

Original research article**To study of pericardial effusion in newly diagnosed adult hypothyroid individuals****¹Dr. Nischal Reddy M Ramchandra R, ²Dr. Vinoth N**¹Assistant Professor, Department of General Medicine, Madha Medical College and Research Institute, Chennai, Tamil Nadu, India²Assistant Professor, Department of Anesthesiology, RVS Institute of Medical Sciences, Chittoor, Tirupati Road, Andhra Pradesh, India**Corresponding Author:**

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Abstract

Background and Objective: The thyroid gland, which is the most sizable endocrine gland in the human body, has an approximate weight of 20 grams in adult individuals. The objective of this study was to investigate the occurrence of pericardial effusion among adult patients with hypothyroidism. The objective of this study is to investigate the potential association between the severity of a disease and the existence of pericardial effusion.

Material and Methods: A total of 60 patients were included in the present investigation. The Out Patient Department of the RVS Institute of Medical Sciences, Chittoor, Tirupati Road, Andhra Pradesh. A study was conducted from October 2016 to October 2017.

Results: Hypothyroidism is a disease characterized by its multisystem involvement and diverse clinical presentations, including the occurrence of pericardial effusion, a cardiovascular complication. Initial investigations on patients with overt hypothyroidism indicated that pericardial effusion was a relatively frequent occurrence. However, more recent echocardiographic studies conducted on individuals with hypothyroidism have reported a wide range of incidence rates for pericardial effusion, ranging from 3% to 88%.

Conclusion: The prevalence of macroglossia was higher among those diagnosed with pericardial effusion. Electrocardiography (ECG) and chest X-ray (CXR) have the potential to serve as predictive tools for the detection of pericardial effusion. The presence of pericardial effusion is more frequently observed in patients with a higher degree of disease severity when serum thyroid hormone levels are utilized as an indicator.

Keywords: Prevalence, pericardial effusion, hypothyroid patients

Introduction

Although the link between hypothyroidism and pericardial effusion has been recognized for decades, studies reveal widely variable prevalence rates. The current study aims to shed light on this previously proven link by tracking the frequency and severity of pericardial effusion in relation to hypothyroidism's onset, progression, and treatment ^[1, 2]. Unlike other forms of exudative effusion, "Hypothyroid" pericardial effusion resolves completely after medical intervention ^[3, 4].

Myxedema and hypothyroidism are two names that are commonly used interchangeably with one another. The latter, however, is more comprehensive, covering hypometabolism in all its forms, from normal to advanced atherosclerosis. Myxedema is a rare syndrome, a kind of florid hypothyroidism that falls on the low end of this range. In 1918, pericardial effusion was first reported in a patient with hypothyroidism. Pericardial effusion and other serous effusions have been linked to hypothyroidism in a number of studies since then. The most common cardiovascular consequence of hypothyroidism is pericardial effusion, whose frequency is estimated to be between 30% and 80% ^[5-7].

The thyroid gland, with around 20g in a fully grown adult, is the heaviest endocrine gland in the body. The Thyroid gets its name from the geographical proximity of the gland to the laryngeal cartilage, which resembles a Greek shield. The thyroid gland is generated from the endoderm near the base of the tongue ^[8]. Loose connective tissue attaches the gland to the front and sides of the trachea. The isthmus's upper edge often rests at or below the cricoid cartilage. The lobule is the functional unit, and it is made up of 20–40 follicles that are bordered by cubical epithelium. Thyroglobulin is contained in the colloid of the resting follicle. The production of thyroid hormones can be broken down into three distinct phases. Transparent active iodine for the gland. Hormone-inactive iodotyrosines are produced from the oxidation of iodine and subsequent iodination by oxidized tyrosyl residues within thyroglobulin. Iodotyrosine is a precursor of the hormones T₃ and T₄, which are synthesized via a different coupling reaction ^[9, 10]. Thyroid hormone is stored in abundance by the thyroid gland. The thyroid's organic make-up is as follows. Thyroid hormone is transported into the bloodstream in the form of thyroglobulin via the

lymphatic system. Proteolytic breakdown of thyroglobin within the follicular cell releases T₃ and T₄ into the bloodstream. TSH stimulates the NADPH-dependent enzyme micro-somal iodotyrosine dehalogenase, which removes the halogen from the iodotyrosines released by thyroglobulin^[11, 12]. The researchers set out to determine how often pericardial effusion is among adults with hypothyroidism. The goal of this study is to determine whether pericardial effusion is correlated with disease severity.

Materials and Methods

A total of 60 patients were included in the present investigation. The Out Patient Department of the RVS Institute of Medical Sciences, Chitoor, Tirupati Road, Andhra Pradesh. A study was conducted from October 2016 to October 2017.

Inclusion Criteria

- Patients who have just received a diagnosis and have lower levels of T₃ and T₄.
- The patients' age exceeds eighteen years.

Exclusion criteria

- Individuals receiving thyroxine medication already.
- Individuals with additional recognized causes of pericardial effusion, such as radiation, cancer, uremia, and TB

Data collection

The study included patients who met the inclusion criteria and provided their consent at the outpatient Clinic of the Department of Endocrinology. A comprehensive questionnaire was employed to elicit symptoms associated with hypothyroidism. The individual underwent a thorough examination in order to identify any indications of hypothyroidism. Particular emphasis was placed on the assessment of the cardiovascular system in order to identify and assess the clinical manifestations associated with pericardial effusion.

Results

The study observed a prevalence rate of 17% for pericardial effusion. Out of the total sample of 60 patients diagnosed with hypothyroidism, a subset of 12 individuals exhibited observable indications of pericardial effusion.

Age of the patient

The age distribution of the patients in the study spanned from 18 years to 60 years, with a mean age of 33.97 years. The age distribution within the study group was ascertained.

Table 1: Age of the Patient

Sr. No.	Age Group (yrs.)	No. of patients	%
1.	18-30	30	50.00
2.	31-40	10	16.66
3.	41-50	10	16.66
4.	51-60	10	16.66

Sex

Out of the total sample size of 60 individuals diagnosed with hypothyroidism, 55 were identified as female while the remaining 5 were identified as male. The male-to-female ratio was determined to be 1:13. Within the male population, a single patient experienced the development of pulmonary embolism (PE), but among the female population, 11 patients exhibited the occurrence of PE.

Table 2: Gender of the patient

Sr. No.	Gender	PE	No PE
1.	Males	1	4
2.	Females	10	45

There was no statistically significant correlation observed between the gender of the patient and the presence of pericardial effusion.

Symptoms

The prevailing symptoms observed in the patients were lethargy and weight gain, with a prevalence of 71% and 64% respectively. A prevalence of 60% was noted among the patients in terms of dry skin and peri-orbital edema. A total of 12% of the participants experienced dyspnea, while 44% reported hoarseness of voice. The distribution of symptoms of hypothyroidism was observed among the study

group in the following manner.

Table 3: Symptoms of the patient

S. No.	Symptom	No. of patients
1	Lethargy	10
2	Aches And Pains	05
3	Hair Loss	06
4	Weight Gain	04
5	Dry Skin	02
6	Cold Intolerance	01
7	Hoarseness Of Voice	02
8	Swelling Around Eyes And Limbs	03
9	Anorexia	04
10	Dyspnea	02
11	Chest Pain	01
12	Constipation	03
13	Menstrual Disturbances	10
14	Memory Impairment	05
15	Tingling In Toes And Fingers	03

Out of the total sample size of 12 individuals diagnosed with pericardial effusion, it was observed that merely two patients exhibited cardiovascular manifestations such as chest discomfort and dyspnea. Eleven patients who did not have pulmonary embolism (PE) reported experiencing symptoms of chest discomfort and/or dyspnea. Upon conducting a statistical analysis, it is observed that there is no significant association between cardiovascular symptoms and pericardial effusion.

Signs

The prevalence of overweight among patients was observed to be 64% during clinical evaluation. The average pulse rate seen was 80 beats per minute, while the average blood pressure recorded was 110 mmHg systolic and 70 mmHg diastolic. Fifty percent of patients had pallor. The study observed that 28% of patients exhibited clinically unclear heart sounds, while 10% of patients displayed cardiomegaly. A prevalence of 37% of patients exhibited delayed deep tendon reflexes. A prevalence rate of 30% was noted for the occurrence of macroglossia among the patients. There was no presence of pulses paradoxus or indications indicative of heart failure among any of these patients.

Table 4: The signs of hypothyroidism elicited in the study

Sr. No.	Sign	No. of patients
1	Goitre	05
2	Weight Gain	20
3	Pallor	10
4	Macroglossia	12
5	Cardiomegaly	05
6	Distant Heart Sounds	04
7	Slow Relaxation Of DTR	02
8	Galactorrhoea	02

Three patients with pulmonary embolism (PE) were observed to exhibit clinical symptoms such as distant heart sounds and/or cardiomegaly upon percussion during echocardiography. However, it is worth noting that these indications were also observed in 16 of the patients who did not have pulmonary embolism (PE). Upon doing statistical analysis of the data, a notable correlation is observed between the existence of signals indicating effusion and the evidence of such effusion on echocardiography.

Discussion

Hypothyroidism is a medical condition characterized by its multisystemic manifestations, which can manifest in numerous clinical presentations. One such presentation is the occurrence of atypical pericardial effusion, which represents a cardiovascular consequence. Initial investigations on individuals with evident hypothyroidism indicated that the occurrence of pericardial effusion was very prevalent. Recent echocardiographic studies conducted on individuals with hypothyroidism have revealed a considerable range in the occurrence of pericardial effusion, with incidence rates ranging from 3% to 88%^[13, 14].

In a study conducted by Mancuso *et al.*, a cohort of 25 patients diagnosed with primary hypothyroidism was examined using M-Mode and 2D Echo techniques. The researchers observed a high incidence rate of pericardial effusion, specifically 88%^[15]. The number 8. Based on the research conducted by Kabadi U.M. and Kumar S.P. *et al.*, it was shown that the prevalence of pericardial effusion ranged from 30% to

80% in individuals with advanced hypothyroidism. Nevertheless, the aforementioned research were carried out during a time when the identification of hypothyroidism was merely speculative and its confirmation was contingent upon the manifestation of traditional clinical characteristics^[16]. On the other hand, the diagnosis has been more commonly identified in the early mild stage or, more frequently, in an asymptomatic stage due to the increased frequency of thyroid function testing, particularly in the older population. Therefore, it should be noted that the individuals included in the earlier research were afflicted with severe hypothyroidism at the point of diagnosis, which may limit their representativeness of the current hypothyroid population. As a result of improved early diagnosis methods, the prevalence has currently decreased to a range of 3% to 6%^[17,18].

Gunderson *et al* conducted a study with a cohort of 20 patients diagnosed with hypothyroid cardiomyopathy. Fifteen individuals exhibited pericardial effusion, which subsequently resolved with thyroxin medication. The average age of the patients included in the study was 33.97 years, with a majority falling between the age range of 18 to 44 years. The literature research revealed that the average age at which individuals are diagnosed with autoimmune thyroiditis is 60 years. Additionally, it has been observed that the incidence of hypothyroidism tends to rise with advancing age. However, the reported pattern was not evident within our study cohort, perhaps because to the limited sample size analyzed^[19,20].

Upon doing an analysis of the average age among patients with pericardial effusion and those without, it was determined that there was no statistically significant disparity. It has been determined that there is no correlation between the age of the patient and the occurrence of pericardial effusion^[21]. The determination of hypothyroidism in community research is subject to modest variations in criteria, resulting in varying female-to-male ratios. Thyroid disease exhibits a higher incidence in females compared to males, as evidenced by data indicating a 2-8 times greater occurrence in the female population. A comparative analysis was conducted to assess the prevalence of pericardial effusion in male and female individuals with hypothyroidism. The results of the study indicate that there is no statistically significant correlation between the sex of the patient and the occurrence of pericardial effusion. The existing literature on hypothyroid-associated pericardial effusion indicates that patients typically exhibit a higher frequency of clinical manifestations related to the underlying endocrine problem rather than the consequences of pericardial effusion^[22,23].

In the present study, a significant proportion of the patients (71%) reported experiencing symptoms of widespread myalgia and fatigue. Less frequently observed were additional manifestations of hypothyroidism. However, a mere 14% of the patients exhibited symptoms indicative of cardiovascular system involvement, such as dyspnea upon exertion and chest discomfort. In a comparable manner, indications of pericardial effusion, such as muffled heart sounds and cardiomegaly, were observed in a mere 28% of the subjects, although indications of hypothyroidism, such as weight gain and pedal edema, were present in approximately 64% of the individuals. Upon statistical analysis, a notable correlation was observed between the existence of signs and symptoms and the incidence of pericardial effusion^[24,25].

The presence of macroglossia was observed in approximately 30% of the patients within the research group. The presence of macroglossia has been documented as a clinical manifestation of hypothyroidism, with a suggested etiology involving the retention of fluid within the tongue. In their study titled "Massive macroglossia as an initial manifestation of hypothyroid-associated pericardial effusion," Meares, Braude, and colleagues presented a case report. The fast resolution of macroglossia was achieved with the draining of pericardial effusion in this particular case. The authors contended that the macroglossia may have resulted directly from the effusion, perhaps leading to venous engorgement^[25,26].

Out of the total sample size of 21 individuals diagnosed with macroglossia, a subset of five patients exhibited pericardial effusion. Upon conducting a statistical analysis to compare this subset with the remaining patients who did not display macroglossia, it was observed that the presence of pericardial effusion was more frequently observed in individuals with macroglossia. Early investigations have revealed that 30-80% of individuals with hypothyroidism exhibited pericardial effusion. Nevertheless, the aforementioned research were carried out during a time when the identification of hypothyroidism relied solely on traditional clinical manifestations. On the other hand, the identification of the diagnosis has more recently been achieved during the first stages of moderate symptoms or even in the absence of symptoms, owing to the widespread utilization of thyroid function tests that exhibit high sensitivity. Furthermore, the presence of pericardial effusion in individuals with hypothyroidism seems to be contingent upon the extent of the condition. Therefore, the occurrence of a significant pericardial effusion is commonly observed in individuals with myxoedema, although it is infrequently associated with hypothyroidism during the initial stages of mild severity^[25-27].

In this study, we conducted a comparison of the average values of Serum T₃, Serum T₄, and Serum TSH between individuals diagnosed with pericardial effusion and those who did not exhibit any effusion. The average thyroid-stimulating hormone (TSH) level in patients diagnosed with Pericardial effusion was found to be 41.22, whereas patients without this condition had an average TSH level of 28.26. The average blood T₄ level in individuals diagnosed with pericardial effusion was found to be 4.08, while the average serum T₄ level in the control group was seen to be 6.04. A statistically significant association

was seen between elevated serum TSH levels and decreased serum T₄ levels with the incidence of pericardial effusion. In light of the evidence, it can be inferred that pericardial effusion exhibits a higher prevalence among those afflicted with severe hypothyroidism^[28, 29].

Conclusion

The incidence of pericardial effusion in recently diagnosed hypothyroid patients was found to be 17%. The study did not find a significant association between the patient's age and sex and the likelihood of developing pericardial effusion in individuals with hypothyroidism. There is a statistically significant correlation between the clinical characteristics of pericardial effusion and its existence as observed on an echocardiography. The prevalence of macroglossia was higher among patients diagnosed with pericardial effusion. Electrocardiography and chest X-ray have the potential to serve as predictive tools for the detection of pericardial effusion. The presence of pericardial effusion is shown to be more prevalent in patients with a higher degree of disease severity, as indicated by serum thyroid hormone levels.

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Conflict of Interest

None

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