

Original Research Article

Thyroid function test in relation with hypertension

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ABSTRACT

Background: The most common cause of cardiovascular disease affecting human is hypertension and reported that they may have tendency for impaired thyroid function. T3 acts directly on arterial smooth muscle of blood vessels to cause vasodilatation, when hypothyroidism occurs; declining T3 level increases the vascular resistance and the level of blood pressure. Clinically, hypertension may be defined as that level of blood pressure at which the institution of therapy reduces blood-pressure-related morbidity and mortality. The aim of our study was to assess the correlation and association of thyroid function with hypertension.

Methods: This case-control study was conducted in the Department of Medicine Government Medical College Jammu from August 2017 to August 2018 on 75 subjects with hypertension.

Results: The male to female ratio was 62.7% to 37.3%. Among total patients, 12 came out to be hyperthyroid, 6 cases were hypothyroid while 5 and 13 pertained to subclinical hyperthyroidism/ hypothyroidism respectively. The comparative values of T3 among Cases and Controls showed significant variation. However, the values of T4, TSH and FT3 showed no significant correlation. It was shown that hyperthyroidism can cause hypertension, i.e. Hypothyroidism is positively related to hypertension.

Conclusions: Thus it was observed in our study that there was significant relation between thyroid dysfunction with hypertension. Screening should be recommended for all the hypertensive patients to rule out thyroid dysfunction.

Keywords: Hypertension, Thyroid profile, Blood pressure

INTRODUCTION

Thyroid hormones influence cardiovascular function and modulate the vascular response.¹ Several studies have reported that hypertensive patients may have tendency for impaired thyroid function.² In general population, thyroid disorders are very common and it is second to diabetes mellitus among the endocrine disorders.³ 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 degrees of clinical severity and the extent of abnormalities in thyroid indices.⁴ Common symptoms of hypothyroidism are fatigue, feeling cold, weight gain, hoarseness of voice, irregular menstrual period, etc. Mild

increase in TSH levels and normal free thyroid hormones is called as subclinical hypothyroidism.

Previous studies have found that hypertension existed in the patients with subclinical hypothyroidism that is characterized as having high serum TSH (thyroid stimulating hormones) levels and normal thyroid levels. This association was especially stronger in females and no statistical significance in males.⁵ T3 acts directly on arterial smooth muscle of blood vessels to cause vasodilatation, when hypothyroidism occurs, declining T3 level increases the vascular resistance and the level of blood pressure.⁶ Clinically, hypertension may be defined as that level of blood pressure at which the institution of therapy reduces blood-pressure-related morbidity and mortality. Current clinical trials for defining hypertension generally are based on the average of two or more seated

blood pressure readings during each of two or more outpatient visits.⁷ Based on the seventh report of joint national committee on prevention, detection, evaluation and treatment of high blood pressure (JNCVII) BP is classified into four major stages (Table 1).

Table 2: Blood pressure classification.

Blood pressure classification	Systolic, mm Hg	Diastolic, mm Hg
Normal	<120	<80
Pre hypertension	120-149	Or 80-90
Stage 1 hypertension	140-159	Or 90-99
Stage 2 hypertension	>160	Or>100

The aim of our study was to assess the correlation and association of thyroid function with hypertension. The study is important in the sense that we have incorporated complete diagnostic profile of thyroid hormones in consideration while correlating its association with hypertension in patients as well as controls.

The study is significant in the sense that it pertains to the rural belt of Jammu region and very less number is such studies have been taken up in the recent past.

METHODS

This hospital based ‘case-control’ study was conducted in the Department of Medicine Government Medical College Jammu from August 2017 to August 2018. Simple Random Sampling technique was used to conduct the present study, where, 75 subjects with hypertension and 75 healthy controls were included. After obtaining prior consent for the study, all the subjects and controls were subjected to detailed medical history, general and

systemic physical examination, thereafter they were subjected to thyroid function tests and other appropriate and related tests. The results were analysed statistically using student ‘t’ test through Microsoft Excel 2010 software. P values <0.001 were considered as statistically significant.

Total 75 patients diagnosed with hypertension and 75 patients without hypertension, were included in the study. Patients not willing to participate in the study, below age of 25 years, pregnant women, patient on drugs known to cause hypothyroidism (propranolol, iopanoic acid, iodide, amiodarone, lithium, and interleukins), patients with heart failure and cirrhosis of liver were excluded from the study.

Fasting 5 ml blood sample were taken from antecubital vein under all aseptic conditions and the serum was analyzed for thyroid stimulating hormone (TSH), free and total T3 and T4. TSH levels were estimated by sandwich immunoassay using direct chemiluminiscent technology serum FT3 and Serum FT4 were estimated by competitive immunoassay using direct chemiluminiscent technology.^{8,9}

RESULTS

A total of 150 individuals were enrolled in the present study, out of which were 75 healthy controls for comparative analysis. Out of the 75 patients, who were hypertensive, the ratio of male to female was: 47:28, i.e. 62.7% to 37.3%. Among total patients, 12 came out to be hyperthyroid, 6 were hypothyroid and 5 and 13 were the cases of subclinical hyperthyroidism/ hypothyroidism respectively. However, among controls, a total of 7 people showed some levels of Subclinical hyperthyroidism/ hypothyroidism (Table 2).

Table 2: Blood pressure classification.

	Cases			Controls		Total
	Males (%)	Females (%)	Total (%)	Males	Females	
Euthyroid	25 (33.3)	14 (18.7)	39 (52.0)	36	32	68
Hyperthyroid	7 (9.3)	5 (6.7)	12 (16.0)	0	0	0
Hypothyroid	3 (4.0)	3 (4.0)	6 (8.0)	0	0	0
Subclinical Hyperthyroid	3 (4.0)	2 (2.7)	5 (6.7)	1	2	3
Subclinical Hypothyroid	9 (12.0)	4 (5.3)	13 (17.3)	3	1	4
Total:	47 (62.7)	28 (37.3)	75	40	35	75

Table 3: Mean values of thyroid profile.

Parameters	Mean±SD		P value
	Cases	Controls	
T3	1.76±0.32 ng/dl	0.93±0.14 ng/dl	0.0006*
T4	9.77±2.55 µg/dl	7.42±0.57 µg/dl	0.67
TSH	2.89±0.34 mIU/l	2.06±0.36 mIU/l	0.03
FT3	3.75±0.89 pmol/l	2.84±0.15 pmol/l	0.41
FT4	11.81±1.12 pmol/l	15.63±2.09 pmol/l	0.004**

*p <0.001=significant; **p <0.005=very significant

The comparative values of T3 among cases and controls showed significant variation. However, the values of T4, TSH and FT3 showed no significant correlation (Table 3).

DISCUSSION

Thyroid hormone is known to play an important role in blood pressure homeostasis. Hypertension, among clinical hypothyroid patients, may be an outcome of increased systemic vascular resistance. In the large scale cross sectional study by Gu et al the relationship between thyroid and elevated blood pressure are positively related with each other.¹⁰

In addition, previous studies have indicated that hyperthyroidism can cause hypertension, and interestingly, studies undertaken by Klein et al and Stabouli et al have also demonstrated that hypothyroidism is positively related to hypertension.^{11,12} Few studies have analyzed the relationship between thyroid level and hypertension in euthyroid patients, like the one by Abdi et al with results being quite similar to what we have obtained here.¹³

Thyroid hormone has well-recognized effects on the cardiovascular system and blood pressure regulation. Blood pressure seems to be altered across the entire spectrum of thyroid disease. Although thyroid hormone is known to affect all tissues of the body and mediates changes in homeostasis, thus leading to adaptations of the cardiovascular functioning, which result in change in blood pressure.¹¹ Increased T3, but decreased TSH and higher FT4 can be directly associated with systolic blood pressure as well as diastolic blood pressure.

The study is slightly limited by the size of the studied population to infer demographic implications and therefore, it will be better that our results are not generalized to the general population. Further studies are needed to verify the results in all sections of population, both urban and rural and further more studies to establish the gender bias of the disease.

CONCLUSION

Thus it was observed in our study that there was significant relation between thyroid dysfunction with hypertension and together they account for major morbidities and mortalities associated with the disease. In order to rule out the associated thyroid dysfunction, screening should be recommended or made mandatory for all the hypertensive patients.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Biondi B, Cooper DS. The clinical significance of subclinical thyroid dysfunction. *Endocr Rev* 2008;29:76-131.
2. Gumieniak O, Perlstein TS, Hopkins PN, Brown NJ et al. thyroid function and blood pressure homeostasis in euthyroid subjects. *J Clin Endocrinol Metab*. 2004;89:3455-61.
3. Vijj V, Chitnis P, Gupta V. Evaluation of thyroid dysfunction among type 2 diabetic patients. *Int J Pharma Bio Sci*. 2012;2:150-5
4. Nazir S, Itagappa M, Hassan A. latest insights into the relation of metabolic syndrome with thyroid dysfunction. *Glob J Med Res*. 2015;15:5-12
5. Asvoid B, Bjoro T, Nilsen T, Vatten L. Association between blood pressure and serum thyroid stimulating hormone concentration within the reference range: A population based study. *J Clin Endocrinol Metab*. 2009;92:841-5.
6. Lui D, Jiang F, Shan Z, Wang B, Wang J, Lai Y, et al. A cross sectional survey of relationship between serum TSH level and blood pressure. *J Hum Hypertens*. 2010;24:134-8.
7. Chobanian AV. The seventh report of the joint national committee on prevention, detection, evaluation and treatment of high blood pressure: the JNC 7 Report. *J Am Med Assoc*. 2003;289:2560-2.
8. Clinical and laboratory standards institute. defining, establishing and verifying reference interval in the clinical laboratory: approved guideline-third edition CLSI document C28-A3 wayne, PA: clinical and laboratory standard institute 2008.
9. Christofides ND, Sheehan CP, Migdley JE. One step labelled antibody assay for measuring free thyroxine. Assay development and validation. *Clin chem*. 1992;1:11-8.
10. Gu Y, Zhan LZQ. Relationship between thyroid function and elevated Blood pressure in euthyroid adults. *J Clinic Hyperten*. 2018;20:110-4.
11. Klein I, Danzi S. Thyroid disease and heart circulation. *J Hyperten*. 200;115:1725-35.
12. Stabouli S, Papakaisika S, Kotsis V. hyperthyroidism and hypertension. *Expert Rev Cardio Vasc Ther*. 2010;8:1559-65.
13. Abdi H, Gharibzadeh S, Tasdighi E, Amouzegar A, Mehran L, Tohidi M, et al. Association between thyroid and BP in euthyroid adults. A 9 years longitudinal study. *Horm Metab Res*. 2018;50:236-41.

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