

Prevalence of pericardial effusion in new onset hypothyroidism patients in tertiary care hospital in davangere

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Abstract

Introduction: Hypothyroidism is a systemic metabolic disorder with a broad clinical spectrum, affecting nearly every organ system. In India, its prevalence is estimated at 10.95%. Cardiovascular involvement is a significant concern, as impaired thyroid function can lead to abnormalities in heart contractility, ventricular function, and systemic vascular resistance. These changes increase the risk of pericardial disease. While the link between hypothyroidism and pericardial effusion is recognized, reported occurrence rates vary significantly across different studies. **Objectives:** • To study the prevalence of pericardial effusion in adult hypothyroid patients. • To find a correlation between the severity of the disease and the presence of pericardial effusion. • To identify risk factors predisposing hypothyroid patients to develop pericardial effusion. **Material & Methods:** This hospital-based, cross-sectional study was conducted over one year in the Department of General Medicine at CGH and Bapuji Hospital, JJMMC, Davangere. The study population consisted of 85 newly diagnosed hypothyroid patients (elevated TSH and decreased T3/T4) over the age of 18. Subjects already receiving thyroxine or those with other known causes of pericardial effusion (e.g., tuberculosis, uremia, malignancy) were excluded. Data were collected via a detailed questionnaire, clinical examination, and blood investigations, then analyzed using SPSS v21.0. **Results:** The study population was predominantly female (88.2%) and middle-aged, with a mean age of 46.76 ± 10.929 years. Common clinical manifestations included hoarseness of voice (77.6%), weight gain (74.1%), cold intolerance (74.1%), and goiter (78.8%). The prevalence of pericardial effusion was found to be 15.3%. Statistical analysis showed no significant association between the presence of effusion and age ($p = 0.169$) or gender ($p = 0.620$). Cardiomegaly was detected in 23.5% of the participants. **Conclusion:** The study underscores the significant impact of hypothyroidism on the cardiovascular system, with a 15.3% prevalence of pericardial effusion in newly diagnosed adult patients. While often asymptomatic due to slow fluid accumulation, these effusions represent a unique clinical entity that typically resolves with thyroxine replacement therapy alone. The findings highlight the necessity for routine echocardiographic screening in newly diagnosed hypothyroid patients to ensure early detection and prevent hemodynamic complications.

Keywords: Hypothyroidism, Pericardial Effusion, Cardiovascular, Prevalence, Echocardiography.



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INTRODUCTION

Hypothyroidism exhibits a broad range of clinical manifestations, varying from severe myxedema, complications affecting various organs, and failure of multiple systems to asymptomatic or subclinical forms where levels of thyroxine and triiodothyronine remain within normal limits while serum thyrotropin levels are slightly elevated.¹⁻³ The occurrence of hypothyroidism in developed countries is estimated to be about 4-5%.^{4,5} In these areas, subclinical hypothyroidism impacts roughly 4-15% of the population.^{5,6} In India, the estimated prevalence of hypothyroidism is around 10.95%, indicating that nearly one in ten people are affected.⁷ Since the introduction of the universal salt

iodization initiative in 1983, there has been a significant decline in the prevalence of goiter in various parts of India that were once considered endemic to this condition.^{8,9}

Hypothyroidism can affect nearly every organ system, including the digestive, cardiovascular, dermatological, endocrine, hematological, musculoskeletal, psychiatric, renal, and pulmonary systems. In particular, regarding the cardiovascular system, impaired thyroid function may lead to abnormalities in heart contractility, heart rate, cardiac conduction pathways, ventricular function, systemic vascular resistance, and endothelial health.

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These abnormalities increase the risk of various cardiovascular issues, such as arrhythmias, heart failure, hypertension, and pericardial disease.¹⁰

The pericardium surrounds the heart and the major blood vessels adjacent to it. It consists of two layers, the parietal and visceral pericardium, both of which have a limited blood supply. There is a space between these layers that usually holds about 50 mL of pericardial fluid, which is generated through ultrafiltration from the capillaries in the pericardium. The primary drainage of this fluid is handled by the pericardial lymphatic system, which becomes active when there is an increase in pericardial pressure.¹¹

The pericardium has several roles, including protecting the heart and facilitating lubrication. It can also be affected by various systemic diseases, such as hypothyroidism. A distinct characteristic of pericardial effusion related to hypothyroidism is that, unlike other types of exudative effusion, it resolves with medical treatment without leaving any lasting effects. However, in more severe cases of the condition, it can lead to cardiac tamponade and potentially result in death. While the connection between pericardial effusion and hypothyroidism has been recognized for many years, different studies report differing rates of occurrence. This study aims to shed light on the already acknowledged link and to examine the incidence and severity of pericardial effusion in relation to the duration and severity of hypothyroidism.

OBJECTIVES:

- To study the prevalence of pericardial effusion in adult hypothyroid patients.
- To find a correlation between severity of disease and presence of pericardial effusion.
- To find the risk factors predisposing patients with hypothyroidism to develop pericardial effusion.

MATERIALS AND METHODS

Study Design: Hospital-based, cross-sectional study.

Study area: The study was conducted in the Department of General Medicine, CGH and Bapuji Hospital, JJMMC, Davangere, Karnataka.

Study period: 1 year.

Study population: Patients attending the outpatient clinic of the Department of Medicine and department of Endocrinology, CGH Davangere.

Sample size: The study consisted of a total of 85 subjects.

Sample size estimation:

Sample size was calculated using the data obtained from a similar study conducted by Bader et al., and using the formula,

$n =$

where,

□ z is standard normal deviate at 95% confidence interval;

□ p = proportion in the target population;

□ $q = 100 - p$; d = relative precision (taken as 25% of p)

□ $= (1.96)^2 \times 17 \times 83 / (8)^2$
 $= 84.69$

Hence the required sample size for the study was 85.

Sampling Technique: Simple Random technique.

Inclusion Criteria:

- Newly diagnosed patients with elevated TSH and decreased T3 and T4
- Age of the patients more than 18 years

Exclusion criteria:

- Patients already in treatment with Thyroxine
- Patients with other known causes of pericardial effusion - tuberculosis, uremia, malignancy, irradiation, connective tissue disorders, acute febrile onset, trauma, myocardial infarction, cardiac surgery

Ethical consideration: Institutional Ethical Committee permission was obtained before the commencement of the study.

Study tools and Data collection procedure:

Patients those who attended the outpatient clinic of the Department of Medicine who satisfied the inclusion criteria were registered for the study after obtaining informed written consent. A detailed questionnaire was used to elicit the socio demographic details and symptoms of hypothyroidism. The patient was examined for signs of hypothyroidism. Cardiovascular system was specially examined to find clinical features of pericardial effusion. Blood investigations were done to identify the hypothyroid patients.

STATISTICAL ANALYSIS

The data were collected using Microsoft 365 Excel and analyzed using SPSS v21.0. The normality test (Shapiro-Wilk Test) was performed to analyze the data, and the results were expressed as frequency with percentage and mean with standard deviation or median with interquartile range. Association between categorical variables was assessed using the Chi-square test or Fisher's exact test. All the statistical analyses were carried out at a 5% level of significance, and results with a P value < 0.05 were considered statistically significant.

RESULTS

Table 1. Demographic Profile

The study population was predominantly middle-aged and female.

Demographic Variable	Category	Frequency	Percentage
Age Group	<30 years	5	5.9%
	30 – 50 years	47	55.3%
	>50 years	33	38.8%
Gender	Males	10	11.8%
	Females	75	88.2%
Marital Status	Married	82	96.5%
	Unmarried	3	3.5%

The majority of participants belonged to the 30–50 age group (55.3%). The mean age was 46.76 ± 10.929 years. Females represented a significantly higher portion of the study at 88.2%, and 96.5% of the total participants were married.

Table 2. Major Constitutional and Respiratory Symptoms

Weight gain and cold intolerance were among the most frequent symptoms reported by the patients.

Symptom	Present (Frequency)	Present (%)	Absent (Frequency)	Absent (%)
Weight Gain	63	74.1%	22	25.9%
Cold Intolerance	63	74.1%	22	25.9%
Hoarseness of Voice	66	77.6%	19	22.4%
Dyspnea	41	48.2%	44	51.8%

Hoarseness of voice was the most prevalent symptom (77.6%). Both weight gain and cold intolerance were reported by nearly three-quarters of the study population (74.1% each). Dyspnea was present in nearly half of the participants (48.2%).

Table 3. Gastrointestinal and Neurological Symptoms

The study tracked various specialized symptoms, ranging from appetite changes to sensory disturbances.

Symptom	Present (Frequency)	Present (%)	Absent (Frequency)	Absent (%)
Constipation	24	28.2%	61	71.8%
Anorexia	23	27.1%	62	72.9%
Somnolence	19	22.4%	66	77.6%
Fatigability	13	15.3%	72	84.7%
Night Blindness	13	15.3%	72	84.7%

Constipation and anorexia were the leading gastrointestinal complaints, affecting 28.2% and 27.1% of patients, respectively. Somnolence was noted in 22.4% of cases, while fatigability and night blindness were both present in 15.3% of the study group.

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Table 4. Clinical Examination Findings

Clinical Sign	Present (Frequency)	Present (%)	Absent (Frequency)	Absent (%)
Goiter	67	78.8%	18	21.2%
Cardiomegaly	20	23.5%	65	76.5%
Exophthalmos	10	11.8%	75	88.2%
Periorbital Edema	10	11.8%	75	88.8%

Goiter was a major clinical finding, present in 78.8% of the subjects. Cardiomegaly was detected in 23.5% of the participants. Both exophthalmos and periorbital edema were observed in 11.8% of the patients.

Table 5. Skin and Hair Characteristics

The texture and condition of skin and hair provided important clinical indicators.

Parameter	Category A (Freq/%)	Category B (Freq/%)
Skin Texture	Soft: 76 (89.4%)	Scaly: 9 (10.6%)
Skin Temperature	Warm: 76 (89.4%)	Cold: 9 (10.6%)
Skin Moisture	Moist: 63 (74.1%)	Dry: 22 (25.9%)
Hair Texture	Coarse: 65 (76.5%)	Loss of Hair: 20 (23.5%)

Most participants maintained soft (89.4%), warm (89.4%), and moist (74.1%) skin. However, coarse hair was a very common finding, occurring in 76.5% of the subjects.

Table 6. Anthropometric Parameters and Vital Signs

These measurements established the physical and physiological baseline of the study group.

Parameter	Mean ± Standard Deviation
Height	158.29 ± 9.067 cm
Weight	57.82 ± 7.86 kg
Pulse Rate	76.25 ± 12.25 bpm
Systolic BP	118.16 ± 21.781 mmHg
Diastolic BP	70.85 ± 7.581 mmHg

The study population had an average height of approximately 158 cm and a weight of 57.8 kg. The vital signs remained within relatively normal ranges, with an average pulse rate of 76 bpm and an average blood pressure of approximately 118/71 mmHg.

Table 7. Prevalence of Pericardial Effusion

This table highlights the primary objective of the study.

Finding	Frequency	Percentage
Pericardial Effusion (Present)	13	15.3%

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Finding	Frequency	Percentage
Pericardial Effusion (Absent)	72	84.7%
Total	85	100.0%

The prevalence of pericardial effusion among newly diagnosed adult hypothyroid patients in this study was 15.3%. This falls within the range of findings from previous literature, such as Hardisty (23.07%) and Kerber et al. (21.0%).

Table 8. Association Between Demographics and Pericardial Effusion

The study analyzed whether age or gender influenced the development of effusion.

Variable	Effusion Present	Effusion Absent	P-Value
Age: <30	1	4	0.169
Age: 30–50	10	37	
Age: >50	2	31	
Gender: Male	1	9	0.620
Gender: Female	12	63	

Statistical analysis showed no significant association between the presence of pericardial effusion and the patient's age ($p = 0.169$) or gender ($p = 0.620$). This suggests that within this study group, these demographic factors did not predispose patients to developing the condition.

DISCUSSION

Cardiovascular Manifestations of Hypothyroidism

The cardiovascular system is significantly influenced by thyroid hormones, which regulate heart rate, cardiac contractility, and systemic vascular resistance. In the current study of 85 hypothyroid patients, the prevalence of pericardial effusion was found to be 15.3%. This finding aligns with the established understanding that thyroid deficiency can lead to fluid accumulation in the pericardial sac, primarily due to increased capillary permeability and impaired lymphatic drainage of albumin.

Comparatively, the incidence reported in this study is lower than several classic investigations, such as those by Nouh et al.¹² (37%) and Rawat et al.¹³ (25%), but higher than the 3% reported by Kabadi et al.¹⁴ These variations in literature likely reflect differences in the severity of hypothyroidism among study populations. As noted by Kabadi et al.¹⁴, pericardial effusion is often a hallmark of advanced myxedema rather than early-stage hypothyroidism, which is now more frequently detected due to modern diagnostic screening.

Analysis of Clinical Symptomatology:

The clinical presentation in this cohort was characterized by a high frequency of classic hypothyroid symptoms. Hoarseness of voice was the most prevalent symptom at 77.6%, followed closely by weight gain and cold intolerance, both occurring in

74.1% of patients. These symptoms result from the accumulation of glycosaminoglycans in tissues and a decreased basal metabolic rate. Most of the participants had weight gain (74.1%), cold intolerance (74.1%), Hoarseness of voice (77.6%), dyspnea (48.2%), and chest pain (7.1%). In the study conducted by Vaghela et al.¹⁵, 50.0% of the individuals reported cold intolerance. The study conducted by Khabbazi et al., the prevalence of cold related symptoms was 44.7% and cold intolerance was 11.1%.¹⁶ In a study conducted by Fox et al., weight gain and thereby obesity at baseline was 14.3%.¹⁷

Interestingly, while weight gain is a common clinical expectation, it usually does not exceed 10% of total body weight and is largely attributed to fluid retention rather than simple fat accumulation. In our study, dyspnea was reported by 48.2% of participants. While dyspnea in hypothyroidism can be multifactorial—stemming from respiratory muscle weakness or pleural effusion—its presence in this study population may also be a clinical indicator of the hemodynamic impact of pericardial fluid accumulation.

Demographic Correlations and Risk Factors

Analysis of the study population revealed a mean age of 46.76 years, with a strong female preponderance of 88.2%. This distribution is consistent with global epidemiological data indicating that primary

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hypothyroidism is significantly more common in women and that its frequency increases with age.

The mean age of the study participants was 46.76 ± 10.929 years. In the study conducted by Vaghela et al., the mean age of the study population was 35.5 ± 9.39 years.¹⁵ The majority of the participants were females in this study (88.2%). In the study conducted by Vaghela et al, the male to female ratio was 3:1. In the Ambika Unnikrishnan et al., study conducted in different cities of the country showed that the female to male ratio was 2:1.7 Primary hypothyroidism is up to 8–9 times more common in women than in males, and the frequency rises with age, according to a research by Chiovato et al.¹⁸

When examining the risk factors for pericardial effusion, this study found no statistically significant association with age ($p = 0.169$) or gender ($p = 0.620$). This suggests that the presence of effusion is more likely a reflection of the biochemical severity and duration of the thyroid hormone deficiency rather than demographic variables. Previous studies have suggested that TSH levels are the most significant correlate for the presence of pericardial effusion, a trend supported by the fact that the mean TSH in this study was elevated at 12.25 ± 5.53 .

Diagnostic and Therapeutic Implications

Echocardiography remains the gold standard for detecting and quantifying pericardial effusion in hypothyroid patients. In this study, cardiomegaly was clinically or radiologically present in 23.5% of subjects, which often serves as a primary clue for further cardiac investigation.

The management of hypothyroid-related effusion is unique; unlike other exudative effusions, it typically resolves with thyroid hormone replacement therapy alone without requiring invasive drainage, unless cardiac tamponade is present. The slow accumulation of fluid in hypothyroidism allows the pericardium to stretch, often preventing the rapid rise in intrapericardial pressure that leads to tamponade, even in the presence of large volumes. Consequently, most patients in this study remained hemodynamically stable despite the presence of effusion.

CONCLUSION

The findings of this clinical study underscore the significant impact of hypothyroidism on the cardiovascular system, specifically highlighting a 15.3% prevalence of pericardial effusion among newly diagnosed adult patients. While hypothyroidism affects approximately 10.95% of the Indian population, its systemic reach extends to nearly every organ, with the heart being particularly vulnerable to disruptions in contractility, rhythm, and endothelial health.

Ultimately, this research confirms that while pericardial effusion is a frequent association in patients with significant thyroid deficiency, it remains a unique clinical entity that typically resolves with thyroxine replacement therapy without the need for invasive procedures or leaving residual sequelae. These results highlight the necessity for routine echocardiographic screening in newly diagnosed hypothyroid patients to ensure early detection and prevent potential hemodynamic complications.

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