

Serum TSH Concentration as a Predictor of Thyroid Malignancy in Patients with Thyroid Nodules

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Conflict of interest: Nil

Abstract:

Introduction: Though frequent, thyroid nodules seldom cause cancer. Blood TSH levels can distinguish benign from malignant nodules. TSH levels are tested for thyroid cancer detection in this study.

Methodology: The prospective observational study was conducted in Konaseema Institute of Medical Sciences and Research Foundation, Amalapuram, Andhra Pradesh from December 2022 to December 2023 in 100 patients with thyroid nodule. Serum TSH levels, ultrasonography and histological findings were collected.

Results: Of the participants, 20 had thyroid cancer, predominantly women, with an older average age in malignant cases. Higher TSH levels were linked to cancer, especially in papillary and follicular types.

Conclusion: The data support utilizing serum TSH as a thyroid cancer biomarker in thyroid nodule patients, emphasizing its significance in early diagnosis.

Keywords: Serum Thyroid-Stimulating Hormone, Thyroid nodules, thyroid cancer, papillary and follicular cancer

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Introduction

Thyroid nodules are common in healthcare and impact many people worldwide. Most thyroid gland forms are benign, but a minority may be cancerous, highlighting the need for accurate thyroid nodule diagnosis [1]. TSH levels may indicate thyroid cancer risk in thyroid nodule patients, according to recent studies. This study investigates whether blood TSH levels predict malignancy in these nodules. Thyroid hormones regulate metabolism in the endocrine system [2]. TSH, produced by the pituitary gland, regulates hormone synthesis and activity. Due to its effect on thyroid cell proliferation, elevated serum TSH levels may indicate cancer risk in thyroid nodule patients [3].

Investigating the use of serum TSH levels to predict thyroid cancer involves a comprehensive analysis of the pathological link between TSH and the onset and malignancy of thyroid nodules [4]. This requires examining current epidemiological evidence, and clinical trials, and incorporating TSH-level evaluations with other diagnostic tools,

such as ultrasound, fine-needle aspiration biopsy, and genetic testing [5].

The study will conduct a detailed examination of the role of serum TSH levels in indicating cancer risk in individuals with thyroid nodules, with a focus on the relationship between TSH levels and the progression of thyroid cancer [6]. It will assess the effectiveness of measuring serum TSH levels in distinguishing between noncancerous and cancerous nodules, considering various clinical and pathological aspects. The research aims to pinpoint the specific serum TSH concentration that most reliably indicates thyroid cancer risk. Integrating serum TSH measurements with additional diagnostic methods is crucial to improve the accuracy of diagnosing thyroid nodules [7,8].

Furthermore, the study will investigate the biological processes connecting serum TSH levels with the development of thyroid nodules, thus enhancing our comprehension of thyroid cancer's pathogenesis and aiding in the creation of focused

treatment approaches. The aim is to establish serum TSH as a reliable, non-invasive marker for the early detection and individualized treatment of thyroid cancer, ultimately advancing patient care and outcomes [9].

Material and Methodology

Research Design and Location: This forward-looking observational study was conducted from December 2022 to December 2023 at the Konaseema Institute of Medical Sciences and Research Foundation in Amalapuram, Andhra Pradesh..

Study Cohort: The study enrolled 100 individuals with thyroid nodules within the research timeframe.

Inclusion Criteria:

- Male and female subjects aged 15 years and older.
- Patients identified with thyroid nodules through ultrasound examination.
- Participants who have not undergone any thyroid-specific medical intervention before the initial TSH assessment.

Exclusion Criteria:

- Individuals who have had a thyroidectomy or similar surgical interventions.
- Patients currently receiving thyroid hormone or antithyroid medication treatments.
- Subjects with a prior diagnosis of thyroid cancer, Graves' disease, Hashimoto's thyroiditis, or secondary malignant growths in the thyroid.

Data Gathering Techniques: The study will collect data on the demographics, medical history, results of physical examinations, and ultrasound characteristics of the nodules of participants. Initial serum TSH levels will be documented before the commencement of any diagnostic or treatment procedures.

Diagnostic Approach: Thyroid nodules will be classified using fine-needle aspiration cytology (FNAC) and the Bethesda System for Reporting Thyroid Cytopathology.

Monitoring Plan: Patients will be evaluated for surgical procedures, thyroid cancer histopathology and serum TSH variations throughout the study.

Statistical Methods: Statistical programs were used to analyze the data, displaying statistics as mean \pm standard deviation and qualitative information as frequencies and percentages. Pearson's correlation coefficient determined the relationship between blood TSH levels and thyroid nodule pathology, with a p-value < 0.05 indicating statistical significance.

Ethical Considerations: The Konaseema Institute of Medical Sciences and Research Foundation Institutional Ethics Committee gave ethical clearance and informed consent was collected from all the subjects before data collection.

Results

In the conducted prospective study, 100 subjects with thyroid nodules were examined, and histological evaluation confirmed cancer in 20 instances. According to Table 1, 82% of the participants were female, while males made up 18%. The average age of the study group was 39.06 years; however, the mean age for those with cancerous nodules was higher at 44.5 years, suggesting a correlation between advancing age and the occurrence of cancer, as depicted in Table 2. Analysis of the size of the nodules, presented in Table 3, found that nodules exceeding 3 cm were prevalent. Histological examination uncovered several types of nodules, with papillary carcinoma being the predominant malignant form.

The study examined thyroid cancer risk and serum TSH levels. Table 4 shows that malignant nodules had higher mean serum TSH levels than noncancerous nodules. Graphs showed that patients with malignant nodules, notably papillary and follicular carcinomas, had higher serum TSH levels and were more likely to develop thyroid cancer. These visual aids show nodule diameters, the association involving serum TSH levels and nodule pathology, and the differences in TSH levels between thyroid cancer types, which are important for assessing serum TSH's diagnostic accuracy.

The study found a strong link between elevated blood TSH levels and thyroid cancer in thyroid nodule patients, recommending serum TSH as an efficient risk indicator.

Table 1: Demographic Distribution of Patients

Gender	Number of Patients	Percentage
Male	18	18%
Female	82	82%
Total	100	100%

Table 2: Age Distribution of Patients

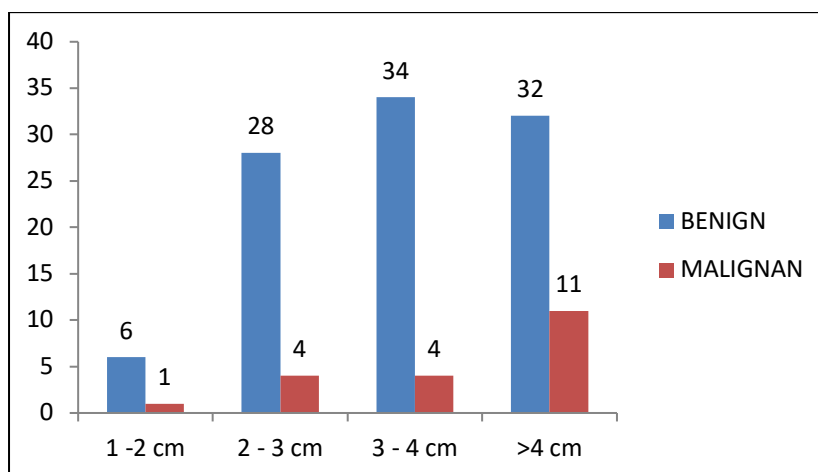
Description	Mean Age (Years)
Overall Population	39.06
Malignancy Cases	44.5

Table 3: Nodule Size and Histopathological Outcomes

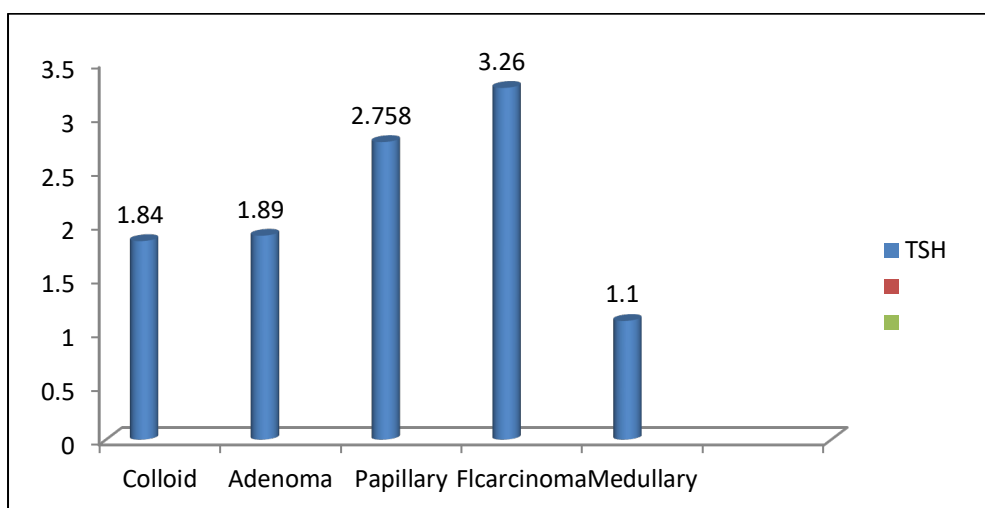
Nodule Size (cm)	Number of Cases	Malignancy Cases
<2	8	-
2-3	24	-
3-4	35	-
>4	33	-

Table 4: Serum TSH Levels and Histopathological Findings

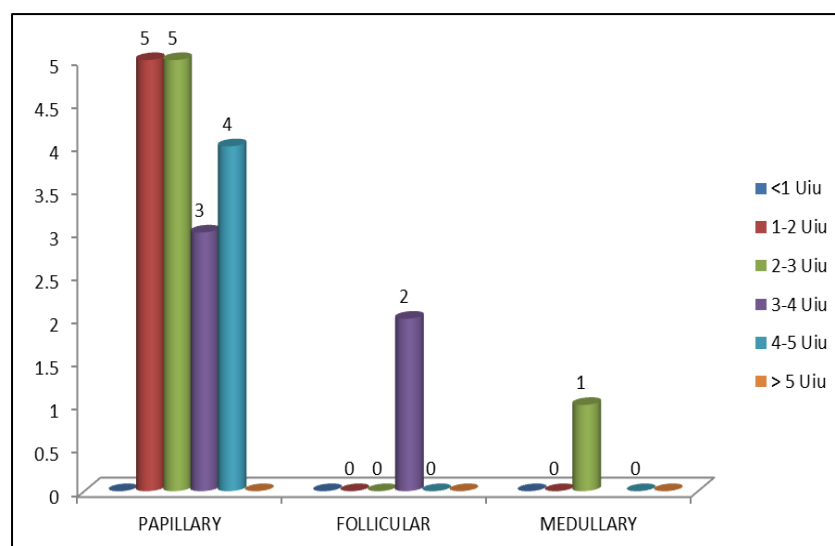
Histopathological Type	Average Serum TSH (uIU/ml)
Colloid Goiter	1.84
Adenoma	1.89
Papillary Carcinoma	2.758
Follicular Carcinoma	3.26
Medullary Carcinoma	1.1



Graph 1: Showing comparison between benign and malignancy.



Graph 2: TSH relation with post-operative biopsy.



Graph 3: TSH levels in various carcinomas.

Discussion

Clinically, enlarged thyroids are common and used to detect thyroid cancer, which may require surgery. Thyroid cancer is the most common endocrine malignancy and is rising [10]. This malignancy frequently has a solitary nodule or a prominent nodule in a gland with many nodules. Physical exams cannot usually distinguish benign from malignant thyroid nodules; hence they must be distinguished [11,12].

The study emphasizes the need to identify potential signs of increased cancer risk in thyroid nodules. Factors contributing to a heightened cancer risk include exposure to radiation in childhood, typically linked to papillary carcinoma, and environmental factors such as dietary intake of iodine, retinol, and vitamin E, which are associated with elevated cancer risks [13]. Age is also a critical factor; the likelihood of cancer escalates notably in individuals under 20 or over 70. Conditions like familial polyposis coli, Gardner's syndrome, and Cowden's syndrome are linked to medullary thyroid cancer. Clinical indicators of potential malignancy encompass hard, fixed nodules, large nodules with enlarged neck lymph nodes, rapid nodule enlargement, changes in voice, difficulties in swallowing, and respiratory issues [14,15,16].

Sonographic characteristics suggestive of cancer include central nodule vascularity, microcalcifications, uneven borders, and extension into adjacent structures. Ultrasound is superior to physical examination in detecting swollen cervical lymph nodes, underscoring its essential role in assessing thyroid cancer risk [17]. This research points out the diagnostic complexities and the need for a holistic approach in evaluating thyroid nodules, combining radiological, clinical, and

historical information to ensure precise diagnosis and treatment strategy [18,19].

Conclusion

A study of 100 thyroid nodule patients found a robust correlation between elevated serum TSH levels and thyroid cancer, especially in older women and those with nodules larger than 3 cm. Increased TSH levels were more common in thyroid cancer patients, suggesting that TSH may be a useful risk marker, especially in individuals with bigger nodules. The study supports utilising serum TSH to detect and treat thyroid cancer early, potentially improving patient care and outcomes.

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