



RELATIONSHIP BETWEEN THYROID FUNCTION AND ICU MORTALITY (SICK EUTHYROID SYNDROME)

Endocrinology

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ABSTRACT

Background And Objective: Non thyroid illness syndrome or sick euthyroid syndrome refers to alterations that occur in thyroid hormone levels in response to any critical illness like sepsis, ARDS, patients on mechanical ventilation and also any ICU patients. The objective of the study is to study the relation between thyroid hormone level changes and critical illness in ICU patients and to predict the mortality based on thyroid hormone levels in ICU patients. **Methodology:** It is a prospective study conducted between Non 2020 to December 2021, in patients admitted in ICU irrespective of the diagnosis. Patients with ICU stay more than 7 days were included. Patients with previous intrinsic thyroid, hypothalamic pituitary axis disease were excluded. Usage of iodine contrast agents in the past 8 weeks and Usage of drugs causing hypothyroidism were excluded. **Results:** Results obtained with this comparison is that on day 7 levels of T3, T4 and TSH significantly correlated with APACHE II scores in predicting the outcome of the patients. The significance of T3 is higher when compared to T4 and TSH. **Conclusion:** Thyroid profile can be used in predicting the mortality in ICU patients. Thyroid profile can also increase the sensitivity of APACHE II score in predicting the outcome

KEYWORDS

Euthyroid , APACHE II score, Thyroid profile

1.INTRODUCTION

Nonthyroid illness syndrome or sick euthyroid syndrome refers to alterations that occur in thyroid hormone levels in response to any critical illness like sepsis, ARDS, patients on mechanical ventilation and also any

ICU patients. The metabolic response to any critical illness involves every organ but the underlying pathology is not completely understood.

Despite the primary diagnosis, as a stress induced response in critical illness, a state of hyper-metabolism prevails leading to increased energy expenditure, hyperglycemia and muscle loss. Thyroid hormone alterations commonly occur in critical illness in patients with no previous known intrinsic thyroid disease. The changes in thyroid hormone levels is not an isolated phenomenon as it is also associated with changes in other endocrine axis as a response to stress. Various theories have been proposed for alterations in thyroid function. In early course of the illness, the peripheral conversion of T4 to T3 is reduced leading to decreased free T3 with normal or reduced T4 associated with an increase in reverseT3 (rT3) and no alterations in TSH. In prolonged illness, central hypothyroidism occurs leading to reduced TSH and T4 along with T3.

In this study thyroid profile is taken from patients admitted in ICU on day 1 and day 7 and to correlate the levels the thyroid hormones and the outcome of the patients and also to know the outcome of the disease can be prognosticated with thyroid function tests in patients admitted in ICU.

AIMS AND OBJECTIVES

- 1) To study the relation between thyroid hormone level changes and critical illness in ICU patients.
- 2) To predict the mortality based on thyroid hormone levels in ICU patients.

2.METHODOLOGY :

This is a prospective study with a sample size of 40 patients admitted in ICU irrespective of the diagnosis Narayana medical college and hospital, Nellore with duration of study 18 months.

2.1 Inclusion Criteria

1. Patients admitted in ICU irrespective of the diagnosis.
2. Patients with ICU stay more than 7 days.

2.2 Exclusion Criteria

1. Patients with previous intrinsic thyroid, hypothalamic – pituitary axis disease.

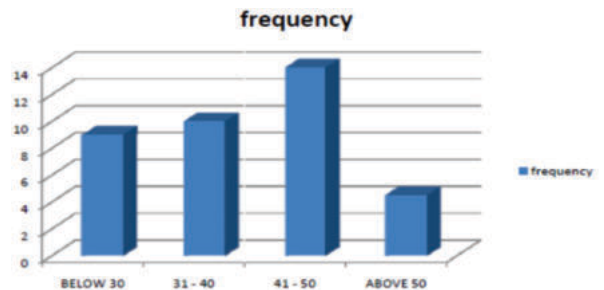
2. Usage of iodine contrast agents in the past 8 weeks.
3. Usage of drugs causing hypothyroidism.

Statistical Analysis

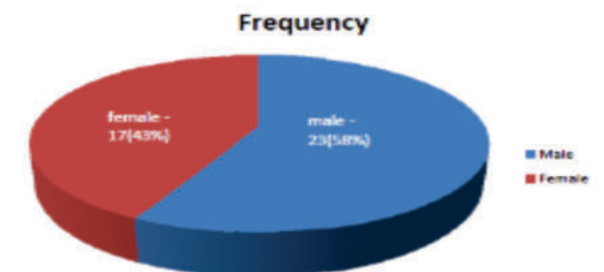
All the collected data were statistically analysed using appropriate statistical test. P value less than 0.01 were considered significant.

3.OBSERVATIONS AND RESULTS

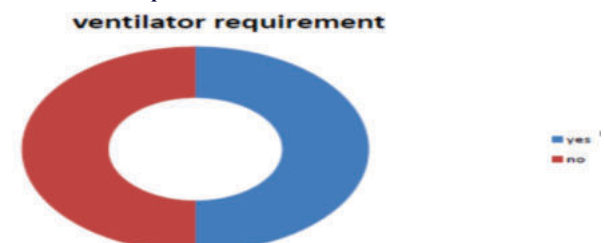
1-Age distribution



2-Sex distribution

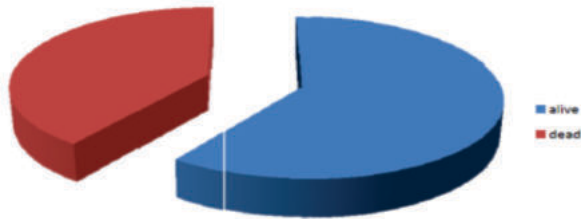


3-Ventilator requirement

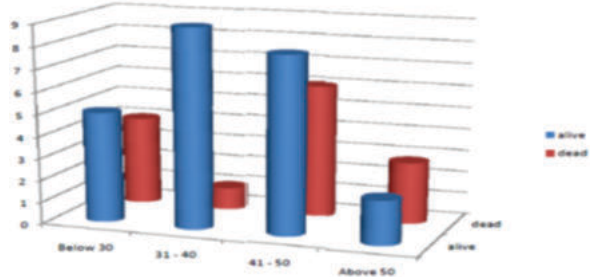


4- Outcome of patients

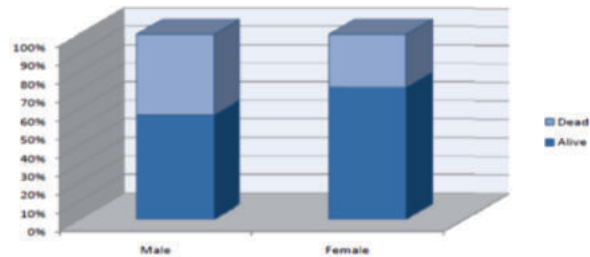
outcome



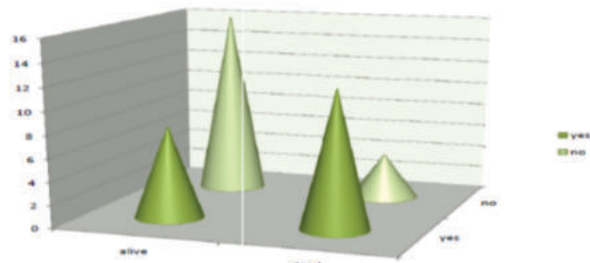
Comparison between
• Age and outcome



• Sex and outcome



• Ventilator requirement and outcome



In our study, 20 out of 40 patients required ventilator support. This value is statistically significant. The p value is 0.010.

• APACHE II and outcome

APACHE II



Significance of T3 levels in predicting the outcome

	Outcome	N	Mean	P value
T3 Day 1	Alive	24	48.13	0.087
	Died	16	42.44	
T3 Day 7	Alive	24	67.33	0.001**
	Died	16	33.88	

In our study, Thyroid function tests were done on day 1 of ICU stay. The p value for T3 levels on day 1 is 0.087 and for day 7 is <0.001**.

Significance of T4 levels in predicting the outcome

	Outcome	N	Mean	P value
T4 - Day 1	Alive	24	3.9958	0.980
	Died	16	4.0000	
T4 - Day 7	Alive	24	4.9667	0.001**
	Died	16	3.7000	

In our study, Thyroid function tests were done on day 1 of ICU stay. The p value for T4 levels on day 1 is 0.980 and for day 7 is <0.001**.

But the p value of T3 levels on day 1 is 0.087 whereas that of T4 is 0.980. So, when compared to T4, T3 levels will more accurately predict the outcome than T4.

Significance of TSH levels on day 1 and day 7 in Predicting the Outcome of Patients

	Outcome	N	Mean	P value
TSH - Day 1	Alive	24	.7754	0.085
	Died	16	.4831	
TSH - Day 7	Alive	24	1.2988	0.001**
	Died	16	0.3462	

In our study, Thyroid function tests were done on day 1 of ICU stay. The p value for TSH levels on day 1 is 0.085 and for day 7 is <0.001**.

Correlation between APACHE II and TFT on day 1

	P value	Apache II
T3 - Day 1	.002	
	N	40
T4 - Day 1	.551	
	N	40
TSH - Day 1	.216	
	N	40

In our study, APACHE II score which is calculated within 24 hours of ICU admission is compared with thyroid function tests which is taken on day 1. The results obtained with this comparison is that on day 1 levels of T3 significantly correlated with APACHE II scores whereas T4 and TSH levels are not statistically significant.

Correlation between APACHE II and TFT on day 7

	P value	Apache II
T3 - Day 7	.001**	
	N	40
T4 - Day 7	.010	
	N	40
TSH - Day 7	.013	
	N	40

In our study, APACHE II score is also compared with thyroid function test which is taken on day 7. The results obtained with this comparison is that on day 7 levels of T3, T4 and TSH significantly correlated with APACHE II scores in predicting the outcome of the patients. The significance of T3 is higher when compared to T4 and TSH.

4. DISCUSSION

This study was conducted in the patients admitted in ICU irrespective of the diagnosis. The study group size was 40. Patients included in the study were closely monitored and thyroid function tests were taken on day 1 and day 7 as explained in methodology. All the patients are followed till the outcome which was either recovery and discharge or death of the patient. Outcome analysis was done in comparison with whether thyroid function tests were able to predict the outcome of the patients independently. The significance is also assessed by comparison of thyroid hormone levels with APACHE II scores. Following were the main observations of the study.

Age And Sex Distribution:

Out of 40 patients, maximum number of patients were observed in the age group of 41 – 50 years with the percentage of 35% as observed in the frequency distribution table. Out of 40 patients, 23 (57.5%) patients were male and 17 (42.5%) patients were female. Chi square tests were applied to these values to observe whether age and sex distribution affects the outcome of the study. The observed p values for age distribution are 0.080 and for sex distribution is 0.601. Both the values are not statistically significant. So age and sex distribution did not affect the outcome of the study.

Ventilator And Outcome:

In the study group population, 20 patients required ventilator support. Out of the 20 patients, 12 patients expired and 8 of them survived. Out of 20 patients not requiring ventilator support 16 of them survived and 4 patients expired. Chi square tests were applied to observe whether the requirement of ventilator significantly affect the outcome of the study. The observed p value was 0.010, this was statistically significant in affecting the outcome of the study.

Apache II Score And Outcome:

APACHE II scores were calculated for all the 40 patients to assess whether thyroid function tests could independently predict the outcome of 78 the patients. Statistical tests were applied to APACHE II scores separately to observe whether the scores are statistically significant. The observed p value for APACHE II score predicting the mortality separately was <0.001**. This result was statistically significant. As documented in previous studies, in this study also APACHE II score affects the outcome of the patients.

Thyroid Profile And Outcome:

Thyroid profile was taken from all subjects on day 1 and day 7 as per inclusion and exclusion criteria. T3, T4 and TSH values are separately subjected to statistical analysis and also they are compared with APACHE II score in predicting the outcome. As for day 1, the observed p values for T3 in predicting the outcome was 0.087, for T4 was 0.980 and for TSH was 0.085. These values are not statistically significant. The p values, seen on day 7 for T3 in predicting the outcome was 0.001, T4 was 0.001 and for TSH was 0.001. All these values are statistically significant in predicting the outcome of the patient as an independent factor in predicting the outcome of the patient. Again the thyroid profile was compared with APACHE II scores in predicting the outcome. On day 1, the observed p values for the correlation for T3 was 0.002, T4 was 0.551 and for TSH was 0.216. T3 values on day 1 correlated with APACHE II scores in predicting the outcome based on statistical analysis. Thyroid function tests obtained on day 7 were again compared with APACHE II scores in predicting the outcome. Based upon statistical analysis the observed p values were 0.001 for T3, 0.010 for T4 and 0.013 for TSH. All these values are statistically significant. Thyroid profile measured serially in ICU patients can independently predict the outcome of the patients.

5.CONCLUSION

- 1) Thyroid profile can be used in predicting the mortality in ICU patients.
- 2) Serial monitoring of thyroid profile will increase the sensitivity in predicting the outcome.
- 3) Outcomes assessed by thyroid profile are comparable with that of APACHE II scores.
- 4) Thyroid profile can be used as an independent factor in predicting the outcome of the patients.
- 5) Thyroid profile can also increase the sensitivity of APACHE II score in predicting the outcome.

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