

A Clinical Study of Hypothyroidism Associated With Type - 2 Diabetes Mellitus

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Abstract

Background: Thyroid disorders are common in the general population and the incidence of type 2 diabetes mellitus is also rapidly increasing day by day. The objective is to determine the age and sex prevalence, pattern of presentation and management of patients suffering from hypothyroidism associated with type-2 diabetes mellitus. **Subjects and Methods:** Design: The study was an observational study of 20 types 2 diabetics attending the Department of Medicine (outpatient/inpatient). Duration: 1 year i.e. from December 2004 – December 2005. Setting: Out-patient department. Participants: 20 patients with both Diabetes Mellitus type 2 and Hypothyroidism. Patients with known diabetes attending OPD were considered. Data were collected using a standardized case report form. **Results:** The majority of the patients had got diagnosed with hypothyroidism and diabetes within a span of 0 to 5 years, followed by 6 to 9 years span with 4 patients and 3 patients within the span of 10 to 14 years and 2 patients in the span of 15 to 19 years. Only 1 patient was diagnosed with both in a span of 20- to 24 years and one patient in 25 to 29 years. **Conclusion:** Annual Screening is mandatory in all hypothyroid patients for the early detection and treatment of diabetes mellitus, thereby to prevent and/or postpone the complications of diabetes, and all diabetes mellitus patients to undergo thyroid function screening (TFT) yearly for the early detection of thyroid dysfunction and thereby reducing the morbidity and mortality.

Keywords: Hypothyroidism, Diabetes Mellitus

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Introduction

Thyroid disorders are common in the general population and are reported to be 6.6% and the incidence of type 2 diabetes mellitus is also rapidly increasing day by day. Epidemiological studies in India indicate that there has been an increase in diabetic patients from 8.2% to 11.6% in the urban areas and from 1.5% to 2.75% in rural areas. India is going to be the world capital of diabetes in near future. One out of every 6 diabetic lives in India.

The association between hypothyroidism and diabetes has long been recognized through the reported prevalence of thyroid dysfunction varied between studies.^[1]

The increased association of diabetes and thyroid disorder whether a co-existing disease or causal relation between these two disorders has not well been studied.^[2] Hence this small study is undertaken to have some insight into the association of diabetes and hypothyroidism.

Hypothyroidism

The thyroid gland produces two related hormones, thyroxine (T4) and triiodothyronine (T3). These hormones play a critical role in cell differentiation during development and help to maintain thermogenic metabolic homeostasis in the adult. Thyroid hormone act through nuclear hormone receptor to modulate gene expression. Disorders of the thyroid gland result primarily from autoimmune processes that either stimulates the overproduction of thyroid hormones (Thyrotoxicosis) or cause glandular destruction and underproduction of thyroid hormones (Hypothyroidism).

Diabetes Mellitus

The worldwide prevalence of diabetes mellitus has risen dramatically over the past two decades; it is projected that individuals with DM will continue to increase in the near future. The number of Although the prevalence of both type 1 and type 2 DM is increasing worldwide, the prevalence of

type DM is expected to rise more rapidly in the near future because of increasing obesity and reduced activity levels. The prevalence of type 2 DM and its harbinger, impaired glucose tolerance (IGT), its highest in certain pacific islands, intermediate in countries such as India and the United States and relatively low in Russia and China.^[3] The variability is likely due to both genetic and environmental factors. There is also considerable variation in DM prevalence among the different ethnic populations within a given country Type 2 diabetes is rapidly emerging, as a major public health problem. There are an estimated 25-30 million persons with diabetes in India.^[4] This number could raise to 57million and increase of 148% by 2025.^[5] Infect, by the year 2010, India will surpass the world as regards the number of diabetic patients. The high prevalence is reported particularly from urban areas. High genetic predisposition changing lifestyle with the associated and high imbalanced intake of dietary fats seems to play a role. In India type 2 diabetes seems to occur a decade earlier (30-40 years) compared to the west. The paucity of dramatic symptoms, poor health awareness and the Prevailing socio-economic conditions delay diagnosis.

Aims of the Study

- The Age and Sex prevalence,
- The pattern of presentation,
- The other associated disorders and
- The management aspects of hypothyroidism associated with type 2 diabetes mellitus patients.

Objective

To determine the age and sex prevalence, pattern of presentation and management of patients suffering from hypothyroidism associated with type-2 diabetes mellitus.

Subjects and Methods

The present study was conducted on 20 patients who attended the outpatient clinic to M.G.M. Hospital, Warangal from December 2004 to December 2005.

Inclusion Criteria: The patients who have both hypothyroidism and type 2 diabetes mellitus were included.

Method of Study

The patients who have both hypothyroidism and Type 2 diabetes mellitus were studied as outlined in the following Proforma.

Results

The majority of the patients belonged to the age group of 30 to 39 years when diagnosed with hypothyroidism were 6 patients,

The least belonging to the age group of 60 to 69 years group with 1 patient.

The majority of the patients who belonged to the age group of 30 to 39 years and 50 to 59 years group were diagnosed with type 2 diabetes. The least belonged to the age group of 40 to 49 years and 60 to 69 years with 3 patients in each age group.

The majority of the patients had got diagnosed with hypothyroidism and diabetes within a span of 0 to 5 years, followed by a 6 to 9 years span with 4 patients and 3 patients within the span of 10 to 14 years and 2 patients in the span of 15 to 19 years. Only 1 patient was diagnosed with both in a span of 20- to 24 years and one patient in 25 to 29 years.

Discussion

The present study enrolled 20 patients who have both hypothyroidism type-2 diabetes mellitus. Sex: Out of these 20 patients females were 15 and males were 5 (F: M ratio is 3:1). So this, the association is 3 times more common in females than males. According to the study of Perused. et al.^[6] female to male ratio was 2.3 1. Age: The mean age at diagnosis of hypothyroidism is 39.95 ± 9.3 {Range (23- 63 Years)}. A High Incidence of 30% (6/20) was seen in the age group of 30-39 years. A low incidence of 5% (1/20) was seen in the age group of 60-69 years. The mean age at diagnosis of diabetes is 48.15 ± 10.135 ears [Range 33-69 years]. A high incidence of 70% [14/20] was observed in the 4th decade [7/20] and 6th decade [7/20]. The incidence of diabetes mellitus in hypothyroid patients is showing a bite pa pattern. The reason is not well explained anyhow it is a significant finding. The mean age of these 20 patients is 54.10 ± 9.4 years [30.71 years]. The peak incidence of this association was observed in the 6th decade in 45% of patients [9/20]. The low incidence of this association was observed in the 5th decade 5% [1/20]. Perros et. al.^[6] reported a high incidence of hypothyroidism in Type-2 Diabetes in the 7th and 8th decades.

The onset of two diseases is not simultaneously noted in any single majority of the cases i.e. 95% (19 out of 20) patients presented with the case. In hypothyroidism first, only in 5 % (1 patient) type 2 diabetes mellitus was noted first. If the time interval is taken into consideration between the onsets of two disorders maximum number of patients with hypothyroidism developed Type-2 diabetes mellitus within 5 years of onset of hypothyroidism. The maximum period taken is 25 years. The mean duration between diagnosis of hypothyroidism and Type 2 diabetes is 8.85 ± 5.52 . The delay in the diagnosis of diabetes mellitus may be possible in these patients because hypothyroidism with raised TSH levels may mask the symptoms of diabetes mellitus and it may increase insulin sensitivity. Analysis of thyroid hormones showed that TSH levels were increased in almost all patients i.e., 95% (19 out of 20 patients). T3 levels and T4 levels were below

Table 1: Master chart depicting age onset of diabetes and hypothyroidism and age difference between both

I.P / O.P no.	Sex	Age	Age at diagnosis of Hypothyroidism	Age at diagnosis of Diabetes	The duration between these 2 disorders
6005	F	55	25	35	10
7042	F	38	33	34	1
7085	F	39	31	35	4
9842	M	50	25	43	18
10047	F	48	45	47	2
11052	F	70	63	68	5
12127	F	56	35	53	18
14143	F	50	30	35	5
15726	F	71	51	59	8
12756	F	53	38	33	5
27237	F	65	50	63	13
32756	F	70	50	69	19
33729	F	64	50	55	5
34123	F	55	53	52	3
47527	M	38	23	33	10
56734	F	39	31	37	6
62135	F	57	35	55	20
72134	M	70	40	58	18
82175	M	59	44	50	6
79639	M	50	47	49	1

normal majority of patients (13 below normal in 55% and T4 below normal 75%) in spite of taking an optimum dose of thyroid replacement therapy. It is reviewed in the literature that subclinical hypothyroidism is a common feature of diabetes mellitus and T3 levels are selectively increased in relation to hyperglycemia.^[7-10]

In our study selected hypothyroidism patients with type 2 Diabetes mellitus and who are on thyroid replacement therapy, still, show low levels of T4 in spite of optimum dose. Most probably this group of people may require higher doses of hormone replacement therapy. An interesting finding is noted in the family history of these patients that 5 patients had a family history of hypothyroidism but none had a history of diabetes. On the other hand, two patients having a family history of Diabetes mellitus had no history of hypothyroidism in their family members. It is concluded that the common hereditary factor for both diseases does not exist. Anyhow polyglandular autoimmune diseases (PGA) were not studied in this considering high-risk factors, in this group of patients, it is interestingly noted that hypertension is more common i.e., in 55% (11 patients). Complications like coronary artery disease are seen in the hypertension-associated group i.e., 45% (4 out of 11 patients) and 20% (4 out of 20

patients) in this study group. Whereas stroke CVA / T1A is seen in 22% (2 out of 11 patients) of those who are also hypertensive group and 10% (2 out of 20 patients) in this study group. It is considered that more morbidity either in the form of CAD and CVA is noted when hypertension is added as a risk factor. The common sharing risk factor is hyperlipidemia i.e., present in 80% com (16 out of 20 patients). Hence it is suggested that hyperlipidemia is having a stronger relation to complications in these patients. On review of lipid profile pattern total cholesterol is raised more than 250 mg in 5 patients and target level of LDL below 100mg is not seen in any patients even though on treatment. Hence lipid control may be a difficult problem in these subsets of patients. Any have control of hypothyroidism resulting in better glycemc and lipid control is not studied well and it is beyond the scope of this work. Interestingly one patient has presented with recurrent hypokalemic periodic paralysis. The correlation is not well explained in the literature, may be related to potassium channelopathy. All patients are on thyroxine replacement therapy. 16 patients are on oral hypoglycemic agents, 2 patients are on insulin + Oral hypoglycemic agents, 1 patient is only on a diabetic diet and 11 patients who have hypertension are on ACE inhibitors. HBA1c. Levels were estimated only in three patients, all of them have p

Table 2: Lab profile of T3, T4, TSH, FBS, PLBS of the patients

I.P / O.Pno.	T3 (mg/dl)	T4(μ g/dl)	TSH(μ IU/ml)	FBS (mg/dl)	PLBS (mg/dl)
6005	66.5	7.8	0.71	120	206
7042	35	1.8	16.2	152	178
7085	80	5.4	14.2	210	296
9842	30	3.5	20.5	110	150
10047	45	2.8	16.2	14.3	260
11052	59	0.8	10.4	11.6	194
12127	55	2.8	8.6	220	320
14143	85	5.8	10.2	166	210
15726	45	1.8	10.6	112	187
12756	105	6.4	6.2	112	210
27237	25	0.8	17.4	130	240
32756	30	4.0	20.0	157	248
33729	45.3	3.1	130.96	110	210
34123	40	4.0	19.6	200	265
47527	55.4	3.5	18.3	150	270
56734	50.3	3.6	12.9	130	245
62135	35.6	1.8	99.6	140	250
72134	55.7	2.8	99.6	140	200
82175	30	2.8	18.2	140	176
79639	45	2.8	20.2	116	200

Table 3: Age of the patient

Rural (Years)	No. of patients
30 - 39	4
40 - 49	2
50 - 59	9
60 - 69	2
70 -79	4

Table 4: Age of the patient at diagnosis of hypothyroidism

Rural (Years)	No. of patients
20 - 29	5
30 - 39	6
40 - 49	3
50 - 59	5
60 - 69	1

shown higher level i.e., >8. However, it may be a premature statement to say that control of Type 2 diabetes mellitus may be difficult in hypothyroidism. Large studies involving a greater number of patients followed for a number of years will definitely throw some light into the causation, interrelation,

or co-existence of two disorders.^[11] As both these disorders require lifelong therapy early recognition and diagnosis definitely help in the prevention and postponement of chronic complications thereby reducing morbidity and mortality.^[12] Hence annual screening is mandatory for both hypothyroid

Table 5: Age of the patient at diagnosis of type 2 diabetes

Rural (Years)	No. of patients
30 - 39	7
40 - 49	3
50 - 59	7
60 - 69	3

Table 6: Duration (in years) between the diagnosis of hypothyroidism and diabetes

Years	No. of patients
0 - 5	9
6 - 9	4
10 - 14	3
15 - 19	2
20 - 24	1
25 - 29	1

and diabetic patients, for their coexistence. Further advances in molecular biologic techniques, immunology and human genetics combined with rigorous epidemiological assessments should clarify these observations.

Conclusion

Hypothyroidism is more commonly seen in female diabetic patients. The onset of Type 2 Diabetes Mellitus in hypothyroid patients is seen within 5 years in the majority of patients. Type - II Diabetes Mellitus patients suffering from hypothyroidism may require higher doses of thyroid hormone. Hypothyroidism characterized by raised TSH with normal T3 is noted in 45% of patients; on the other hand, T4 level normal with TSH raised levels noted in 20% of patients suggests its sub-clinical presentation. Hypertension when associated as an added risk factor produces more morbidity. Hyperlipidemia is a common risk factor present in these bihormonal disorders with the increasing incidence of CVA and CAD. Annual Screening is mandatory in all hypothyroid patients for the early detection and treatment of diabetes mellitus, thereby to prevent and/or postpone the complications of diabetes, and all diabetes mellitus patients to undergo thyroid function screening (TFT) yearly for the early detection of thyroid dysfunction and thereby reducing the morbidity and mortality. Further studies are needed to show insight into the association of hypothyroidism and Type-2 Diabetes mellitus.

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