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Original Research

Investigating the Prevalence of Left Ventricular Diastolic Dysfunction in Patients with Subclinical Hypothyroidism

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ABSTRACT:

Background:Subclinical hypothyroidism (SCH) is identified when peripheral thyroid hormone levels fall within the standard reference range, while serum thyroid-stimulating hormone (TSH) levels show a slight elevation. Thyroid hormone plays a crucial role in governing various cellular and molecular processes, influencing nearly every cell and organ in the body, including the heart. Our objective was to investigate the occurrence of left ventricular diastolic dysfunction among individuals with subclinical hypothyroidism.**Methods**:A hospital-based study was conducted on individuals with subclinical hypothyroidism (SCH), meeting specified inclusion and exclusion criteria, who were attending the outpatient department (OPD) or admitted to the inpatient department (IPD).**Results**: The average TSH levels in cases of subclinical hypothyroidism are 7.51±1.57 mU/L, with mean Free T4 levels at 1.67±0.38 pmol/L and mean Free T3 levels at 4±0.81 pmol/L. Additionally, the mean left ventricular end-diastolic diameter (LVEDD) is 47.66±3.24 mm, mean left ventricular end-systolic diameter (LVESD) is 30.618±5.7 mm, diastolic interventricular septum thickness (Diastolic IVST) is 9.8±1.59 mm, diastolic left ventricular posterior wall thickness (Diastolic LVPWT) is 9.8±1.8 mm, and left ventricular mass (LVM) is 35.91±5.7 mm.**Conclusion**:Newly identified subclinical hypothyroidism is frequently linked to cardiovascular changes. Timely diagnosis and correction of hypothyroidism are imperative to minimize the early impact on the cardiovascular system.

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

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INTRODUCTION

Subclinical Hypothyroidism (SCH), often termed mild thyroid failure, represents a prevalent condition characterized by peripheral thyroid hormone levels within the normal reference range, alongside a mild elevation in serum thyroid-stimulating hormone (TSH) levels.[1] To unravel the intricate relationship between thyroid dysfunction and cardiovascular health, it becomes crucial to delve into the cellular mechanisms through which thyroid hormones exert their influence on the heart and the broader cardiovascular system.Our understanding of these mechanisms allows us to elucidate the consequential alterations in cardiac output, cardiac contractility, blood pressure, vascular resistance, and rhythm disturbances arising from thyroid dysfunction. The significance of these effects becomes even more apparent considering the well-documented observation that the most common signs and symptoms of thyroid disease are manifestations of the thyroid hormone's impact on the heart and cardiovascular system.[2]

In our research endeavors, we sought to shed light on a specific aspect of this intricate connection by investigating the prevalence of left ventricular diastolic dysfunction in patients diagnosed with subclinical hypothyroidism.[3] Our findings indicated that abnormal left ventricular diastolic filling, indicative of impaired left ventricular relaxation, is a prevalent occurrence in individuals grappling with subclinical hypothyroidism.

What further emerged from our study was a noteworthy observation — this abnormality in left ventricular diastolic function showed potential for reversal through short-term substitutive Levothyroxin therapy. This underscores the potential benefits of

early diagnosis and intervention in managing the cardiovascular implications associated with subclinical hypothyroidism. The prospect of mitigating these effects through targeted therapeutic measures emphasizes the importance of further research and clinical attention to optimize outcomes for individuals navigating this common yet intricate thyroid disorder.

MATERIALS AND METHODS

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

Inclusion Criteria: All females within the age range of 20 to 50 years who are identified to have subclinical hypothyroidism will be included in the study. The criteria for selecting patients for 2D Echo include the following serum levels: Serum FT3 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.

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 50 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	38	21.1
Facial puffiness	14	7.8
Swelling of limbs	12	6.7
Hoarseness of voice	24	13.3
Cold intolerance	14	7.8
Weight gain	22	12.2
Skin changes	12	6.7
Pain in muscle & joints	34	18.9
Constipation	28	15.6
Slow in physical activities	24	13.3

Figure1: Distribution of Cases according to Clinical Symptoms

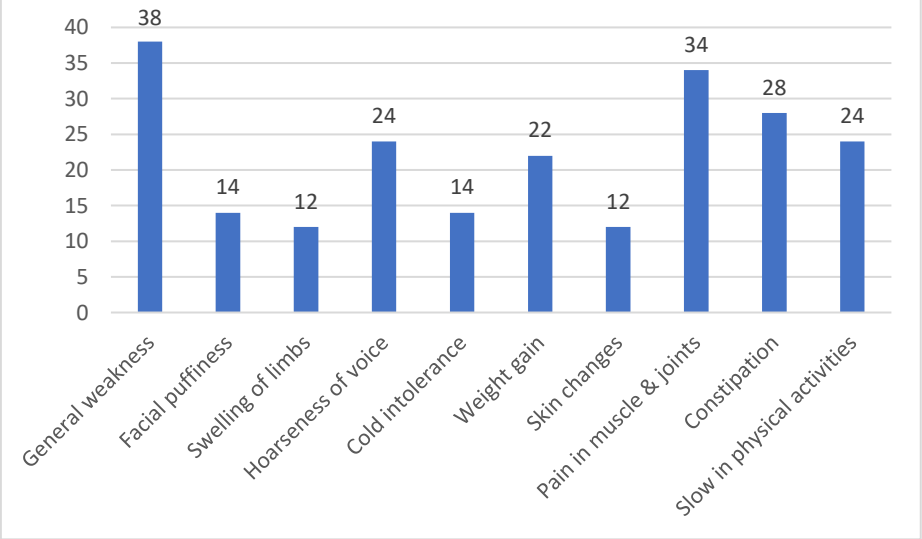
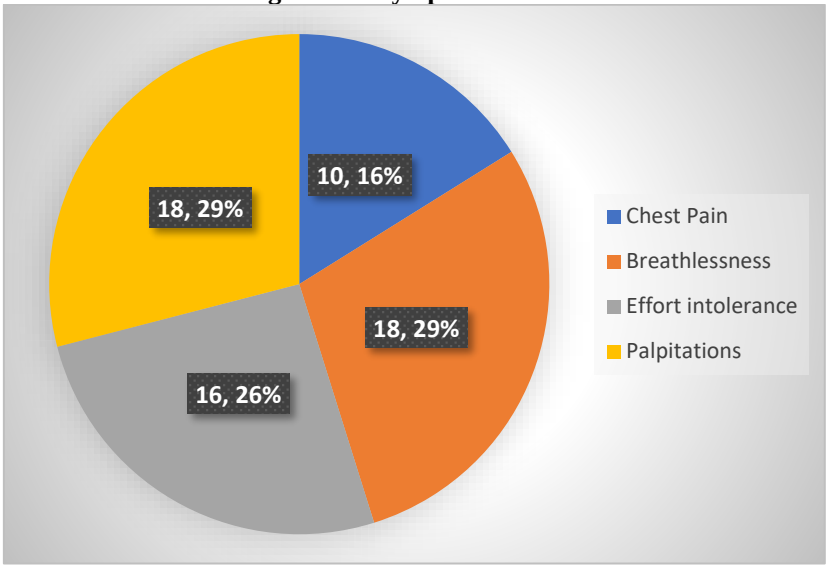


Table 2: Distribution of Cases according to CVS Symptoms

CVS symptoms	No. of Cases	Percent
Chest Pain	10	5.6
Breathlessness	18	10.0
Effort intolerance	16	8.9
Palpitations	18	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 38 cases (21.1%), followed by muscle and joint pain in 34 cases (18.9%). Hoarseness of voice was reported by 24 cases (13.3%), weight gain by 22 cases (12.2%), facial puffiness by 14 cases (7.8%), and swelling of limbs and skin changes by 12 cases (6.7%). Some individuals exhibited cardiovascular symptoms, with 18 cases (10%) reporting breathlessness and palpitations, and 16 cases (8.9%) indicating effort intolerance. Additionally, 10 cases (5.6%) reported chest pain.In the subgroup of subclinical hypothyroidism cases, the mean TSH levels were measured at 7.51±1.57 mU/L, with mean Free T4 levels at 1.67±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 indicated by the comprehensive findings of our study. 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.[4] Our research sheds light on the intricate interplay between thyroid function and cardiovascular health, emphasizing the need for a nuanced understanding and proactive management strategies.The utilization of Doppler echocardiography in our study represents a pivotal aspect of our investigative approach. Doppler echocardiography serves as a sophisticated yet accessible method for evaluating both the morphology and function of the heart in individuals with SCH. Its simplicity and reliability make it a valuable tool for not only cross-sectional assessments but also longitudinal tracking of left ventricular diastolic function. This capability enhances our ability to discern the dynamic changes in cardiac parameters over time, providing clinicians with valuable insights for tailored patient care.

The identification of hypothyroid patients, as highlighted in our study, extends beyond individual health concerns and holds implications for public health at large. The early recognition of individuals with SCH becomes a crucial step in the broader context of health management. Early diagnosis and correction of hypothyroidism stand out as imperative interventions, not only 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.

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. 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. 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. It underscores the importance of anticipating and preventing health issues rather than merely reacting to their manifestations. By identifying SCH early and taking corrective actions, healthcare systems can significantly contribute to minimizing the overall burden of cardiovascular diseases within the population.Furthermore, this proactive approach has profound implications for population health. Integrating thyroid screening into routine health check-ups expands the reach of early identification efforts, allowing a larger segment of the population to benefit from timely interventions.[6] As a result, the overall health and productivity of the population stand to improve, fostering a more resilient and thriving society.Economically, the shift toward proactive health management can lead to a reduction in the burden associated with advanced cardiovascular diseases. 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) is a noteworthy observation in the realm of thyroid disorders. The cardiovascular system is intricately linked to thyroid function, and alterations in thyroid hormone levels can exert profound effects on cardiac function and vascular health.In the context of newly detected SCH, where peripheral thyroid hormone levels are within the normal reference range but serum thyroid-stimulating hormone (TSH) levels are mildly elevated, the cardiovascular system often undergoes discernible changes. These changes may encompass variations in heart rate, blood pressure, and alterations in cardiac contractility. The association between SCH and cardiovascular changes has been a subject of increasing interest in medical research, recognizing that even mild disruptions in thyroid function can have notable consequences on the cardiovascular system.Common cardiovascular manifestations associated with newly detected SCH include changes in cardiac output, impaired left ventricular diastolic function, and alterations in vascular resistance. These changes may contribute to symptoms such as palpitations, effort intolerance, and in some cases, more severe cardiovascular outcomes if left unaddressed.The understanding of these cardiovascular implications emphasizes 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 underscores the significance of a comprehensive approach to managing thyroid disorders, taking into account their impact on the cardiovascular system to optimize overall health outcomes for individuals with newly detected Subclinical Hypothyroidism.

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