



A STUDY ON PREVALENCE AND SIGNIFICANCE OF LOW T3 SYNDROME IN CONGESTIVE HEART FAILURE PATIENTS

General Medicine

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ABSTRACT

Background : Thyroid hormone has an important role in cardiovascular homeostasis, both in physiological and pathological conditions. More than 80% of biologically active hormone triiodothyronine (T3) originate from the peripheral conversion of prohormone thyroxine (T4) secreted by the thyroid gland. In heart failure patient's who are euthyroid, the main alteration of the thyroid function is decreased total serum T3 and free T3 with normal levels of thyroxine and thyrotropin. It is called Low T3 syndrome. Heart failure symptoms will worsen because of low T3 levels, which impairs the intrinsic contractility of the myocardium. In this way, it causes faster progression of heart failure. **Aim:** To estimate the prevalence of low-T3 (triiodothyronine) syndrome in chronic heart failure patients. **Materials And Methods:** This study is done in 75 CHF patients admitted in MICU between February 2021 to August 2022 in the Department of General Medicine, Government Medical College Kadapa. Two-dimensional echocardiography, Thyroid hormone measurements TSH, total T3, total T4, free T3, free T4 were made in all patients in the same fasting morning sample. All the above data were obtained between two to five days of enrollment in the study. Results were analysed. **Results:** In our study, patients with age groups between 60-69yrs showed higher mortality. Advanced age, Male sex, Higher class of NYHA, left ventricular end-diastolic diameter, TT3, Ejection fraction showed significant mortality predictors. BMI, DM, HT, smoking and beta-blocker does not show any relation to mortality. In our multivariate analysis finds that age, ejection fraction, and total T3 levels are associated with increased mortality. In the study, TT3 levels showed a significant mortality indicator in Low T3 syndrome.

Conclusion:

1. Thyroid function tests are significantly altered in patients with chronic heart failure.
2. The prevalence of low T3 syndrome in chronic heart failure is 33.33%.
3. Patients with low total T3 levels have lower ejection fraction.
4. Advancing age correlates with reduced total T3 levels.
5. Total T3, ejection fraction and age are the most important predictors of mortality in this patient population.
6. Total T3 levels can be used as an adjunct to other parameters for risk stratification and survival estimation in chronic heart failure.

KEYWORDS

Low T3 Syndrome, Congestive Heart Failure

INTRODUCTION

Thyroid hormone has an important role in cardiovascular homeostasis, both in physiological and pathological conditions. More than 80% of biologically active hormone triiodothyronine (T3) originate from the peripheral conversion of prohormone thyroxine (T4) secreted by the thyroid gland. In heart failure patient's who are euthyroid, the main alteration of the thyroid function is decreased total serum T3 and free T3 with normal levels of thyroxine and thyrotropin. It is called Low T3 syndrome. Heart failure symptoms will worsen because of low T3 levels, which impairs the intrinsic contractility of the myocardium. In this way, it causes faster progression of heart failure.

Survival rate is markedly decreased in patients with heart failure. The overall five-year mortality for all patients with a heart failure was nearly 50 per cent, and the 1-year mortality in patients with end-stage heart failure might be as high as 75 percent¹. Heart failure is a complex clinical syndrome such can result from any structural or functional cardiac disorder that impacts the ability of ventricles to fill with or eject blood¹. Coronary artery disease is the most common cause of chronic heart failure. Low T3 levels play an important role in estimating morbidity and mortality in patients with a chronic heart failure because it act as an adjunct to functional and clinical parameters of heart failure. So, this study is conducted in our tertiary care hospital amongst CHF patients attending CCU and General Medicine department by detailed history based on clinical symptoms and investigations like chest X-ray, ECG, 2-D Echo and thyroid profile, to find out the prevalence of low T3 syndrome in CHF patients. Low-T3 syndrome is a strong predictor of death in cardiac patients and might be directly implicated in the poor prognosis of cardiac patients benefited gained from thyroid hormone supplementation^{3,4}. The Framingham heart study³ has been the very essential longitudinal source of data on the epidemiology of heart failure.

AIM:

To estimate the prevalence of low-T3 (triiodothyronine) syndrome in

chronic heart failure patients.

Objectives:

1. To estimate the prevalence of low-T3 (triiodothyronine) syndrome in chronic heart failure patients.
2. To assess the role of Total T3 as an adjunct to clinical & functional parameters when estimating mortality in patients with chronic heart failure.

Study design : Prospective observational study.

Study setting : All patients were prospectively enrolled from the CCU and General Medicine Department at Government General Hospital, Kadapa.

Study subjects : 100 patients with clinical evidence of heart failure were enrolled in this study. All patients had documented evidence of prior myocardial infarction and were on heart failure treatment for at least one month. Informed consent was taken from all patients.

Sample size : 75

Study period : JULY 2021 to AUGUST 2022.

Inclusion criteria:

1. Duration of heart failure for a minimum period of one month
2. Left ventricle ejection fraction less than 45%
3. Left ventricle end-diastolic diameter more than 56 mm

Exclusion criteria:

1. Hypothyroidism patients
2. Hyperthyroidism patients
3. Subclinical hypothyroidism and Subclinical hyperthyroidism
4. Amiodarone therapy
5. History of revascularization procedures
6. Clinical evidence of Sepsis
7. Evidence of renal failure
8. Any other acute systemic illness

Procedure:

A questionnaire prepared noted the duration, symptoms and treatment of heart failure. Questions were asked about chest pain, dyspnoea, syncope, cough, smoking and medications. All previous clinical records of the patients were analyzed in detail.

Based on the degree of effort needed to elicit symptoms, patients were assigned to NYHA (New York Heart Association) class I to IV.

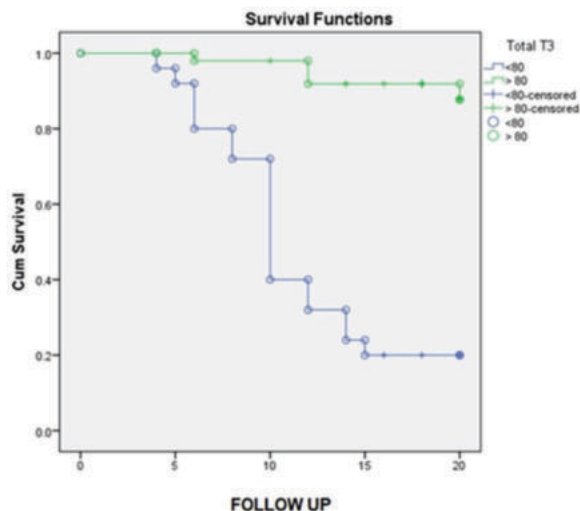
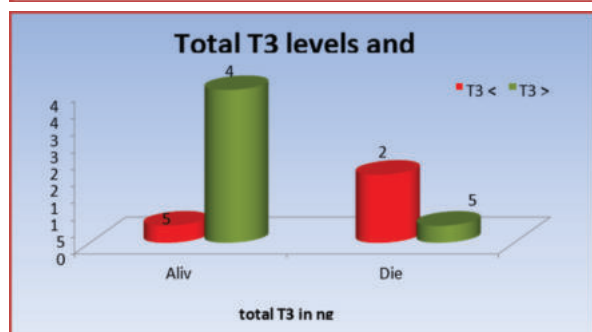
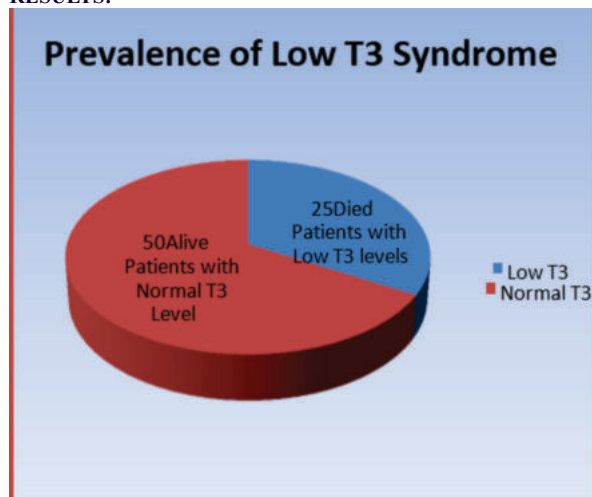
Two-dimensional echocardiography was done in the General medicine department of Government General Hospital for all patients. Complete blood count, blood glucose (fasting and 2 hours postprandial), Fasting lipid profile, blood urea, serum creatinine, and serum electrolytes were measured in all patients. All patients had an ejection fraction of less than 45 per cent and a left ventricular end-diastolic diameter greater than 56 mm.

Thyroid hormone measurements TSH, total T3, total T4, free T3, free T4 were made in all patients in the same fasting morning sample. All the above data were obtained between two to five days of enrollment in the study.

Ethical clearance: Before collection of data, all subjects were briefed about the purpose of the study and written informed consent was obtained. All investigations were done free of cost and no financial burden imposed on the patient. Ethical clearance was obtained from the institutional ethics committee.

Statistical analysis: Statistical analysis was carried out for 75 subjects (50 alive, 25 died). Age, sex, BMI, diabetes, hyper tension, dyslipidemia, obesity, smoking left ventricle end-diastolic diameter, NYHA class, Ejection fraction, TSH, Total T3, Free T3, Total T4 and Free T4 were analyzed. Results were expressed as Mean and Standard Deviation (SD). The difference in means between the two groups was calculated using the Student t-test and the significance of the difference in proportions using the chi-square statistic. Statistical significance was taken when $p < 0.05$. All variables with significant associations were entered in Cox Proportional Hazard Model for multivariate analysis with 95% confidence intervals. Pearson's correlation was used to analyze the correlation between variables found significant in multivariate analysis. All statistical analysis were performed using SPSS (Statistical package for social sciences) software for windows.

RESULTS:



DISCUSSION :

A study by Zargar et al.¹³ on sick euthyroid syndrome showed a prevalence of Low t3 syndrome 20.6%. Our study showed a prevalence of 33.33%. Low T3 concentrations are a strong independent predictive marker of poor prognosis in cardiac patients & might represent a determinant factor directly implicated in the evolution and prognosis of these patients. A low free T3 index/reverse T3 ratio was associated with higher right atrial, pulmonary artery and pulmonary capillary wedge pressures and lower ejection fraction, cardiac index, serum sodium, albumin and total lymphocyte count¹¹.

Shimoyama et al. demonstrated lower FT3 values in heart failure patients with ventricular tachycardia⁵³.

In univariate analysis, advancing age, male sex, higher NYHA class, high left ventricular end-diastolic diameter, lesser ejection fraction, the low total T3 and free T3 levels are higher mortality.

In our study, patients with age groups between 60-69yrs showed higher mortality. This is in line with the study Pingitore et al. In our study, Males mortality was higher than females. The same results were reported by Pingitore et al. in their study on risk stratification in chronic heart failure.

Advanced age, Male sex, Higher class of NYHA, left ventricular end-diastolic diameter, TT3, Ejection fraction showed significant mortality predictors in our study.

The same results were reported by Pingitore et al. in their study on risk stratification in chronic heart failure, who detected age, male sex, NYHA class, left ventricular end-diastolic diameter, ejection fraction, total T3, free T3 levels and obesity as significant univariate mortality predictors. However, there is no significant association between mortality and obesity in my study.

Opasich C et al., in a large representative population of moderate to severe heart failure, found that sick euthyroid patients have higher NYHA class, weight loss and low insulin levels.

In our study, BMI, DM, HT does not show any relation to mortality. Other studies like Opasich et al., Pingitore et al. showed no relation with mortality.

In our study, smoking and beta-blocker did not show any relation to mortality in my study. Other studies like Opasich et al., Pingitore et al. showed no relation with mortality.

In our multivariate analysis finds that age, ejection fraction, and total T3 levels are associated with increased mortality. Also, there is a noticeable correlation of total T3 levels with age and ejection fraction. Therefore, total T3 is a significant predictor of mortality and not the only predictor.

Alike, Opasich et al., in a study on 199 chronic heart failure patients, noticed that Low T3 syndrome was not an independent negative prognostic factor but had a definite role when used with other

parameters.

When compared, the study by Alessandro et al. stated male sex, ejection fraction and total T3 as the multivariate predictors of higher mortality. We noticed advancing age is also a significant multivariate predictor of increased mortality, in contrast to the study by Pingitore et al.

We noticed a significant correlation of low total T3 levels with ejection fraction, indicating that patients with lesser ejection fraction have less total T3 levels. Alike, Kozdag G et al. found a significant correlation between low T3 values and decreased ejection fraction. This contrasts with the study by Pingitore et al., who did not detect any correlation between low total T3 and the ejection fraction. We also noticed a significant correlation of low total T3 levels with advancing age. However, Pingitore et al. stated no correlation between age and low T3 levels in a study. In the study, T3 levels showed a significant mortality indicator in Low T3 syndrome. Studies by Pingitore et al. and Iervasi et al. found T3 levels are independent predictors of mortality in patients with chronic heart failure. But Opasich et al. and this study find that Total T3 is significant but not the only parameter that estimates mortality. The following parameters are firmly associated with increased mortality in chronic heart failure are recommended in risk stratification are :Advanced age, Reduced LV ejection Fraction, Resuscitated sudden death, NYHA functional class 3-4, persistent hypotension, High serum BNP^{7,8}, Increased LV diameter, High serum creatinine and Bilirubin.

CONCLUSION:

1. Thyroid function tests are significantly altered in patients with chronic heart failure.
2. The prevalence of low T3 syndrome in chronic heart failure is 33.33%.
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