Association Between Gallstone Disease and Hypothyroidism

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Abstract

Background: Digestive system complications caused by gallstones frequently result in hospital admissions. These stones are surprisingly common, even among young and otherwise healthy people, with autopsy studies revealing an occurrence rate of 11-36%. While some individuals may remain asymptomatic, the condition can nonetheless have substantial financial implications for healthcare systems and potentially lead to severe, life-threatening complications. The frequency of gallstone formation varies, with factors such as age, sex, and racial background playing a role, and can show differences across various countries and geographical areas.

Materials & Methods: A cross-sectional observational study was conducted at a private medical college's Department of General Surgery over six months. The research involved 100 patients as the total sample size. Data collected was input into Microsoft Excel, with variables being coded. Statistical analysis was performed using IBM SPSS software, version 27.

Results: In the study population of 100 patients, 71% were female and 29% were male. The diagnoses were distributed as follows: 68% had cholelithiasis, 13% suffered from chronic calculous cholecystitis, and 16% presented with acute calculous cholecystitis. A small minority, only 2% of cases, involved gallbladder polyps. Regarding gallstone characteristics, 60% of patients had a single stone, while 40% presented with multiple gallstones. The study also found that the prevalence of hypothyroidism among the patients was 14%.

Conclusion: The research investigated the occurrence of hypothyroidism among patients with cholelithiasis, examining their demographic and clinical features. As expected, females constituted the majority, aligning with the higher prevalence of both conditions in women. The predominant age group ranged from forty to fifty years. Hypothyroidism was identified in 14% of the cases, showing a correlation with the presence of multiple gallstones during surgery. The investigation indicates that extended periods of elevated TSH levels contribute to stone development over time, particularly in older individuals. These outcomes align with existing research and call for more extensive studies to confirm the findings. Regular TSH screening is recommended for early detection of hypothyroidism.

KEYWORDS: correlation, gall stone disease, hypothyroidism

INTRODUCTION

Gallstones represent a common health concern that can impact the digestive tract and potentially require hospital admission[1]. These formations are often found in young, otherwise healthy people, with autopsy studies indicating an occurrence rate of 11-36%[2]. Although some individuals may remain asymptomatic, the condition nonetheless contributes

significantly to healthcare expenses and has the potential to develop into severe, life-threatening complications[3]. The occurrence of gallstones shows significant variation across countries and ethnic groups, with age and gender also playing influential roles[4]. For example, a study conducted in northern India identified a 6.12% prevalence rate, while another investigation found that individuals in northern India were seven times more likely to develop gallbladder stones compared to their southern counterparts[5].

The formation of gallstones is primarily attributed to multiple factors, including the stagnation of bile, the presence of bacteria in bile (bactibilia), imbalances in chemical composition and pH levels, changes in bile makeup, and the emergence of sludge[6]. Thyroid diseases rank among the most prevalent endocrine disorders globally, including in India[7]. There has been ongoing discussion regarding the potential connection between thyroid disorders, particularly hypothyroidism, and the development of gallstone disease[8]. Various theories have been proposed to elucidate the possible association between hypothyroidism and gallstone formation[9]. Our research aimed to explore the relationship between gallstone disease and both previously identified and undetected hypothyroidism in patients treated at our medical facility.

This study's purpose was to examine the association between gallstone disease and hypothyroidism, as well as to assess the frequency of hypothyroidism in patients diagnosed with gallstones.

MATERIALS & METHODS

This cross-sectional observational study was conducted over a one-year period in the General Surgery Department of a private medical college hospital. The research involved a total of 100 patients. To be eligible for inclusion, participants had to meet the following criteria: 1) be 18 years of age or older, regardless of gender, and 2) have a diagnosis of cholelithiasis. Exclusion criteria encompassed: 1Pregnancy, prior thyroid surgery, diagnosed hematological disorders, use of medications causing hypothyroidism (such as Amiodarone, Lithium, antidepressants, Phenytoin, Interferon, Imatinib), and use of drugs inducing gallstones (including Estrogen, Fenofibrate, Gemfibrozil). The private medical college's Institutional Ethics Committee approved the study. All patients provided written informed consent. The following protocol was used to evaluate and assess patients:

• Comprehensive medical history

• Thorough clinical examination

- Full blood count
- Renal function tests
- Hepatic function tests
- Thyroid function tests (FT3, FT4, TSH)
- Cholesterol levels
- Serum amylase (when necessary)
- Coagulation profile
- Standard urinalysis
- Abdominal ultrasound
- Chest X-ray
- Electrocardiogram (ECG)

Microsoft Excel was utilized for data entry. Variables were subsequently coded. Statistical analysis was conducted using SPSS software (Version 27, IBM). The study employed descriptive statistics and examined associations between categorical variables. To test the hypothesis, the outcomes across treatment groups were compared, with statistical significance set at a P value below 0.5.

RESULT

The study included 100 patients with ages spanning from 19 to 77 years. On average, participants were 43.5 years old, with a standard deviation of 14.1 years. Only 1% of patients were below 20 years of age, while 19% fell within the 21-30 age bracket. The 41-50 age group comprised 16% of the sample, followed by 8% in the 61-70 range, 17% between 51 and 60, and 31% aged 31-40. Six patients were over 70 years old. The gender distribution showed 71% females and 29% males. (Chart-1, table 1).

Chart 1: Gender distribution among the study participants

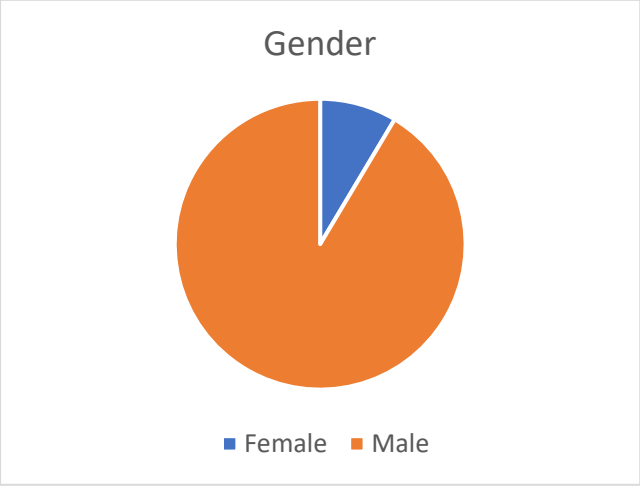
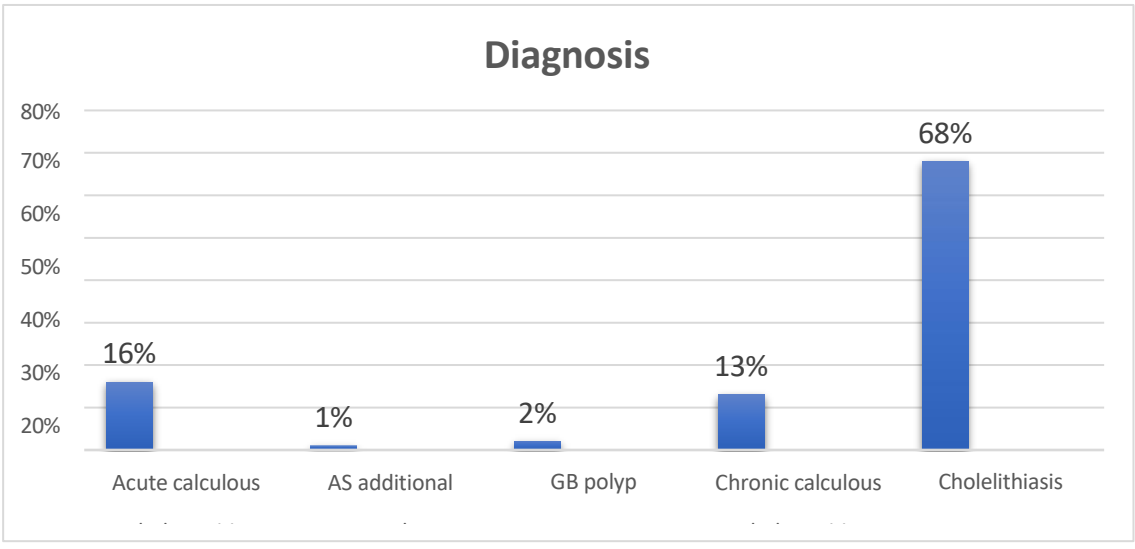


Table 1: Details of age distribution

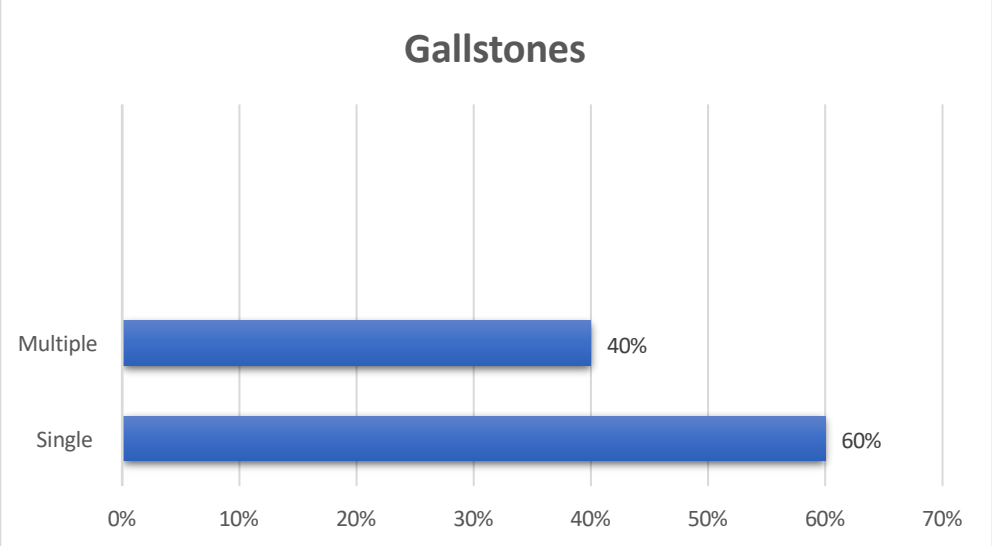
Age	Frequency	Percentage (%)
< 20 years	1	1%
21-30 years	19	19%
31-40 years	31	31%
41-50 years	16	16%
51-60 years	17	17%
61-70 years	10	10%
>70 years	6	6%

Chart 2: Details on Diagnosis of the study patients



In the study population, 68% of patients were found to have gallstones in their gallbladder, a condition known as cholelithiasis. Within this group, 13% suffered from chronic calculous cholecystitis, characterized by long-term gallbladder inflammation due to gallstones. Additionally, 16% experienced acute calculous cholecystitis, a sudden and intense gallbladder inflammation caused by gallstones. Gallbladder polyps, which are abnormal growths on the gallbladder wall, were observed in only 2% of cases. Finally, 1% of patients underwent an additional surgical intervention related to their gallbladder condition.

Chart 3: Details on gallstones



In the patient cohort examined, 60% presented with a solitary gallstone, whereas 40% exhibited multiple gallstones.

Table 2: details on the Size of gallstones

Size of gallstones	Frequency	Percentage (%)
< 10 mm	80	80%
> 11 mm	20	20%

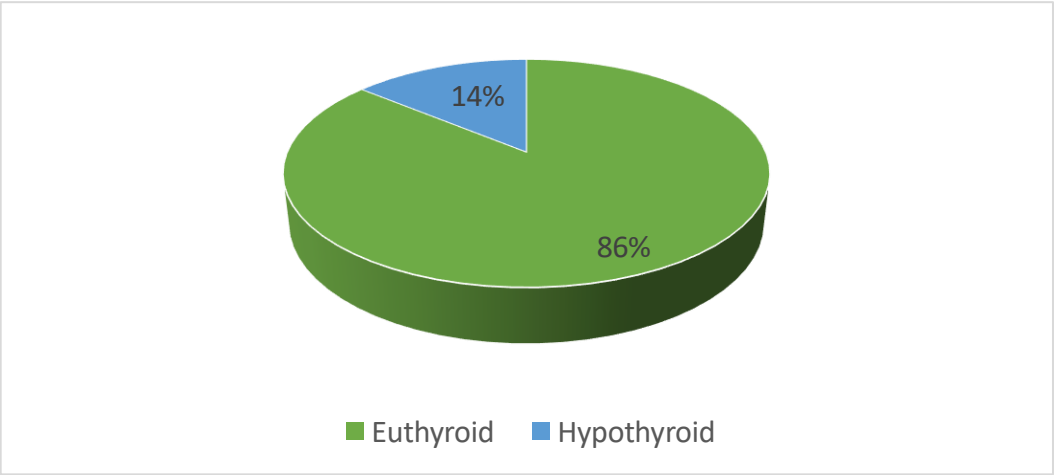
An analysis of gallstone dimensions in patients reveals that smaller gallstones, less than 10mm in size, are found in 80% of cases. The remaining 20% of patients exhibit larger gallstones, exceeding 10mm in diameter.

Table 3: Mean ± SD of thyroid profile

Thyroid profile	Mean	Standard deviation
T3	3.138600	0.869199
T4	1.264500	0.372063
TSH	4.492460	11.853027

The analysis of thyroid hormone levels encompasses average values and standard deviations for T3, T4, and TSH. T3 exhibits an average concentration of 3.138600, with a standard deviation of 0.869199, suggesting moderate fluctuation around the mean. The T4 hormone shows an average level of 1.264500 and a standard deviation of 0.372063, indicating relatively consistent measurements. In contrast, TSH demonstrates an average value of 4.492460, accompanied by a substantial standard deviation of 11.853027, pointing to considerable variation in TSH concentrations within the examined group.

Chart 4: Prevalence of hypothyroidism



The research findings indicate that 86% of participants exhibit normal thyroid function, while 14% demonstrate an underactive thyroid condition.

Table 4: Associations with hypothyroidism

Variables		Euthyroid	Hypothyroid	P value
Gender	Female	65	10	**0.000***
	Male	25	4	
Diagnosis	Acute calculous cholecystitis	15	1	**0.001***
	AS additional procedure	1	0	
	GB polyp	1	1	
	Chronc calculs cholecystitis	10	2	
	Cholelithiasis	58	10	
Gall Stone	Single	58	2	**0.000***
	Multiple	28	12	
Gall stone Size	< 10 mm	70	10	**0.000***
	>10 mm	15	5	

The provided table outlines the variable distribution among patients classified as euthyroid or hypothyroid. Notable disparities are evident across multiple factors between these groups. Gender composition varies considerably (p=0.000), with females constituting the majority in both euthyroid (65 of 90) and hypothyroid (10 of 14) categories. Diagnostic classifications also differ significantly (p=0.001), with acute calculous cholecystitis being more common in euthyroid individuals (15 of 90) compared to hypothyroid patients (1 of 14). Regarding gallstone features, both their occurrence (p=0.000) and dimensions (p=0.000) exhibit marked differences. Euthyroid patients typically present with solitary gallstones (58 of 90) and smaller concretions (<10 mm in diameter, 70 of 80 with available size data). In contrast, hypothyroid patients show a higher incidence of multiple stones (12 of 40) and larger formations (>10 mm, 5 of 20 with available size data). These observations highlight the

relationship between thyroid function and the clinical aspects of gallstone disease, suggesting the need for additional research into potential mechanisms and clinical ramifications.

DISCUSSION:

The research was carried out in a hospital setting, involving 100 patients diagnosed with cholelithiasis who underwent cholecystectomy. Abdominal ultrasonography confirmed the presence of gallstones in all participants. For years, researchers have been exploring the potential link between thyroid disorders and gallstone formation. Multiple investigations have pointed to a possible association between hypothyroidism and the development of gallstones. These findings suggest that impaired thyroid function may disrupt lipid metabolism, potentially altering bile composition[10,11].

Our study's gender distribution revealed a higher proportion of women, with 71% female participants compared to 29% male. This aligns with existing research indicating a greater incidence of cholelithiasis among females. The ratio of males to females in our study was 1:5.25. Comparable results have been observed in other investigations. For instance, Bansal et al5 reported 65% females and 35% males in their 104-patient study, while Bhattacharya et al6 found that 71.4% of their subjects were female and 28.6% were male. Additionally, the research conducted by Sharma et al7 demonstrated a female to male ratio of 70:30.

Our study revealed that 14% of patients exhibited elevated TSH levels in their thyroid profile, suggesting hypothyroidism. This translates to a prevalence of 14 out of 100 patients. Similar research has shown varying rates of hypothyroidism prevalence. For example, a study by Ahmad MM8 identified an 8% prevalence, while Kotwal et al9 observed a 14.4% prevalence in their Sikkim-based research.

The increased prevalence can be explained by a greater number of individuals with undiagnosed or mild hypothyroidism. As radiological tests become more accessible, ultrasound technology is enabling the detection of cholelithiasis in more patients. Research has shown variations in both geographical distribution and population demographics.

The research revealed that out of 14 individuals, 10 were diagnosed with hypothyroidism. Among these patients, 71.4% were women and 28.5% were men. In contrast, Stephan's et al10 investigation found hypothyroidism in 83.3% of females and 16.7% of males. Our study

showed hypothyroidism rates of 21.15% in females and 12.5% in males. Earlier research by Stephan conducted outside India reported hypothyroidism prevalence of 4.8% in males and 20% in females. Ibrahim et al11's study found hypothyroidism in 13.20% of males and 95.47% of females. However, the Fisher test result of 0.6606 was not significant at $p < 0.05$, suggesting no correlation between gender and gallstone presence. This lack of significance might be attributed to the higher occurrence of hypothyroidism in women.

Research revealed a statistically significant higher occurrence of cholesterol stones among individuals with hypothyroidism. This finding was corroborated by studies conducted by Ibrahim et al[11], Taher et al[12], and Yousif et al[13].

Conclusion:

This research aimed to examine the frequency of hypothyroidism among individuals with cholelithiasis to elucidate the connection between these two conditions. As anticipated, our study population consisted primarily of women, given that both hypothyroidism and cholelithiasis are more prevalent in females. The majority of participants were between forty and fifty years old. Hypothyroidism was identified in 14% of the patients, who were found to have multiple gallstones during surgery. The higher occurrence of hypothyroidism in older individuals can be attributed to the extended time required for stone formation due to elevated TSH levels. Our findings corroborate previous research mentioned in the discussion section and contribute to the current understanding of how hypothyroidism and cholelithiasis are related. To bolster these results, we suggest conducting future studies with larger sample sizes to validate our findings and potentially recommend regular TSH monitoring for early detection of subclinical hypothyroidism. This approach could ultimately reduce the burden of cholelithiasis in this specific subgroup through timely intervention.

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Conflicts of interest: Nil

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