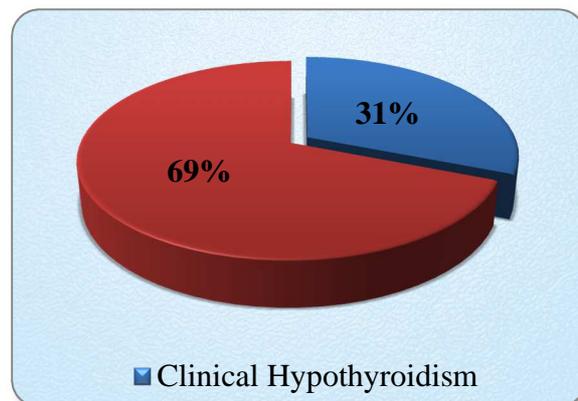


Figure 1: Spectrum of Hypothyroidism

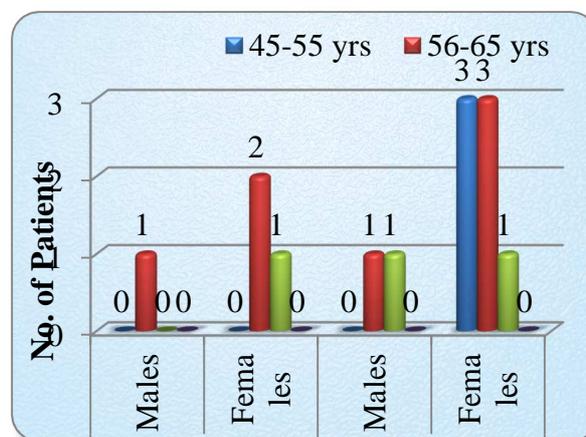


Figure 2: Hypothyroidism in Relation to Age Groups

Type 2: Spectrum of Hypothyroidism

Hypothyroidism	No. of Patients (N=100)	No. of Males (N=55)	No. of Females (N=45)	'p' Value*
Clinical Hypothyroidism	4 (4%)	1 (1.82%)	3 (6.67%)	0.324
Subclinical Hypothyroidism	9 (9%)	2 (3.64%)	7 (15.56%)	0.074
'p' Value*		1.000	0.318	

Table 3: Relation between Duration of DM and Thyroid Dysfunction

Duration	Total no. of subjects	No. of subjects hypothyroid
0-5 yrs	28	2 (7.14%)
6-10 yrs	35	4 (11.42%)
11-15 yrs	21	4 (19.04%)
> 15 yrs	16	3 (18.75%)

Chi-square = 2.073 with 3 degrees of freedom; P = 0.762

Table 4: Relation between Glycemic Control and Thyroid Dysfunction

	Diabetics with hypothyroidism	Diabetics without hypothyroidism
Good glycaemic control	6 (46.15%)	40 (45.97%)
Poor glycaemic control	7 (53.85%)	47 (54.03%)

Fisher Exact Test P = 1.000

DISCUSSION

The present study showed that of the 100 type 2 diabetics studied, a total of 13% had thyroid dysfunction. All of the 13 with thyroid dysfunction were hypothyroid. The above results were in agreement with previous studies showing an association between T2D and thyroid dysfunction. A study by Smithson et al^[8], showed a prevalence of 10.8% of thyroid dysfunction in diabetic patients registered in general practice. Another study by Perros et al^[9], in a randomly selected group of 1,310 diabetic adults estimated that the prevalence of thyroid dysfunction was found to be 13.4%.

A recent study by Akbar DH et al^[10], reported that thyroid dysfunction was present in 16% of Saudi T2D patients. Also, a study by Radaideh AR et al^[11], Jordan showed that the overall prevalence of thyroid dysfunction was 12.5% in T2D patients. Another recent study done in Greek diabetic patients by Papazafropoulou A et al^[12], estimated the prevalence of thyroid dysfunction was 12.3%. An OPD based study conducted by Vikram et al^[13] in DY Patil Medical College with 50 diabetic and 50 non diabetic patients the prevalence of thyroid dysfunction among type 2 DM patients is very high (30%) and all patients with type 2 DM should be screened for thyroid dysfunction to reduce the mortality rate.

The present study also showed higher prevalence of thyroid dysfunction among diabetic females. Of the 13 hypothyroid subjects, 3 (23.08%) were male and 10 (76.92%) were females with a statistically significant difference (p=0.017). It is well established that hypothyroidism is more common in diabetic females. The study carried out at the Metabolic Research Unit of the University College Hospital, Ibadan, Nigeria by Ghazali SM and Abbiyesuku FM^[14] showed that the prevalence of

thyroid dysfunction was 32.4% in females and 25.9% in males. According to this study the prevalence of thyroid dysfunction was higher in Type 2 DM than that in the general population, more females were affected than males.

In a study by Perros et al^[9] the prevalence of thyroid dysfunction was 10.9% in females and 6.9% in males. The NHANES-III study^[15] reported that the prevalence of subclinical hypothyroidism was 3.4% in males and 5.8% in females. Another study conducted in Nigeria^[16] had shown a high incidence (46.5%) of abnormal thyroid hormone levels among the diabetics in Nigeria (hypothyroidism 26.6%). The prevalence of hypothyroidism was higher in females (16.8%) than in males (9.9%).

The prevalence of clinical hypothyroidism in my study was 4% whereas prevalence of subclinical hypothyroidism was 9%. This is comparable to the previous studies. In a study by Nobre et al^[17] subclinical hypothyroidism was 7.2% whereas hypothyroidism was 3.5%. In another study by Rajan SK et al^[18], the prevalence of clinical hypothyroidism was only 1% whereas subclinical hypothyroidism accounted for 11%. In one more study conducted by Palma et al^[19] with 386 patients the prevalence of thyroid disorders in all diabetic patients was 14.7% and the most frequent thyroid disorder was subclinical hypothyroidism in 12%. Another study conducted in India by Ravishankar SN^[20] (2013) also showed that elderly females had high incidence of sub clinical hypothyroidism (18.2%).

Hence, this fact of occurrence of hypothyroidism most common being subclinical hypothyroidism in type 2 diabetes mellitus patients should be taken into consideration and all type 2 diabetic patients should be evaluated for hypothyroidism so that further complications can be prevented.

LIMITATIONS

1) Small sample size. 2) As total thyroid hormones were measured in the study, they were subject to variations due to varying levels of binding proteins though majority of the conditions which caused binding protein abnormalities were excluded from the study.

CONCLUSION

In this study I observed that hypothyroidism coexists with type 2 diabetes mellitus. The prevalence of hypothyroidism was high in individuals with type 2 diabetes mellitus. It was 13% in this study and it was statistically significant.

In this study when subclinical was compared with clinical hypothyroidism it was found that subclinical hypothyroidism was more common in diabetics.

On taking duration of diabetes into account in this study it was observed that with increasing duration of diabetes, the percentage of diabetics with hypothyroidism were more.

In this study in relation to glycemic control it was found that there was no difference in glycemic control in type 2 diabetics with hypothyroidism and without hypothyroidism.

REFERENCES

1. Feely J, Isles TE. Screening for thyroid dysfunction in diabetics. *Br Med J*. 1979;1(9):1678.
2. Mbanya JC. *The Diabetes Atlas*. 4th ed. 2009;54(3):9.
3. Spollett GR. Glycaemic Challenges: Diabetes Confounded by Serious Illness. *Diabetes Spectrum*. 2006;19:146-7.
4. Tamez-Pérez HE, Martínez E, Quintanilla-Flores DL, Tamez-Peña AL, Gutiérrez- Hermosillo H, Díaz de León-González E. The rate of primary hypothyroidism in diabetic patients is greater than in the non-diabetic population. An observational study. *Med Clin (Barc)*. 2012;138(11):475-7.
5. Tunbridge WM, Evered DC, Hall R, Appleton D, Brewis M, Clarke F et al. The spectrum of thyroid disease in a community: The Whickham survey. *ClinEndocrinol*. 1977;7(6):481-93.
6. Hage M, Zantout MS, Azar ST. Thyroid disorders and diabetes mellitus. *J Thyroid Res*. 2011;21:439-63.
7. Sathish R Mohan V. Diabetes and thyroid Disease. *Int J Diab Dev Countries* 2003;23:120-3.
8. Smithson MJ. Screening for thyroid dysfunction in a community population of diabetic patients. *Diabet Med*. 1998;15(2):148-50.
9. Perros P, McCrimmon RJ, Shaw G, Frier BM. Frequency of thyroid dysfunction in diabetic patients: value of annual screening. *Diabet Med*. 1995;12(7):622-7.
10. Akbar DH, Ahmed MM, Al-Mughales J. Thyroid dysfunction and thyroid autoimmunity in Saudi type 2 diabetics. *Acta Diabetol*. 2006;43(1):14-8.
11. Radaideh AR, Nusier MK, Amari FL, Bateiha AE, El-Khateeb MS, Naser AS, et al. Thyroid dysfunction in patients with type 2 diabetes mellitus in Jordan. *Saudi Med J*. 2004;25(8):1046-50.
12. Papazafiropoulou A, Sotiropoulou A, Kokolakis A, Kardara M, Stamatakis P, Pappas S. Prevalence of Thyroid Dysfunction Among Greek Type 2 Diabetic Patients Attending an Outpatient Clinic. *J Clin Med Res* • 2010;2(2):75-8.
13. Vikram VB, Kanitkar SA, Tamakuwala KK, Gaikwad AN, Kalyan M, Agarwal RR. Thyroid Dysfunction in Patients with Type 2 Diabetes Mellitus at Tertiary Care Centre. *Natl J Med Res*. 2013;3(4):377-80.
14. Ghajali SM, Abhiyeesuku FM. Thyroid Dysfunction in Type 2 Diabetics seen at the University College Hospital, Ibadan, Nigeria. *Nig. J. Physiol. Sci*. 2010;25:173-9.
15. Hollowell JG, Staehling NW, Flanders WD, Hannon WH, Gunter EW, Spencer CA, et al. Serum TSH, T(4), and thyroid antibodies in the United States population (1988 to 1994): National Health and Nutrition Examination Survey (NHANES III). *J Clin Endocrinol Metab*. 2002;87(2):489-99.
16. Udiong CEJ, Udoh AE, Etukudoh ME. Evaluation of thyroid function in diabetes mellitus in Calabar, Nigeria. *Indian J Clin Biochem*. 2007;22(2):74-8.
17. Nobre EL, Jorge Z, Pratas S, Silva C, Castro JJ. Profile of the thyroid function in a population with type 2 diabetes mellitus. *Endocr Abstr*. 2000;3:298.
18. Rajan SK, Ezhilarasi A, Sasidharan M. Thyroid dysfunction in patients with Type 2 diabetes mellitus. *J Assoc Phys India* 2003;51:12-29.
19. Palma CC, Pavesi M, Nogueira VG, Clemente EL, Vasconcellos MD, Pereira LC, et al. Prevalence of thyroid dysfunction in patients with diabetes mellitus. *Diabetol Metab Syndr*. 2013;5(1):58.
20. Ravishankar SN, Champakamalni, Venkatesh, Mohsin. A prospective study of thyroid dysfunction in patients with Type 2 diabetes in general population. *I Med Pub Journals*. 2013;5(1):2-7.

How to cite this article: Lal B, Pandey M, Rao S, Mathur S, Rishi JP. Prevalence of Thyroid Disorders in Type 2 Diabetes Mellitus. *Ann. Int. Med. Den. Res*. 2016;2(1):216-19.

Source of Support: Nil, **Conflict of Interest:** None declared.