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Original Research Article

Thyroid status among critically Ill patients admitted in the intensive care unit of the government tertiary care hospital in Mandya: a retrospective study

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ABSTRACT

Background: The nonthyroidal illness syndrome, also known as the low T3 syndrome or euthyroid sick syndrome. Any acute severe illness can cause abnormalities of circulating Thyroid Stimulating Hormone (TSH) or Thyroid Hormone (TH) levels in the absence of underlying thyroid disease. The laboratory parameters of this syndrome include low serum levels of T3 and high levels of reverse T3, with normal or low levels of thyroxine (T4) and normal or low levels of TSH. This condition may affect 60-70% of critically ill patients. The severity of illness correlates well with the reduction in total serum T3 level. Objectives of the study was to assess the thyroid status of critically ill patients admitted in intensive care unit of a tertiary care hospital.
Methods: This is a retrospective observational study done at Department of General Medicine, MIMS, Mandya among patients admitted with critical illness to ICU. 100 patients admitted with critical illness to ICU are included in this study. Thyroid function reports obtained from case sheets, data entered into MS Excel sheet and analysed.
Results: Out of 100 patients studied 34 patients had sepsis, 26 patients had respiratory failure, 20 patients had Congestive cardiac failure, 12 patients had acute renal failure and 8 patients had Diabetic ketoacidosis. Among 100 patients 63% had abnormal thyroid function test, 56% had low T3, 12% had low T4, 2% had high T4 and 3% had low TSH.
Conclusions: Thyroid function abnormality suggesting Non thyroid illness or euthyroid sick syndrome is common among critically ill patients.

Keywords: Critically ill, Euthyroid sick syndrome, Low T3 syndrome, Thyroid status

INTRODUCTION

The nonthyroidal illness syndrome, also known as the low T3 syndrome or euthyroid sick syndrome, describes a condition characterized by abnormal thyroid function tests encountered in patients with acute or chronic systemic illnesses. The laboratory parameters of this syndrome include low serum levels of T3 and high levels of reverse T3, with normal or low levels of Thyroxine (T4) and normal or low levels of TSH.[1]

T3 is the biologically active thyroid hormone and its low serum levels in critical illness reflect altered thyroid homeostasis and a mechanism of adaptation.

Normally most (80%-90%) of T3 is produced by Monod iodination of 40% of circulating T4, a reaction catalyzed by 5'-monodeiodinases in organs such as the liver and kidney. The remaining (10%-20%) is directly secreted by the thyroid gland.

Any acute severe illness can cause abnormalities of circulating Thyroid Stimulating Hormone (TSH) or Thyroid Hormone (TH) levels in the absence of underlying thyroid disease. The most striking abnormality detected in critically ill euthyroid patients is a highly significant reduction in the mean total serum Triiodothyronine (T3) level. Critical illness is often associated with alterations in thyroid hormone concentrations in patients with no previous intrinsic thyroid disease.[2]

Changes in parameters of thyroid function are very common but any acute severe illness can cause abnormalities of circulating TSH or TH levels in the absence of underlying thyroid disease.[3]

This condition may affect 60-70% of critically ill patients.[1] These changes may at least partly be explained by reduced levels of thyroid hormone binding protein and albumin and a reduced binding activity, whereby the hormone is freed from the binding proteins and the clearance of the hormone is increased.[4] Also, an acute alteration in the peripheral conversion of T4, due to a decreased D1 activity and an increased D3 activity.[5,6] Medications also have a very important role in this alterations.[1]

The severity of illness correlates well with the reduction in total serum T3 level. The major cause of these hormonal changes is the release of cytokines such as IL-6. Low T3 is an important marker of mortality in critically ill patients. T4 and TSH did not vary between survivors and non survivors.[7]

This study is done to understand the alteration in thyroid function test in acutely ill patients admitted in ICU and to identify the incidence of Low T3 syndrome or euthyroid sick syndrome in ICU patients.

Objective of the study was to assess the thyroid status of critically ill patients admitted in intensive care unit of a tertiary care hospital.

METHODS

This is a retrospective observational study done at Department of General Medicine, MIMS, Mandya among patients admitted with critical illness to ICU. 100 patients admitted between July 2020 to November 2020 with critical illness to ICU are included in this study. Thyroid function reports obtained from case sheets, data entered into MS Excel sheet and analyzed.

Inclusion criteria

- All critically ill patients admitted to ICU with Acute Renal failure, Acute Respiratory failure, Congestive cardiac failure, Sepsis, Diabetic Ketoacidosis were included in the study.

Exclusion criteria

- Known Thyroid illness patients were excluded.

Statistical analysis

Data entry was done using Microsoft Excel and analyzed using EPI INFO version 7. Data was presented in percentage and proportion.

RESULTS

Out of 100 patients studied 62 were male and 38 were female and the mean age of the patients is 54±8 years. Among 100 patients 34 patients had sepsis, 26 patients had respiratory failure, 20 patients had Congestive cardiac failure, 12 patients had acute renal failure and 8 patients had Diabetic ketoacidosis. Among 100 patients 63% had abnormal thyroid function test, 56% had low T3, 12% had low T4, 2% had high T4, 3% had low TSH and 6 patients had High TSH (Figure 1).

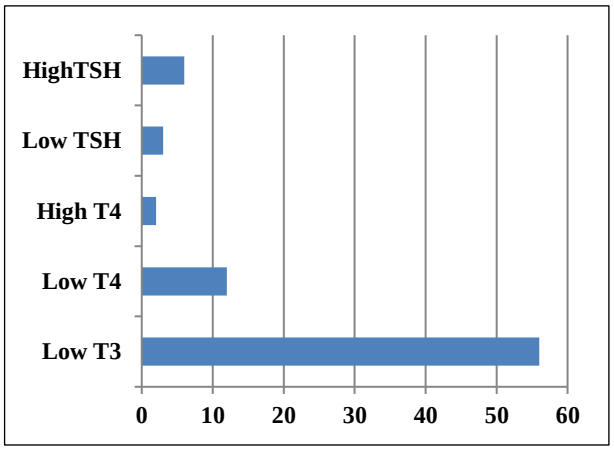

Figure 1: % of TFT abnormality.

A 56 patients had low T3 levels, 28 with sepsis, 12 with respiratory failure, 8 with Congestive cardiac failure, 6 with acute renal failure and 2 with Diabetic ketoacidosis. 12 patients had low T4 levels, 4 with sepsis, 1 with respiratory failure, 3 with Congestive cardiac failure, 3 with acute renal failure and 1 with Diabetic ketoacidosis.

The 2 patients had high T4 levels, 1 with respiratory failure and 1 with Congestive cardiac failure. 6 patients had high TSH, 2 with Resiratory failure, 2 with Congestive cardiac failure, 1 with Diabetic ketoacidosis, and 1 with acute renal failure. 3 patients had low TSH, 2 with sepsis and 1 with Diabetic ketoacidosis.

DISCUSSION

In this study 63% patients had thyroid function test abnormality which matches the similar studies done by Agrawal V et al, found in 55% and in Kiran bhat et al, 59.1% had abnormality.[8,9] Most common derangement

was low T3 found in 56% patients similar to Agrawal V et al, 60%, Kiran bhat et al, 50%, Inturi bhavana et al, 60%.[8-10] Most common co-morbidity in present study was Sepsis in 34% patients, studies by Agrawal V et al, Sasi Sekhar TVD et al, also sepsis was the commonest comorbidity.[8,11] Sepsis is characterized by profound release of proinflammatory cytokines likes interleukins, tumor necrosis factor. This cytokine is known to inhibit the thyroid hormone synthesis and functions at multiple steps.[12,13]

Euthyroid sick syndrome is the term used to describe thyroid hormonal changes in critically ill patients due to nonthyroidal illness. Low T3 is the earliest manifestation followed by low T4 and finally low TSH, indicating a continuum of changes in the spectrum.[14]

Sripad DV et al, study found Low T3 syndrome as a very important prognostic factor of short term survival in ICU patients and FT3 and FT4 as the most powerful and independent factor of ICU mortality among the complete thyroid panel of indicators, the cumulative death rate was significantly higher in patients with low T3 syndrome as compared to those without.[15]

CONCLUSION

Thyroid function test abnormality suggesting euthyroid sick syndrome is common among critically ill patients admitted to ICU with various comorbid conditions. T3 level was low in 56% patients. Authors recommend Thyroid function assessment in all patients admitted with critical illness to identify the thyroid dysfunction early.

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REFERENCES

1. Economidou F, Douka E, Tzanela M, Nanas S, Kotanidou A. Thyroid function during critical illness. Hormones. 2011 Apr 1;10(2):117-24.
2. Adler SM, Wartofskv I. The non-thyroidal illness syndrome. Endocrinol Metab Clin N Am, 2007;36:657-72.
3. De Groot LJ. Non-thyroidal illness syndrome is a manifestation of hypothalamic-pituitary dysfunction, and in view of current evidence, should be treated with appropriate replacement therapies. Criti Care Clin. 2006 Jan 1;22(1):57-86.
4. Docter R, Van Toor H, Krenning EP, De Jong M, Hennemann G. Free thyroxine assessed with three assays in sera of patients with nonthyroidal illness and of subjects with abnormal concentrations of thyroxine-binding proteins. Clin Chem. 1993 Aug 1;39(8):1668-74.
5. Peeters RP, Wouters PJ, Kaptein E, van Toor H, Visser TJ, Van den Berghe G. Reduced activation and increased inactivation of thyroid hormone in tissues of critically ill patients. J Clin Endocrinol Metab. 2003 Jul 1;88(7):3202-11.
6. Rodriguez-Perez A, Palos-Paz F, Kaptein E, Visser TJ, Dominguez-Gerpe L, Alvarez-Escudero J, et al. Identification of molecular mechanisms related to nonthyroidal illness syndrome in skeletal muscle and adipose tissue from patients with septic shock. Clin Endocrinol. 2008 May;68(5):821-7.
7. Kumar KH, Kapoor U, Kalia R, Chandra NA, Singh P, Nangia R. Low triiodothyronine predicts mortality in critically ill patients. Ind J Endocrinol Metab. 2013 Mar;17(2):285.
8. Agrawal V, Kshirsagar A, Patil V. Derangements in thyroid hormone status in seriously ill patients: does it matter?. Inter J Advan Med. 2019 Jul;6(4):1216.
9. Bhat K, Sharma S, Sharma K, Singh RK. Assessment of thyroid function in critically ill patients. Biomed Res. 2016;27:449-52.
10. Bhavana I, Kommineni R, Gayatri GK. Study on Assessment of Thyroid Status among Critically Ill Patients Admitted in a Tertiary Care Hospital. J Assoc Phys Ind. 2019 Jan;67(1):46-8.
11. Sekhar TS, Appalaneni R, Jada A, Pinnamaneni S. Study of thyroid function in patients admitted in intensive care unit in a tertiary care centre. Intern J Res Med Sci. 2018 Aug;6(8):2717.
12. Van der Poll T, Romijn JA, Wiersinga WM, Sauerwein HP. Tumor necrosis factor: a putative mediator of the sick euthyroid syndrome in man. J Clin Endocrinol Metab. 1990 Dec;71(6):1567-72.
13. Cowley HC, Heney D, Gearing AJ, Hemingway I, Webster NR. Increased circulating adhesion molecule concentrations in patients with the systemic inflammatory response syndrome: a prospective cohort study. Criti Care Med. 1994 Apr;22(4):651-7.
14. Lodha R, Vivekanandhan S, Sarthi M, Arun S, Kabra SK. Thyroid function in children with sepsis and septic shock. Acta Paediatr. 2007;96:406-9.
15. Sripad DV, Chowdary NVS, Sivaprabodh V, Shekhar R. Relationship between Free T3 and ICU Mortality: A Prospective Observation. Inter J Sci Res Publi. 2015;5:1-5.

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