EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 7
Issue: 9
441-447
Year: 2020

THYROID FUNCTION IN DIABETESMELLITUS

Dr. Md Tarique Anwar*, Dr. Begam Rubia and Dr. M. M. Patil

*Department of Medicine Faculty of Medicine Jawaherlal Nehru Medical College Wardha Maharastha India.
Department of Peadritrics Faculty of Medicine Jawaherlal Nehru Medical College Wardha Maharastha India.

***Corresponding Author: Dr. Md Tarique Anwar**
Department of Medicine Faculty of Medicine Jawaherlal Nehru Medical College Wardha Maharastha India.

Article Received on 18/07/2020 **Article Revised on 08/08/2020** **Article Accepted on 28/08/2020**

ABSTRACT

Background: Diabetes Mellitus (DM) and thyroid diseases are two common endocriniopathies seen in general population. Even a term 'thyroid diabetes' was coined in the early literature to depict the influence of thyroid hormone excess in the deterioration of glucose control. Thyroid disease which can occur in diabetes mellitus and causes more metabolic disturbances which can further complicate management of patients and escalate the costs of diabetes mellitus treatment. **Methods:** It is Cross sectional study. Study included 160 cases that were diagnosed case of type 2 diabetes mellitus. Duration of study was 2years. All known cases of type 2 diabetes mellitus are included. All Type 1 diabetes mellitus, thyroid dysfunction, pregnancy and Drugs affecting thyroid function cases were excluded. Consent was taken and Interviewed as Per the Performa. Relevant Clinical Examination and Thyroid Function Test fbs pmbs was done. **Result:**The prevalence of thyroid dysfunction in present study was 33.1%.In present study 66.9% (107) cases were euthyroid, 28.8 %(46) were hypothyroid and 4.4 %(7) were hyperthyroid. Mean age in present study was 59.11±10.40, In present study 51.25 %(82) cases were male and 48.75% (78) cases were female .In euthyroid 59.81 %(64) were male 40.19%(43) were female , in hypothyroid 34.78% (16)were male 65.22%(30) were female , in hyperthyroid 28.57%(2) were males and 71.43%(5) were female. In present study we observed poor glycemic control in cases of thyroid dysfunction as compared to euthyroid group. Mean FBS & PMBS were higher in thyroid dysfunction group as compared to euthyroid group. **Conclusion:** Prevalence of thyroid dysfunction in patient of type 2 diabetes mellitus was 33.1%. Thyroid dysfunction was more common in female .Cases with thyroid dysfunction had higher BMI (hypothyroid). Cases with thyroid dysfunction had poor glycemic control as compared to euthyroid group.

KEYWORDS: Fbs – fasting blood sugar, pmbs –post meal blood sugar tsh –thyroid stimulating hormone.

INTRODUCTION

An overview

Diabetes Mellitus (DM) and thyroid diseases are two common endocriniopathies seen in general population.[1] It has long been recognized that thyroid hormones have marked effects on glucose homeostasis. The literature concerning the effects of thyroid hormones on glucose metabolism in normal and diabetic states has been evaluated in detail over a century.[2]

The first report showing the association between diabetes and thyroid dysfunction were published in 1979.[3] Diabetes Mellitus when associated with thyroid dysfunction is known to affect the glycemic control, lipid profile and other associated factors.[4] Since there may be a link between diabetes and thyroid diseases, the American Diabetes Association (ADA) has proposed that people with diabetes be checked for thyroid disorders.

Population screening for thyroid dysfunction may prevent the development of overt thyroid dysfunction and may allow early treatment of hyperlipidemia, control of glycaemia and prevention of associated cardiovascular complications.

Population screening for thyroid dysfunction may prevent the development of overt thyroid dysfunction and may allow early treatment of hyperlipidemia, control of glycaemia and prevention of associated cardiovascular complications.

MATERIALS AND METHOD

The present study was carried out in the Department of Medicine, Acharya Vinoba Bhave Rural Hospital (AVBRH) of Jawaharlal Nehru Medical College, Sawangi(Meghe), Wardha. This was a cross sectional study**.** The study included 160 cases who were diagnosed case of type 2 diabetics mellitus . Duration of study was 2 years.

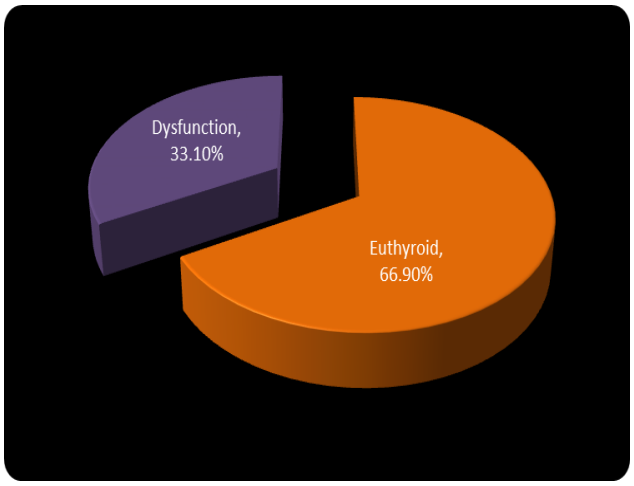
All known cases of type 2 diabetes mellitus were included. All Type 1 diabetes mellitus, known thyroid

dysfunction, pregnancy and Drugs affecting thyroid function cases were excluded. Consent was taken and Interviewed as Per the Performa. Relevant Clinical Examination and Thyroid Function Test fbs pmbs was done.

OBSERVATIONS AND RESULT

Table 1(a): Prevalence of thyroid dysfunction.

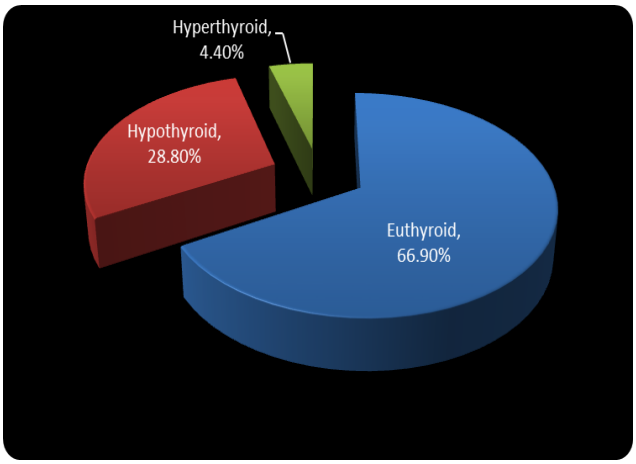
Thyroid Function	No of cases	Percentage(%)
Euthyroid	107	66.9
Dysfunction	53	33.1
Total	160	100.00



In our study total 160 cases were taken, out of which 66.9 %(107) of the cases were Euthyroid and 33.1 %(53) cases were having thyroid dysfunction

Table 1(b): Prevalence of thyroid dysfunction.

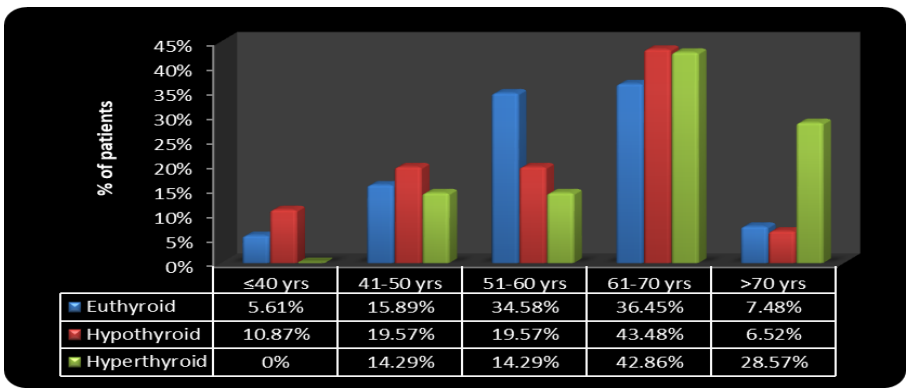
Thyroid Function	No of cases	Percentage(%)
Euthyroid	107	66.9
Hypothyroid	46	28.8
Hyperthyroid	7	4.4
Total	160	100



In our study out of 160 cases 66.9% (107) of the cases were euthyroid, 28.8% (46) cases were hypothyroid and 4.4 %(7)cases were hyperthyroid.

Table 2: Age wise distribution of cases.

Age Group (yrs)	Euthyroid	Hypothyroid	Hyperthyroid	Total
≤40 yrs	6(5.61%)	5(10.87%)	0(0%)	11(6.88%)
41-50 yrs	17(15.89%)	9(19.57%)	1(14.29%)	27(16.88%)
51-60 yrs	37(34.58%)	9(19.57%)	1(14.29%)	47(29.38%)
61-70 yrs	39(36.45%)	20(43.48%)	3(42.86%)	62(38.75%)
>70 yrs	8(7.48%)	3(6.52%)	2(28.57%)	13(8.13%)
Total	107(100%)	46(100%)	7(100%)	160(100%)
Mean	58.59	58.93	68.28	59.11
SD	9.90	10.83	12.51	10.40
⨪2-value	9.38			
p-value	0.311,NS			



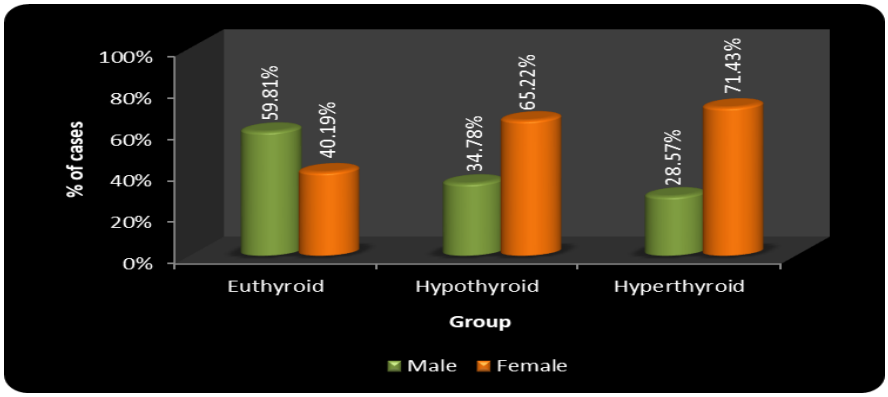
In our study Maximum cases 38.75%were in age group of 61-70 years. 36.45% of the cases in euthyroid, 43.48% in hypothyroid and 42.86% in hyperthyroid group were in the age of 61-70 years.

34.58% cases in euthyroid, 19.57% in hypothyroid and 14.29% in hyperthyroid were in the age of 51-60 years.

Mean age of the cases in study was 59.11±10.40, in euthyroid group it was 58.59±9.90, in hypothyroid it was 58.93±10.83 and in Hyperthyroid it was 68.28±12.51.

Table 3: Gender wise distribution of patients.

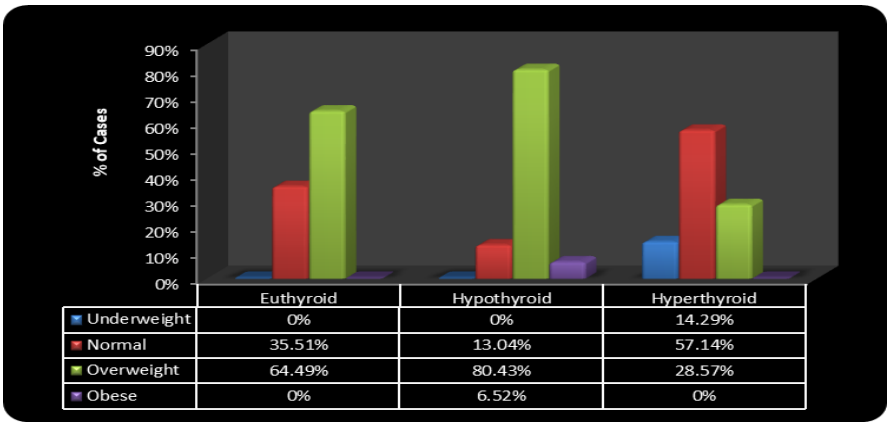
Gender	Euthyroid	Hypothyroid	Hyperthyroid	Total
Male	64(59.81%)	16(34.78%)	2(28.57%)	82(51.25%)
Female	43(40.19%)	30(65.22%)	5(71.43%)	78(48.75%)
Total	107(100%)	46(100%)	7(100%)	160(100%)
ϰ2-value	9.57			
p-value	0.008,S			



In our study 51.25% (82) cases were male and 48.75% (78) cases were female. In euthyroid 59.81 % (64) were male 40.19% (43) were female, in hypothyroid 34.78 %(16) were male 65.22% (30) were female, in hyperthyroid 28.57 %(2) were males and 71.43 %(5) were female.

Table 4: Distribution of patients according to BMI(kg/m2).

BMI(kg/m2)	Euthyroid	Hypothyroid	Hyperthyroid	Total
Underweight(<18.5)	0(0%)	0(0%)	1(14.29%)	1(0.63%)
Normal(18.5-22.9)	38(35.51%)	6(13.04%)	4(57.14%)	48(30%)
Overweight(23-29.9)	69(64.49%)	37(80.43%)	2(28.57%)	108(67.50%)
Obese(>30)	0(0%)	3(6.52%)	0(0%)	3(1.88%)
Total	107(100%)	46(100%)	7(100%)	160(100%)
Mean	23.48	25.99	22.68	24.16
SD	1.42	2.47	3.52	2.22
ϰ2-value	39.36			
p-value	0.0001,S			

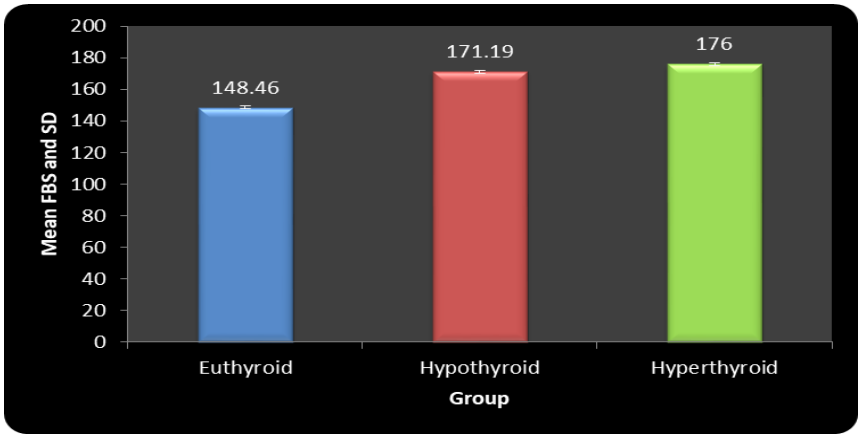


In our study total 67.50% cases were overweight, 30% cases were having normal BMI. 64.49% cases in euthyroid, 80.43% in hypothyroid group and 28.57% in hyperthyroid group were overweight. 35.51% cases in

euthyroid, 13.04% cases in hypothyroid and 57.14% cases in hyperthyroid were having normal weight.
6.52% of cases in hypothyroid were obese and 14.29% cases in hyperthyroid were underweight. Mean BMI in our study was 24.16± 2.22, in euthyroid group 23.48±1.42 in hypothyroid 25.99± 2.47, in hyperthyroid it was 22.68±3.52.

Table 5: Distribution of patients according to FBS.

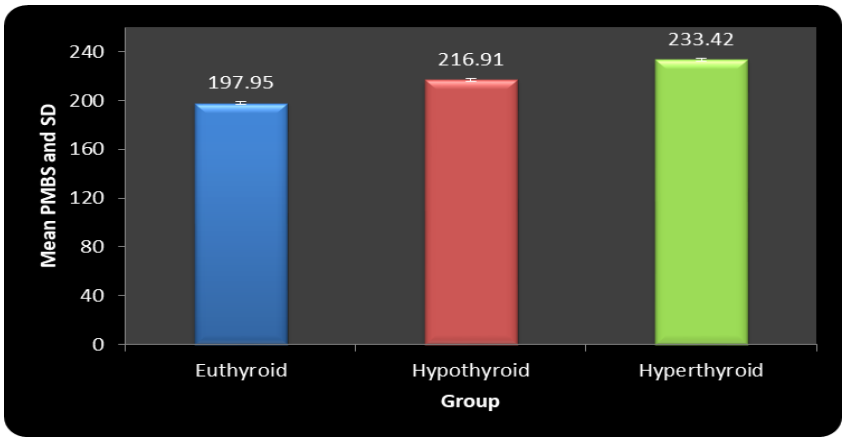
Group	N	Mean (mg/dl)	Std. Deviation	Std. Error	Minimum	Maximum
Euthyroid	107	148.46	43.56	4.21	76	344
Hypothyroid	46	171.19	46.12	6.80	100	256
Hyperthyroid	7	176.00	32.72	12.36	146	224
Total	160	156.20	45.05	3.56	76	344
F-value	5.04,, p-value=0.008 Significant					



Mean FBS in our study was 156.20±45.05mg/dl. In euthyroid it was 148.46±43.56 mg/dl, in hypothyroid it was 171.19 ±46.12 mg/dl in hyperthyroid it was 176±32.72 mg/dl

Table 6: Distribution of patients according to PMBS.

Group	N	Mean (mg/d)l	Std. Deviation	Std. Error	Minimum	Maximum
Euthyroid	107	197.95	51.62	4.99	106	365
Hypothyroid	46	216.91	33.61	4.95	142	276
Hyperthyroid	7	233.42	61.53	23.25	151	332
Total	160	204.95	48.46	3.83	106	365
F-value	3.85, p-value=0.023, Significant					



Mean PMBS in our study was 204.95±48.46 mg/dl. In euthyroid it was 197.95±51.62, mg/dl in hypothyroid it was 216.91 ±33.6 mg/dl in hyperthyroid it was 233.42±61.53 mg/dl.

DISCUSSION

In present study total 160 cases were studied. Out of 160 cases 107 cases were euthyroid 53 had thyroid dysfunction. Out of 53 thyroid dysfunction cases 46 were hypothyroid and 7 were hyperthyroid. The prevalence of thyroid dysfunction in present study was 33.1%., 28.8% were hypothyroid and 4.4% were hyper thyroid.

Udiong, Udoh, Etukudoh et al(2007)[5] from Calabar, Nigeria, studied 275 diabetic and non-diabetic subjects for evaluating thyroid dysfunction. They observed that 46.5% diabetic subjects had abnormal thyroid profiles. Their study had showed a high incidence (46.5%) of abnormal thyroid hormone levels among the diabetics in Nigeria (hypothyroidism 26.6%, hyperthyroidism, 19.9%).

Celani, Bonatti, Stucci et al(1994)[6] had done a study of 290 type 2 diabetics. In their study they founded that abnormal TSH concentrations were detected in 91 cases (31.4%). Subclinical hypothyroidism (high TSH, normal FT4) was most common (48.3%), followed by subclinical hyperthyroidism (low TSH, normal FT4) (24.2%) and by definite hypothyroidism (high TSH, low FT4) (23.1%), and definite hyperthyroidism (low TSH, raised FT4) was founded in 4 patients (4.4%).

Pasupathi, Bakthavathsalam, Saravanan & Sundaramoorthi(2008)[7] studied a population consisting of 200 subjects divided into two groups: diabetic (n=100) and non-diabetic (n=100). Out of 100 diabetic patients studied, 28% had low plasma thyroid hormone levels, 17% had high thyroid hormone, and 55% had euthyroid levels.

Makandar et al(2015)[8] in their study observed that 32% of the cases in their study had abnormal thyroid hormone levels and 68% had normal thyroid hormone levels. Among the 32% of diabetic patients with abnormal thyroid hormone levels, 22% of them had hypothyroidism (8% clinical hypothyroidism, 14% subclinical hypothyroidism) and 10% of patients had hyperthyroidism (4% clinical hyperthyroidism, 6% subclinical hyperthyroidism).

However **Perros et al(1995)**[9] observed a prevalence of thyroid dysfunction of 13.4% in 1301 adult diabetes clinic patients with T1DM and T2DM.

Radaideh et al(2004)[10] in their study founded that overall prevalence of thyroid disease was to be 12.5%. The most common was subclinical hypothyroidism (4.1%).

Prevalence of thyroid dysfunction in present study nearly correlate with study of **Udiong, Udoh, Etukudoh et al(2007), Celani, Bonatti, Stucci et al(1994), Pasupathi, Bakthavathsalam, Saravanan & Sundaramoorthi(2008), Makandar et al(2015).**

In present study 51.25 %(82) cases were male and 48.75% (78)cases were female. In euthyroid 59.81 %(64) were male 40.19%(43) were female , in hypothyroid 34.78% (16)were male 65.22%(30) were female , in hyperthyroid 28.57%(2) were males and 71.43%(5) were female.

Udiong, Udoh, Etukudoh et al(2007) had founded in their study that the prevalence of hypothyroidism was higher in women (16.8%) than in men (9.9%), while hyperthyroidism was higher in males (11%) than in females (8%).

Michalek, Mahoney & Calebaugh(2000)[11] in their study founded that the prevalence of diabetes (21%) and hypothyroidism (5%) among women were higher than those observed men (13% and 0.2%, respectively).

Celani, Bonatti, Stucci et al(1994) reported that the prevalence of abnormal thyroid function test was significantly higher in the female than in the male patients (40.9% vs. 19.8%, $p < 0.0005$)

Radaideh et al(2004) observed that prevalence of subclinical and overt hypothyroidism was10.3% (14.3% in female and 5.8 male) , and hyperthyroidism was 1.7% (2.3% female and 0.9 % male).

Perros et al(1995) observed high prevalence of thyroid dysfunction in female(10.9% in female and 6.9 % males).

Papazafiropoulou et al(2010)[12] reported higher prevalence of thyroid dysfunction in females $p<0.001$.

The overweight condition and obesity are frequently confirmed by calculating body mass index (BMI). Hyperinsulinemia and insulin resistance is pervasive feature of obesity. Obesity leads to insulin resistance by several ways like impairing insulin action, intracellular lipid accumulation and by insulin receptor down regulation.

Mean BMI in present study was 24.16± 2.22, in euthyroid group 23.48±1.42 in hypothyroid 25.99± 2.47, in hyperthyroid it was 22.68±3.52.

In present study cases who had thyroid dysfunction (hypothyroidism) had higher BM. **Laloo Demitrost, Salam Ranabir et al(2012)**[13] reported that cases with BMI > 25 were at increased risk of having hypothyroidism ($P < 0.016$).

Papazafiropoulou et al(2010) founded in their study that cases with thyroid dysfunction had higher value of BMI as compared to cases without thyroid dysfunction (p=0.003).

Glycemic status

In present study Mean FBS was 156.20±45.05mg%, in euthyroid it was 148.46±43.56 mg%, ,in hypothyroid it was 171.19 ±46.12 mg%, in hyperthyroid it was 176±32.72 mg%, Statistically significant variation was founded in mean fasting blood sugar of the cases in different groups (p-value=0.008).

The Mean PMBS in this present study was 204.95±48.46 ,in euthyroid it was 197.46±51.62,in hypothyroid it was 216 ±33.61in hyperthyroid it was 233±61.53 Statistically significant variation was founded in mean post meal blood sugar (p-value=0.023).

In present study we had not done glycosylated Hb (HbA1c).

In present study we observed poor glycemic control in cases of thyroid dysfunction as compared to euthyroid group

Similar finding was observed by **Makandar et al(2015)** in their study.

They observed poor glycemic control in diabetes cases with thyroid dysfunction than without dysfunction. Although they had taken both fasting and HbA1c ($p< 0.001$).

Mohammad Afkhami-et al(2010)[14] in their cross-sectional study which was carried out in type 2 diabetic patient observed poor diabetic control in the form of high HbA1c in group of thyroid dysfunction then euthyroid (8.9 ±1.99 vs. 7.1±1.02).

Bazrafshan et al. (2002)[15] in their study of 210 type 2 diabetics assessed the relationship between thyroid dysfunction and NIDDM. In their study mean concentration of HbAlc in patients with hypothyroidism was significantly higher than those that of non-hypothyroid subjects. A significant positive correlation was observed between HbAic concentration and TSH levels by them.

Satish and mohan(2003) studied the effect of thyroid dysfunction on diabetic status .They concluded that varied metabolic changes may occur as a result of hyperthyroidism that contribute to the deterioration of glycemic control.

Bagchi et al.[16] showed that the thyroidal secretory response to large doses of TSH is decreased in uncontrolled type 2 diabetes mellitus and strict glycemia control improves the response .

Also **in Custro's study**[17] patients showed significantly lower serum T3 levels and significantly higher serum rT3 levels in comparison with a group of normo glycemic subjects. In this study after 3 months treatment, these patients showed significant decrease of rT3 and delta-TSH. They concluded there is a connection betweenalternations in thyroid hormone picture and glycometabolic imbalance.

Suzuki et al. attributed the abnormal thyroid hormone levels founded in diabetes to the presence of Thyroid Hormone Binding Inhibitor (THBI), an inhibitor of extra thyroidal conversion enzyme of T4 to T3, and dysfunction of the hypothalamus hypophyseal thyroid axis. These situations may prevail in diabetics and would be aggravated in poorly controlled diabetics. Stress, which is associated with diabetes mellitus, may also cause changes in the hypothalamus anterior-pituitary axis in these diabetics

Presence of subclinical hypothyroidism and hyperthyroidism may result from hypothalamus-hypophyseal-thyroid axis disorders as suggested in study of **Celani, Bonatti, Stucci et al(1994).**

CONCLUSION

Following conclusion were made from present study

1. Higher prevalence of Thyroid dysfunction in patient of type 2 diabetes mellitus.
2. Thyroid dysfunction was more common in female.
3. Cases with thyroid dysfunction had higher BMI (Hypothyroid).
4. Cases with thyroid dysfunction had poor glycemic control.

In nutshell in present study revealed high prevalence of thyroid dysfunction, no age the finding variation was seen. Thyroid dysfunction was more prevalent in female gender. BMI in thyroid dysfunction (hypothyroid) group was high. And there was poor glycemic control

Limitations

This study had important limitations that should be noted and addressed in future investigations of these populations. The limitation of this study:

- cross sectional study
- Small sample size.
- Hospital based study
- No assessment of Glycosylated hemoglobin (HbA1c) which is more reliable predictor of glycemic status
- No assessment of free thyroid hormone which is more reliable then bound thyroid hormone.

Recommendations

Patients with diabetes are at an increased risk of thyroid dysfunction. Recent decades have seen a growing understanding of the pleiotropic effects of thyroid hormones on various vascular and metabolic processes. Furthermore, insights are being developed into the complex interactions, at the phenotypic and molecular levels, between thyroid dysfunction, insulin resistance, and cardiovascular risk. At present, a selective annual screening strategy may allow monitoring to be streamlined to those diabetic patients who are at the greatest risk of thyroid dysfunction such as those with

high BMI, baseline positive antibodies or TSH concentrations in the upper half of the normal reference range.

REFERENCES

1. Satish, R. and Mohan, V.: Diabetes and thyroid diseases: a review. Int. J. Diab. Dev.Countries, 2003; 23(4): 120-123.
2. Lenzen S, Bailey CJ. Thyroid hormones, gonadal and adrenocortical steroids and the function of the islets of Langerhans. *Endocr Rev*, 1984; 5: 411–34.
3. Feely J, Isles TE. Screening for thyroid dysfunction in diabetic. Br Med J, 1979; 1(6179): 1678.
4. Afkhami-Ardekani M, Rashidi M, Shojaoddiny A. Effect of thyroid dysfucntion on metabolic response in type 2 diabetic patients. Iranian J Diabetes and Obesity, 2010; 2(1): 20-26.
5. C.E.J. Udiong, A.E. Udoh and M. E. Etukudoh.Evaluation of thyroid function in diabetes mellitus in Calabar, Nigeria.Indian Journal of Clinical Biochemistry, 2007; 22(2): 74-78.
6. Celani MF, Bonati ME, Stucci N. Prevalence of abnormal thyrotropin concentrations measured by a sensitive assay in patients with type 2 diabetes mellitus. Diabetes Res, 1994; 27: 15-25.
7. Pasupathi P, Bakthavathsalam G, Saravanan G, Sundaramoorthi R. Screening for Thyroid Dysfunction in the Diabetic/Non-Diabetic Population. Thyroid Science, 2008; 3(8): 1-6.
8. Makandar etal EFFECT OF THYROID DYSFUNCTION ON METABOLIC RESPONSE IN TYPE 2 DIABETIC PATIENTS al. UJMDS, 2015.
9. Perros P, McCrimmon RJ, Shaw G, Frier BM. Frequency of thyroid dysfunction in diabetic patients: value of annual screening. Diabet Med, 1995; 12: 622-627.
10. Radaideh AR, Nusier MK, Amari FL, Bateiha AE, El-Khateeb MS, Naser AS, Ajlouni KM. Thyroid dysfunction in patients with type 2 diabetes mellitus in Jordan. Saudi Med J, 2004; 25: 1046-1050.
11. Michalek AM, Mahoney MC, Calebaugh D. Hypothyroidism and Diabetes Mellitus in an American Indian Population. J Fam Pract, 2000; 49(7): 638-40.
12. Papazafiropoulou A, Sotiropoulos A, Kokolaki A, Kardara M, Stamataki 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. Demitrost L, Ranabir S. Thyroid dysfunction in type 2diabetes mellitus: A retrospective study. Indian J Endocr Metab, 2012; 16: 334-5.
14. Afkhami-Ardekani M, Rashidi M, Shojaoddiny A. Effect of thyroid dysfucntion on metabolic response in type 2 diabetic patients. Iranian J Diabetes and Obesity, 2010; 2(1): 20-26.
15. Bazrafsham HR, Ramezani A, Salehi A, Shir Afkan A.A, Mohammadian S, Faraj Elahi M, Rais Zadeh F, Azizi F, Thyroid dysfunction and its relation with diabetes mellitus (NIDDM).Journal of Gorgan university of medical Sciences. Spring-summer, 2002; 2: 5-11.
16. Bagchi N, Palaniswami N, Desai H, Felicetta J,Brown TR. Decreased thyroidal response to thyrotropin in type II diabetes mellitus. Metabolism, 1988; 37(7): 669-71.
17. Custro N, Scafidi V, Borsellino T. Changes in the thyroid hormone picture that may be found in severely decompensated type II diabetics. Minerva Med, 1991; 82(1-2): 9-14.