

## Original Research Article

# The study of correlation between thyroid function and blood pressure in hypertensive patients attending out patient department in tertiary care centre

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### ABSTRACT

**Background:** Hypertension may be the initial clinical presentation for at least 15 endocrine disorders, including overt and subclinical hyperthyroidism and hypothyroidism. The correction of thyroid dysfunction may normalize Blood Pressure (BP) in most cases, therefore checking thyroid function is essential during the workup for hypertension. The present study was conducted to find out the association between hypertension and thyroid dysfunction.

**Methods:** It was a retrospective, observational study conducted among patients having hypertension visiting the outpatient department of Medicine in KIMS Karad, during the period of 2 months.

**Results:** The mean values of various thyroid function parameters among hypertensive cases was assessed in the current study, Authors found that the mean Serum T3 level was  $93.5917 \pm 32.82$ , Mean Serum T4 level was  $6.72 \pm 1.64$  and the mean Serum TSH level was  $2.52 \pm 2.71$ . Among all the cases about 52% cases had deranged thyroid function reports.

**Conclusions:** The results of this study suggest an association between subclinical hypothyroidism and increased blood pressure levels.

**Keywords:** Hyperthyroidism, Hypertension, Subclinical hypothyroidism, Thyroid dysfunction, Thyroid Stimulating Hormone

### INTRODUCTION

Hypertension affects 26.4% of the global adult population remaining the leading preventable risk factor for premature death and disability worldwide.<sup>1,2</sup> Besides the majority of patients with primary (essential) hypertension, a subgroup of ~10% of patients is affected by secondary hypertension. Among the underlying diseases several are of endocrine origin and thyroidal impairments represent an even smaller percentage of the secondary hypertension cases; their incidence and form of presentation varies with age and studied population.<sup>3</sup> Hypertension may be the initial clinical presentation for at least 15 endocrine disorders, including overt and subclinical hyperthyroidism and hypothyroidism.<sup>4</sup>

Hypothyroidism is a decreased functioning of thyroid gland. It can present itself as an overt state of myxedema, end-organ effects, and multisystem failure or subclinical condition with normal levels of thyroxine and triiodothyronine and mildly elevated levels of serum thyrotropin.<sup>5</sup> The prevalence of hypothyroidism was documented in ~4%-5% of population in the developed world, while in Indian population it was reported in around one in ten adults.<sup>6,7</sup>

The correction of thyroid dysfunction may normalize Blood Pressure (BP) in most cases, therefore checking thyroid function is essential during the workup for hypertension. Related literature is lacking in the Indian scenario; hence the present study was conducted to find

out the association between hypertension and thyroid dysfunction.

**METHODS**

It was a retrospective, observational study conducted among patients having hypertension visiting the outpatient department of Medicine in KIMS Karad, during the period of 2 months (June 2019 to July 2019).

Sample Size calculation:  $p= 9.45\%$ ;  $q= 90.55\%$ ;  $l= 7\%$

$$n= 4pq = 4 \times 9.45 \times 90.55 = 70$$

Hence, considering attrition rate, total 100 patients were examined.<sup>4</sup>

**Inclusion criteria**

- Hypertensive patient >18 years of age attending Medicine Outpatient Department in Krishna Institute of Medical Sciences, Karad.

**Exclusion criteria**

- Pregnant patients and patients with chronic kidney disease.

**Data collection procedures**

The data was collected in the Medicine Outpatient Department of KIMS Hospital, Karad with the help of standard, semi-structured, pre-validated case record proforma. The demographic features, clinical features, presenting complaints of the cases were recorded. General examination and systemic examination findings were recorded after getting their due consent.

Their blood pressure was measured after which their blood samples shall be collected and given for thyroid function assessment. Hypertension classification was done on the basis of JNC 8 Classification. Thyroid function assessment was done by measuring T3, T4 and TSH levels of the patient. The reports were collected, and the values registered. The charges for various investigations was sponsored by the Department of Medicine, KIMS, Karad.

**Statistical analysis**

The data was entered with the help of MS Excel software, the data was presented in the form of tables and charts for frequency analysis.

**Confidentiality**

Patient dignity, reports record will be kept in safe custody by the principal investigator.

Study was approved by the Institutional ethic review committee consent form of patient shall be obtained.

**RESULTS**

It was a retrospective, observational study conducted among patients having hypertension visiting the outpatient department of Medicine in KIMS Karad, to assess the relationship between hypertension and thyroid dysfunction.

Initially authors assessed the demographic data of the cases. Majority of the cases were males (54%), and 46% were female subjects. The male:female ratio observed in the present study was 1: 0.85 (Table 1).

**Table 1: Gender-wise distribution of study subjects.**

Gender-wise distribution	No of cases	Percentage
Females	46	46
Males	54	54
Total	100	100

**Table 2: Age-wise distribution of study subjects.**

Age-wise distribution	No of cases	Percentage
<25 years	5	5
26-35	6	6
36-45	14	14
46-55	22	22
56-65	28	28
66-75	16	16
>76	9	9
Total	100	100

When assessed the age distribution of the study subjects, authors observed that majority of the cases belonged to age group of 56-65 years (28%), followed by 46-55 years (22%). The mean age of the study subjects was 55.73±16.14 years. The detailed age distribution of the cases is shown in the table number 2.

The cases enrolled in the present study were hypertensive cases. The mean systolic blood pressure of the cases was 142.4±30.4 mmHg, and the mean diastolic BP was 83.8±11.7 mmHg. The mean values of various thyroid function parameters among hypertensive cases was assessed in the current study, authors found that the mean Serum T3 level was 93.5917±32.82, Mean Serum T4 level was 6.72±1.64 and the mean Serum TSH level was 2.52±2.71 (Table 3). Among all the cases about 48% cases had deranged thyroid function reports (Figure 1).

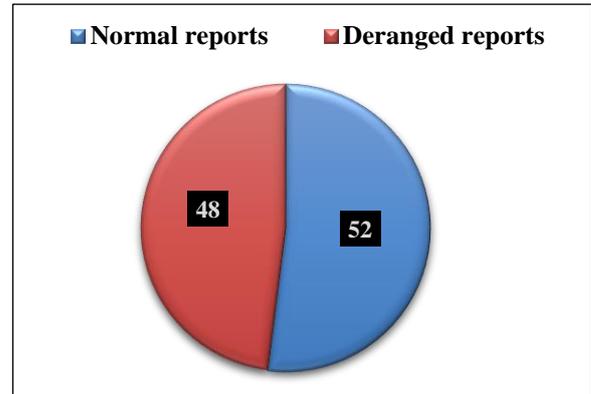
In the present study authors assessed the mean levels of thyroid function parameters among hypertensive cases. Authors observed that the mean levels of serum T3 were 99.45±49.93 in subclinical hypothyroidism while it was 50.05±23.71 in clinical hypothyroidism.

**Table 3: Mean levels of thyroid function parameters.**

Parameters	Mean levels	Standard deviation
Serum T3	93.5917	32.828821
Serum T4	6.728989899	1.645517408
Serum TSH	2.521836735	2.719381125

Similarly, mean levels of serum T4 were  $7.23 \pm 2.17$  in subclinical hypothyroidism, while it was  $4.4 \pm 2.07$  in clinical hypothyroidism. The difference between serum T4 levels of clinical and subclinical hypothyroidism among hypertensive cases was observed to be statistically significant. And mean levels of serum TSH were  $8.50 \pm 3.92$  in subclinical hypothyroidism, while it was  $6.355 \pm 2.24$  in clinical hypothyroidism, the difference was not statistically significant (Table 4). Prevalence of thyroid disorders among hypertensive cases. When authors classified the hypertensive cases according to the types of thyroid dysfunction, it was reported that the

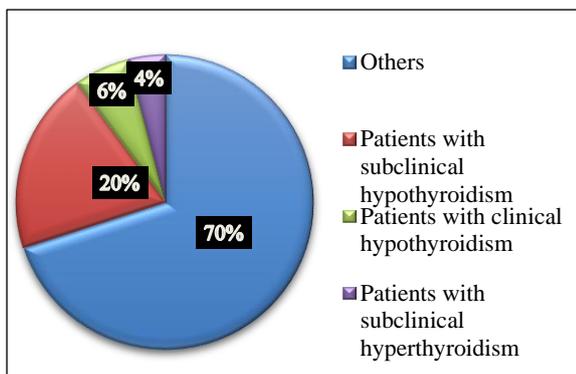
prevalence of subclinical hypothyroidism was 20%, clinical hypothyroidism was 6% and sub-clinical hyperthyroidism was 4% (Figure 2).



**Figure 1: Distribution of cases according to status of their deranged reports.**

**Table 4: Mean levels of thyroid function parameters among hypothyroid cases.**

Parameters		Mean T3	Mean T4	Mean TSH
Subclinical hypothyroidism	Mean value	99.45	7.23	8.50
	Standard deviation	49.93	2.17	3.92
Clinical hypothyroidism	Mean value	50.05	4.4	6.355
	Standard deviation	23.71	2.07	2.24
Significance		The t-value is 1.2979.	The t-value is 2.86738.	The t-value is 0.42731.
		The p-value is 0.109358.	The p-value is 0.007079.	The p-value is 0.338359



**Figure 2: Distribution of cases according to types of thyroid dysfunctions among hypertensive subjects.**

**DISCUSSION**

In the current study, the mean age of the study subjects was  $55.73 \pm 16.14$  years. Talwalkar et al, in their similar type of study reported the mean age of the cases was  $51.6 \pm 13.58$  years.<sup>8</sup>

In this study, authors found that the mean Serum T3 level was  $93.5917 \pm 32.82$ , Mean Serum T4 level was  $6.72 \pm 1.64$

and the mean Serum TSH level was  $2.52 \pm 2.71$ . Among all the cases about 52% cases had deranged thyroid function reports.

When authors classified the cases according to the types of thyroid dysfunction, it was reported that the prevalence of subclinical hypothyroidism was 20%, clinical hypothyroidism was 6% and sub-clinical hyperthyroidism was 4%. Iya E. Basse et al, in their similar study conducted in Nigerian population, reported that The mean serum TSH value for hypertensive subjects was  $3.01 \pm 2.42$   $\mu\text{Iu/ml}$  and was significantly higher ( $p < 0.0001$ ) than that of the normotensive subjects ( $1.74 \pm 0.92$   $\mu\text{Iu/ml}$ ). Female hypertensive subjects had significantly higher ( $3.34 \pm 2.74$   $\mu\text{Iu/ml}$ ) mean TSH than the female normotensives with mean value of  $1.79 \pm 0.86$   $\mu\text{Iu/ml}$  ( $p < 0.002$ ). Mean TSH value for male hypertensive subjects was  $2.78 \pm 2.4$   $\mu\text{Iu/ml}$  and was significantly higher ( $p < 0.007$ ) than that of male normotensive subjects ( $1.72 \pm 0.96$   $\mu\text{Iu/ml}$ ).<sup>9</sup>

Luboshitzky et al, found that the prevalence of hypertension in the subclinical hypothyroidism group was significantly higher than that in the normal control group, supporting this conclusion.<sup>10</sup> Rotterdam's study showed

that subclinical hypothyroidism was an independent risk factor for atherosclerosis and myocardial infarction. Blood hypercoagulability, blood viscosity and lipid abnormalities presenting in subclinical hypothyroidism patients could increase the risk for atherosclerosis. These factors may also be involved in the pathogenesis in which subclinical hypothyroidism affects blood pressure.<sup>11</sup>

## CONCLUSION

The results of this study suggest an association between subclinical hypothyroidism and increased blood pressure levels. Several mechanisms could explain why subclinical hypothyroidism has an adverse effect on blood pressure.

Clinical hypothyroidism is known to increase blood pressure due to increased systemic vascular resistance. Various studies indicate that cardiovascular disorders have existed in the subclinical hypothyroidism stage.

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*Conflict of interest: None declared*

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

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