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RATIONAL THYROID SCREENING BY THYROID STIMULATING HORMONE ASSAY

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ABSTRACT
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 evaluated the extra information generated by analysing fT3 and fT4 during 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. FT3, fT4 and TSH were analysed by chemiluminescence immunoassay. Results revealed that in 100% cases with normal TSH, fT3 and fT4 remained normal. Likewise in 107 cases with normal fT3 and fT4, TSH was abnormal leading to the diagnosis of sub-clinical hypothyroidism in 82 cases and sub-clinical hyperthyroidism in 25 cases. In a total of 213 abnormal TSH cases fT3 was abnormal 19 and fT4 was abnormal in 87. It was ***concluded*** *that in cases with normal TSH levels there is no need of fT3 and fT4. Only patients with abnormal TSH merit detailed evaluation.*

INTRODUCTION

Thyroid dysfunction affects each system of the body and involves each specialty. Likewise symptoms of other organs of the body may mimic thyroid symptoms. This results in frequent advise of thyroid function tests (TFT's) by the clinicians. More often than not, results do not reveal any abnormality. Symptoms like weight loss or gain, tiredness, heat or cold intolerance, increased or decreeased appetite and palpitation are quite non specific and not specifically attributable to thyroid disease. Goiter being specific to thyroid may yield normal thyroid functions.[1]

Thyroid disorders are insidious in onset and fT3 and fT4 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.[2] In addition due to rather poor socioeconomic condition of local population there is a need for 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.[3] Despite the routine pattern of fT3, fT4, and TSH assays for screening is commonly followed. There is some doubt among clinicians that if all these investigations are required for thyroid screening or not. The purpose of the current study was to assess usefulness of TSH alone for thyroid screening. It also compared 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 endocrinology department for thyroid function tests, were selected for the study. All adult, non-pregnant, outdoor patients of either sex were selected. The tests requested by gynaecologist, 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, fT4 and fT3 tests were ordered by clinicians during the period of study was collected. The TSH was performed using third generation immunometric assay by chemiluminescence, fT4 and fT3 tests were performed by competitive analog chemiluminescence assay on Immulite 1000 hormone analyser. The reference ranges used were 0.4 - 4.0 mIU/L for TSH, 0.65 – 2.3 ng/dL for FT4 and 1.5-4.1 ng/mL for fT3.[4] The diagnosis of primary hyperthyroidism was made when TSH was lower than and fT4 or fT3 were higher than reference ranges.[5] The

diagnosis of primary hypothyroidism was made when the TSH was higher than and fT4 was lower than the reference range. The diagnosis of sub clinical hyperthyroidism was made when the TSH was lower than 0.1mIU/L and fT4 was within the reference range[1]. The diagnosis of sub clinical hypothyroidism was made when the TSH was higher than 5 mIU/L and fT4 was within reference range.[6] If the test result did not fit into this combination the results were classified as discordant. Data was analysed by using SPSS version 10.0 computer software.

RESULTS

A total of 522 (192 male, 330 female) patients were referred to endocrinology department for thyroid function tests. Among these, 309 (59.2%) patients had normal TFTs and 213 (40.8%) had abnormal test results. Out of 213 patients with abnormal TFTs, results 56 (10.7%) were diagnosed as primary hyperthyroidism, 30 (5.7%) were diagnosed as primary hypothyroidism, 25 (4.8%) as subclinical hyperthyroidism, 82 (15.7%) were diagnosed as subclinical hypothyroidism, one (0.05%) was labelled as secondary hypothyroidism (Fig. 1). In 309 cases with normal TSH, fT3 and fT4 remained

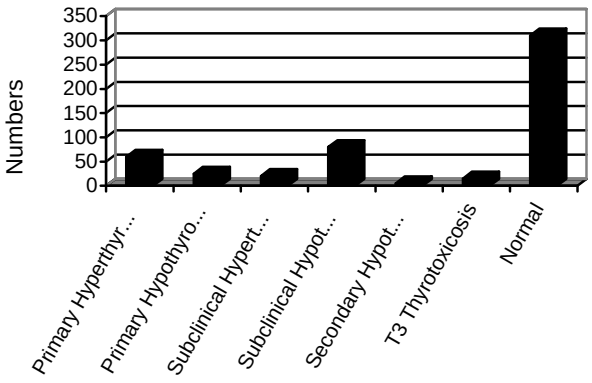

Fig 1: *Clinical diagnosis in cases analyzed for thyroid function tests.*

essentially within normal limits (Fig. 2), likewise in 213 cases with abnormal TSH, fT3 was abnormal in only 19 cases, while fT4 was abnormal in 84 cases (Fig. 3). Results also revealed that fT4 was not required as a primary investigation in 417 cases whereas fT3 was not required as primary investigation in 503 cases. By doing only TSH assay which revealed normal results, fT3 and fT4 were also normal, and out of 213 abnormal TSH results, fT3 was normal in 19 and fT4 was normal in 87 results.

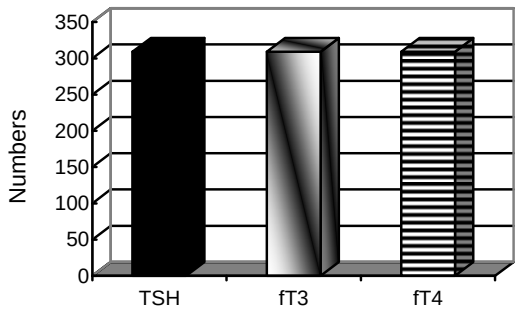

Fig 2: *fT3 and fT4 in cases with normal TSH.*

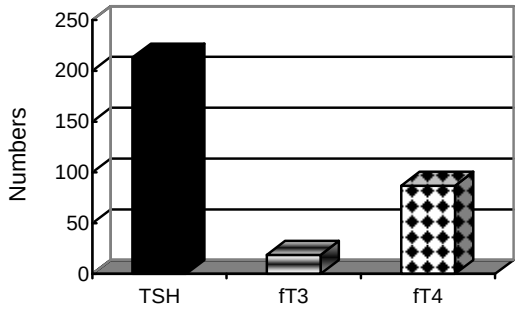

Fig 3: *Abnormal fT3 and fT4 in cases with abnormal TSH.*

DISCUSSION

Thyroid function is the most frequently advised endocrine investigation in clinical practice. Meticulous and systematic use of this investigation is required to get the same information with minimum efforts and cost. TSH screening with third and fourth generation assay has minimised the need of complete thyroid profile for screening. Although many public service laboratories providing free community service already follow the protocol of the performing TSH assay alone irrespective of advice. In established thyroid disease, more frequent changes in FT3 and FT4 are expected compared to screening population. In Europe most of labs make TSH as its gold standard irrespective of screening, diagnosis or monitoring with ultra sensitive TSH results of up to 0.001 mIu/ml. TSH assay may suffice in majority of the patients.[7]

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.[8] The only handicap is because of longer negative feed back effect; TSH values take longer to change contrary to changes in fT3 and fT4 values. It is recommended that in thyroid crisis or among emergency indoor patients only complete thyroid profile may be

appropriate otherwise in cold cases, TSH essays are available within days. So we should always screen using TSH alone, followed by fT4 or fT3 as clinically indicated in selected cases. This will streamline thyroid investigation and simplify diagnosis without increasing the cost.[9] TSH screening of newborn has already been included in neonatal screening programs in the developed world. With increase in 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 the severity of the condition.

It is **concluded** that whether a patient has thyroid diseased or otherwise ultra sensitive TSH assay is sufficient for all practical purposes. However complete profile is required in cases of abnormal TSH values.

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