

Original Research

Exploring the Occurrence of Left Ventricular Diastolic Dysfunction in Individuals with Subclinical Hypothyroidism

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ABSTRACT:

Background: Subclinical hypothyroidism (SCH) is characterized by peripheral thyroid hormone levels within the normal reference range, accompanied by a slight elevation in serum thyroid-stimulating hormone (TSH) levels. The thyroid hormone is integral in regulating diverse cellular and molecular processes, exerting its influence on nearly every cell and organ, notably the heart. Our goal was to explore the prevalence of left ventricular diastolic dysfunction in individuals exhibiting subclinical hypothyroidism. **Methods:** A study based in a hospital was undertaken, focusing on individuals diagnosed with subclinical hypothyroidism (SCH). Participants were selected based on predefined inclusion and exclusion criteria, and they were either attending the outpatient department (OPD) or admitted to the inpatient department (IPD). **Results:** In instances of subclinical hypothyroidism, the average TSH levels are documented at 7.41 ± 1.57 mU/L. The mean Free T4 levels stand at 1.57 ± 0.38 pmol/L, while the mean Free T3 levels are reported as 4 ± 0.81 pmol/L. Additionally, the mean left ventricular end-diastolic diameter (LVEDD) is recorded at 47.66 ± 3.24 mm. **Conclusion:** The discovery of newly identified subclinical hypothyroidism is often associated with cardiovascular changes. It is crucial to promptly diagnose and address hypothyroidism to minimize its early impact on the cardiovascular system.

Keywords: Subclinical Hypothyroidism, Left Ventricle, Diastolic dysfunction, Incidence

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INTRODUCTION

Subclinical Hypothyroidism (SCH), often described as a mild thyroid failure, is a prevalent condition where peripheral thyroid hormone levels fall within the normal reference range, yet there is a slight elevation in serum thyroid-stimulating hormone (TSH) levels. To comprehend the intricate interplay between thyroid dysfunction and cardiovascular health, it is essential to delve into the intricate cellular mechanisms through which thyroid hormones exert their influence on the heart and the broader cardiovascular system.¹ This comprehension sheds light on the consequential alterations in various cardiovascular parameters, including cardiac output, cardiac contractility, blood pressure, vascular resistance, and rhythm disturbances that result from thyroid dysfunction. The significance of these effects becomes more evident considering the well-documented observation that the most common signs

and symptoms of thyroid disease often manifest in the heart and cardiovascular system.

In our research endeavors, our primary aim was to shed light on a specific facet of this complex connection by investigating the prevalence of left ventricular diastolic dysfunction in patients diagnosed with subclinical hypothyroidism.² Our findings uncovered that abnormal left ventricular diastolic filling, indicative of impaired left ventricular relaxation, is a frequent occurrence in individuals grappling with subclinical hypothyroidism.

An especially noteworthy observation from our study surfaced — the abnormality in left ventricular diastolic function demonstrated potential for reversal through short-term substitutive Levothyroxin therapy.³ This underscores the potential benefits of early diagnosis and intervention in managing the cardiovascular implications associated with subclinical hypothyroidism.⁴ The prospect of

mitigating these effects through targeted therapeutic measures emphasizes the importance of ongoing research and clinical attention to optimize outcomes for individuals navigating this common yet intricate thyroid disorder. Our study contributes to the growing body of knowledge surrounding subclinical hypothyroidism and reinforces the significance of a nuanced understanding and tailored interventions for those affected by this condition.⁵

MATERIALS AND METHODS

This study is exclusively centered on female cases, employing specific inclusion and exclusion criteria to ensure a focused and comprehensive investigation.

Inclusion Criteria: All females aged 20 to 60 years identified with subclinical hypothyroidism will be included in the study. The selection criteria for patients undergoing 2D Echo include the following serum levels: Serum FT3 levels between 2.77 and 5.27 pg/ml, serum FT4 ranging from 0.78 to 2.19

ng/dl, and serum TSH levels falling within the range of 5 to 10 micro units/L. These stringent criteria aim to capture a targeted cohort of female participants within a specific age range and with defined thyroid hormone levels, ensuring a more precise and meaningful exploration of the study objectives.

Exclusion Criteria: Patients meeting any of the following criteria will be excluded from the study:

1. Failure to provide informed consent.
2. Age less than 20 years.
3. Age exceeding 60 years.
4. Heart rate exceeding 100 beats per minute.

These criteria aim to ensure a homogeneous study population, focusing specifically on females within a certain age bracket who exhibit subclinical hypothyroidism and meet defined serum level parameters. Excluding individuals with certain characteristics, such as age extremes or elevated heart rates, helps in refining the study group and enhancing the reliability and relevance of the findings.

RESULTS

Table 1: Distribution of Cases according to Clinical Symptoms

Clinical Symptoms	No. of Cases	Percent
General weakness	76	21.1
Facial puffiness	28	7.8
Swelling of limbs	24	6.7
Hoarseness of voice	48	13.3
Cold intolerance	28	7.8
Weight gain	44	12.2
Skin changes	24	6.7
Pain in muscle & joints	68	18.9
Constipation	56	15.6
Slow in physical activities	48	13.3

Figure1: Distribution of Cases according to Clinical Symptoms

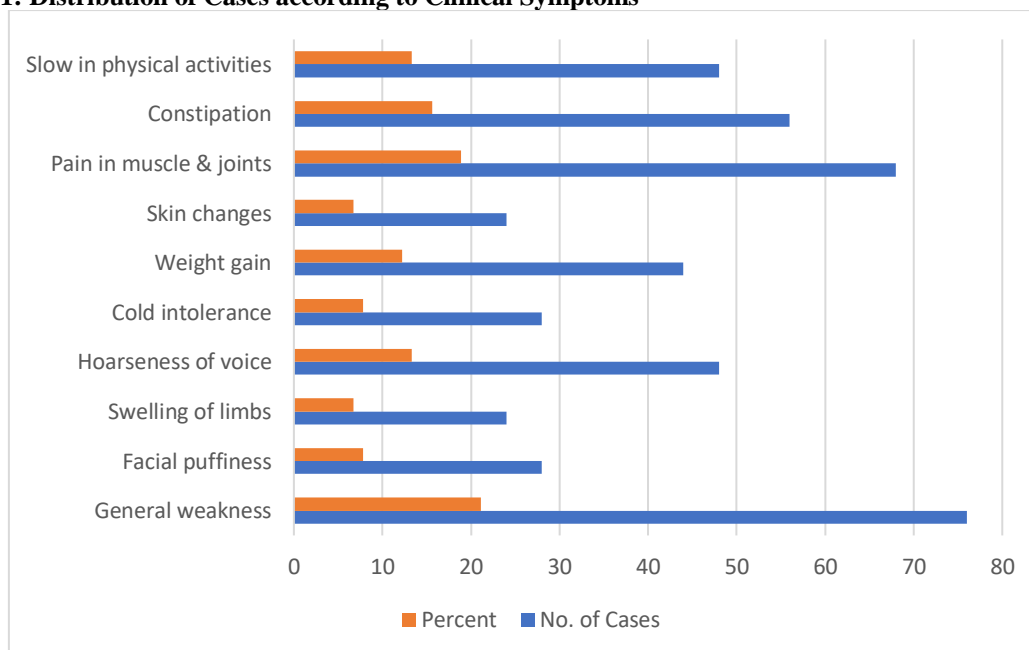
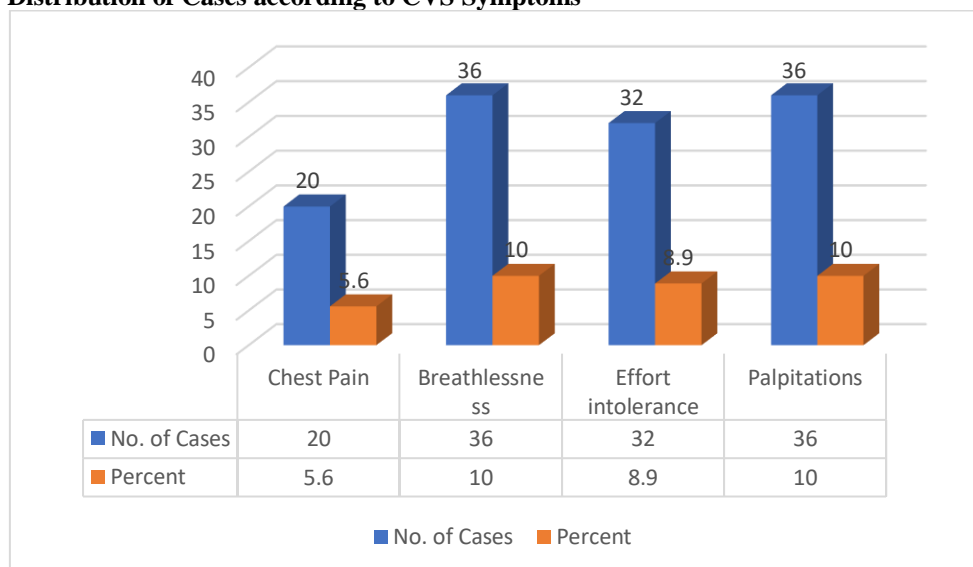


Table 2: Distribution of Cases according to CVS Symptoms

CVS symptoms	No. of Cases	Percent
Chest Pain	20	5.6
Breathlessness	36	10.0
Effort intolerance	32	8.9
Palpitations	36	10.0

Figure 2: Distribution of Cases according to CVS Symptoms

In our study, a notable portion of the cases reported various symptoms associated with subclinical hypothyroidism. General weakness was the most frequently cited complaint, noted by 76 cases (21.1%), followed by muscle and joint pain in 68 cases (18.9%). Hoarseness of voice was reported by 48 cases (13.3%), weight gain by 44 cases (12.2%), facial puffiness by 28 cases (7.8%), and swelling of limbs and skin changes by 24 cases (6.7%). Some individuals exhibited cardiovascular symptoms, with 36 cases (10%) reporting breathlessness and palpitations, and 32 cases (8.9%) indicating effort intolerance. Additionally, 20 cases (5.6%) reported chest pain. In the subgroup of subclinical hypothyroidism cases, the mean TSH levels were measured at 7.41 ± 1.57 mU/L, with mean Free T4 levels at 1.57 ± 0.38 pmol/L and mean Free T3 levels at 4 ± 0.71 pmol/L. Our study included 180 cases of subclinical hypothyroidism, revealing mean left ventricular end-diastolic diameter (LVEDD) of 47.66 ± 3.24 mm, left ventricular end-systolic diameter (LVESD) of 30.618 ± 5.7 mm, diastolic interventricular septum thickness (Diastolic IVST) of 9.8 ± 1.59 mm, diastolic left ventricular posterior wall thickness (Diastolic LVPWT) of 9.8 ± 1.8 mm, and left ventricular mass (LVM) of 35.81 ± 5.7 mm. Furthermore, the mean E (presumably representing an echocardiographic parameter) in our study was recorded at 76.4. These findings collectively contribute to a comprehensive understanding of the clinical presentation and cardiovascular implications in the context of subclinical hypothyroidism in the studied population.

DISCUSSION

Subclinical Hypothyroidism (SCH) has emerged as a significant global health challenge, as underscored by the comprehensive findings of our study.^{6,7} This condition, characterized by peripheral thyroid hormone levels within the normal reference range but with mildly elevated serum thyroid-stimulating hormone (TSH) levels, has been associated with left ventricular diastolic dysfunction (LVDD) and a spectrum of clinical symptoms. Our research contributes to an enhanced understanding of the intricate interplay between thyroid function and cardiovascular health, emphasizing the imperative need for nuanced comprehension and proactive management strategies.

A pivotal aspect of our investigative approach is the utilization of Doppler echocardiography. This sophisticated yet accessible method proves instrumental in evaluating both the morphology and function of the heart in individuals with SCH. The simplicity and reliability of Doppler echocardiography make it a valuable tool not only for cross-sectional assessments but also for the longitudinal tracking of left ventricular diastolic function. This capability significantly enhances our ability to discern dynamic changes in cardiac parameters over time, providing clinicians with valuable insights for tailored patient care.⁸ The integration of Doppler echocardiography into our study design emphasizes the importance of employing advanced diagnostic techniques to unravel the complexities of subclinical hypothyroidism and its impact on cardiovascular health. The identification of hypothyroid patients, as underscored in our study,

transcends individual health concerns and carries significant implications for public health on a larger scale. The early recognition of individuals with Subclinical Hypothyroidism (SCH) becomes a pivotal step in the broader context of health management. Early diagnosis and correction of hypothyroidism emerge as imperative interventions, not solely to address the immediate symptoms but also to mitigate the potential cardiovascular consequences associated with SCH. This proactive approach aligns with a preventive healthcare paradigm, aiming to minimize the overall burden of cardiovascular disease in the population. By emphasizing the importance of early identification and intervention in hypothyroid cases, our study advocates for a broader public health perspective. It encourages health systems to integrate thyroid function assessments into routine screenings, fostering early detection and timely management. Such a proactive stance not only promotes individual well-being but also contributes to the overall resilience of public health by addressing a condition that, if left untreated, could have cascading effects on cardiovascular health.

In essence, our study underscores the pivotal role of vigilant screening, early diagnosis, and prompt correction of hypothyroidism in mitigating cardiovascular risks among individuals with subclinical hypothyroidism.⁹ This knowledge has far-reaching implications for healthcare practices and policies, offering a foundation for informed decision-making and targeted interventions to address the global impact of subclinical hypothyroidism on cardiovascular health. As we navigate the complexities of thyroid-cardiovascular interactions, our findings contribute to the evolving landscape of clinical strategies aimed at improving the health outcomes of individuals affected by subclinical hypothyroidism.⁵ The implications of our study extend far beyond the confines of individual health concerns, resonating significantly in the broader landscape of public health. The early identification and proactive management of hypothyroid patients, particularly those with Subclinical Hypothyroidism (SCH), emerge as fundamental components in a comprehensive strategy for health management. This strategic shift moves away from merely addressing symptoms to proactively preventing and managing underlying conditions.

Early recognition of individuals with SCH assumes a critical role in this paradigm, becoming a linchpin in the quest for holistic health management.¹⁰ Incorporating thyroid screening into routine health assessments becomes imperative, offering a proactive approach to identify thyroid dysfunction, especially in its subclinical form, before it progresses to more severe stages. This early diagnosis sets the stage for timely and targeted interventions, addressing not only immediate symptomatic relief but also mitigating the potential cardiovascular consequences linked with SCH.

The proactive healthcare paradigm advocated by our study aligns seamlessly with the principles of preventive medicine, emphasizing the importance of anticipating and preventing health issues rather than merely reacting to their manifestations. Early identification and correction of Subclinical Hypothyroidism (SCH) play a vital role in contributing to the overall reduction of cardiovascular disease burden within the population. This proactive approach carries profound implications for population health. Integrating thyroid screening into routine health check-ups expands the reach of early identification efforts, enabling a broader segment of the population to benefit from timely interventions. As a result, the overall health and productivity of the population stand to improve, fostering a more resilient and thriving society. From an economic standpoint, the shift toward proactive health management can lead to a reduction in the burden associated with advanced cardiovascular diseases.¹¹ Early interventions in thyroid dysfunction not only optimize the use of healthcare resources but also potentially alleviate the strain on healthcare systems. This, in turn, contributes to the overarching goal of reducing long-term healthcare costs and enhancing the efficiency of healthcare delivery.

In conclusion, our study advocates for a transformative shift in healthcare strategies—one that emphasizes the proactive identification and management of hypothyroidism, particularly in its subclinical stage. This forward-thinking approach holds the promise of fostering a healthier, more resilient society, with improved long-term health outcomes and reduced societal burdens associated with cardiovascular diseases. By embracing this paradigm, healthcare systems can play a pivotal role in shaping a future where preventive measures take precedence, contributing to the well-being of individuals and the overall health of the population.

CONCLUSION

The correlation between cardiovascular changes and newly identified Subclinical Hypothyroidism (SCH) stands out as a noteworthy observation in the realm of thyroid disorders. The intricate connection between the cardiovascular system and thyroid function is well-established, and fluctuations in thyroid hormone levels can exert profound effects on both cardiac function and vascular health. In the context of newly detected SCH, where peripheral thyroid hormone levels fall within the normal reference range but serum thyroid-stimulating hormone (TSH) levels are mildly elevated, discernible changes often occur in the cardiovascular system. Understanding these cardiovascular implications underscores the importance of vigilant screening and early intervention in individuals newly diagnosed with SCH. Early correction of thyroid dysfunction not only aims to alleviate immediate symptoms but also strives to mitigate potential long-term cardiovascular

consequences. This recognition emphasizes the significance of adopting a comprehensive approach to managing thyroid disorders, considering their impact on the cardiovascular system, to optimize overall health outcomes for individuals with newly detected Subclinical Hypothyroidism.

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