

## THYROID STIMULATING HORMONE ASSAY AS A SCREENING TOOL OF THYROID DISEASE

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*Serum thyroid stimulating hormone (TSH) estimation is an ideal investigation for thyroid disease. It gives most comprehensive information about whether a patient has a thyroid disease and what is the cause. It has been frequently observed in clinical settings that complete profile of thyroid function tests is advised for screening and vague symptoms. Aims and objectives of current study were to assess the usefulness of TSH alone as a screening tool of thyroid disease. It also aimed at evaluating the extra information generated by analyzing fT<sub>3</sub> and fT<sub>4</sub> in screening. It was a prospective comparative cross sectional study. Adult patients referred for routine thyroid disease were selected for study. Their history was taken and detailed clinical examination was carried out. fT<sub>3</sub>, fT<sub>4</sub> and TSH were analyzed by chemiluminescence immunoassay. Results revealed that in % of cases with normal TSH, fT<sub>3</sub> and fT<sub>4</sub> remained normal. Likewise in 116 cases with normal fT<sub>3</sub> and fT<sub>4</sub>, TSH was abnormal leading to diagnosis of sub-clinical hypothyroidism in (88%) cases and sub-clinical hyperthyroidism in (28%) cases. In total of 213 abnormal TSH cases fT<sub>3</sub> was abnormal in 19 cases and fT<sub>4</sub> was abnormal in 87 cases. It was concluded that in cases with normal TSH values there is no need of fT<sub>3</sub> and fT<sub>4</sub>. Only patients with abnormal TSH merit detailed evaluation.*

**Key Words:** *Thyroid Stimulating Hormone, Thyroid Function Tests, Thyroid Screening.*

Thyroid dysfunction affects each and every system of the body and involves each and every speciality. Like wise symptoms of other organs of the body may mimic thyroid symptoms. This results in frequent advise of thyroid function test (TFT's) by the clinicians. More often than, result do not reveal any abnormality. Symptoms like weight loss or gain, tiredness, heat or cold intolerance, increased or decreased appetite and palpitation are quite non specific and not specifically attributable to thyroid disease. Goiter which is specific to thyroid may yield absolutely normal thyroid functions<sup>1</sup>.

Thyroid disorders are insidious in onset and fT<sub>3</sub> and fT<sub>4</sub> are maintained at their normal level at the cost of increased or decreased TSH. In the clinical setting of nonspecific and non-life threatening conditions TSH analysis should suffice. In iodine deficiency endemic areas the prevalence of thyroid disease is much more than in non-endemic areas.<sup>2</sup> Moreover due to the poor socioeconomic condition of local population there is a need of a single test to distinguish between diseased and healthy population.

Currently third and fourth generation TSH assays are available and their sensitivity is much

better than first generation assays.<sup>3</sup> Despite of this routine pattern of fT<sub>3</sub>, fT<sub>4</sub>, and TSH assays for screening is extensively practiced. There is doubt among clinicians that whether all these investigations are required for thyroid screening or other wise. Aims are objectives of current study were to assess usefulness of TSH alone for thyroid screening. It also aimed at comparing its diagnostic significance when performed with complete thyroid profile.

### MATERIALS AND METHODS

The study was performed at the department of endocrinology from January 2005 to December 2005. Patients reporting to endocrine department for thyroid function tests were selected for the study. All adult, nonpregnant, outdoor patient of either sex were selected. The tests requested by child specialist, gynecologist, tests of admitted patients and tests of patients who were known cases of any thyroid dysfunction were excluded from the study. Data of all the patients in whom TSH, fT<sub>4</sub> and fT<sub>3</sub> tests were ordered by clinicians during the period of study was collected. The TSH was performed using third generation immunometric assay by chemiluminescence, fT<sub>4</sub>

and fT<sub>3</sub> tests were performed by competitive analog assay chemiluminescence on Immulite 1000 hormone analyzer. The reference ranges were 0.4 - 4.0 mIU/L for TSH, 0.65 - 1.9 ng/dL for fT<sub>4</sub> and 1.5-4.1 ng/mL for fT<sub>3</sub>.<sup>4</sup> The diagnosis of primary hyperthyroidism was made when TSH was lower than and fT<sub>4</sub> or fT<sub>3</sub> were higher than reference ranges. The diagnosis of primary hypothyroidism was made when the TSH was higher than and fT<sub>4</sub> was lower than the reference range. The diagnosis of sub clinical hyperthyroidism was made when the TSH was lower than 0.1mIU/L and fT<sub>4</sub> was within the reference range.<sup>5</sup> The diagnosis of sub clinical hypothyroidism was made when the TSH was higher than 5 mIU/L and fT<sub>4</sub> was within reference range.<sup>6</sup> If the test result did not fit in to this combination the results were classified as discordant. Data was analyzed by using SPSS V 10.0.

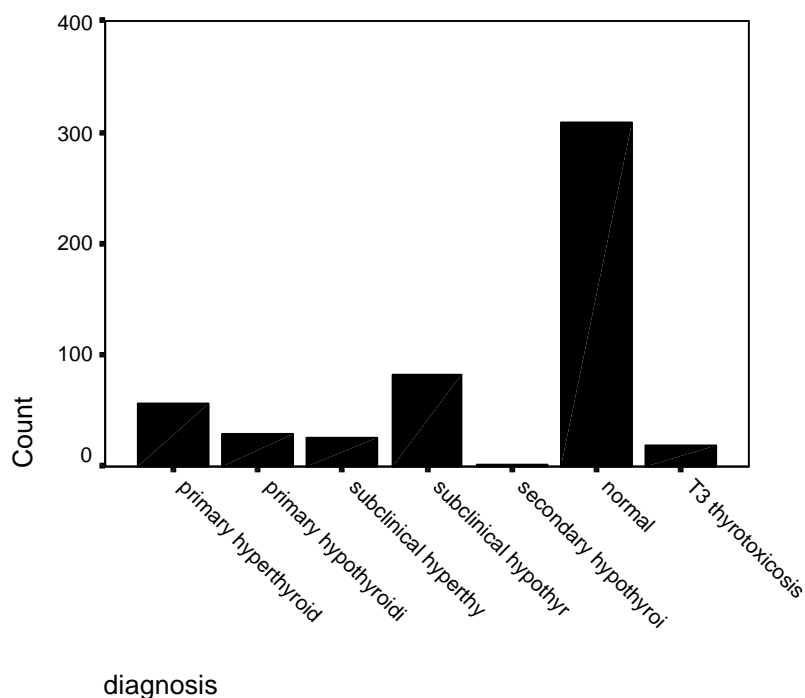
## RESULTS

A total of 522 (192 male, 330 female) patients were referred to endocrinology department for thyroid function tests. Out of these, 309 (59.2%) patients had normal TFTs and 213 (40.8%) patients had abnormal test results. Out of 213 patients with abnormal TFTs results 56 (10.7%) patients were diagnosed as the case of primary hyperthyroidism, 30 (5.7%) patients were diagnosed as primary

hypothyroidism, 25 (4.8%) patient were diagnosed as subclinical hyperthyroidism, 82 (15.7%) patients were diagnosed as subclinical hypothyroidism. One (0.05%) case was labeled as secondary hypothyroidism (Fig. 1). In 309 cases with normal TSH, fT<sub>3</sub> and fT<sub>4</sub> remained essentially within normal limits (Fig. 2). Likewise in 213 cases with abnormal TSH, fT<sub>3</sub> was abnormal in only 19 cases. While fT<sub>4</sub> was abnormal in 84 cases (Fig. 3). Results also revealed that fT<sub>4</sub> was not required as primary investigation in 417 cases while FT<sub>3</sub> was not required as primary investigation in 503 cases and by doing TSH assay which revealed normal results, fT<sub>3</sub> and fT<sub>4</sub> were normal, while out of 213 abnormal TSH results, fT<sub>3</sub> was abnormal in 19 cases and fT<sub>4</sub> was abnormal in 87 cases.

## DISCUSSION

Thyroid function is the most frequently advised Endocrine investigation Meticulous and systematic use of this investigation is required to get the same information in minimum efforts and cost. TSH screening with thyroid and fourth generation assay has minimum the need of complete thyroid profile for screening. Although many public service laboratories has free service to choose already follow the protocol of the performing TSH, assay above irrespective of advice. In established thyroid disease, known more



**Fig 1:** Clinical diagnosis in cases analyzed for thyroid function tests.

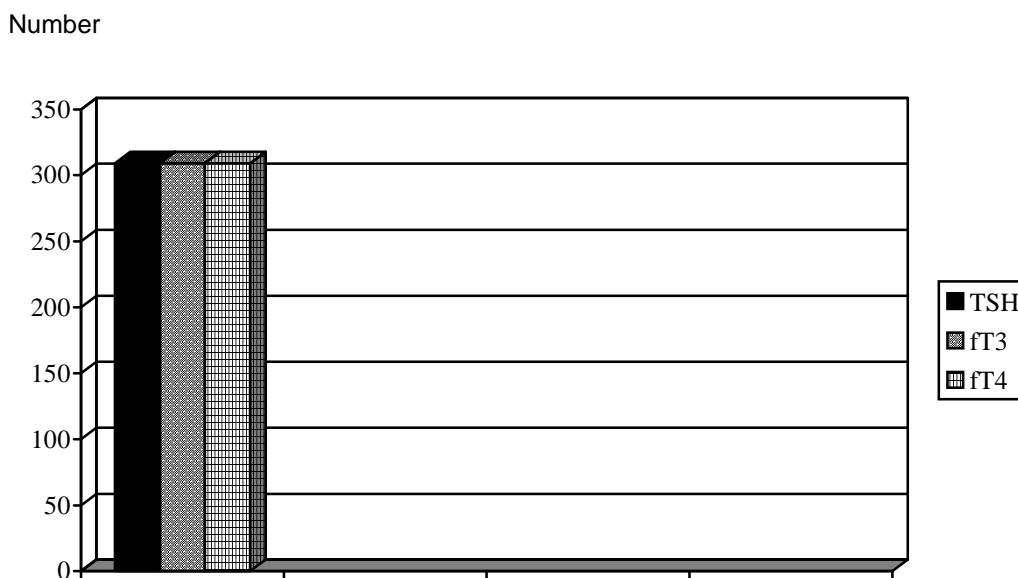


Fig 2: Normal fT3 and fT4 in cases with normal TSH.

frequent changes in FT3 and FT4. in expected compared to screening population. In Europe most of labs make TSH as its gold standard irrespective of whether it is screening, diagnosis or monitoring with ultra sensitive TSH results of up to 0.001 mIU/ml, TSH essay may specific in majority of climb tale.<sup>7</sup>

The United Kingdom guidelines for use of thyroid function tests also revealed that TSH assay alone was sufficient to yield same information of complete thyroid function tests.<sup>8</sup> The only handicap is because of longer negative feed back effect; TSH values take longer to to change ascendancy to changes in fT3 and fT4 value. It is recommended that in thyroid crisis or in emergency indoor patients only complete thyroid profile may be appropriate other wise in cold cases, where TSH essays are available within a few days, we should always screen with TSH alone, followed by fT4 or fT3 as clinically indicated in selected cases. This will steam live thyroid investigation and simplify diagnosis with increasing extra cost.<sup>9</sup> TSH screening of newborn has already been included in neonatal screening programs in the developed world. With increase in

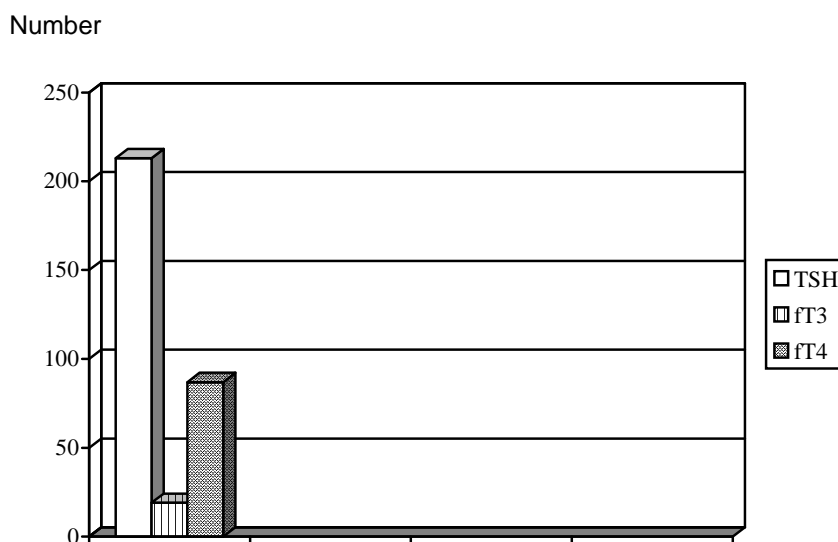


Fig 3: Normal fT3 and fT4 in cases with abnormal TSH.

clinical acumen and knowledge about thyroid disease clinical utility of this assay can be enhanced. TSH assay, which is available in the stat mode in most tertiary care laboratories, should be utilized. In cases of abnormal TSH values, nature and cause of thyroid disease should be investigated according to severity of the condition.

It is **Concluded** that to know whether a patient has thyroid diseased or not ultra sensitive TSH assay is sufficient for all practical purposes. However complete profile is required in cases with abnormal TSH values.

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