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Original Article

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Study of Thyroid Dysfunction in Type 2 Diabetes Mellitus Patients in Kr Hospital, Mysore

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Background: Diabetes mellitus and thyroid dysfunction are two common endocrine disorders. The unrecognized subclinical Thyroid dysfunction may adversely affect metabolic control and increase cardiovascular risk. Our aim was to investigate the prevalence and patterns of Thyroid dysfunction in patients with type 2 diabetes mellitus in an observational cross-sectional study. Screening for thyroid dysfunction in diabetic patients will allow early treatment of hypothyroidism. Thyroid hormones and insulin both are involved in cellular metabolism antagonistically. Therefore, excess or deficit of any one of them may result in metabolic derangement. Recently, interest has been raised for the influence of thyroid hormone action on insulin levels. Conflicting data are available on influence of insulin levels on thyroid dysfunction. The development of IR may also lead to many metabolic abnormalities.
Objective: Study of thyroid dysfunction in type 2 diabetes mellitus.
Methods: Data was collected from the Type 2 Diabetes mellitus patients who visited the OPD or got admitted at KR Hospital, Mysore medical college, Mysore.
The necessary blood tests, urine examination and imaging were done as per the proforma.
Results: In our study,16 out 100 patients had abnormal thyroid profile.7 patients have overt hypothyroidism,5 patients have subclinical hypothyroidism,3 have hyperthyroidism and 1 has subclinical hyperthyroidism. Our study has high Prevalence of Thyroid dysfunction in females among type 2 diabetes mellitus.
Conclusion: This study showed high prevalence of thyroid dysfunctions in patients of type 2 diabetes mellitus. Hence, we conclude that screening for thyroid dysfunction among patients with diabetes mellitus should be routinely performed, so as to recognize these dysfunctions early

Key Words: Diabetes mellitus, Hypothyroidism, Hyperthyroidism

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INTRODUCTION

One of the primary health problems presents globally which is assuming epidemic proportions is Diabetes Mellitus[1]. It was 366 million in 2011[2], 382 million in 2013[3], and 415 million in 2015[4]. It is estimated that it would increase by 2045 to 629 million[5], 4 out of 5 persons affected by diabetes mellitus are reported to be from low income and middle income countries. Globally, India is emerging as a leader in diabetes mellitus, with the maximum number of subjects with diabetes next only to China[6,7].

Several micro and macrovascular complications of diabetes arise with the increasing duration of diabetes and poor glycaemic control[8]. Globally, the most commonly prevalent endocrine disorders are Thyroid diseases. Around forty-two million people were estimated to be suffering from thyroid diseases in India. Thyroid disease has higher widespread among the diabetic population as compared to the population with normal individuals[9,10,11].

Diabetes mellitus is the most commonly occurring endocrine disorder with thyroid dysfunction being the second most common. Therefore, it is appropriate to evaluate the potential interrelationship between these two disease entities.Some of the factors like sedentary lifestyle, hypertension, dietary indiscretions, ethnicity and obesity are thought to be major contributions[12]. The association of thyroid dysfunction with type 2 DM is widely known and this study was first published in 1979[13,14]. The thyroid hormones directly controls insulin secretion. In hypothyroidism there is a reduction in glucose-induced insulin secretion by beta cells and catecholamines are increased in hyperthyroidism, and insulin resistance will be increased[15-17]. The DM influences the thyroid dysfunction in two sites, first at the level of hypothalamus by controlling TSH release and second at the peripheral tissues by converting T4 to T3[18,19]. It was reported that type 2 DM patients with subclinical hypothyroidism are at risk of complications like neuropathy and cardiovascular events[20]. Studies suggested that detection of subclinical hypothyroidism especially in type 2 DM is

required to avoid further complications. There are contradictory reports regarding the prevalence of thyroid dysfunction among normal and patients with type 2 DM[21]. Hence the study was designed to assess the status of thyroid function in type 2 DM.

AIM: Study of thyroid dysfunction in type 2 diabetes mellitus patients.

METHODS:

- This is a cross sectional-observational study carried out on type 2 diabetes mellitus patients who came to OPD or gotadmitted in the department of General medicine, KR Hospital, Mysore Medical College, Mysore, Karnataka. The study included 100 type 2 diabetes mellitus patients.
- Study Period: a period of one year between July 1st 2021 to June 30th 2022.

Inclusion criteria:

- Age group of more than 18 years.
- All patients with type 2 Diabetes mellitus.

Exclusion criteria:

- All those who had prior thyroid disorder and on treatment.
- Liver disorder
- Renal diseases

Sample size

- In the present study , sample size was calculated using the formula n= 4pq/d2

Institutional ethical committee approval has been taken after presenting the study to IEC. As per the inclusion and exclusion criteria subjects are enrolled in the study. All subjects included in the study has been explained the procedure and valid informed written consent was taken.

Data was collected from type 2 diabetes mellitus patients who came to OPD or got admitted in KR Hospital, Mysore medical college, Mysore. All patients fulfilling the inclusion criteria was interviewed as per proforma and a detailed clinical examination was done.

The necessary blood tests including Thyroid function tests, FBS, PPBS, HbA1C, urine examination and imaging were done as per the proforma.

Statistical analysis:

Data obtained from the study has been entered in excel sheets and analyzed using SPSS(Statistical package for social sciences) software version 2.0 and has been presented as descriptive statistics in the form of frequency, tables, figures and graphs.

- Descriptive statistics of the explanatory and outcome variables were calculated by mean, Standard deviation for quantitative variables, frequency and proportions for qualitative variables.

- Inferential statistics like
  -Chi-square test was applied for qualitative variables.
  -Independent sample t test will be applied to compare the quantitative variables between the groups.

- The level of significance is set at 5%.
  -A ‘p’ value of <0.05 is considered statistically significant.

RESULTS:

In the present study TFT, Lipid profile, FBS, PPBS and HbA1C ares studied among Type 2 Diabetes mellitus patients and their correlation and results observed has been tabulated as follows.

MEAN AGE GROUP AND DISTRIBUTION OF THE SUBJECTS BASED ON AGE GROUP

Table.No-1 –Gender and Mean Age Group Distribution

	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
Male	48	54.750	9.95842	1.43737	40.00	80.00
Female	52	59.0769	11.73038	1.62671	26.00	85.00
Total	100	57.000	11.07641	1.10764	26.00	85.00

In our study of 100 patients, the minimum age taken was 26 years and the maximum age taken was 85 years with a mean value of 57.0000 and standard deviation of 11.07.

Table.No-2-AGE DISTRIBUTION

AGE GROUPS	FREQUENCY	PERCENTAGE
18 to 40 yrs	2	2
41 to 50 yrs	32	32
51 to 60 yrs	28	28
>60 yrs	38	38
Total	100	100.0

Majority of patients were above 60 years of age

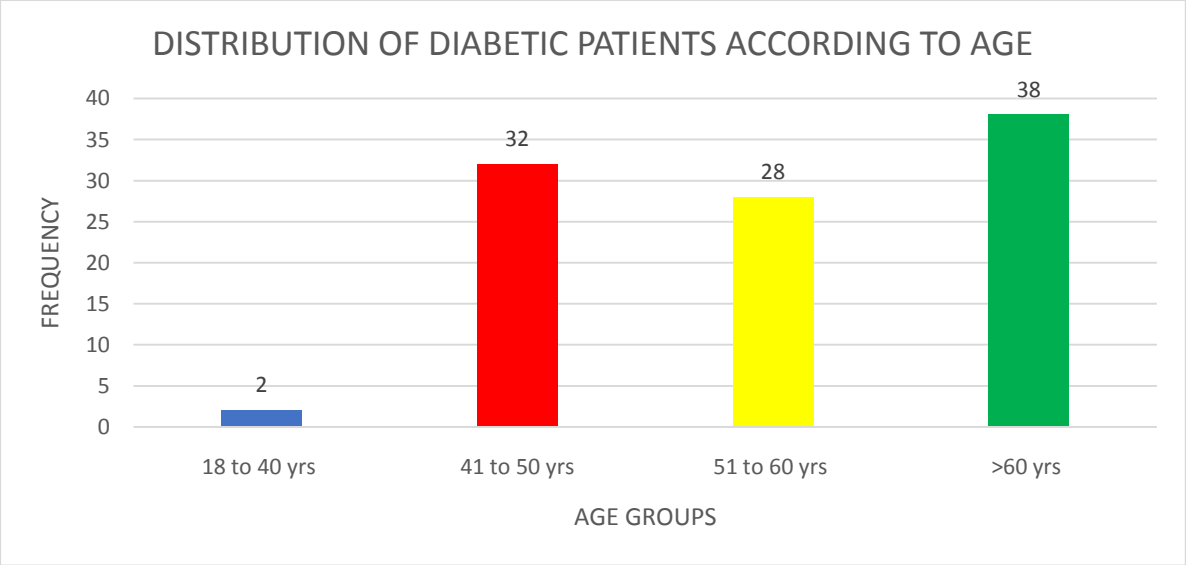

Figure.No-1-AGE DISTRIBUTION

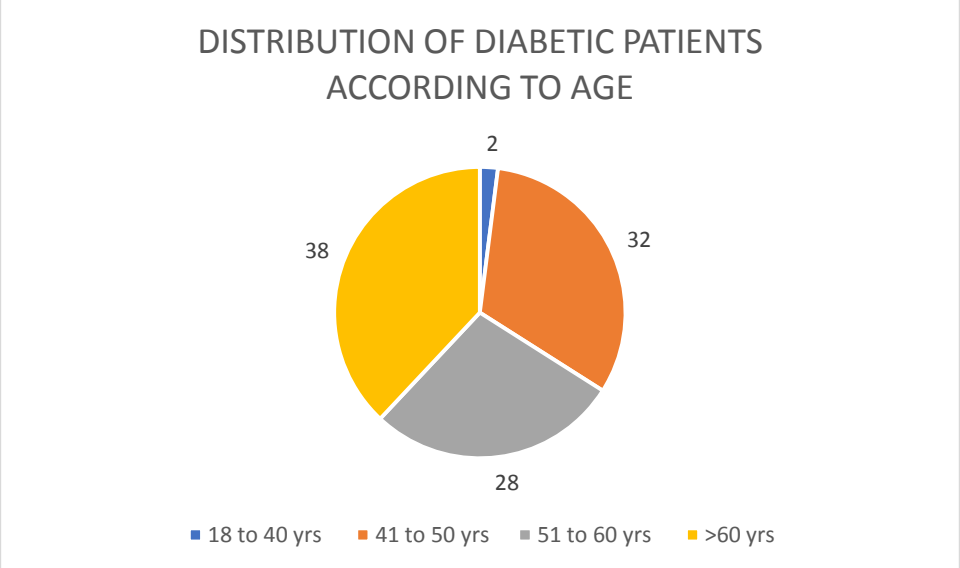

Figure No-2-AGE DISTRIBUTION

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.622	3	.202

Table No.3-Distribution of the Subjects Based On Gender

GENDER	Frequency	Percentage
Females	52	52
Males	48	48
Total	100	100

Our study had female predominance with 52% and male: female ratio of 12:13

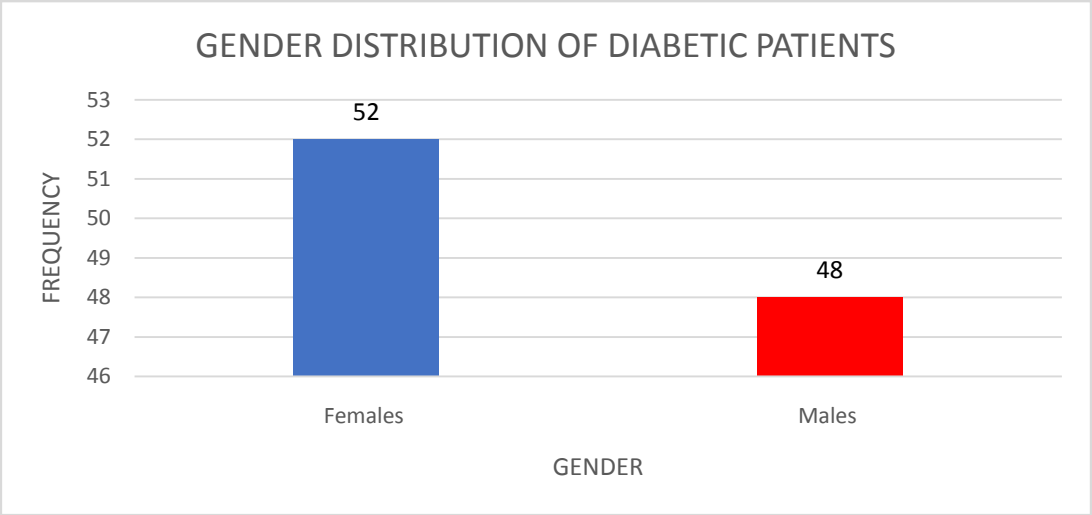

Figure No.3-GENDER DISTRIBUTION:

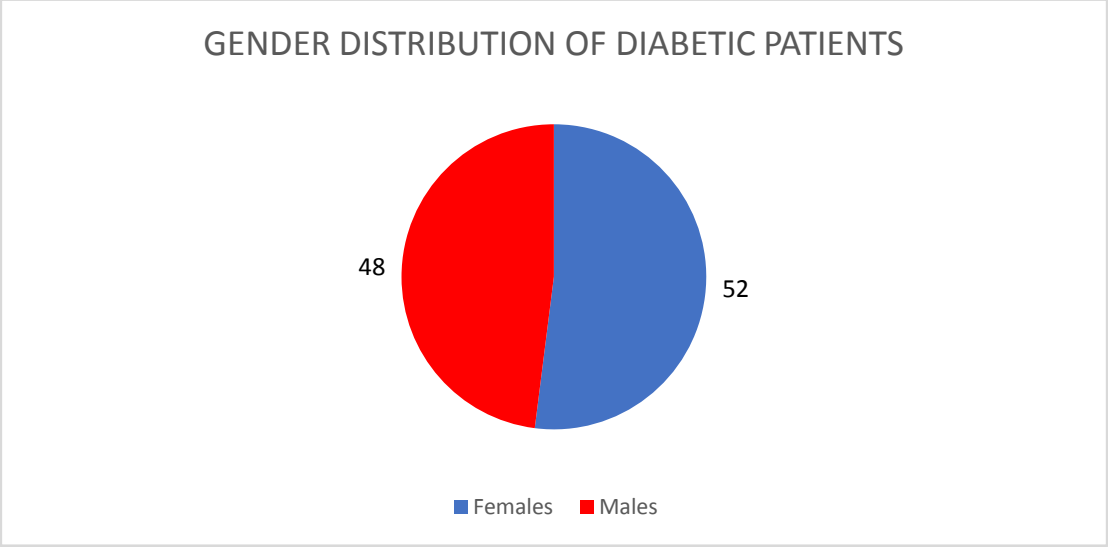

Figure No-4- GENDER DISTRIBUTION

Test Statistics

	ages	Sex
Chi-Square	30.240	.160
Df	3	1
Asymp. Sig.	.000	.689

Table No-4-DISTRIBUTION OF PATIENTS ACCORDING TO HbA1C LEVELS

HbA1C	Number of patients	Percentage
<7	26	26
>7	74	74
Total	100	100

In our study,74% patients have HbA1C level >7

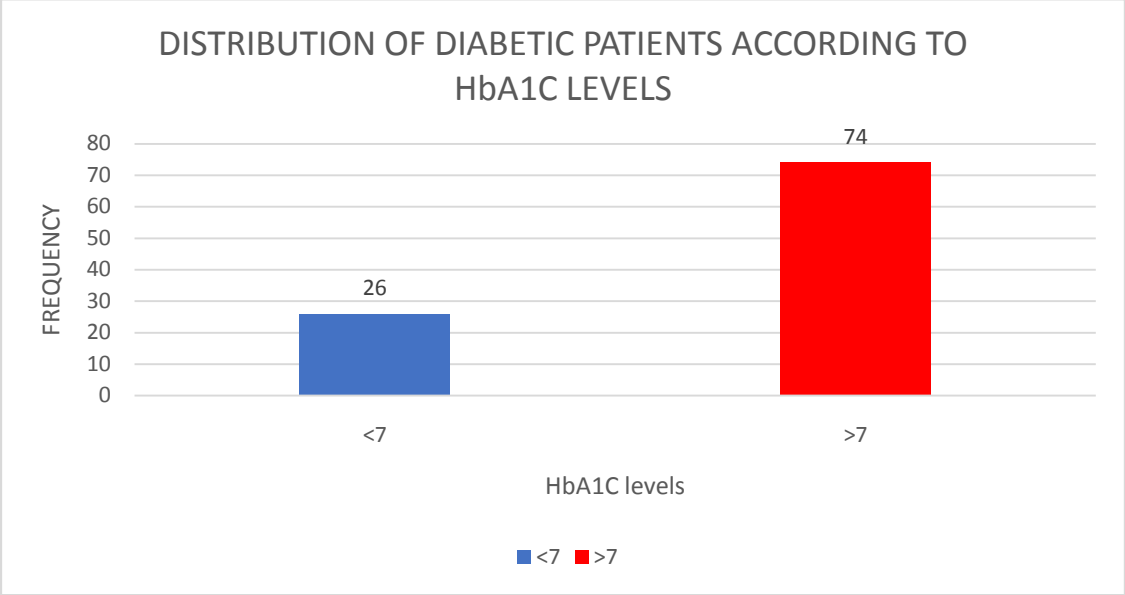

Figure No-5- Distribution of Patients According to Hba1c Levels

In our study,Majority of patient have HbA1C levels >7

Table No-5-Number of Patients with Thyroid Disorder

THYROID DISORDER	FREQUENCY	PERCENT
HYPOTHYROID	7	7
SUBCLINICAL HYPOTHYROID	5	5
HYPERTHYROID	3	3
SUBCLINICAL HYPERTHYROID	1	1
TOTAL	16	16

Our study has High Prevalence of Hypothyroid patients among type 2 diabetes mellitus

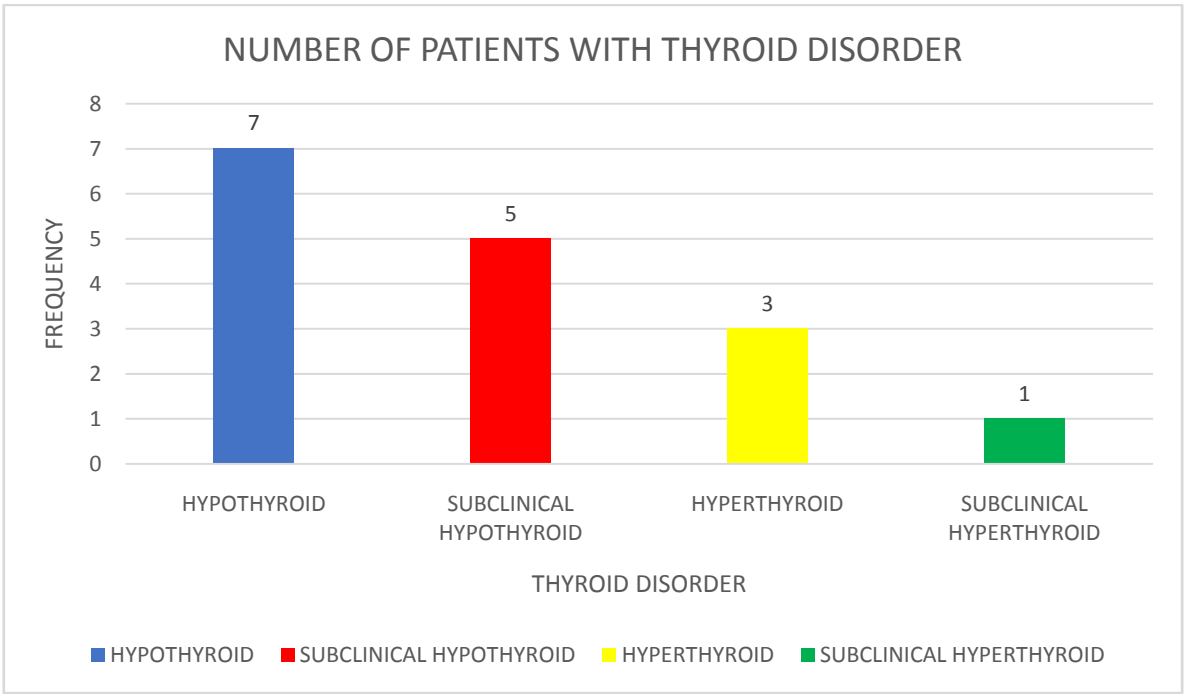

Figure No-6- Number of Patients with Thyroid Disorder

Table No-6-Gender Distribution of Thyroid Disorder Patients

	MALES	FEMALES	TOTAL
HYPOTHYROIDISM	2	5	7
SUBCLINICAL HYPOTHYROIDISM	1	4	5
HYPERTHYROIDISM	0	3	3
SUBCLINICAL HYPERTHYROIDISM	0	1	1
TOTAL	3	13	16

Our study has High Prevalence of Thyroid dysfunction in females among type 2 diabetes mellitus

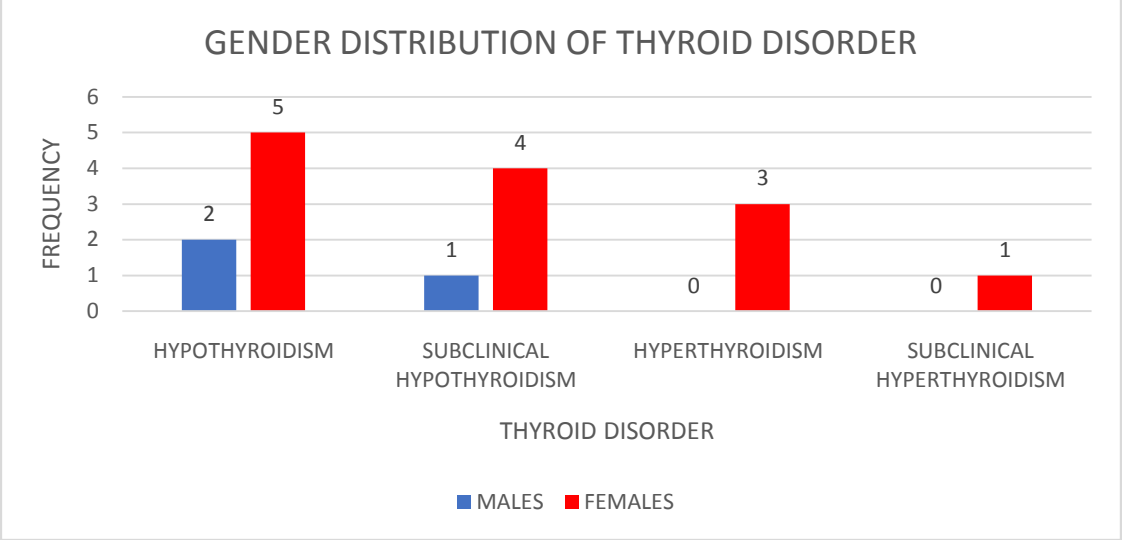

Figure No-7-Gender Distribution of Thyroid Dysfunction in Type 2 Diabetes

Table No-7-Thyroid Profile Versus Hba1c Levels

	NORMAL THYROID PROFILE	ABNORMAL THYROID PROFILE	**TOTAL**
HbA1C<7	26	2	28
HbA1C>7	58	14	72
TOTAL	84	16	100

In our study,Thyroid dysfunction is more when HbA1C levels are >7,which is statistically significant($p<0.05$)

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.864	2	.020

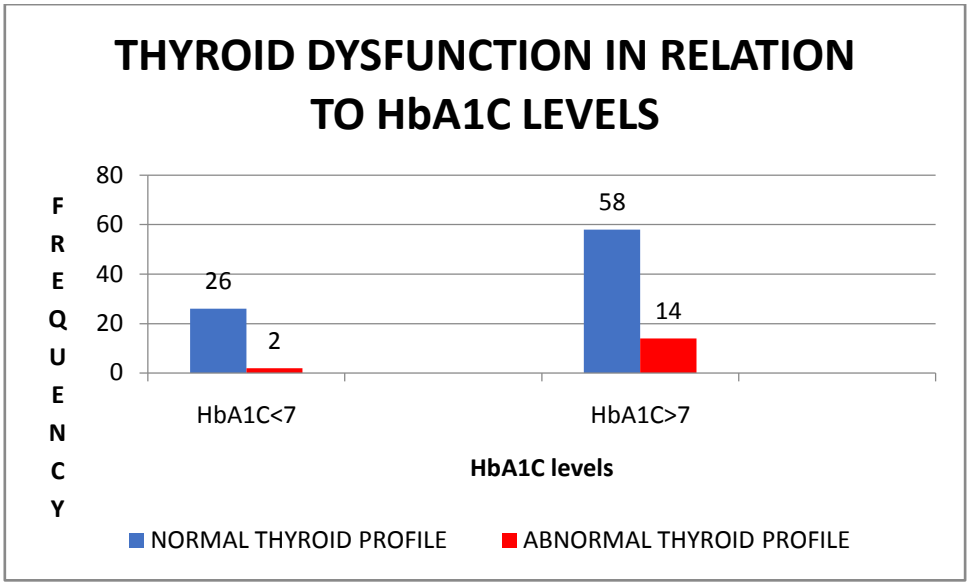

Figure No-8- Thyroid Profile Versus Hba1c Levels

In our study,Thyroid dysfunction is more when HbA1C levels are above 7

Table No-8-Thyroid Profile Versus Duration of Diabetes Mellitus

DM DURATION	NORMAL THYROID FUNCTION	ABNORMAL THYROID FUNCTION	TOTAL
DM <5 YEARS	32	2	34
DM 5-10 YEARS	45	3	48
DM >10 YEARS	7	11	18
TOTAL	84	16	100

In our study, as duration of Diabetes increases, Thyroid dysfunction is more which is statistically significant($p<0.05$)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	46.341	4	.000

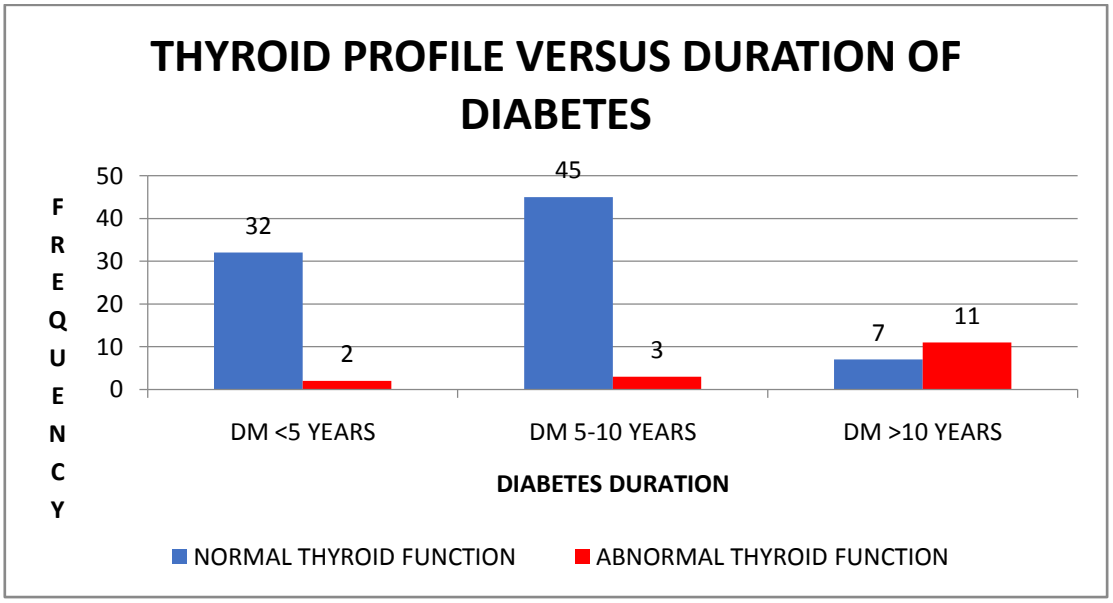

Figure No-9- Thyroid Profile Versus Duration of Diabetes

DISCUSSION

- Several studies have been done In India as well as abroad on thyroid dysfunction in type 2 diabetes mellitus patients.Patients might be having overt hypothyroidism or overt hyperthyroidism. Some patients will have

subclinical values.The various studies which have been done in our country and abroad have been reviewed in our study.

- A total of 100 patients with type 2 diabetes mellitus presented to opd or who got admitted in KRH from July 1st 2021 to June 30th 2022 were studied.
- Statistical data of age,gender,FBS,PPBS,HbA1C,thyroid function test,lipid profile were studied and compared with those published in literature

Table No-9-Comparison of Age and Sex Ratio between Different Studies in Thyroid Dysfunction in Type 2 Diabetes Mellitus Patients

Study	Number of patients	Mean age in years	Sex ratio
Present study	100	>60 years	12:13
Madhavaram Sreelatha et al Warangal Telangana	108	41- 50 years	2:3
Ravishankar S N et all Hosakote, Bangalore	100	51-60 years	1:1

In our study majority of patients were in the age group of >60 years and sex ratio of 12:13

As compared to study done by Madhavaram Sreelatha et all and Ravishankar S N et all,majority of patients were in age group of 41-50 years and 51-60 years respectively with sex ratio of 2:3 and 1:1 respectively.

Table No-10-Comparison of Thyroid Dysfunction in Type 2 Diabetes Mellitus Patients between Different Studies

STUDY	Number of patients	Hypothyroid patients	Subclinical hypothyroid patients	Hyperthyroid patients	Subclinical Hyperthyroid patients
PRESENT STUDY	100	7	5	3	1
Madhavaram Sreelatha et al	108	2	9	0	3
Ravishankar S N et all Hosakote,Bangalore	100	1	15	13	0

In our study, Prevalence of Overt hypothyroidism is higher among type 2 diabetic mellitus patients.
In studies conducted by Madhavaram Sreelatha et al and Ravishankar S N et all Hosakote,Bangalorealso showed prevalence of Subclinical hypothyroidism is higher among type 2 diabetes mellitus patients.

- In our study,16 out 100 patients had abnormal thyroid profile.7 patients have overt hypothyroidism,5 patients have subclinical hypothyroidism,3 have hyperthyroidism and 1 has subclinical hyperthyroidism.
- Study done by Madhavaram Sreelatha,Vsureshkumar,G Chandra sekhar, V Chandra sekhar of 108 patients over a period of 1 year showed prevalence of thyroid dysfunction among 108 patients was 14.Among them, 2 patients had overt hypothyroidism,9 patients had subclinical hypothyroidism and 3 patients had subclinical hyperthyroidism and non had overt hyperthyroidism.
- Study done by Ravishankar S N et all Hosakote, Bangaloreon 100 type 2 diabetic patients showed that 1 patient had overt hypothyroidism,15 had subclinical hypothyroidism and 13 patient had overt hyperthyroidism.

Table No-11-Thyroid Dysfunction in Relation to Duration of Diabetes between Different Studies

Study	Duration of DM	Number of patients	Thyroid disorder	Percentage
Present study	0-5 years 5-10 years >10 years	34 48 18	2 3 11	5.88% 6.25% 61.1%
Madhavaram Sreelatha et al Warangal Telangana	0-5 years 5-10 years >10 years	76 20 12	6 5 3	7.89% 25% 25%
Ravishankar S N et al Hosakote,Bangalore	0-5 years 5-10 years >10 years	54 36 10	18 10 1	33.3% 27.7.% 10%

- In our study, Thyroid dysfunction is more as duration of type 2 diabetes mellitus increases.
- Studies done by Madhavaram Sreelatha et al shows thyroid dysfunction is more as duration of diabetes increases.
- Studies done by Ravishankar S N et al shows that thyroid dysfunction is more among diabetics whose duration is less than 5 years.

CONCLUSION

1. This study showed high prevalence of thyroid dysfunctions in patients of type 2 diabetes mellitus. Hence, we conclude that screening for thyroid dysfunction among patients with diabetes mellitus should be routinely performed, so as to recognize these dysfunctions early. This will improve the quality of life and reduce the morbidity rate in them.
2. Thyroid dysfunction is more as duration of diabetes mellitus is higher especially hypothyroidism.Hence,regularly diabetic patients should be screened for thyroid dysfunction especially of diabetic patients with longer duration of diabetes.
3. Thyroiddysfunction is more when diabetes is uncontrolled especially when HbA1C >7.Hence,strict diabetic control is needed.
4. Hence type 2 diabetic patient should undergo the routine monitoring of blood sugar and thyroid profile so that any abnormalities can be identified and preventive measures along with interventions can be initiated at the earliest.

LIMITATIONS

- This Study is conducted in very small population further studies in larger population is recommended.
- Associated thyroid autoimmunity was not evaluated due to constraints.Hence, it was not able to refine the spectrum of Thyroid dysfunction in type 2 diabetes.
- Follow up study was not done.Hence the natural history of subcinicalthyoid dysfunction and its effect on various parameters could not be assessed.

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