

SUBCLINICAL HYPOTHYROIDISM AND HYPERTHYROIDISM IN PATIENTS WITH CONGESTIVE HEART FAILURE

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ABSTRACT

OBJECTIVE: To determine frequency of subclinical hypothyroidism and hyperthyroidism in patients with congestive heart failure (CHF).

METHODOLOGY: This descriptive cross-sectional study was conducted from 05-07-2010 to 04-07-2011, at cardiology department of Hayatabad medical complex, Peshawar. Adult patients of >15 years, diagnosed as CHF by using echocardiography were included. Exclusion criteria included patients taking thyroxine or antithyroid medications, dopamine, glucocorticoides, metoclopramide & phenothiazines; thyroxine level <9pmol/L, triiodothyronine level <95 ng/dl or thyroxine level >24 pmol/L & Triiodothyronine level >190ng/dl and diagnosis of sub-acute, painless or postpartum thyroiditis. History was taken and thorough clinical examination was performed. Diagnosis of CHF was confirmed through echocardiography by using Simpson's method for calculating ejection fraction and by using pulse wave Doppler of mitral inflow and pulmonary venous flow. Serum TSH, free T4 and T3 levels were determined. Presence or absence of subclinical hypothyroidism and hyperthyroidism was ascertained in heart failure patients.

RESULTS: Out of 753 patients, there were 431 (57.2%) male and 322 (42.8%) female patients. The mean age was 57.66 ± 12.81 years. Subclinical thyroid disease was found in 46 (6.1%) patients including 26 (3.45%) males and 20 (2.65%) females. Subclinical hypothyroidism was found in 30 (3.98%) patients of CHF including 19(2.52%) males and 11(1.46%) females. Subclinical hyperthyroidism was found in 16 (2.12%) patients with CHF including 7(0.92%) males and 9(1.19%) females. Majority of subclinical hypothyroid (66.7%) and subclinical hyperthyroid (81.25%) patients were <60 years of age.

CONCLUSION: Subclinical hypothyroidism and hyperthyroidism are not very common in CHF patients. Hypothyroidism was more frequent than hyperthyroidism.

KEY WORDS: Subclinical hypothyroidism, Subclinical hyperthyroidism, Congestive heart failure

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above the upper limit of normal and free thyroxine & triiodothyronine level within normal limits². The prevalence of subclinical hypothyroidism is about 4 to 8.5%, and may be as high as 20% in females aged more than 60 years³. Subclinical hyperthyroidism is defined as low or undetectable thyrotropin level with normal thyroxine and triiodothyronine levels². Subclinical hyperthyroidism has a prevalence of about 2%³.

Cardiovascular system is one of the main body systems affected by changes in thyroid hormone levels, which both directly and indirectly effect its function.⁴ Subclinical hyperthyroidism is associated with 5 times high risk for atrial fibrillation⁵. Screening for subclinical thyroid disease, although not recommended routinely, but is strongly advocated in high risk groups, as it has a risk of progression to overt thyroid disease especially in case of subclinical hypothyroidism. Subclinical hyperthyroidism has a particular effect on the heart and may be associated with cardiac dysfunction and atrial fibrillation.¹ Subclinical hypothyroidism affects the heart by disturbing both the systolic and diastolic function of the heart⁶.

Heart failure or congestive heart failure is basically the structural or functional inability of the heart to maintain adequate output as per the demands of the body⁷. Heart failure has a mortality of 10% per year.⁸ Heart failure imparts morbidity in the form of recurrent admissions for worsening shortness of breath, and with passage of time morbidity and health care cost related to heart failure is on the rise.⁹ Heart failure is direct consequence of deterioration of systolic and diastolic

INTRODUCTION

Subclinical thyroid disease is a common clinical problem. There are many

controversies regarding screening, evaluation and management of subclinical thyroid disease.¹ Subclinical hypothyroidism is defined as thyrotropin level

function of heart.⁶ Atrial fibrillation (AF) causes deterioration of heart function by deranging co-ordination of atrial and ventricular contraction in turn reducing ejection fraction thereby increasing the severity of heart failure.¹⁰

Echocardiography is the main tool used to assess the heart structure and function. Echocardiography is an invaluable imaging tool that is widely available, rapid, non invasive and safe for assessing heart function.¹¹ It assesses heart function by calculating EF, measuring mitral inflow velocity to atrial contraction and recording pulmonary venous flow pattern.¹²

Screening for thyroid disease is not routinely recommended in general population and especially in those under 60 years of age. However, the population at high risk should be routinely screened for the thyroid problems. Subclinical thyroid disease especially subclinical hyperthyroidism has a very high probability of developing into overt Hyperthyroidism, therefore, asymptomatic patients with thyroid stimulating hormone levels between 4.5 and 10 micro units per milliliter

should have repeat testing at every 6 to 12 months.¹³

Iodine deficiency is one of the main problems in the Khyber Pakhtunkhwa. Seventy percent population in the rural areas and above 50% population in the urban areas is iodine deficient. Hazara, Malakand and Chitral are the mainly affected areas. In Pakistan the prevalence of subclinical hypothyroidism is 5.4%, while that of subclinical hyperthyroidism is 5.8%. Both forms of subclinical thyroid dysfunction appear to be more common in females than males. Overt thyroid disease, which may be the end result of subclinical hyperthyroidism, is a cause of heart failure in 0.68% of cases.^{14,15}

This study was conducted to find out the frequency of subclinical hypothyroidism and subclinical hyperthyroidism in patients with congestive heart failure (CHF). Most of the clinicians are to be focused on this aspect of heart failure. This study highlights the problem of subclinical thyroid disease as it can lead to worsening of symptoms in heart failure patients. Not only the frequency of AF

is increased in subclinical hyperthyroid patients but also metabolic derangements in subclinical hypothyroidism worsen the overall prognosis of heart failure.

METHODS

This descriptive case series study was conducted from 5th July 2010 to 4th July 2011, at Cardiology Department of Hayatabad Medical Complex, Peshawar Pakistan. In this study, 753 adult patients, ≥ 15 years of age of either gender diagnosed as congestive heart failure by using echocardiography were included.

Patients <15 years of age, those taking medications like thyroxine or antithyroid medications, dopamine, glucocorticoids, metoclopramide and phenothiazines were excluded from study. thyroxine level <9pmol/L and triiodothyronine level <95 ng/dl or thyroxine level >24 pmol/L and Triiodothyronine level >190ng/dl or clinical diagnosis of subacute, painless or postpartum thyroiditis were excluded as well. Written informed consent was taken from all included patients after explaining all the benefits and risks. Complete history was taken and thorough clinical examination was performed. The history highlighted the cardinal symptoms of heart failure. Diagnosis of congestive heart failure confirmed using Toshiba echocardiography equipment using Simpson's method for calculating ejection fraction for assessment of systolic heart function, and using pulse wave Doppler of mitral inflow and pulmonary venous flow for calculating diastolic heart function thus determining degree of heart failure. Serum TSH, free T₄ and T₃ levels were determined using Roche cobas e 411 analyzer. Any bias was controlled through proper questionnaire using standardized instruments for investigation, similar level of expertise in laboratory and echocardiography, and by following the exclusion criteria to overcome confounders. Data on subclinical hypo and hyperthyroidism was collected through

TABLE I: AGE GROUPS IN THE SAMPLE POPULATION

Age group (years)	Number of patients	Percentage (%)
21-30	14	1.85
31-40	77	10.22
41-50	167	22.17
51-60	235	31.20
61-70	161	21.38
71-80	81	10.75
81-90	16	2.12
90-100	2	0.26

TABLE II: SUBCLINICAL THYROID DISEASE WITH GENDER IN HEART FAILURE PATIENTS (n=753)

Gender Distribution	Subclinical Thyroid Disease	Hypothyroidism	Hyperthyroidism
Males	26 (3.45%)	19(2.52%)	7(0.92%)
Females	20 (2.65%)	11(1.46%)	9(1.19%)
Total of Heart Failure Patients	46 (6.1%)	30 (3.98%)	16(2.12%)

TABLE III: AGE-WISE DISTRIBUTION OF THE SUBCLINICAL HYPOTHYROIDISM AND HYPERTHYROIDISM

Age group (years)	Subclinical hypothyroidism (total=30)		Subclinical hyperthyroidism (total=16)	
	Count	Percentage	Count	Percentage
21-30	0.0	0%	1	6.25%
31-40	2	6.66%	3	18.75%
41-50	9	30%	2	12.5%
51-60	9	30%	7	43.75%
61-70	6	20%	3	18.75%
71-80	4	13.33%	0	0%
81-90	0.0	0%	0	0%
90-100	0.0	0%	0	0%

TABLE IV: GENDER RELATED FREQUENCY OF SUBCLINICAL HYPOTHYROIDISM AND SUBCLINICAL HYPERTHYROIDISM

Study (Year)	Subclinical Hypothyroidism (%)		Subclinical Hyperthyroidism (%)	
	Males	Females	Males	Females
Current study (2010-11)	2.52	1.46	0.92	1.19
Akhter et al (2001) ¹⁹	1.5	3.9	1.5	4.3

TABLE V: FREQUENCY OF SUBCLINICAL HYPOTHYROIDISM IN DIFFERENT STUDIES DONE ON GENERAL POPULATION

Study	Frequency of Subclinical Hypothyroidism
EPIC-Norfolk Study, 201020	5.7%
Whickham Survey, 201021	5.2%
HUNT Study, 200822	3.3%
Pisa cohort, 200723	7.9%
Cardiovascular Health Study, 2006 24	16.4%
Busselton Health Study, 200525	4.5%

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RESULTS

Out of 753 patients with CHF, there were 431 (57.2%) male and 322 (42.8%) female patients. The mean age of the study population was 57.66 ± 12.81 years, with age ranging from 22 to 95 years.

Different age's groups in the whole sample population are shown in Table I. Majority (n=235, 31.20%) of patients were in 51-60 years age group.

Subclinical thyroid disease was found

in 46 (6.1%) patients including 26 (3.45%) males and 20 (2.65%) females. Subclinical hypothyroidism was found in 30 (3.98%) patients of CHF and subclinical hyperthyroidism was found in 16 (2.12%) patients with CHF (Table-II).

Out of 30 subclinical hypothyroid patients, 20 (66.7%) patients were <60 years of age while 13/16 (81.25%) subclinical hyperthyroid patients were <60 years of age (Table III).

DISCUSSION

Heart failure is a very important cardiovascular disease considering its high

mortality and economic burden. Nearly 65% of the patients diagnosed as heart failure die within 5 years of diagnosis, while 1 to 2% of health budget is spent on its treatment. Cost on treatment of heart failure is more because every patient with heart failure gets admitted again and again for the recurrent episodes of deterioration of his disease. Such recurrent admissions not only impart morbidity to these patients but also need for proper workup to control factors destabilizing heart failure.¹⁶

As disturbances in thyroid hormone levels affect heart function and rhythm of its contraction, it is vital to evaluate patients with heart failure for thyroid dysfunction.^{3,6} Thyroid hormones affect heart at molecular levels and by also by inducing metabolic changes in the body.¹⁷ In Pakistan 50 million population is affected by iodine deficiency disorders and about 6.5 million people are seriously affected.¹⁸

In our study of 753 heart failure patients subclinical hypothyroidism was found in 3.9% population while subclinical hyperthyroidism is 2.1%. However in a study in 2001 by Akhter et al¹⁹, the frequency of subclinical hypothyroidism in general population is 5.4%, while that of subclinical hyperthyroidism is 5.8%. As far as gender distribution of the disease is concerned, subclinical hyperthyroidism was more in females with heart failure and subclinical hypothyroidism was more common in males with heart failure. However in the study by Akhter et al, both forms of subclinical thyroid dysfunction in general population appears to be more in females than males.¹⁹ Comparison of gender related frequency of subclinical hypothyroidism and subclinical hyperthyroidism are summarized for comparison in the Table IV.

Subclinical hypothyroidism has been reported to be in the range of 3.3% to 16.4 % (Table V) in various studies.²⁰⁻²⁵

The current study is different from these studies in the context that it has been done in heart failure patients and this difference might explain the difference in results for subclinical hypothyroidism. Frequency of subclinical hyperthyroidism has not been studied in general population²⁵, and so there are no studies to compare with.

CONCLUSION

In this study on subclinical thyroid disease in heart failure patients it was found that subclinical hyperthyroidism and hypothyroidism are not very frequent in this sample of patients. Hypothyroidism is more frequent than hyperthyroidism. However, screening for thyroid problems in heart failure is a standard practice.

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AUTHOR'S CONTRIBUTION

Asifullah has solely contributed to the manuscript including conception and design, acquisition & analysis of data, drafting the manuscript and final approval of the version to be published

CONFLICT OF INTEREST

Author declares no conflict of interest

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