

Effect of Gender on the Prevalence of Thyroid Dysfunction in Type II Diabetes Mellitus Patients

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Abstract: Hypothyroidism and diabetes share clinical sign and symptoms, such as fatigue, lethargy and weight gain. Thyroid hormones and insulin exert their metabolic effects which are similar in some respects but antagonistic in others, Insulin inhibits glycogenolysis, glycolysis as well as gluconeogenesis. Whereas thyroid hormones has a stimulating effects on this action.

Aims and Objectives: To study the effect of gender on the prevalence of thyroid dysfunction in type II diabetes mellitus patients.

Methods: It was a cross sectional study done on type 2 diabetes mellitus patients. 100 cases (47 males and 53 females) and 50 controls (25 males and 25 females) were included in the study. Diabetic patients on medication that alter thyroid functioning, patients with previously known thyroid dysfunction & pregnant women were excluded from the study. Detailed history was taken; physical examination and required investigations were conducted on patients who satisfied inclusion & exclusion criteria. Investigations done were fasting Plasma glucose, TSH, FT₃ and FT₄. Differences between various parameters were considered statistically significant when the p value was <0.05.

Results: Prevalence of abnormal thyroid function test results was higher in the diabetic females than in diabetic males (32.07% vs. 21.27%).

Conclusions: The prevalence of thyroid dysfunction was found to be more in the diabetic female patients than the diabetic male patients. The present study shows that the prevalence of thyroid dysfunction is high in type 2 DM female patients, hence regular monitoring of TSH levels in such patients should be suggested.

Date of Submission: 06-05-2019

Date of acceptance: 20-05-2019

I. Introduction

Diabetes mellitus (DM) refers to a group of common metabolic disorders that share the phenotype of hyperglycemia, caused either by absolute or relative deficiency of insulin. Lack of insulin affects the metabolism of carbohydrate, protein and fat⁽¹⁾.

It is worth to compare the metabolic effects of insulin with those of thyroid hormones, which may be summarised as follows:-

	Effects of insulin	Effects of thyroid hormones
Carbohydrate metabolism		
I. Glucose absorption from gut	--	↑
II. Glycogenesis	↑	--
III. Glycogenolysis	↓	↑
IV. Gluconeogenesis	↓	↑
V. Glycolysis	↓	↑
Lipid metabolism	↑	↓
Lipogenesis		
Protein metabolism	↑	↑
Protein synthesis		

Thus it is evident that both thyroid hormones and insulin exert their metabolic effects which are similar in some respects but antagonistic in others, Insulin inhibits glycogenolysis, glycolysis as well as gluconeogenesis. Whereas thyroid hormones have a stimulating effects on these action.

Thus insulin tends to conserve glucose in liver and peripheral tissues thereby keeping the blood glucose level towards the lower side, whereas thyroid hormones tend to increase blood glucose level. ⁽²⁾

II. Material And Methods

This Cross-sectional comparative study was carried out on patients at Rajendra institute of medical science, Ranchi, Jharkhand from November 2013 to January 2015. A total 150 adult subjects (both male and females) of aged ≥ 18 , years were for in this study.

Study Design: Cross-sectional observational study

Study Location: This was a tertiary care teaching hospital based study done in Department of Physiology, at Rajendra institute of medical sciences, Ranchi, Jharkhand.

Study Duration: November 2013 to January 2015.

Sample size: 150 patients.

Subjects & selection method:

Selection of cases: Subjects for the study were selected from the Diabetes mellitus patients in the inpatients of medicine and surgery department of Rajendra Institute of Medical Sciences, Ranchi. A total of 100 type 2 diabetic patients who satisfied inclusion and exclusion criteria were included in the study after a well informed consent obtained from them. In 100 patients 47 male and 53 female was there.

Selection of Control:- A total of 50 control were selected of same age group of cases from the attendant of the indoor patients, hospital staff of Rajendra Institute of Medical Sciences, Ranchi. All these individuals were healthy and clinically euthyroid at the time of assessment and there was no history suggestive of thyroid disease. None of these individuals had family history of diabetes mellitus neither of them were taking any drugs including oral contraceptives and had given the consent for the study. In 50 controls 25 male and 25 female was taken.

Inclusion criteria:

1. Subjects were diagnosed patients of Type II Diabetes Mellitus who previously had fasting plasma glucose levels of ≥ 126 mg/dl and were receiving treatment such as combination of Insulin and oral hypoglycaemic agents or only oral hypoglycaemic agents.
2. Diabetics irrespective of glucose control.
3. Diabetics Irrespective of their age and sex.
4. Patients had neither sign nor symptoms of thyroid abnormalities or were not assessed earlier.

Exclusion criteria:

1. Pregnant women.
2. Patients on medication that alter thyroid function other than hypoglycaemic drugs and insulin.
3. Diabetic Patients with previously known Thyroid dysfunction

Procedure methodology

The estimation of fasting plasma glucose level was done by GOD/POD method. The serum TSH, FT₃, and FT₄ levels were done by ELISA Microwells method and the readings were taken at 450 nm in a strip ELISA reader.

Statistical analysis

The results were statistically analyzed by using the student's t- test and the probability (p value) was calculated using SPSS software. A p-value of <0.001 was taken as highly significant, a p-value of <0.05 as significant and p-value of >0.05 as non-significant.

III. Result

TABLE-01: Gender distribution of thyroid disorders in the subjects

Sex	Diabetic subjects (n=100)				Non Diabetic subjects (n=50)			
	Total no.	Euthyroid	Hypo thyroid	Hyper thyroid	Total no.	Euthyroid	Hypo thyroid	Hyper Thyroid
Male	47	37	8	2	25	25	0	0
Female	53	36	17	0	25	24	1	0
Total	100	73	25	2	50	49	1	0

In female diabetic subjects 17 patients (32.07%) of thyroid dysfunction was found and all were hypothyroid, no case of hyperthyroid was detected. Among the diabetic male subjects 10 patients (21.27%) had thyroid dysfunction, in which 8 had hypothyroidism and 2 had hyperthyroidism.

In female non diabetic subjects only 1 had thyroid dysfunction. She had hypothyroidism. In male non diabetic subjects there was no case of thyroid dysfunction.

TABLE- 02: Thyroid hormone levels in females of diabetic and non-diabetic subjects

Parameter	Diabetic subjects	Non diabetic subjects	't' value	'p' value
	Females (n=53)	Females(n=25)		
TSH	6.61+/-5.50	1.98+/-1.52	4.122	0.0001
FT ₃	1.89+/-1.21	2.76+/-0.85	3.220	0.0019
FT ₄	1.02+/-0.58	1.49+/-0.37	3.673	0.0004

Present study shows that the levels of TSH (6.61+/-5.50) in diabetic females was significantly higher (p<0.0001) than the non-diabetic females (1.98+/-1.52) while FT₃ (1.89+/-1.21) in diabetic females was significantly lower (p=0.0019) than non-diabetic females (2.67+/-0.85) and FT₄ (1.02+/-0.58) in diabetic females was significantly lower (p=0.0004) than non-diabetic females (1.46+/-0.34).

So, the result of present study show low thyroid hormone level in diabetic females as compared to non-diabetic females.

TABLE-03: Thyroid hormone levels in males of diabetic and non-diabetic subjects

Parameter	Diabetic subjects	Non diabetic subjects	't' value	'p' value
	Male (n=47)	Male(n=25)		
TSH	3.87+/-3.25	2.17+/-1.00	2.554	0.012
FT ₃	2.52+/-1.47	2.58+/-0.81	0.210	0.834
FT ₄	1.31+/-0.56	1.43+/-0.31	0.929	0.355

Present study shows that the levels of TSH, FT₃ and FT₄ in diabetic males were (3.87+/-3.25), (2.52+/-1.47) and (1.31+/-0.56) respectively while the level of TSH, FT₃ and FT₄ in non-diabetic males were (2.17+/-1.00), (2.58+/-0.81) and (1.43+/-0.31) respectively.

The differences between mean TSH between both males of diabetic and non-diabetic were statistically significant but differences between mean FT₃ and FT₄ were not significant (P>0.05).

Reason for this insignificant FT₃ and FT₄ might be due to presence of both hypothyroid and hyperthyroid in diabetic males, as will be evident from next table.

TABLE- 04: Thyroid hormone levels in diabetic hypothyroid males and non-diabetic males

Parameter	Diabetic subjects	Non diabetic subjects	't' value	'p' value
	Hypothyroid males (n=47)	Males(n=25)		
TSH	9.55+/-2.59	2.17+/-1.00	11.961	<0.0001
FT ₃	0.95+/-0.28	2.58+/-0.81	5.520	<0.0001
FT ₄	0.57+/-0.12	1.43+/-0.31	7.431	<0.0001

This table shows that the levels of TSH (9.55+/-2.59) in diabetic hypothyroid males was significantly higher (p<0.0001) than the non-diabetic males (2.17+/-1.00) while FT₃ (0.95+/-0.28) in diabetic hypothyroid males was significantly lower (p<0.0001) than non-diabetic males (2.58+/-0.81) and FT₄ (0.57+/-0.12) in diabetic hypothyroid males was significantly lower (p<0.0001) than non-diabetic males (1.43+/-0.31).

So, the results of present study show low thyroid hormone level in diabetic hypothyroid male subjects as compared to non-diabetic males.

Diabetic hyperthyroid males were not compared as there were only 2 cases and none in control group.

TABLE- 05: Thyroid hormone levels in males and females of diabetic subject

Parameter	Diabetic subjects	Diabetic subjects	't' value	'p' value
	Male (n=47)	Female(n=53)		
TSH	3.87+/-3.25	6.61+/-5.50	2.929	0.0036
FT ₃	2.52+/-1.46	1.89+/-1.21	2.342	0.0212
FT ₄	1.31+/-0.56	1.02+/-0.58	2.512	0.0136

Present study shows that the levels of TSH (6.61+/-5.50) in diabetic females was significantly higher (p=0.0036) than the diabetic males (3.87+/-3.25) while FT₃ (1.89+/-1.21) in female diabetic was significantly lower (p=0.02) than the diabetic males (2.52+/-1.46) and FT₄ (1.02+/-0.58) in diabetic female was significantly lower (p=0.013) than diabetic males (1.31+/-0.56).

So, the results of present study show low thyroid hormone level in diabetic female as compared to diabetic male.

IV. Discussion

Prevalence of thyroid dysfunction was higher in females (32.07%) compared to males (21.27%) which when evaluated statistically was significant.

Our results are consistent with studies of Mirella Hage et al, Perros P et al, Papazafiropoulou et al, Pimenta WP et al, Hessa T Al Wazzan et al, Babu K et al, Pasupathi et al and CEJ Udiong et al in which they also reported higher prevalence of thyroid disorder in diabetic females as compared to diabetic males. Thyroid disorder in diabetic patients is more prevalent in females.

From Table-1 and Table-5 this is evident that the prevalence of hypothyroidism was more in females and hyperthyroidism in males. This study was in accordance with study done by Pasupathi et al who also found the incidence of low hormone level was higher in females than in males, while the number with high hormone level was higher in males than in females.

V. Conclusion

In this study we conclude that there is a high prevalence of thyroid disorders in patients of type 2 diabetes mellitus which was further found to be more in diabetic females. It is thus suggested that regular screening of thyroid function should be done in all patients of type 2 diabetes.

Thus a systemic approach to thyroid testing in diabetic patients is favorable, however no definitive guideline exist regarding screening for thyroid dysfunction in diabetic patients. So it is suggested that regular screening for thyroid abnormalities in all diabetic patients especially in diabetic females will allow early treatment of thyroid dysfunction in these population and may greatly enhance the quality of life.

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Dharmendra Kumar. "Effect of Gender on The Prevalence of Thyroid Dysfunction in Type II Diabetes Mellitus Patients." IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 18, no. 05, 2019, pp 47-50.