

Research Article

A Comparative Evaluation of Thyroid Disorders among the Patients of Cholelithiasis

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ABSTRACT

Background: Cholelithiasis is a prevalent biliary system pathology, particularly in Northern India, influenced by factors such as age, gender, and metabolic changes. Thyroid hormones play a critical role in cholesterol metabolism and biliary motility, suggesting a potential link between thyroid dysfunction and gallstone formation. This study aimed to evaluate the comparative occurrence of thyroid disorders among patients diagnosed with cholelithiasis.

Methods: This retrospective and observational study was conducted at MM Medical College and Hospital, Solan, involving 100 diagnosed cases of cholelithiasis in patients over 30 years of age. Biochemical parameters, specifically serum TSH, fT4, and fT3 levels, were analyzed to determine the thyroid profile of each participant.

Results: The study population was predominantly female (80%), with a mean age of 45.14 years; the 40-50 age group was the most affected. The findings revealed that 50% of the patients had deranged thyroid profiles. Specifically, 25% of the total participants were diagnosed with hypothyroidism, of which 60% were sub-clinical cases. Hyperthyroidism was identified in 10% of the participants.

Conclusion: The study demonstrates a significant association between thyroid dysfunction and cholelithiasis, with half of the patients exhibiting abnormal thyroid levels. Hypothyroidism, in particular, contributes to gallstone development through hypercholesterolemia, reduced bile flow, and sphincter of Oddi dysfunction. Consequently, serum TSH levels serve as an independent risk factor for the development of gallstones, highlighting the importance of thyroid screening in these patients

Keywords: Cholelithiasis, LDL, HDL, Ft4, Ft3, TSH, Thyroid Diseases.

INTRODUCTION

Cholelithiasis or gallstone is one of the most common pathologies of the biliary system and one of the major causes of abdominal morbidity throughout the world. The major events leading to the disease include supersaturation of bile with cholesterol, rapid precipitation of cholesterol crystals in the gallbladder (a prerequisite for gallstone formation), increased bile salt hydrophobicity, and inflammation of the gallbladder. Its prevalence in India is estimated to be around 2 to 29%, where it is most commonly prevalent in northern states as compared to southern states. The high prevalence of cholesterol gallstones in the north Indian population may be due to some of the non-modifiable risk factors like ethnicity, increasing age of the patient, female gender

and family history and modifiable risk factors like sedentary lifestyle, obesity and rapid loss of weight^{1,2,3}.

The composition and transport of lipoproteins can be seriously affected in thyroid disease. Hypothyroidism is associated with hypercholesterolemia causing increased concentrations of total and low-density lipoprotein (LDL) cholesterol. Hyperthyroidism is associated with lower total, LDL, and high-density lipoprotein (HDL) cholesterol levels and the promotion of reverse cholesterol transport. Previous studies have shown a possible association between hypothyroidism and cholesterol gallstone disease in human beings because of decreased fractional clearance of LDL by a reduced number of LDL receptors in the liver, low bile flow, and sphincter of Oddi

dysfunction. Hypothyroidism may result in delayed emptying of the biliary tract due to the absence or weakness of the pro-relaxing effect of thyroxine on the sphincter of Oddi, which expresses thyroid hormone receptors β_1 and β_2 . This causes subjects to be prone to gallstone formation.^{4,5}

Study conducted by Wang Y et al in experimental mice showed the incidence of cholesterol monohydrate crystal formation as 100% in case of hyperthyroidism, 83% in case of hypothyroidism, and 33% in case of euthyroidism. Among the hepatic lithogenic genes, $Tr\beta$ was found to be up-regulated and Rxr down-regulated in the mice with hypothyroidism. In contrast, $Lxr\alpha$, Rxr , and $Cyp7a1$ were up-regulated and Fxr down-regulated in the mice with hyperthyroidism.⁵

Therefore, the present retrospective study aims to see the relation between thyroid dysfunction and cholelithiasis.

Aim: To observe the comparative occurrence of thyroid disorders among patients of cholelithiasis

MATERIALS AND METHODS

The present retrospective and observational study was conducted in the Department of Biochemistry, MM Medical College and Hospital, Solan. The data was generated from the Medical Record Department of the college after getting permission from the Medical Superintendent.

Inclusion Criteria

- 100 diagnosed cases of cholelithiasis of either gender.
- Age above 30 years.

Exclusion Criteria

- Age below 30 years.
- Pregnancy
- Lactation

Biochemical parameters to be analysed are

- Thyroid Profile

Ethical Consideration

- The present study was conducted after approval from the Institutional Ethics Committee.

Statistical Analysis

- The data obtained was statistically analysed.

RESULTS

Among 100 subjects nearly 20 percent were males and 80% females. The average age of the patients was 45.14 years. The most affected age group was 40 – 50 years. The mean serum TSH level was 4.39 ± 10.1 μ IU/ml; minimum 0.001 and maximum 100.00 (Table 1), mean serum ft4 level 1.5 ± 1.66 ng/dl; minimum 0.06 and maximum 11.80 (Table 2) and mean ft3 level 2.73 ± 0.65 pg/ml; minimum 0.73 and maximum 4.32 (Table 3). 50% of the patients had normal thyroid profile whereas 50% had deranged thyroid profile.

Nearly 25% of the total participants were having hypothyroidism defined by serum TSH level greater than 4.4 μ IU/ml and ft4 level below 1.0 ng/dl. Among the hypothyroidism cases, nearly 30% were with high TSH level and low ft4 level, where 60% had high TSH level with normal ft4 level (sub-clinical hypothyroidism) and 10% of cases have high TSH and high ft4 levels. as nearly 10 percent of the participants were having hyperthyroidism defined by serum TSH level less than 0.27.

Table 1: Serum Tsh Level

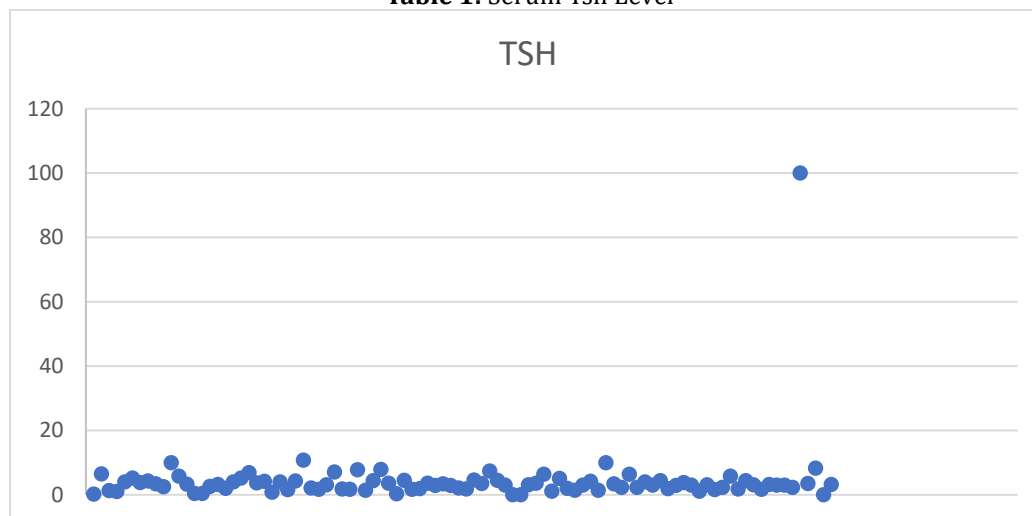


Table 2: Serum Ft4 Level

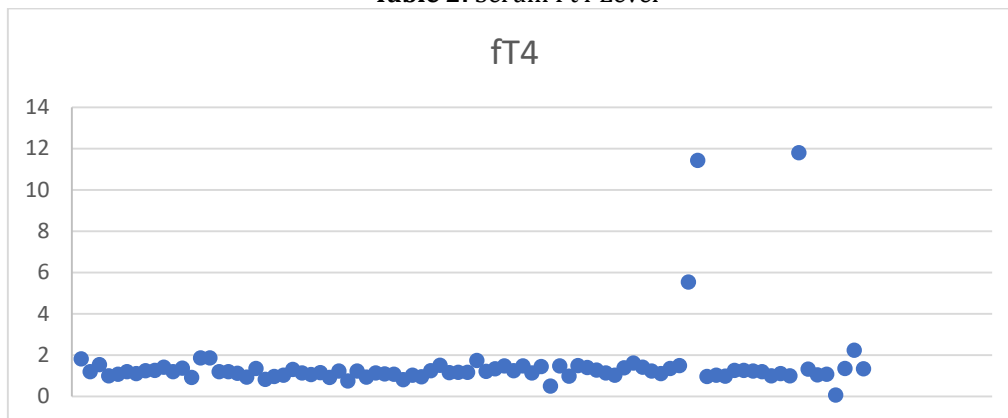
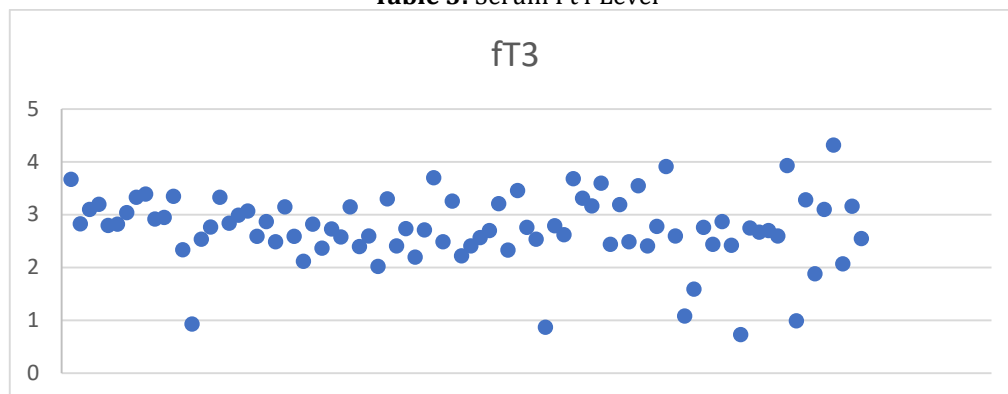


Table 3: Serum Ft4 Level



DISCUSSION

The average age of the participants was 45.14 years; most affected age group was 40 – 50 years. Majority of the participants (80%) being females. Our results are consistent with studies conducted by N. M S et al. among 80 cholelithiasis patients in 2025 in Karnataka within similar age group and affected gender as of our study⁶. Nair KP et al. in Pondicherry in 2021 among 60 patients majority being below 50 years and females⁷, Parambil et al. in Kerala in 2016, which showed that the age group most commonly being affected with gallstone disease was between 31-50 years⁸ and Bansal et al. in Uttar Pradesh, who concluded that the mean age of occurrence of Gallstones is 43.5 years⁹. Prevalence of Hypothyroidism: Approximately 25% of cases has TSH level above 4.4, indicating hypothyroidism. Extreme Outliers: The data shows cases of severe primary hypothyroidism (TSH 100) and cases of "T4-toxicosis" or secondary discrepancies where fT4 is extremely high despite a relatively normal TSH.

Srivastava et al. (2016) - "Prevalence of Thyroid Dysfunction in Patients with Cholelithiasis"¹⁰. Similar Finding: This study conducted in North India found a 16% to 20% prevalence of

hypothyroidism in patients with gallstones, which closely mirrors the 21.8% rate¹¹. Demographics: Over 80% female, this study confirmed that the association is strongest in females over the age of 40. Rahman et al. (2018) - "Association between cholelithiasis and thyroid profile - a tertiary hospital care based study"¹². Similar Finding: These researchers found a significantly higher level of TSH in gallstone patients compared to healthy controls. Specifics: They noted that even "subclinical" hypothyroidism (TSH > 4.5 with normal fT4), which our study also shows, is a major risk factor for the formation of cholesterol gallstones in the Indian population. Manimegalai et al. (2019)¹³- "The prevalence of undiagnosed thyroid dysfunction and diagnosed diseases of gallstones". Similar Finding: This study highlighted that hypothyroidism leads to reduced bile flow and gallbladder dysmotility, explaining why so many gallstone patients present with the exact TSH elevations seen in our study.

The mechanism leading to this is multifactorial. Thyroid hormones influence the synthesis, absorption, and usage of cholesterol in human body. So, it can be concluded that the serum TSH level is an independent factor that could be

considered a risk factor for the formation of gallstones¹⁴.

10% of the cases were suffering hyperthyroidism. The result is similar to study done by Nair KP et al. (2021) who reported 5% of their cases were hyperthyroidism⁷ and Saxena AK et al reported 8% of the cases as hyperthyroidism¹⁵.

Limitations: While the present study offers valuable insights into the association between cholelithiasis and thyroid dysfunction, certain limitations must be acknowledged. Firstly, the sample size was relatively small, it may lack the generalization of the findings. Larger, more diverse populations are necessary to validate these associations. The study was cross-sectional, without follow-up to evaluate the impact of thyroid treatment on the progression or recurrence of gallstone disease post-cholecystectomy.

Summery and Conclusion

A retrospective study involving 100 patients with cholelithiasis found a significant association between thyroid dysfunction and gallstone formation, revealing that 50% of the participants-who were predominantly female (80%) with an average age of 45.14 years-had deranged thyroid profiles. Specifically, approximately 25% of patients presented with hypothyroidism, which contributes to gallstone development through hypercholesterolemia, reduced bile flow, and delayed biliary tract emptying resulting from sphincter of Oddi dysfunction. Although less frequent, hyperthyroidism was present in 10% of cases and is also linked to lithogenesis via the up-regulation of specific hepatic genes. Because thyroid hormones are essential for regulating cholesterol metabolism and gallbladder motility, the study concludes that serum TSH level serves as an independent risk factor for the development of cholelithiasis.

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