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## PREFERRED SAMPLE FOR THYROID PROFILE IN DIABETIC PATIENTS

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**ABSTRACT:** Hypothyroidism and Hyperthyroidism are the two primary pathological conditions that involve the thyroid gland. Diabetic patients have a higher prevalence of thyroid disorders compared with the normal population. Accurate measurement of thyroid hormone concentrations is the key for proper diagnosis of thyroid gland dysfunction. This article is mainly focused on the effect of food on serum levels of Thyroid profile (TSH, FT3 and FT4) and preference of blood sample for Thyroid Profile in diabetic patients. An observational cross sectional study was done on 120 Diabetic patients attending OPD of our hospital for regular health checkup. Thyroid profile was done on the fasting and postprandial samples. The values of TSH, FT3 and FT4 in postprandial samples were decreased as compared to fasting samples which were significant statistically with p- value less than 0.05 in all the parameters. Hence from our study, it can be stated that Thyroid profile in fasting state would be more beneficial for proper diagnosis of thyroid disorders.

**INTRODUCTION:** Thyroid hormones play a critical role in the metabolism, growth, development and overall homeostasis of the body. The presence of thyroid hormones in optimal levels is essential for the normal functioning of almost all organ systems of the body<sup>1</sup>. Hypothyroidism and Hyperthyroidism are the two primary pathological conditions that involve the thyroid gland<sup>2</sup>. Diabetic patients have a higher prevalence of thyroid disorders compared with the normal population<sup>3</sup>. Laboratory testing of thyroid hormones is used to diagnose and document the presence of thyroid diseases.

Accurate measurement of thyroid hormone concentrations is the key for proper diagnosis of thyroid gland dysfunction<sup>2,4</sup>. Most commonly used biochemical parameters for assessing thyroid function are serum levels of Thyroid Stimulating Hormone (TSH), Total triiodothyronine (T3) or 3,5,3'-L- triiodothyronine, Total Thyroxine (T4) or 3,5,3', 5'- L-tetraiodothyronine, Free T3 (FT3) and Free T4(FT4). Usually TSH, T3, T4, FT3 and FT4 are measured from samples collected in fasting state.

Kamat V, Hecht WL and Rubin RT in their study published in 1995 concluded that ingestion of food can result in an acute decline of serum thyrotropin (TSH)<sup>5</sup>. Scobbo RR, Von Dohlen, Hassan M and Islam S in their study published in 2004 noted that the late morning non fasting TSH test values declined when compared to early morning fasting samples<sup>6</sup>. Rakesh Nair, Shriram Mahadevan, RS Muralidharan and S Madhavan in their study published in 2014 also stated that there is post

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prandial lowering of TSH levels<sup>7</sup>. In light of the above studies done on non diabetic patients, we conducted an observational study in diabetic patients attending the OPD of ESIC Medical College, Rajajinagara, Bengaluru to the know the effect of food on the Thyroid profile in diabetic patients. Thyroid profile refers here to TSH, FT3 and FT4.

**MATERIALS AND METHODS:** An observational cross sectional study was done on Diabetic patients attending OPD for regular Health Checkup in ESIC Medical College, Rajajinagara, Bengaluru with normal range blood sugar in fasting state and two hours post prandial state. The blood samples given by the patients for fasting and post prandial glucose was used to analyse serum TSH, FT3 and FT4 and because the analysis was done on already drawn sample, no consent was taken.

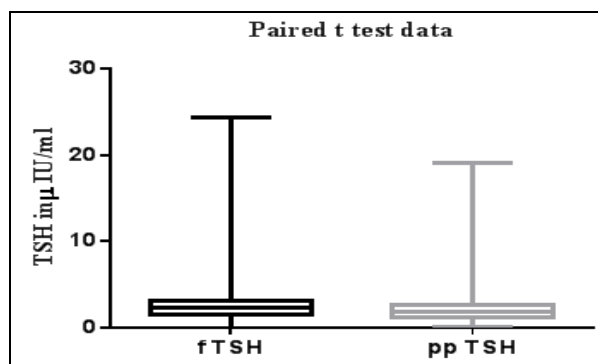
Age group of the patients was between 30 to 60 years. Out of 120 patients, 57 were males and 63 were females.

Serum levels of TSH, FT3 and FT4 were estimated using Chemiluminescent Immunoassay in automated Access-2 Hormone Analyser from Beckman Coulter. The data was analysed using Graph Pad Prism 6. The measured parameters were expressed as Mean  $\pm$  Standard deviation. The parameters were compared using paired 't' test at 5% level of significance. P value < 0.05 was considered statistically significant.

**RESULTS:** A total of 120 diabetic patients of age between 30 to 60 years with controlled sugars in fasting and post prandial state were involved in this study. The results obtained along with the graphs are as given below:

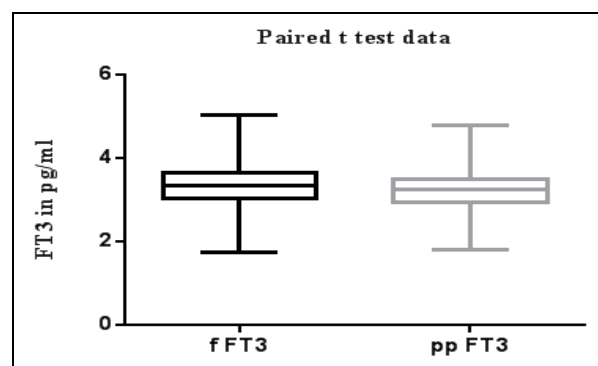
**TABLE 1: A TOTAL OF 120 DIABETIC PATIENTS OF AGE BETWEEN 30 TO 60 YEARS WITH CONTROLLED SUGARS IN FASTING AND POST PRANDIAL STATE**

Parameters	Fasting sample	Post prandial sample	P-value
TSH	2.94 $\pm$ 3.02	2.43 $\pm$ 2.38	0.0001
FT3	3.36 $\pm$ 0.47	3.23 $\pm$ 0.41	0.0001
FT4	0.90 $\pm$ 0.24	0.88 $\pm$ 0.22	0.02



**FIG. 1: SERUM TSH LEVEL**

The mean TSH levels in fasting state is 2.94 with a standard deviation of 3.02, the mean TSH in post prandial state is 2.43 with a standard deviation of 2.38 with p-value less than 0.0001.



**FIG. 2: SERUM FT3 LEVEL**

The mean FT3 levels in fasting state is 3.36 with a standard deviation of 0.47, the mean FT3 in post prandial state is 3.23 with a standard deviation of 0.41 with p-value less than 0.0001.

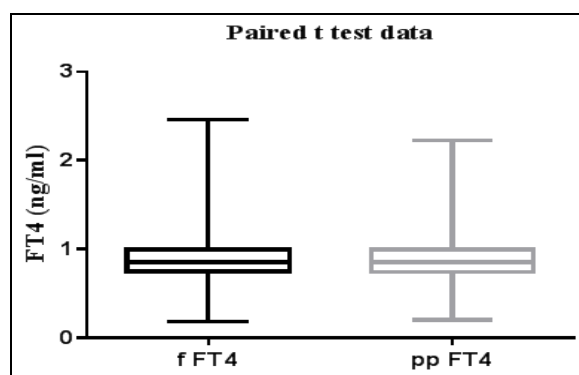


FIG. 3: SERUM FT4 LEVEL

The mean FT4 levels in fasting state is 0.90 with a standard deviation of 0.24, the mean FT4 in post prandial state is 0.88 with a standard deviation of 0.22 with p-value of 0.02.

**DISCUSSION:** Our study showed significant difference in serum levels of TSH, FT3 and FT4 between fasting state and postprandial state. This is in accordance with the other studies where in TSH values are decreased postprandially<sup>5, 6, 7</sup>. In our study, we also noted decrease in post prandial FT3 and FT4. It is a well known fact that thyroid hormones have a negative feedback action on TSH but decrease in all three parameters TSH, FT3 and FT4 after food intake is a contradictory finding. Diabetes may be a causative factor here but the probable mechanism with logical reason is difficult to postulate with our study.

Surks MI, Goswami G and Daniels GH in their study stated that TSH level varies throughout the day, with early morning values greater than later ones<sup>8</sup> attributing the decrease in TSH value to diurnal variations. Other studies attribute the decrease in TSH levels to intake of food<sup>5, 6, 7</sup>. In our study, the sample was taken two hours after breakfast, the reason for change in the level of TSH, FT3 and FT4 can be either due to food intake or due to diurnal variation or both. Kamath *et al.*,<sup>5</sup> in their study postulate that food induced elevation of somatostatin might be causing suppression of TSH secretion. Food intake not only increases Somatostatin but also increases insulin which also provoke a school of thought pertaining to the effect of insulin on TSH.

Majority of the south Indian food is carbohydrate rich which would cause an increase in release of insulin. Also, when any person is in fasting state, the serum insulin level will be minimal and in early morning fasting state, TSH level is more. A correlation study of serum TSH and insulin levels might establish an association in this context. The

extent of decrease in values of the above parameters with food may also vary with the type and volume of food being consumed and the magnitude of descent in the values may or may not be same every day.

A study demonstrating the extent and consistency of decrease in everyday values of parameters of Thyroid profile after food or with time would also help in better interpretation and use of Thyroid profile. Irrespective of the cause of decrease in TSH, FT3 and FT4 after food or due to diurnal variation, post prandial and late samples when analysed would lead to misinterpretation of Thyroid profile report.

Hence, early morning and fasting samples should be encouraged to maintain uniformity as almost all laboratories everywhere prefer early morning fasting samples for Thyroid profile. It is also supported by the studies where it is very essential for early diagnosis and treatment of subclinical Hypothyroidism where in fasting TSH levels led on to regrouping of patient's condition as subclinical Hypothyroidism when post prandial TSH levels had put them in Euthyroid state<sup>7</sup>.

**CONCLUSION:** Thyroid Profile, eventhough is being done from decades to diagnose, monitor and treat Thyroid dysfunction still does not clearly address few pre analytical variables like fasting state sample or random sample and timing of sample collection although studies support fasting sample. Universally for any parameter, fasting sample is preferred with some exceptions. From our study we would conclude that, it would be better to perform Thyroid Profile on an early morning fasting sample in Diabetic patients.

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**CONFLICT OF INTEREST:** The authors declare no conflict of interest.

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