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A CORELATIVE STUDY OF THYROID FUNCTION IN DIABETES MELLITUS IN HADOTI REGION OF RAJASTHAN

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ABSTRACT

Background: This study compare thyroid hormone (T3, T4, TSH) levels among diabetic and non-diabetic subjects and investigate the effect of diabetes mellitus on thyroid hormone levels in diabetic patients. The present study also enumerates the prevalence of abnormal thyroid hormone levels in diabetes mellitus. **Material and Methods:** We have determined the incidence of abnormal thyroid hormone levels in diabetics, fasting blood samples from 40 diabetic subjects and 40 non-diabetic controls were analyzed. **Results:** Out of 40 cases maximum, 72.50% had serum T3 level within the normal range of 0.7-2.0 ug/d1, 62.50% had serum T4 level within the normal range of 5.5-13.5 ug/dl and maximum 75.00% had serum TSH level within the range of 0.3-6.5 u IU/ml. Out of 40 controls; 90.00% had serum T3 level within the range of 0.7-2.0 ng/dl, 65.00% had serum T4 level within the range of 5.5-13.5 ug/dl and 80.00% had serum TSH level within the range of 0.3-6.5 u IU/ml. The significance of difference between case sample mean and control sample mean regarding Serum T3, T4 and TSH values in these 2 populations; the difference between two sample means was statistically not significant in case of serum T3 values ($P>0.05$) whereas it was statistically highly significant in case of serum T4 values ($P<0.001$) and statistically significant in case of serum TSH values ($P<0.01$). **Conclusion:** These findings demonstrate that detection of abnormal thyroid hormone levels in the early stage of diabetes will help patients improve their health and reduce their morbidity rate. Thus routine assessment of thyroid hormone levels should be recommended in diabetics.

Keywords: Blood sugar level, thyroid dysfunction, subclinical hyperthyroidism

INTRODUCTION:

It estimates recently that, the total number of people with diabetes would be rise from 171 million in 2000 to 366 million in 2030 and in developing countries; the urban population is projected to double between 2000 and 2030. The diabetes trend of prevalence across the world appears to be the increase in the proportion of people > 65 years of age1.

Diabetes is a complicated and multi-systemic illness which is characterized by a relative or absolute inadequacy of insulin secretion or simultaneous resistance of the metabolic actions of insulin on target tissues. This hormonal

change affects the metabolism of carbohydrate, lipid, protein, and glycoprotein and subsequently leading to long-term complications of diabetes2.

The effect of other endocrine and non-endocrine organs on diabetes mellitus is documented such as abnormal thyroid hormone levels are found in diabetes mellitus3-4.

Diabetes mellitus and hyperthyroidism are metabolic disorders that affect the metabolism and level of carbohydrates, proteins, and lipids. Since thyroid hormone abnormalities are frequently associated with diabetes, the present study demonstrated the adverse effects of diabetes on thyroid hormone levels. This study compares thyroid hormone (T3, T4, TSH) levels among diabetic and non-diabetic subjects and investigate the effect of diabetes mellitus on thyroid hormone levels in diabetic patients.

MATERIAL AND METHOD

In the present study, convenience sampling method was used and done at Department of Biochemistry and Department of Medicine Jhalawar Medical College and Hospital Jhalawar. This was hospital-based study and all patients attending Central Laboratory, SRG Hospital Jhalawar for biochemical investigation during study duration of 6 months was included. Patients with diabetes mellitus had age between 20-80 years were included in present study while those were very ill patients with complications of diabetes mellitus, known the history of thyroid dysfunction, Pregnant and Patients with malignancy were excluded from the study. Before starting the study, the permission of hospital ethical committee was taken. Samples of all eligible patients according to inclusion criteria were screened for Diabetes Mellitus through fasting blood glucose level. Basic information regarding patient's age, sex, religion and clinical history was obtained through OPD sheet. Samples thus screened were categorized into Diabetic and Non-Diabetic groups. Diabetic group was defined as case and the Non-Diabetic group as control respectively. Samples were further tested for Thyroid function as well as RFT, lipid profile, total protein, and albumin.

Data Organization and Analysis:

Information thus collected was transferred from proforma into excel sheet and appropriate test of significance was applied wherever required ('t' test, 'z' test). The valid inference drawn from information revealed and results were thoroughly discussed with other available studies conducted in the same field.

RESULTS

Table 1 showed the distribution of 80 participants according to age in years that maximum 30% population belonged to 20-29 years age group followed by 25% subjects in 30-39 years age group. Table 1 shows that 50% subjects were detected as diabetics and rest as non-diabetics. Among both groups of study population there were equal proportions of male and female cases i.e. out of 40 patients screened as diabetics there were 20 males and 20 female patients. A similar proportion was observed among 40 non-diabetics/controls.

Out of 40 cases maximum 72.50% had serum T3 level within the range of 0.7-2.0 ng/dl followed by 17.50% cases with serum T3 levels < 0.7 ng/dl and out of 40 controls maximum 90.00% had serum T3 level within the range of 0.7-2.0 ng/dl followed by 07.50% cases with serum T3 levels > 2.0 ng/dl in which both groups were not statistically significant ($Z=1.07$ & $P> 0.05$). (Table 2)

Out of 40 cases maximum 62.50% had serum T4 level within the range of 5.5-13.5 ug/dl followed

by 20.00% cases with serum T4 levels < 5.5 ug/dl and out of 40 controls maximum 65.00% had serum T4 level within the range of 5.5-13.5 ug/dl followed by 20.00% cases with serum T4 levels > 13.50 ug/dl which were statistically significant (Z = 37.58 & P < 0.001). (Table 2)

Out of 40 cases maximum 75.00% had serum TSH level within the range of 0.3-6.5 u IU/ml followed by 17.50% cases with serum TSH levels < 0.3 u IU/ml and out of 40 controls maximum 80.00% had serum TSH level within the range of 0.3-6.5 u IU/ml followed by 17.50% cases with serum TSH levels < 0.3 u IU/ml which were statistically significant (Z=3.04 & P < 0.01). (Table 2) Table 3 showed serum T3 levels in diabetic males & females and the mean value of serum T3 = 1.07 ± 0.59 ng/ml 1.07 ± 0.60 ng/ml respectably. The difference between two sample means is statistically not significant. Table 3 also showed the serum T4 levels in diabetic males & females and the mean value of serum T4 = 11.50 ± 5.28 ug/dl & 7.87 ± 2.55 ug/dl respectably. The difference between two sample means is statistically significant. Serum TSH levels in diabetic males & females and the mean value of serum TSH = 1.14 u ± 1.16 u IU/ml & 3.93 ± 2.54 u IU/ml. the difference between two sample means is statistically highly significant.

DISCUSSION

This hospital-based study population of 100 patients comprised of 50% cases and 50% controls along with same proportional distribution between males and females. 30% of the study population was composed of 20-29 year age group followed by 25% subjects in 30-39 year age group. In a similar study, S M Sadikot et al5 2005 in their study found that the prevalence rate for DM in subjects aged 25 years and above in the total Indian, urban and rural population was 4.3, 5.9 and 2.7% respectively. Further Wild et al 2004 in their study said the prevalence of diabetes for all age-groups globally was estimated to be 2.8% in 2000 and 4.4% in 2030.

In our study 80% of study subjects were Hindus and 20% were Muslims (Table3). Similarly, Ramaiya KL et al6 1991 found the prevalence of Impaired Glucose Tolerance (IGT) and diabetes mellitus in a migrant Hindu Indian community in Tanzania was 16.2% and 9.1% respectively. Further Chew Boon How et al7 2011 in their study found that the religiosity had a negative correlation with lower FPG but no such correlation was found with HbAlc. Muslim religiosity had a significant negative correlation with HbAlc even after controlling for covariates. Christians and the non-religious group had significantly lower mean rank HbAlc than other religions.

Among both groups of study population there were equal proportions of male and female case i.e. out of 40 patients screened as diabetics there were 20 males and 20 female patients (Table 2).

A similar proportion was observed among 40 non-diabetics/ controls. In a similar study, Celani MF et al8 1994 in their study found abnormal TSH concentrations in 91 Type 2 diabetes mellitus patients (31.4%). Subclinical hypothyroidism was most common (48.3%), followed by subclinical hypothyroidism (23.1%). Definite hyperthyroidism was found in 4 patients (4.4%). None of the patients with low TSH value had increased FT3 concentration. Further, Parros P et al9 1995 study result showed that in the randomly selected group of 1310 adult diabetic patients, 6.8% diagnosed new thyroid disease; the commonest diagnosis was subclinical hypothyroidism (4.8%) followed by

hypothyroidism (0.9%), hyperthyroidism (0.5%), and 0.5% subclinical hyperthyroidism.

In our study, the statistically significant gender difference was found in when compared the mean of T4 & TSH. In a similar study Gray RS et al10 1980, Celani MF et al8 1994 & C E J Udiong et al11 2007 found that the prevalence of an elevated serum TSH concentration in females than that in males.

This shows that since thyroid abnormalities are frequently associated with diabetes, in the present study was to assess the antagonistic effects of diabetes on thyroid hormone levels. Thus our finding demonstrates that detection of abnormal thyroid hormone levels in the early stage of diabetes will help patients improve their health and diminish their morbidity rate.

CONCLUSION

In present case-control study, the significance of the difference in thyroid hormone levels in diabetic males and females was also compared. it was also observed statistically significant ($P<0.01$) as well as statistically very highly significant ($P<<0.001$) in case of serum T4 and serum TSH levels respectively.

This study has shown a high occurrence of abnormal thyroid hormone levels among diabetic patients. In conclusion, these findings demonstrate that detection of abnormal thyroid hormone levels in the early stage of diabetes will help patients improve their health and reduce their morbidity rate. Thus routine assessment of thyroid hormone levels should be recommended in diabetics, particularly the difficult to manage cases.

LIMITATION

If the study had been community-based and the sample size had been large, the study would have been more precise and the results would have been more accurate.

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Table –1: Demographic Distribution of Study Population (N=80)

Age (Years)	Frequency	(%)
20-29	24	30.0
30-39	20	25.0
40-49	08	10.0
50-59	16	20.0
60-69	08	10.0
≥70	04	05.0
Gender		
Male	40	50
Female	40	50
Religion		
Hindu	64	80
Muslim	16	20
Status in Screening Test		
Diabetic	40	50.00
Non-diabetic	40	50.00

Table-2 : Distribution of Cases (N=40) & Control (N=40)according to T3, T4 & TSH levels

	Frequency (%)	Mean ± SD (u IU/ml)	Frequency (%)	Mean ± SD (u IU/ml)	p value
Range T3 (ng/ml) in DM cases			**Range T3 (ng/ml) in Control**		P> 0.05
< 0.7	7 (17.50)	1.06 (0.59)	1(02.50)	1.20 (0.57)	
0.7 – 2.0	29(72.50)		36(90.00)		
> 2.0	4(10.00)		3(07.50)		
Range T4 (ng/ml) in DM cases			**Range T4 (ng/ml) in Control**		P < 0.001
< 5.5	8(20.00)	9.68 (2.48)	6 (15.00)	9.90 (2.75)	
5.5 – 13.5	25(62.50)		26(15.00)		
> 13.5	7(17.50)		8(15.00)		
Range TSH (u U/ml) in DM cases			**Range TSH (u U/ml) in Control**		P < 0.01
< 0.3	7(17.50)	2.53 (2.40)	7(17.50)	1.21 (1.13)	
0.3 – 6.5	30(75.00)		32(80.00)		
> 6.5	3(07.50)		1(02.50)		

Table-3: Distribution of Diabetic Males & Female according to their Serum T3, T4 & THS level

	Frequency (%)	Mean ± SD (u IU/ml)	Frequency (%)	Mean ± SD (u IU/ml)	p value
Range T3 (ng/ml) in DM Male cases (N=20)			**Range T3 (ng/ml) in DM Female (N=20)**		**>0.05**
< 0.7	4 (20.00)	1.07 (0.59)	3(15.00)	1.07(0.60)	
0.7 – 2.0	14(70.00)		15(75.00)		
> 2.0	2(10.00)		2(10.00)		
Range T4 (ng/ml) in DM Male cases(N=20)			**Range T4 (ng/ml) in DM Female(N=20)**		**<0.05**
< 5.5	5(25.00)	11.50(5.28)	3(15.00)	7.87 (2.55)	
5.5 – 13.5	15(75.00)		10(50.00)		
> 13.5	0(0)		7(35.00)		
Range TSH (u U/ml) in Male DM cases(N=20)			**Range TSH (u U/ml) in DM Female (N=20)**		<0.005
< 0.3	2(10.00)	1.14 (1.16)	5(25.00)	3.93(2.54)	
0.3 – 6.5	15(75.00)		15(75.00)		
> 6.5	3(15.00)		0(0)		