RESEARCH PAPER

Association of Renal Parameter and Serum Electrolytes in Sub Clinical Hypothyroidism Patients

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ABSTRACT

Background:

Subclinical hypothyroidism is a common endocrine disorder characterized by elevated serum thyroid-stimulating hormone levels with normal thyroxine levels. Thyroid hormones play a vital role in metabolism and hematopoiesis, and their deficiency may lead to alterations in iron status and hematological parameters, often resulting in anemia.

Aim:

To assess the renal parameters and serum electrolytes in subclinical hypothyroidism patients.

Methods:

A retrospective study was conducted including 200 newly diagnosed, untreated patients with subclinical hypothyroidism and 200 healthy euthyroid individuals. Hematological parameters such as hemoglobin, red blood cell indices, and serum ferritin levels were assessed and compared between the two groups. Statistical analysis was performed using Student's t-test, with a p-value <0.05 considered significant.

Results:

The study revealed that hemoglobin levels, serum ferritin, and red blood cell indices were significantly reduced in patients with subclinical hypothyroidism compared to the euthyroid control group. Additionally, 18.22% of patients with subclinical hypothyroidism were found to have iron deficiency anemia, with many showing hemoglobin levels below 10 g/dL.

Conclusion:

Iron deficiency anemia is commonly associated with subclinical hypothyroidism. Early detection and routine investigation of iron status in such patients are essential for timely management and prevention of progression to overt hypothyroidism.

Key words: Subclinical Hypothyroidism, serum creatinine urea, serum electrolytes, Hematological Parameters etc.

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INTRODUCTION:-

The thyroid gland plays a crucial role in maintaining the metabolic and physiological balance of the body through the secretion of thyroid hormones, namely triiodothyronine (T3) and thyroxine (T4). These hormones significantly influence the function of various organs, including the kidneys. The interaction between thyroid function and renal physiology has been well established, as thyroid hormones regulate renal blood flow, glomerular filtration rate (GFR), and electrolyte balance[1]

The thyroid gland and kidneys are closely interrelated organs, and their functions influence each other significantly. Thyroid hormones play an important role in maintaining normal renal physiology through both direct and indirect mechanisms. Indirectly, thyroid hormones affect renal function by regulating cardiovascular dynamics, including cardiac output and renal blood flow (RBF). Directly, they influence the glomerular filtration rate (GFR), which is a key indicator of kidney function. [2].

Previous studies have reported elevated levels of biochemical markers such as serum urea, creatinine, and uric acid in patients with hypothyroidism. Some studies have also indicated an association between hypothyroidism and hyperuricemia, which may predispose individuals to gout. However, limited data are available regarding the impact of hypothyroidism on renal function, particularly in sub clinical cases[3]

Hypothyroidism is characterized by reduced levels of thyroid hormones, leading to a generalized slowing of metabolic processes. This condition is associated with decreased renal blood flow, reduced GFR, and impaired excretion of water and electrolytes, which may result in electrolyte imbalance. In contrast, Hyperthyroidism is marked by excessive production of thyroid hormones, causing increased metabolic activity and alterations in renal handling of electrolytes. [4]

Subclinical thyroid disorders, including subclinical hypothyroidism and subclinical hyperthyroidism, are defined by abnormal TSH levels with normal circulating T3 and T4 levels. Although these conditions are often asymptomatic, they may still produce subtle biochemical changes, particularly in electrolyte balance. However, the relationship between subclinical thyroid dysfunction and serum electrolyte levels remains inadequately explored. [5]

MATERIALS AND METHODS:-

This hospital-based cross-sectional observational study was conducted in the Department of Biochemistry at NIMS Hospital, Jaipur, over a period of 6 months . A total of 100 participants were included in the study using a convenient sampling technique.

SAMPLE PROCESSING:-

2–3 ml of blood from the antecubital vein was obtained with the aid of a sterile and disposable syringe under strict aseptic conditions to avoid contamination. The specimen was placed in a dry plain red-top vacutainer without the use of any anticoagulant. All tubes were appropriately labeled with the personal data of patients such as their names, IDs, dates, and times when blood samples were obtained. Analysis of the samples was done promptly within 1–2 hours.

Inclusion- -

Patients clinically diagnosed with subclinical hypothyroidism based on thyroid function tests (elevated TSH with normal T3 and T4 levels) were included in the study. Individuals aged 18 years and above, of both genders, and willing to participate with informed consent were selected.

Exclusion-

Patients with known chronic kidney disease, diabetes mellitus, hypertension, or those receiving diuretics and nephrotoxic drugs were excluded from the study.

Sample

Venous blood samples were collected under aseptic conditions. Serum obtained from plain red-top vacutainers after centrifugation was used for the estimation of renal parameters and serum electrolytes.

RESULTS:-

The study was conducted at department of Biochemistry in association with department of general medicine on 263 clinically diagnosed subclinical hypothyroidism patients and equal number of healthy control visiting in the NIMS hospital Jaipur, Rajasthan.

Table 1: Frequency distribution of age of samples

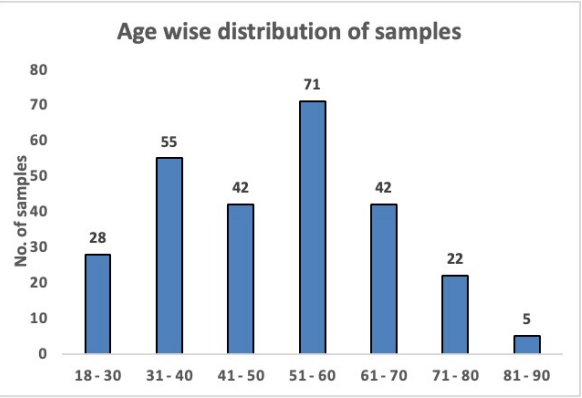

Table no 1:- The age-wise distribution of samples indicates that the highest number of participants (71) belongs to the 51–60 years age group, followed by

31–40 years (55). The 41–50 and 61–70 groups each account for 42 samples. Lower representation is observed in younger (18–30: 28) and older age groups (71–80: 22; 81–90: 5). Overall, middle-aged individuals constitute the majority of the study population.

Table 2:- Frequency distribution of serum creatinine of samples

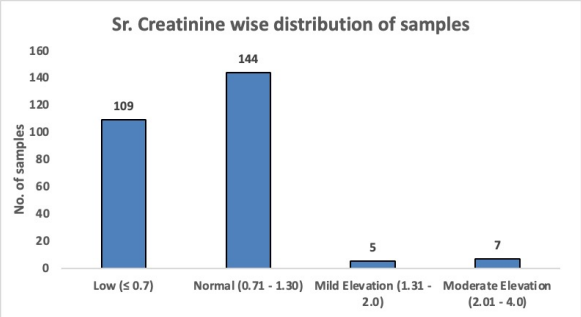

Table no 2**:-** The serum creatinine distribution shows that the majority of samples fall within the normal range (0.71–1.30 mg/dL), accounting for 144 cases, followed by 109 cases with low levels (≤0.7 mg/dL). Mild elevation (1.31–2.0 mg/dL) is observed in only 5 samples, while moderate elevation (2.01–4.0 mg/dL) is seen in 7 samples. Overall, most participants exhibit normal renal function with minimal cases of elevated creatinine levels.

Table 3:- Frequency distribution of potassium of samples

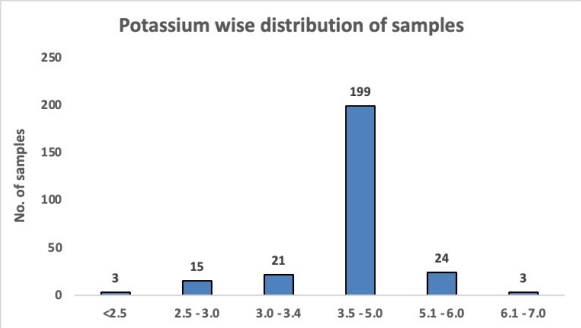

Table no 3:- the potassium-wise distribution of samples reveals that the majority of participants (199) have potassium levels within the normal range of 3.5–5.0 mEq/L. Smaller proportions are observed in the 5.1–6.0 mEq/L (24) and 3.0–3.4 mEq/L (21) ranges. Very few samples fall in extreme categories, including <2.5 mEq/L and 6.1–7.0 mEq/L, with 3 cases each. This indicates that most subjects maintained normal serum potassium levels.

Table 4:- Frequency distribution of sodium of samples

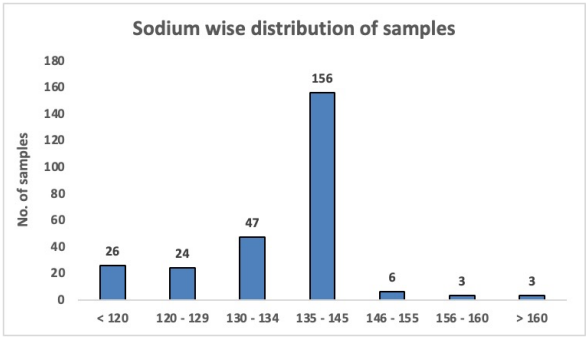

Table no 4:- The sodium-wise distribution of samples indicates that the majority (156) fall within the normal range of 135–145 mEq/L. Moderate numbers are observed in the 130–134 (47), <120 (26), and 120–129 (24) ranges. Very few samples show elevated sodium levels, with 6 in 146–155, and only 3 each in 156–160 and >160 ranges. Overall, most participants maintain normal sodium levels with limited abnormalities.

DISCUSSION:-

The present study highlights the relationship between subclinical hypothyroidism and alterations in renal parameters and serum electrolytes. Elevated TSH levels were associated with changes in serum creatinine, urea, and electrolyte levels, indicating a possible impact on kidney function. These findings are consistent with previous studies that reported reduced glomerular filtration rate and electrolyte imbalance in thyroid dysfunction. Although the changes observed were mild, they suggest early renal involvement even in subclinical cases. Variations in sodium and potassium levels may be due to altered tubular function and renal hemodynamics. Therefore, combined evaluation of thyroid profile, renal parameters, and electrolytes is important for better diagnosis and management.

The present study demonstrates a significant association between subclinical hypothyroidism and changes in renal parameters and serum electrolytes. Increased TSH levels were found to influence kidney function by reducing glomerular filtration rate, leading to elevated serum creatinine and urea levels. Electrolyte imbalances, particularly in sodium and potassium, were also observed, likely due to altered renal tubular function and hemodynamic changes. These findings are in agreement with earlier studies, suggesting that even mild thyroid dysfunction can affect renal physiology. Although the alterations were not severe, they indicate early biochemical changes. Hence, regular monitoring is essential for timely diagnosis and prevention of further complications.

CONCLUSION:- In conclusion, the present study demonstrates that subclinical hypothyroidism is associated with noticeable alterations in renal parameters and serum electrolytes. Elevated TSH levels may influence renal function by reducing glomerular filtration rate and altering electrolyte balance, particularly sodium and potassium levels. Although these changes are often mild, they are clinically significant and may progress if left unmonitored. The findings highlight the importance of routine assessment of renal function tests and electrolyte levels in patients with subclinical hypothyroidism. Early detection and timely management can help prevent complications and improve patient outcomes, emphasizing the need for integrated biochemical evaluation in such cases.

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