Section Biochemistry

Original Research Article

PROSPECTIVE ANALYSIS OF ELECTROLYTES IMBALANCE BETWEEN SUBCLINICAL HYPERTHYROIDISM (SHE) AND SUBCLINICAL HYPOTHYROIDISM (SHO): AN INSTITUTIONAL BASED STUDY

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Abstract

Background: The present study was conducted for assessing the electrolytes imbalance between subclinical hyperthyroidism (SHE) and subclinical hypothyroidism (SHO) and their correlation. **Materials & Methods:** This study was carried out on 50 SHO and 50 SHE patients enrolled in OPD of Krishna Mohan Medical College, Mathura, Uttar Pradesh (India). For identification of thyroid dysfunction and dyselectrolytemia, all the biochemical investigation was done in Biochemistry lab. Complete demographic and clinical details of all the patients were obtained. Under aseptic precautions, 5 mL fasting venous blood is collected from the cases and transferred into plain sterile vacationer tubes, allowed to clot at 37°C, and then centrifuged for 10 minutes to separate the serum. The serum was separated and immediately used for analysis. Serum sodium, potassium and chloride levels were evaluated. All the results were recorded in Microsoft excel sheet and was subjected to statistical analysis using SPSS software. **Results:** A total of 50 SHO and 50 SHE patients were enrolled. Among SHO patients, deranged sodium levels, potassium levels and chloride levels were seen in 40 percent, 46 percent and 6 percent of the patients respectively. Among SHE patients, deranged sodium levels, potassium levels and chloride levels were seen in 18 percent, 30 percent and 22 percent of the patients respectively. While comparing the serum sodium and serum potassium levels in between SHO and SHE patients, significant results were obtained. **Conclusion:** Patients with thyroid disorders are accompanied by electrolyte imbalances and hence; should be regularly monitored for serum electrolytes levels.

INTRODUCTION

Patients with abnormalities of thyroid gland function or structure come to medical attention for several reasons. They present with symptoms attributable to physiologic effects of increased or decreased plasma concentrations of thyroid hormone.[1] All forms of thyroid diseases are much more frequently observed in women than men, although the reasons are still not completely elucidated.[2]

The understanding of thyroid disease and the interpretation of thyroid function tests requires an understanding hypothalamic–pituitary–thyroid feedback control. It also demands an appreciation of thyroid hormone transport and the response of cells to non-protein-bound thyroid hormone. The symptoms related to hyper- or hypothyroidism should be correlated with physical findings. Clinical diagnoses should be further supported by appropriate laboratory testing of thyroid function.[3-5]

Primary hypothyroidism is most commonly caused by Hashimoto's thyroiditis. In patients with autoimmune thyroid diseases, the diagnosis is usually established when the patient reaches the age of 45-65 years. The prevalence of hyperthyroidism has been found to affect 2%-3% of the general population.

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Grave's disease is the most common form of hyperthyroidism, as it nearly accounts for 75% of hyperthyroidism. Electrolytes play an important role in the body with regards to fluid balance, nerve conduction, and muscle contractions.[4,5] Thyroid hormones are considered a central regulatory system in maintaining a wide array of hemodynamic, thermodynamic, and metabolic functions. Furthermore, both thyroid and parathyroid disorders have been long established to affect serum calcium and sodium levels in the body.6- 8 Hence; the present study was conducted for assessing the electrolytes imbalance between subclinical hyperthyroidism (SHE) and subclinical hypothyroidism (SHO) and their correlation.

MATERIALS AND METHODS

This study was carried out on 50 SHO and 50 SHE patients enrolled in OPD of Krishna Mohan Medical College, Mathura, Uttar Pradesh (India). For identification of thyroid dysfunction and dyselectrolytemia, all the biochemical investigation was done in Biochemistry lab. Complete demographic and clinical details of all the patients were obtained. Thyroid tests were done on Maglumi 800 and electrolyte estimations were done on Easylyte electrolyte analyzer. Criteria for the selection of subclinical cases are based on laboratory investigations as follows: SHO Patients with TSH >10 mIU/mL and with normal FT3 and normal FT4, and SHE Patients with TSH <0.1 mIU/mL and with normal FT3 and normal FT4.5 Under aseptic precautions, 5 mL fasting venous blood is collected from the cases and transferred into plain sterile vacationer tubes, allowed to clot at 37°C, and then centrifuged for 10 minutes to separate the serum. The serum was separated and immediately used for analysis. Serum sodium, potassium and chloride levels were evaluated. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software.

RESULTS

A total of 50 SHE and 50 SHO patients were enrolled. Mean age of the SHO and SHE patients was 48.3 years and 51.7 years respectively. Mean sodium levels, potassium levels and chloride levels among patients with SHO were 137.3 mEq/L, 4.16 mEq/L and 108.7 mEq/L respectively. Mean sodium levels, potassium levels and chloride levels among patients with SHE was 140.8 mEq/L, 4.29 mEq/L and 115.3 mEq/L respectively. Among SHO patients, deranged sodium levels, potassium levels and chloride levels were seen in 40 percent, 46 percent and 6 percent of the patients respectively. Among SHE patients, deranged sodium levels, potassium levels and chloride levels were seen in 18 percent, 30 percent and 22 percent of the patients respectively. While comparing the serum sodium and serum potassium levels in between SHO and SHE patients, significant results were obtained.

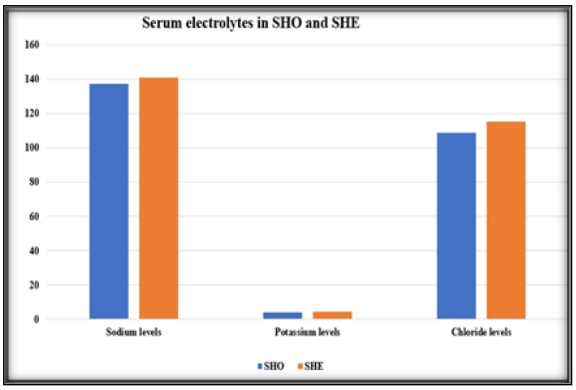

Figure 1: Serum electrolytes in SHO and SHE

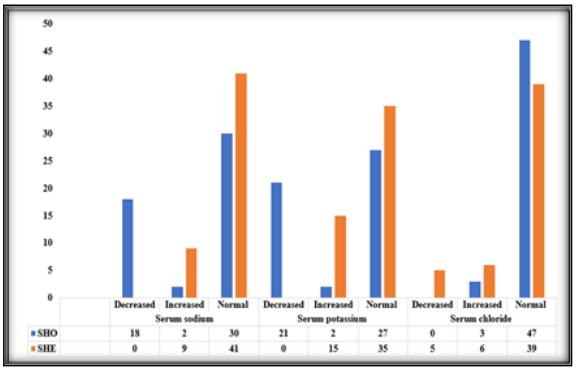

Figure 2: Electrolyte imbalance among SHO and SHE patients

Table 1: Serum electrolytes in SHO

Variable	Mean	SD
Sodium levels (mEq/L)	137.3	6.81
Potassium levels (mEq/L)	4.16	1.08
Chloride levels (mEq/L)	108.7	5.39

Table 2: Serum electrolytes in SHE

Variable	Mean	SD
Sodium levels (mEq/L)	140.8	5.74
Potassium levels (mEq/L)	4.29	2.11
Chloride levels (mEq/L)	115.3	6.27

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Table 3: Electrolyte imbalance among SHO and SHE patients

Electrolyte		SHO		SHE		p-value
		n	%	n	%	
Serum sodium	Decreased	18	36	0	0	0.0012 (Significant)
	Increased	2	4	9	18	
	Normal	30	60	41	82	
Serum potassium	Decreased	21	42	0	0	0.0001 (Significant)
	Increased	2	4	15	30	
	Normal	27	54	35	70	
Serum chloride	Decreased	0	0	5	10	0.745
	Increased	3	6	6	12	
	Normal	47	94	39	78	

DISCUSSION

Thyroid diseases are, arguably, among the commonest endocrine disorders worldwide. India too, is no exception. According to a projection from various studies on thyroid disease, it has been estimated that about 42 million people in India suffer from thyroid diseases. The commonest cause of thyroid disease worldwide is iodine deficiency, which causes goitre and hypothyroidism in some. However, autoimmune thyroid disease is the predominant form of thyroid dysfunction in the developed world. Although genetic (HLA-DR3, CTLA-4, and thyroglobulin gene mutations) and environmental factors (infection, smoking, iodine status) have been implicated, its precise cause is unclear. Thyroid diseases are different from other diseases in terms of their ease of diagnosis, accessibility of medical treatment, and the relative visibility that even a small swelling of the thyroid offers to the treating physician. Early diagnosis and treatment remain the cornerstone of management.[10-12] Hence; the present study was conducted for assessing the electrolytes imbalance between subclinical hypothyroidism (SHO) and subclinical hyperthyroidism (SHE) and their correlation.

In the present study, mean sodium levels, potassium levels and chloride levels among patients with SHO was 137.3 mEq/L, 4.16 mEq/L and 108.7 mEq/L respectively. Mean sodium levels, potassium levels and chloride levels among patients with SHE was 140.8 mEq/L, 4.29 mEq/L and 115.3 mEq/L respectively. Bharti et al. found in their study that there was a significant decrease in calcium in hypothyroidism and subclinical hypothyroidism patients. This is mainly due to the effect of decreased levels of thyroxin. Baajafer et al. previously reported that only 3.9% of their patients with hypothyroidism had hyponatremia. Sun et al. also reported that hyponatremia was not a common finding among their population with extreme TSH elevations.[13-15] In a similar study conducted by Kavitha MM et al, authors assessed the alterations in serum electrolytes in patients with subclinical hypothyroidism (SH) and overt hypothyroidism (OH). Blood samples were collected from all the participants, thyroid profile and electrolytes were measured. Participants were grouped into, group-1: Euthyroid (n=50), Group-2: SH (n=50) and Group-3: OH (n=50). Their study showed the mean serum sodium, potassium and chloride levels were significantly ($p<0.001$) lower in SCH and OH when compared to euthyroids. There is a negative correlation between TSH with serum sodium and potassium. The serum sodium, potassium and chloride levels are significantly reduced in subclinical and overt hypothyroidism.[16]

In the present study, among SHO patients, deranged sodium levels, potassium levels and chloride levels were seen in 40 percent, 46 percent and 6 percent of the patients respectively. Among SHE patients, deranged sodium levels, potassium levels and chloride levels were seen in 18 percent, 30 percent and 22 percent of the patients respectively. While comparing the serum sodium and serum potassium levels in between SHO and SHE patients, significant results were obtained. The effect of hypothyroidism on serum potassium levels in an urban female population was evaluated in another previous study conducted by Koner et al. One hundred and fifty hypothyroid females were included in the study group and one hundred participants were included as a control. The participants of both groups were age-matched. Serum thyroid-stimulating hormone (TSH) and free thyroxine 4 (FT4) levels were estimated by the enzyme-linked immunosorbent assay method and serum potassium was estimated by ion-selective electrode. Hypokalemia was observed in 23 participants among the 150 hypothyroid females included in the study (15.33%). There was a significant difference in TSH, FT4, and potassium levels between the study and control groups. Serum potassium levels were strongly negatively correlated with TSH levels, the R2 value of 54.11%, and positively correlated with FT4 levels.[17]

CONCLUSION

Patients with thyroid disorders are accompanied by electrolyte imbalances and hence; should be regularly monitored for serum electrolytes levels.

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