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ASSESSMENT OF THYROID FUNCTION TEST IN PATIENTS WITH HYPERTENSION: A HOSPITAL BASED STUDY IN NORTH INDIA

Biochemistry

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ABSTRACT

Introduction: The most common cause of cardiovascular disease affecting humans is hypertension. It has been reported that patients with hypertension may have a tendency for impaired thyroid function.

Materials and Methods: The study includes 80 patients with hypertension as a subject and 80 patients without hypertension as a control. Thyroid profile was assayed in hypertension patients.

Results: In our study it was noted that thyroid dysfunction was prevalent in 38 patients out of 80 patients included of which 14 patients were subclinical hypothyroidism, 4 patients were subclinical hyperthyroidism, 6 patients were hypothyroidism and 14 patients were hyperthyroidism.

Conclusion: The study advocates that screening should be recommended for all hypertensive patients to rule out thyroid dysfunction.

KEYWORDS

Hypertension, Systolic blood pressure (SBP), Diastolic blood pressure (DBP), Thyroid profile.

INTRODUCTION:

Systolic blood pressure (SBP) of 140 mm Hg or more and a diastolic blood pressure (DBP) of 90 mm Hg or more, is defined as hypertension.[1] Increase in blood pressure may affect all organs but most commonly the brain, heart and kidney. Restlessness, nervousness, tinnitus, dizziness, headaches and palpitations are symptoms associated with hypertension. It is often referred to as the "silent killer" and can quietly damage the body for years before symptoms develop.[2] Increase level of diastolic BP was found to be common in patients with hypothyroidism and myxedema by several investigators.[3]

In the general population thyroid disorders are very common and it is second to diabetes mellitus among the endocrine disorders.[4] When there is increased synthesis of thyroid hormones by thyroid gland, it results in hyperthyroidism. Hypothyroidism occurs due to decreased production of thyroid hormones and is divided as clinical or subclinical depending on the degree of clinical severity and the extent of abnormalities in thyroid indices. [5] Mild increased in TSH levels and normal free thyroid hormones levels is called as Sub clinical hypothyroidism.[6]

Thyroid hormones influence cardiovascular function and modulate the vascular response. [7,8] Several studies has reported that hypertensive patients may have a tendency for impaired thyroid function.[9] Previous studies have shown that both hypo and hyperthyroid disease may increase the risk of hypertension and that hypertension related to hypothyroidism may be reversed after T4 treatment.[10] One study showed lower thyroid function among people with hypertension. Studies have found that the prevalence of hypertension increased with increasing TSH within the reference range, although more consistently in men than in women.[10]

Previous studies have found that hypertension existed in the patients with subclinical hypothyroidism who are characterized as having high serum thyroid stimulating hormone (TSH) level and normal thyroid hormones. This association was especially stronger in females, and there was no statistical significance in males. Clinical hypothyroidism can increases the levels of blood pressure. [11]

T3 can directly act on arterial smooth muscle cells of blood vessels to cause vasodilation. [12] When hypothyroidism occurs, declining T3 level increases the vascular resistance and the level of blood pressure. [11]

The aim of our study was to assess the correlation and association of thyroid function with hypertensive in hypertension patients.

MATERIAL AND METHODS

The study was done in the department of biochemistry in collaboration with Department of Medicine, Maharishi Markandeshwar institute of Medical Sciences and Research, Mullana, Ambala, Haryana, India. 80 subjects with hypertension and 80 healthy volunteers as a control, randomly selected and were included in this study and they were subjected to detailed Medical history, General and Systemic Physical examination with prior consent of the patient after which they were subjected to Thyroid Function tests and other appropriate and related tests. The results of which were statistically analysed.

INCLUSION CRITERIA:

80 diagnosed patients with hypertension.
80 patients without hypertension.

EXCLUSION CRITERIA

(1) Patients not willing to participate in the study.
(2) Patients who are below age 20.
(3) Pregnant women
(4) Patients on drugs known to cause Hypothyroidism (Propranolol, Iopanoic Acid, Iodide, Amiodarone, Salicylates, Phenytoin, Glucocorticoids, Lithium, Amphetamines, Sertraline, Aminogluthetimide, Dopamine, Somatostatin, Octreotide, Interleukins, Heroin)
(5) Patients with cirrhosis of liver
(6) Patients with Heart failure

Sample collection: Fasting blood sample were collected for estimation of thyroid profile by chemiluminescent microparticle immunoassay method.

Statistical analysis:

For statistical analysis SPSS 20 software was used and data were expressed as the mean and standard deviation. Student's t test was used for analysis of statistical significance. Significance was considered for all tests ($p<0.05$).

RESULTS

Table 1: Genders distribution of the case with respect to control

	Total No. of patients	Males	Females
Case	80	21	59
Control	80	21	59
Total	160	42	118

Table-2: Thyroid status of the case with respect to control.

	Euthyroid	Hypothyroidism	Hyperthyroidism	Sub Clinical Hypothyroidism	Sub Clinical Hyperthyroidism
Case	42	6	14	14	4
Control	80	0	0	3	0

Table-3: Mean values of thyroid profile in hypertensive patients with respect to control

Parameters	Mean & Stdev		Standard Error		P-value
	Case	Control	Case	Control	
T3	1.69±0.49	0.97±0.18	0.06	0.02	**0.0001**
T4	9.74±2.61	7.24±0.64	0.29	0.07	9.461
TSH	2.83±2.41	2.20±0.233	0.29	0.03	**0.05**
FT3	2.82±0.98	2.95±0.07	0.11	0.01	0.21
FT4	1.43±0	1.20±0	0.01	0.00	**0.008**

In our study total number of patients were 160 out of which 80 were hypertensive patients as a case and 80 were normotensive as a control. In hypertensive patients 21 were males 59 patients were females and in normotensive patients 21 were males and 59 were females.

Our study shows that in 80 hypertensive patients, 42 were euthyroid, 14 patients were hyperthyroidism, 6 patients were hypothyroidism, 4 patients were subclinical hyperthyroidism and 14 were sub clinical hypothyroidism.

In our study T3 level in hypertensive patients were **1.69 ± 0.49** and in control were **0.97 ± 0.18 (p< 0.0001)**. T4 level in hypertensive patients were **9.74 ± 2.61** and in control were **7.24 ± 0.64 (p< 9.461).** TSH level in hypertensive patients were **2.83 ± 2.41** and in control were **2.20 ± 0.23 (P< 0.05)**. FT3 level in hypertensive patients were **2.82 ± 0.98** and in control were **2.95 ± 0.07 (p< 0.21)**. FT4 level in hypertensive patients were **1.43 ± 0** and in control were **120 ± 0 (P< 0.008)**.

DISCUSSION:

In our study it was noted that thyroid dysfunction was prevalent in 38 patients out of 80 patients included of which 14 patients were subclinical hypothyroidism, 4 patients were subclinical hyperthyroidism, 6 patients were hypothyroidism and 14 patients were hyperthyroidism.

In our study, a significant association between serum T3 and hypertension ($p< 0.0001$) was observed. TSH ($p< 0.05$) and serum FT4 ($p< 0.008$) was also significantly associated with hypertension. We can't find any association between serum T4 with hypertension and serum FT3 with hypertension.

In a large population study done by Asvold et al including more than 30000 euthyroid subjects, a positive and linear association between systolic and diastolic pressure (mostly diastolic) as well as atherosclerosis and coronary heart disease has been associated with subclinical hypothyroidism in both sexes were found. [13]

FT4-TSH product is positively associated with systolic blood pressure as well as diastolic blood pressure.[13] Decreased level of FT4 concentration was found to be an independent risk factor for atherosclerosis. Several study show that, TSH in the upper part of the referange was associated with arterial stiffness. [10]

Study done by Rotherdam's showed that subclinical hypothyroidism was an independent risk factor for atherosclerosis and myocardial infraction. [11] In subclinical hypothyroidism patients, the risk of atherosclerosis was found to be higher than normal subjects. [14]

In hypothyroid patient SBP values was higher in Kotsis study. A study done by Demirel M in 2017 showed that in hypothyroid patients, most of the blood pressure values especially DBP were higher than the control group. [14]

Thyroid hormone play a role in blood pressure homeostasis. Increase of systemic vascular resistance may be the main mechanism causing hypertension in clinical hypothyroid patients. 30% subclinical hypothyroidism had systolic blood pressure above 140 mmHg and 50% sub clinical hypothyroidism patients had diastolic blood pressure above 90 mmHg, Our study also show same picture. [15] Luboshitzky et al. found that the prevalence of hypertension in the subclinical hypothyroidism group was significantly higher than that in the normal control group. [11]

CONCLUSION

Our study advocate that screening should be recommended for all hypertensive patients to rule out thyroid dysfunction. So that major cardiovascular morbidity and mortality can be prevented.

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