MAK HILL Publications Research Journal of Medical Sciences

Research Article
doi: 10.36478/makrjms.2024.9.633.636

Unmasking the Prevalence of Subclinical Hypothyroidism in Gallbladder Stone Patients: Prospective Study from a Tertiary Care Institute

[1]Yogesh K. Swami, [2]Nikunj D. Bhesaniya, [3]Sameer H. Marediya and [4]Ramkrishna Darji

[1,3,4]Department of General Surgery, Banas Medical College and Research Institute, Palanpur, Gujarat, India

[2]Department of General Surgery, Shantaba Medical College and General Hospital, Amreli, Gujarat, India

OPEN ACCESS

Key Words
Cholelithiasis, hypothysroidism, T3, T4, TSH

Corresponding Author
Ramkrishna Darji,
Department of General Surgery, Banas Medical College and Research Institute, Palanpur, Gujarat, India
rddarji15@gmail.com

Author Designation
[1]Associate Professor
[2-4]Assistant Professor

Received: 10 August 2024
Accepted: 12 September 2024
Published: 17 September 2024

Citation: Ramkrishna Darji, Yogesh K. Swami, Sameer H. Marediya, Nikunj D. Bhesaniya, 2024. Unmasking the Prevalence of Subclinical Hypothyroidism in Gallbladder Stone Patients: Prospective Study from a Tertiary Care Institute. Res. J. Med. Sci., 18: 633-636, doi: 10.36478/makrjms. 2024.9.633.636

ABSTRACT

Gallstone disease is increasingly prevalent in India, particularly among South Asians. Studies suggest a possible link between hypothyroidism and gallstone formation due to factors like impaired bile flow and altered cholesterol metabolism. Despite a high incidence of gallstones in regions like Gujarat, the relationship between undiagnosed hypothyroidism and gallstone disease is not well explored. This study aims to investigate the prevalence of subclinical hypothyroidism in patients with gallstones and its potential role in gallstone formation. A prospective, hospital-based, cross-sectional study was conducted in a tertiary care teaching institute over a year, involving 160 patients diagnosed with gallstone disease. Detailed clinical histories, physical examinations and thyroid function tests (T3, T4, TSH) were performed. Patients were categorized into three groups: euthyroid, subclinical hypothyroid and hypothyroid. Exclusion criteria included prior thyroid surgery, diabetes mellitus, renal stones and pregnancy. Statistical analysis, including chi-square and ANOVA tests, was used to assess the correlation between thyroid dysfunction and gallstone disease. Of the 160 patients, 38 (23.75%) had hypothyroidism, including 32 with subclinical hypothyroidism and 6 with overt hypothyroidism. Hypothyroidism was more prevalent in females (32.25%) than males (19.35%). Symptoms of biliary colic, fatty dyspepsia and right hypochondrial pain were common. The study highlights a significant association between hypothyroidism, particularly subclinical hypothyroidism and gallstone disease. Screening for thyroid dysfunction in patients with cholelithiasis could improve disease management and prevention.

INTRODUCTION

The prevalence of gallbladder stones in India has been on the rise due to changing dietary habits, improved diagnostic methods and increasing accessibility to healthcare. A gallstone survey suggested that gallbladder stones occurred 7 times more commonly in South. Asian people than others[1]. The formation of these stones is influenced by various factors, including cholesterol concentration, bile supersaturation, nucleation processes and impaired gallbladder motility, which lead to biliary stasis[2]. Globally, there has been ongoing discussion for decades about the possible link between thyroid disorders and cholelithiasis. Hypothyroidism, in particular, has been suggested to influence gallstone formation through mechanisms such as altered liver cholesterol metabolism, impaired thyroxine-mediated relaxation of the sphincter of Oddi and reduced bile flow[3]. Despite the high prevalence of cholelithiasis in regions like Gujarat, the association between undiagnosed hypothyroidism and gallstone disease remains underexplored.

Gallstones, which can be classified as cholesterol, pigment, or mixed stones, are among the most common biliary pathologies encountered by surgeons. Their prevalence varies widely across different populations, influenced by factors such as age, gender, ethnicity and geography. Studies have shown that thyroid disorders, particularly subclinical hypothyroidism, are common endocrine disorders worldwide and may be frequently overlooked due to their subtle presentation. Subclinical hypothyroidism is characterized by normal serum thyroid hormone levels but slightly elevated serum thyroid-stimulating hormone (TSH) levels[4]. This condition has been linked to altered lipid metabolism, which may affect bile composition and contribute to gallstone formation[5].

In hypothyroidism, there is often reduced bile flow due to decreased activity of the sphincter of Oddi, which is believed to express thyroid hormone receptors. Thyroxine has a direct relaxing effect on the sphincter, and its deficiency in hypothyroid states may lead to biliary stasis, a critical factor in gallstone formation[6]. In hypothyroidism, the digestive tract often experiences impaired motility, which contributes to a reduced bile flow rate into the duodenum[6]. Additionally, studies have associated hypothyroidism with decreased bilirubin excretion, primarily due to a reduction in the activity of the enzyme UDP glucuronyl transferase[7]. Given these considerations, the present study aims to investigate the prevalence of undiagnosed hypothyroidism in patients with cholelithiasis and to explore the potential role of hypothyroidism as a contributing factor to gallstone disease in the region of Gujarat. This research could help establish a more comprehensive understanding of the relationship between thyroid function and gallbladder pathology.

MATERIALS AND METHODS

Prospective, non randomized study done on all the patients of gall stone disease Admitted in Department of Surgery.

Study Setting: The study was conducted as a prospective, hospital-based cross-sectional analysis in a tertiary care teaching institute in India. Over the course of a year, patients hospitalized for gallstone disease in the general surgery department were included. The study utilized a universal sampling technique and involved 160 patients.

Ethical Considerations: Informed written consent was obtained from all participants, who were informed about the study's purpose and implications. Detailed history, clinical examination and thyroid function tests were conducted for all eligible patients.

Clinical Examination and Data Collection: A detailed clinical history and physical examination were recorded for each patient. Routine blood tests, liver function tests, thyroid function tests and abdominal ultrasounds were performed. The ultrasound was conducted using a 5 MHz transducer, with the sonographers blinded to the participants' clinical and laboratory data. Gallstones were diagnosed if the gallbladder contained echoes that moved with gravity, except in cases with large stones, a septum, or an enclosed infundibulum. Cholelithiasis was confirmed through sonographic evidence of gallstones. Patient with gallstones are included and further evaluated.

Exclusion Criteria: Patients with a history of thyroid surgery or hypothyroidism, hemolytic diseases, concurrent co-morbid conditions (e.g., diabetes mellitus type II), renal stones, pancreatic duct stones, pregnant women, patients taking specific medications (phenytoin, carbamazepine, metoclopramide, amiodarone, or lithium) and those with cholangitis were excluded.

Sample Collection and Testing: Venous blood samples (3-4 ml) were collected from each participant and analyzed at the central hospital laboratory for serum T3, T4 and TSH levels. The TSH assay's functional sensitivity was 0.03 mIU/L, with a reference range of 0.3-3 mIU/L. T3 and T4 were measured with normal reference ranges of 80-210 ng/ml and 4.8-12 µg/dl, respectively. The minimum detectable concentrations for T3 and T4 were 0.2 ng/ml and 0.4 µg/dl, respectively.

Study Population and Grouping: Participants were divided into three groups based on their thyroid function tests, specifically TSH and T3/T4 levels.

- **Subclinical Hypothyroidism:** Patients without symptoms but with elevated TSH levels and normal T3/T4 levels.
- **Clinical Hypothyroidism:** Patients showing symptoms of hypothyroidism with TSH levels above normal and T3/T4 levels below normal.
- **Euthyroid Group:** Patients with normal clinical and laboratory test results.

Statistical Analysis and Analysis Tools: Quantitative data were expressed as mean±SD, while qualitative data were expressed as percentages or absolute numbers. Group comparisons were made using the chi-square test for nominal data and ANOVA for continuous data. Logistic regression, stratified by sex, was performed to evaluate the independent relationship between thyroid function and cholelithiasis, adjusting for age and other potential confounders. Statistical analyses were conducted using SPSS software, version 11.0.5.

RESULTS AND DISCUSSIONS

Out of the 160 participants, 3 were under 20 years old, 44 were aged between 21 and 40 years, 84 fell within the 41-60-year range, 21 were between 61 and 80 years and 8 were over 80 years old.

Table 1: Age-Group Based Distribution of Patients

Age (years)	Frequency (N)	Percentage (%)
<20 years	3	1.8%
21-40 years	44	27.5
41-60 years	84	52.5
61-80 years	21	13.2
>80 years	8	5

A total of 100 random patients meeting the selection criteria were included and their data was collected. 38.75 % were male and 61.25% were female.

Table 2: Gender Wise Distribution of Patients of Gall Stone Disease

Sex	Frequency (N)	Percentage (%)
Male	62	38.75
Female	98	61.25
Total	160	100

Among 160 patients, 122 (76.25%) of them were euthyroid and 32 (20%) of them were identified to have subclinical hypothyroidism and 6 (3.75%) of them were diagnosed with hypothyroidism.

Table 3: Distribution of Thyroid Status in Gall Stone Disease

Thyroid status	Frequency (N)	Percentage (%)
Euthyroid	122	76.25
Sub clinical hypothyroid	32	20
Hypothyroid	6	3.75

Among 160 patients with gallstone disease 38 (23.75%) patients were diagnosed with subclinical hypothyroidism or clinical hypothyroidism and 122 (76.25%) were diagnosed euthyroid.

Table 4: Prevalence of Hypothyroidism in Gall Stone Disease

Hypothyroidism (sub clinical plus clinical)	Frequency (N)	Percentage (%)
Yes	38	23.75
No	122	76.25

Out of 62 male patients diagnosed with gallstone disease 12 (19.35%) were diagnosed subclinical hypothyroidism.

Table 5: Gender Prevalence of Hypothyroidism in Gall stone Disease-in Male

Male hypothyroidism	Frequency (N)	Percentage (%)
Yes	12	19.35
No	50	80.65

Out of 98 female patients diagnosed with gallstone disease 20 (32.25%) were diagnosed subclinical hypothyroidism.

Table 6: Gender Prevalence of Hypothyroidism in Gall Stone Disease- in Female

Female hypothyroidism	Frequency (N)	Percentage (%)
Yes	20	32.25
No	78	67.75

Among 160 patients diagnosed with gallstone disease 62 were came with complaint of billiary colic, 82 had fatty dyspepsia and 16 had complaint of right hypochondrial pain.

Table 7: Symptoms-Based Distribution of Patients

Symptoms of Cholelithiasis	Frequency (N)	Percentage (%)
Biliary colic	62	38.75
Fatty dyspepsia	82	51.25
Pain Right Hypochondrium	16	10
Total	160	100

The development of gallstones is a multifaceted process influenced by various factors that alter bile composition and flow. Research indicates that hypothyroidism, a condition known to disrupt hepatic cholesterol metabolism and reduce bile secretion, might contribute to gallstone formation. Specifically, thyroid receptors found in the Sphincter of Oddi, which usually facilitate bile flow by relaxing the sphincter, may be less effective in individuals with hypothyroidism. This reduction in bile flow to the duodenum can lead to an increased risk of gallstone formation.

Several hypotheses have been proposed to explain the potential link between hypothyroidism and biliary tract stones. One theory suggests that thyroid dysfunction leads to disturbances in lipid metabolism, altering bile composition and increasing the risk of gallstone formation. Additionally, hypothyroidism is associated

with reduced bile flow and impaired bile secretion, further contributing to the formation of sludge and stones within the biliary system. In some cases, the use of thyroxine has even been considered as a treatment to dissolve gallstones, underscoring the complex relationship between thyroid function and biliary health.

The prevalence of gallstone disease is significant worldwide and understanding its association with common conditions like hypothyroidism is crucial. Both clinical and subclinical hypothyroidism has been examined for their roles in gallstone development, with some studies suggesting a notable incidence of hypothyroidism among patients with biliary stones. These findings highlight the importance of screening for thyroid dysfunction in patients presenting with gallstone disease to better manage and possibly prevent the condition.

CONCLUSION

The study highlights a significant association between hypothyroidism, particularly subclinical hypothyroidism and gallstone disease. Screening for thyroid dysfunction in patients with cholelithiasis could improve disease management and prevention.

REFERENCE

1. Nakeeb, A., A.G. Comuzzie, L. Martin, G.E. Sonnenberg, D. Swartz-Basile, A.H. Kissebah and H.A. Pitt, 2002. Gallstones. Ann. Surg., 235: 842-844.
2. Pierre, F.S., 2012. Natural History of Gall Stones and Asymptomatic Gallstones. In: Blumgart's Surgery of the Liver, Biliary Tract, and Pancreas, Jarnagin, W.R., J. Belghiti and L.H. Blumgart, (Eds.)., Elsevier Saunders, Philadelphia, ISBN-13: 9780323697842, pp: 483-583.
3. Laukkarinen, J., J. Sand, S. Aittomäki, I. Pörsti and P. Kööbi, *et al*., 2002. Mechanism of the prorelaxing effect of thyroxine on the sphincter of oddi. Scand. J. Gastr.., 37: 667-673.
4. Canaris, G.J., N.R. Manowitz, G. Mayor and E.C. Ridgway, 2000. The colorado thyroid disease prevalence study. Arch. Internal Med., 160: 526-534.
5. Honore, L.H., 1981. A significant association between symptomatic cholesterol cholelithiasis and treated hypothyroidism in women. J Med, 12: 199-203.
6. Inkinen, J., J. Sand, P. Arvola, I. Porsti and I. Nordback, 2001. Direct effect of thyroxine on pig sphincter of Oddi contractility. Dig Dis Sci., 46: 182-186.
7. Daniel M.R. and U. John, 2013. Association between thyroid function and gallstone disease, World J. Gastroenterol, 23: 135-233.