Original Research Article

Association of blood pressure profile on newly diagnosed subclinical hypothyroidism patients

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Abstract

Background: Bubclinical and Overt hypothyroidism is affiliated with elevated systemic vascular resistance and hypertension. Overt hypothyroidism affects 1 to 4 percent of the population, but the prevalence of subclinical hypothyroidism affects 5 to 10 percent of the population. Hypothyroidism affects cardiac muscle contraction and contributes to high blood pressure due to increase stiffness of blood vessels and peripheral vascular resistance. This study aimed to examine variations of blood pressure in subjects with SCH as compared to age matched controls. **Methods:** Thirty-seven patients with newly diagnosed SCH and 37 control subjects without SCH were included in this study. In all subjects were examined anthropometric parameters, blood pressure profile and thyroid function tests. **Results:** There was Significant difference in weight ($p<0.000$) and BMI ($p<0.000$), were observed . Systolic blood pressure (SBP) did not differ significantly between the two groups ($p<0.81$). A statistically significant increased DBP was observed ($P<.001$) in the hypothyroid patients in comparison to the controls group. TSH levels were significantly higher in the hypothyroid group compared to the control group ($P<.001$). Concentrations of T4 were significantly lower in the hypothyroid group, ($P<.05$), Serum T4 levels were negatively correlated with SBP ($P<.05$) and DBP ($P<.001$). Significant negative correlation was also found between triiodothyronine values and diastolic blood pressure ($P<.01$) **Conclusion:** Our study data advise to that patients with SCH are at higher risk of hypertension and CVD as compared to the controls

Key words: SCH, Hypothyroidism, Blood pressure profile, BMI

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INTRODUCTION

Thyroid hormones effects on the cardiovascular function, decreased systemic vascular resistance (SVR), increased resting heart rate, left ventricular contractility, blood volume. [1] and modulate the vascular response.[2] Overt hypothyroidism may be correlated with hypertension and various detrimental effects of cardiovascular system.[3] Subclinical hypothyroidism (SCH), defined as an asymptomatic state characterized by in elevation of serum thyroid-stimulating hormone (TSH) values within normal range of triiodo thyronine (T3) and thyroxine (T4) levels, is common in the adult population, especially among women above 60 years of age. In males and females mostly diastolic blood pressure has been associated with arterial hypertension, atherosclerosis and coronary heart disease in Subclinical hypothyroidism[4]. TSH variation within the normal range has been associated with alterations in various cardiovascular parameters including arterial pressure and lipid profile [5]. Early markers of atherosclerosis such as increased intima media thickness and impaired endothelial function may be detected among patients with borderline thyroid function [6]. It has further been reported that hypertensive patients may have a tendency for impaired thyroid function [7]; Thyroxine replacement therapy may reverse the cardiovascular effects and may result in the regulation of arterial

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pressure in subjects with subclinical hypothyroidism. The purpose of our study was to investigate alterations of systolic (SAP), diastolic (DAP) arterial pressure and lipid profile in hypothyroid subjects compare with healthy euthyroid individuals.

METHODS

After getting clearance from institute ethics committee. Written and informed consent was obtained from all the participants. All experiments were performed at Our research laboratory . We selected 37 females between 25 – 30 years newly diagnosed hypothyroidism subjects. The control group subjects (n=37) were age, gender matched healthy volunteers. **Exclusion criteria** were a history of diabetes mellitus , overt coronary heart disease or a previous history of stroke. The presence of hypertension (increase systolic and/or diastolic blood pressure) or current use of any antihypertensive drugs.

Methodology

Recording of anthropometric and basal parameters: Participants were instructed to empty their bladder prior to anthropomorphic measurements. Height was measured by using a stadiometer in the upright position and weight was measured on a weighing machine. BMI was calculated by weight (Kg) divided by the square of height in meters. After a 15-minutes of Acclimatization period, BP was measured 3 times to the nearest of 2 mm Hg in the sitting position, using a mercurial sphygmomanometer and appropriately sized cuffs. The average of 3 measurements was used to calculate systolic and diastolic BP; mean BP will be calculated as the diastolic value plus one third of the pulse pressure value.

Data Analysis: The data was expressed as mean ± SD. To study the between group differences, independent t test was used. Pearson's correlation was used to study the association between Thyroid function tests and Blood Pressure parameters.. The null hypothesis will be rejected at $P \leq 0.05$.

RESULTS

The baseline and anthropometric parameters of controls, newly diagnosed hypothyroids were given in Table 1. As shown table no 1 There was no significant difference between age ($p < 0.361$) and height ($p<0.309$) of the study groups. There was Significantly difference in weight ($p<0.000$) and BMI ($p<0.000$), were observed . Systolic blood pressure (SBP) did not vary in significantly between the two groups ($p<0.81$). A statistically significant increased DBP was observed ($P<.001$) in the hypothyroid patients in comparison to the controls group. TSH levels were significantly higher in the hypothyroid group compared to the control group ($P<.001$). plasma Concentrations of T4 were significantly lower in the hypothyroid group, ($P<.05$), while there was no significant difference in T3 levels between the two groups ($P=.853$). The Pearson correlation coefficients for the relationships between thyroid hormones levels and blood pressure parameters are shown in Table 2. This study showed that T4 levels were inversely correlated with SBP ($r=-.272$, $P<.05$) and DBP ($r=-.651$, $P<.001$) . Levels of T3 showed a significant inverse correlation with DBP ($r=-.341$, $P<.01$) . Based on these results, TSH was not significantly correlated with blood pressure parameters.

Table 1: Anthropometric parameter of Hypothyroid and control subjects

Parameter	Control group(n=37) Mean ± SD	Hypothyroid subjests(n=37) Mean ± SD	P – Value
Age (Years)	30.30±3.60	29.43±4.40	0.361
Height (cm)	158.44±5.48	159.75±5.61	0.309
Weight(kg)	57.56±3.46	68.03±6.56	0.000
BMI	22.98±1.58	26.70±2.81	0.000
SBP(mmHg)	120±7.76	124.29±7.69	0.81
DBP(mmHg)	80.76±2.86	89.46±3.1	0.000
PP(mmHg)	44.11±4.07	34.84±5.94	0.000
MAP(mmHg)	95.48±2.96	91.08±3.29	0.000
TSH	2.53±1.34	7.11±3.40	0.000
T3	98.15±20.54	97.14±26.13	0.853
T4	6.04±1.16	5.04±2.18	0.025

Table 2: Blood Pressure parameters and its association with thyroid profile in hypothyroid patients

Parameter	T3		T4		TSH	
	r- value	p-value	r- value	p-value	r- value	p-value
SBP	0.230	0.054	0.272	0.023	0.022	0.85
DBP	0.341	0.004	0. 651	0.000	0.154	.203

DISCUSSION

Hypothyroidism is defined as a deficiency of thyroid activity, which results from reduced secretion of both T3 and T4 irrespective of the cause. Iodine deficiency is the most common cause of hypothyroidism worldwide but it can be due to other conditions. If thyroid gland or less commonly due to disorders of pituitary gland and hypothalamus. Low thyroid hormone levels cause the body's functions to slow down, leading to general symptoms like dry skin, fatigue, loss of energy, memory problems higher cholesterol levels etc. The relationship between thyroid function and body weight in euthyroid individuals has been given a great medical concern. Various researchers have studied the effect of the thyroid hormones on body mass index (BMI), and it has been demonstrated that overt thyroid dysfunction affects body weight. Clinical hypothyroidism causes an increase in body weight, while hyperthyroidism reduces it [8].Hyperthyroidism is usually associated with peripheral vasodilatation and reduction of the diastolic blood pressure (BP) and sometimes with systolic hypertension, while hypothyroidism may be accompanied by diastolic hypertension, as many clinicians are aware. Elevation of the diastolic BP was found to be common in patients with hypothyroidism[9]. Some studies have associated this change in thyroid function with increased risk of CVD. Hak *et al* revealed that SCH is a strong indicator of risk for atherosclerosis and myocardial infarction in elderly women(10)Meanwhile, Völzke *et al* revealed that the current evidence for the association of SCH with mortality is weak.(11) in our study A statistically significant increased DBP was observed (P<.001) in the hypothyroid patients in comparison to the controls group. TSH levels were significantly higher in the hypothyroid group compared to the control group (P<.001). As mentioned above, hypertension, most commonly diastolic, is increased in patients with hypothyroidism because of increased SVR[12].In the past few years, some studies reported higher DBP, or higher prevalence of hypertension in SCH subjects[13]. Duan *et al* demonstrated that SCH is an independent predictor of increased SBP and pulse pressure in females [14]. Consistent with Nagasaki *et al*, the data in this revealed that subjects with SCH had a higher DBP than the euthyroid subjects. It has been revealed that serum TSH concentrations are positively associated with increasing BMI [15]. This finding suggests that the elevation of DBP may be independent of BMI. Pyati *et al* revealed that serum TSH values were positively correlated with DBP[16]. Asvold *et al* reported a linear positive correlation between TSH and both systolic and diastolic blood pressure.[17]. However, this study revealed an increasing trend of DBP as thyroid function declined. In this respect, study investigators observed inverse Correlations between thyroid hormones and blood pressure parameters suggesting that the lower the thyroid hormone levels, the higher blood pressure that may predispose to the long-term implications for CV health.

CONCLUSION

In conclusion, the data from the present study revealed that BMI and DBP were significantly higher in the SCH patients as compared to the healthy subjects. The results suggest that patients with SCH are at higher risk of elevated blood pressure as compared to the controls. On this basis, screening and treatment of hypertension in these patients could be useful in decreasing risk of atherogenic CV disorders at a very early stage.

REFERENCES

1. Biondi B, Cooper DS: The clinical significance of subclinical thyroid dysfunction. Endocr Rev2008, 29:76-131.
2. Danzi S, Klein I: Thyroid hormone and blood pressure regulation. Curr Hypertens Rep2003, 5:513-520
3. Saito I, Saruta T: Hypertension in thyroid disorders. Endocrinol Metab Clin North Am1994, 23:379-386.
4. Nagasaki T, Inaba M, Kumeda Y, Hiura Y, Shirakawa K, Yamada S,Henmi Y, Ishimura E, Nishizawa Y: Increased pulse wave velocity in subclinical hypothyroidism. J Clin Endocrinol Metab2006, 91:154-158
5. Iqbal A, Figenschau Y, Jorde R: Blood pressure in relation to serum thyrotropin: The Tromso study. J Hum Hypertens2006, 20:932-936
6. Fernandez-Real JM, Lopez-Bermejo A, Castro A, Casamitjana R, Ricart W: Thyroid function is intrinsically linked to insulin sensitivity and endothelium-dependent vasodilation in healthy euthyroid subjects. J Clin Endocrinol Metab2006, 91:3337-3343.
7. Gumieniak O, Perlstein TS, Hopkins PN, Brown NJ, Murphey LJ, Jeunemaitre X, Hollenberg NK, Williams GH: Thyroid function and blood pressure homeostasis in euthyroid subjects. J Clin Endocrinol Metab2004, 89:3455-3461.
8. Hoogwerf BJ, Nuttall FQ. Long-term weight regulation in treated hyperthyroid and hypothyroid subjects. Am J Med. 1984;76:963–70.
9. Owen Thompson W, Dickie LFN, Morris AE, Hilkevitch BH. The high incidence of hypertension in toxic goiter and in myxedema. Endocrinology. 1931;15:265–72.
10. Hak AE, Pols HA, Visser TJ, Drexhage HA, Hofman A, Witteman JC. Subclinical hypothyroidism is an independent risk factor for atherosclerosis and myocardial infarction in elderly women: the Rotterdam Study. Ann Intern Med. 2000;132(4):270-278.
11. Völzke H, Schwahn C, Wallaschofski H, Dörr M. Review: the association of thyroid dysfunction with allcause and circulatory mortality: is there a causal relationship?J Clin Endocrinol Metab. 2007;92(7):2421-2429.
12. Walsh JP, Bremner AP, Bulsara MK, *et al*. Subclinicalthyroid dysfunction and blood pressure: a

communitybased study. Clin Endocrinol (Oxf). 2006;65(4):486-491.
13. Nagasaki T, Inaba M, Kumeda Y, *et al*. Increased pulsewave velocity in subclinical hypothyroidism.J Clin Endocrinol Metab.2006;91(1):154-158.
14. Duan Y, Wang X, Peng W, *et al*. Gender-specific associations between subclinical hypothyroidism and blood pressure in Chinese adults. Endocrine.2009;36(3):438-444
15. Iacobellis G, Ribaudo MC, Zappaterreno A, Iannucci CV, Leonetti F. Relationship of thyroid function with body mass index, leptin, insulin sensitivity and adiponectin in euthyroid obese women. Clin Endocrinol. 2005;62(4):487-491.
16. Pyati A, Dhuttargi S, Nagaraj, Das D. Assessment of the cardiovascular risk in subclinical hypothyroidism.Int J Pharm Biol Sci. 2012;2:128-134.
17. Asvold BO, Bjoro T, Nilsen T, Vatten LJ. Association between blood pressure and serum TSH concentration within the reference range: a population-based study. J Clin Endocrinol Metab.2007;92(3):841-845.

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