International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Original Article

To Study Liver Function Profile in Patients of Subclinical Hypothyroidism

Dr Rajesh Kumar Verma[1], Dr Alok Agrawal[2], Dr Vivek Kumar Verma[3], Dr Andam Anjani Kumar Naidu[4]

[1]Postgraduate Junior Resident 3rd Year Department of General Medicine Varun Arjun Medical College and Rohilkhand Hospital Shahjahanpur Uttar Pradesh
[2]Professor Department of General Medicine Varun Arjun Medical College and Rohilkhand Hospital Shahjahanpur Uttar Pradesh
[3]Professor Department of General Medicine Varun Arjun Medical College and Rohilkhand Hospital Shahjahanpur Uttar Pradesh
[4]Postgraduate Junior Resident 3rd Year Department of General Medicine Varun Arjun Medical College and Rohilkhand Hospital Shahjahanpur Uttar Pradesh

Corresponding Author:

Dr Andam Anjani Kumar Naidu
Postgraduate Junior Resident 3rd Year Department of General Medicine Varun Arjun Medical College And Rohilkhand Hospital Shahjahanpur Uttar Pradesh
Email- anjanikumarandam@gmail.com

Received: 20-04-2026
Accepted: 10-05-2026
Available online: 26-05-2026

ABSTRACT

Background: Subclinical hypothyroidism (SCH) is characterized by elevated thyroid stimulating hormone (TSH) levels with normal circulating thyroid hormones and has been increasingly associated with metabolic and hepatic dysfunction. Thyroid hormones play a vital role in hepatic metabolism, and even subtle thyroid dysfunction may influence liver biochemical parameters.
Aim: To study the liver function profile in patients with subclinical hypothyroidism and evaluate the relationship between thyroid dysfunction and hepatic biochemical parameters.
Materials and Methods: This hospital-based prospective observational cross-sectional study was conducted in the Department of General Medicine at Varun Arjun Medical College and Rohilkhand Hospital, Shahjahanpur, Uttar Pradesh. A total of 62 patients with subclinical hypothyroidism aged 18–65 years were included. Detailed clinical evaluation, thyroid function tests, and liver function tests including AST, ALT, alkaline phosphatase (ALP), gamma-glutamyl transferase (GGT), bilirubin, and serum albumin were performed. Statistical analysis was conducted using SPSS software version 16.0, and p-value <0.05 was considered statistically significant.
Results: The majority of participants belonged to the 26–30 years age group (40.3%), and females constituted 77.4% of the study population. Mean AST and ALT levels were 25.416 ± 12.721 IU/L and 27.197 ± 6.518 IU/L, respectively, while mean TSH level was 7.63 ± 2.181 µIU/mL. Mild subclinical hypothyroidism was observed in 79.0% of cases, whereas 21.0% had moderate disease. Significant differences between mild and moderate SCH groups were observed for direct bilirubin ($p = 0.013$) and ALP ($p = 0.003$). Correlation analysis demonstrated significant positive associations between AST and ALT ($r = 0.343$, $p < 0.01$), AST and ALP ($r = 0.533$, $p < 0.001$), and direct bilirubin with TSH ($r = 0.286$, $p < 0.05$). ALT showed a weak negative correlation with TSH ($r = -0.258$, $p < 0.05$).
Conclusion: Patients with subclinical hypothyroidism exhibit subtle but measurable alterations in liver function parameters despite absence of overt liver disease. Significant correlations between thyroid profile and hepatic biochemical markers indicate an important early thyroid–liver interaction. Routine liver function assessment in patients with subclinical hypothyroidism may help identify early metabolic and hepatic alterations.

Keywords*: Subclinical hypothyroidism, liver function tests, thyroid stimulating hormone, hepatic dysfunction, aminotransferases, alkaline phosphatase, thyroid–liver interaction.*

INTRODUCTION

The thyroid gland and liver share a close bidirectional physiological relationship that plays a central role in maintaining endocrine and metabolic homeostasis. Thyroid hormones regulate basal metabolic rate, mitochondrial activity, lipid metabolism, and carbohydrate utilization, while the liver contributes significantly to thyroid hormone metabolism through peripheral conversion of thyroxine (T4) to triiodothyronine (T3), synthesis of thyroid-binding proteins, and degradation of circulating hormones [1]. Hepatic cells contain deiodinase enzymes and thyroid hormone receptors that directly influence lipid oxidation, bile acid metabolism, and lipoprotein synthesis. Consequently, disturbances in thyroid function can produce significant hepatic and metabolic alterations even before overt hypothyroidism develops [2]. Subclinical hypothyroidism (SCH) is defined biochemically by elevated serum thyroid-stimulating hormone (TSH) levels with normal circulating free thyroxine and triiodothyronine concentrations [3]. It represents an early stage of thyroid dysfunction lying between euthyroid status and overt hypothyroidism. Although many patients remain asymptomatic or present with vague symptoms such as fatigue, cold intolerance, and weight gain, metabolic disturbances may already be active at the tissue level [4]. Increasing evidence suggests that even mild thyroid hormone deficiency contributes to dyslipidemia, insulin resistance, low-grade inflammation, and hepatic steatosis [5,6]. Restoration of euthyroid status has been shown to improve liver enzymes and lipid abnormalities, indicating the clinical importance of thyroid–liver interactions [7].

In recent years, attention has increasingly focused on the association between SCH and metabolic dysfunction associated steatotic liver disease (MASLD). Thyroid hormones are known to regulate hepatic fatty acid oxidation and lipid export; therefore, reduced thyroid activity may favor hepatic fat accumulation and progression from simple steatosis to steatohepatitis [8]. Prospective studies have demonstrated that SCH may contribute to the development and progression of non-alcoholic fatty liver disease, suggesting clinically meaningful hepatic consequences even in mild thyroid failure [9]. Furthermore, SCH has been linked with increased cardiovascular morbidity, dyslipidemia, endothelial dysfunction, and atrial fibrillation, emphasizing that SCH should not be considered merely a biochemical abnormality but rather a systemic metabolic disorder [10].

The burden of SCH is considerable worldwide and particularly relevant in India, where metabolic syndrome, obesity, dyslipidemia, and fatty liver disease are increasingly prevalent. Community-based Indian studies have reported a relatively high prevalence of SCH, especially among women, and have shown associations with elevated body mass index, abnormal lipid profile, and adverse cardiometabolic markers [11]. Studies in Indian adults have further demonstrated a significantly higher prevalence of MASLD in individuals with subclinical and overt hypothyroidism compared with euthyroid subjects [12]. In addition, dyslipidemia characterized by elevated total cholesterol and low-density lipoprotein cholesterol is frequently observed in SCH, thereby increasing cardiovascular and hepatic risk [13]. Despite growing evidence linking SCH with metabolic and hepatic dysfunction, several gaps remain in current knowledge. Most studies have concentrated primarily on lipid abnormalities, while detailed liver biochemistry has often been overlooked or reported only as secondary outcomes [14]. Considerable heterogeneity also exists among published studies regarding diagnostic thresholds, obesity status, and associated metabolic factors, resulting in inconsistent conclusions about the exact relationship between SCH and hepatic dysfunction [15]. Moreover, routine clinical practice in Indian hospital settings rarely includes comprehensive evaluation of liver function in patients diagnosed with SCH.

Liver function tests, including serum aminotransferases, alkaline phosphatase, bilirubin, gamma-glutamyl transferase, and serum albumin, provide valuable insight into hepatocellular injury and hepatic synthetic function [16]. Previous studies have suggested that levothyroxine therapy in SCH improves lipid profile, inflammatory markers, and hepatic steatosis, supporting the biological significance of early thyroid dysfunction [17,18]. However, comprehensive characterization of liver function abnormalities in SCH patients without established chronic liver disease remains insufficiently explored, particularly in Indian populations [19]. Given the increasing coexistence of thyroid dysfunction, obesity, MASLD, and cardiovascular risk factors, early identification of hepatic involvement in SCH is clinically important. Systematic evaluation of liver function in SCH may help detect early metabolic derangements, improve risk stratification, and guide timely intervention [20].

Therefore, the present study was undertaken to evaluate the liver function profile in patients with subclinical hypothyroidism and to assess its clinical implications in routine hospital practice.

MATERIALS AND METHODS

This hospital-based study was conducted in the Department of General Medicine at Varun Arjun Medical College and Rohilkhand Hospital. The study included patients attending the outpatient department (OPD) of the institution.The present study was a prospective, observational, cross-sectional study conducted to evaluate liver function profile abnormalities in patients with subclinical hypothyroidism. The study was conducted over a period of 12 months from November 2024 to November 2025 after obtaining approval from the Institutional Ethics Committee. The study included consenting adult patients diagnosed with subclinical hypothyroidism attending the OPD of the Department of General Medicine.

Inclusion Criteria

1. Patients diagnosed with subclinical hypothyroidism.

2. Patients aged between 18 and 65 years.
3. Patients willing to provide informed consent.

Exclusion Criteria

1. Patients with overt hypothyroidism.
2. Patients with chronic liver diseases of any etiology including hepatitis B, hepatitis C, cirrhosis, liver malignancy, or chronic alcoholism.
3. Patients with active or recent infections and individuals with associated bone, muscle, cardiac, pancreatic, hepatobiliary, or other liver diseases.
4. Patients receiving medications known to alter liver function tests or cause hepatotoxicity.
5. Patients with diabetes mellitus, hypertension, malignancy, pregnancy, or those using oral contraceptive pills.

Data Collection Procedure

After obtaining written informed consent, detailed demographic and clinical information was recorded using a structured proforma. Relevant history including duration of thyroid disease, medication history, and symptoms suggestive of liver dysfunction was documented.

All enrolled patients underwent routine evaluation for subclinical hypothyroidism including thyroid function tests and liver function tests.Blood samples were collected under aseptic precautions using standard venipuncture techniques. Samples were properly labeled and transported to the laboratory for analysis following standard quality control protocols.

The following investigations were performed:

- Thyroid function tests including serum free T3 (FT3), free T4 (FT4), and thyroid stimulating hormone (TSH).
- Liver function tests including alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), gamma glutamyl transferase (GGT), total bilirubin, serum albumin, and coagulation profile.
- Hepatitis B surface antigen (HBsAg) and anti-hepatitis C virus (HCV) antibodies by ELISA method.

The laboratory findings were interpreted in correlation with the patient's thyroid status and clinical profile. All collected data were entered into Microsoft Excel 2007 and subsequently analyzed statistically.

Statistical Analysis

Data were entered into Microsoft Excel 2007 and analyzed using Statistical Package for the Social Sciences (SPSS) version 16.0 and Epi Info version 7.2.6.0.appropriate, while categorical variables were presented as frequency and percentages.
The following statistical tests were applied:

- Chi-square test or Fisher's exact test for qualitative variables.
- Test of significance for difference of proportions.
- Student's paired t-test for comparison of mean differences.
- Analysis of Variance (ANOVA) for comparison of biochemical parameters among groups.
- Pearson's or Spearman's correlation coefficient and regression analysis to assess correlation between thyroid function parameters (TSH, FT4 ± FT3) and liver function tests.

For non-parametric continuous variables, Mann–Whitney U test was used where applicable.
A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 62 patients with subclinical hypothyroidism fulfilling the inclusion criteria were enrolled in the present study.The majority of participants belonged to the 26–30 years age group comprising 25 participants (40.3%), followed by the 18–25 years age group with 15 participants (24.2%) and the 36–40 years age group with 13 participants (21.0%). Participants aged 31–35 years accounted for 5 cases (8.1%), while those aged more than 40 years constituted 4 cases (6.5%).There was a marked female predominance among the study participants. Out of 62 participants, 48 (77.4%) were females and 14 (22.6%) were males.Regarding occupational profile, housewives constituted the largest group with 34 participants (54.8%), followed by teachers in 11 cases (17.7%), students in 8 cases (12.9%), business professionals in 6 cases (9.7%), and farmers in 3 cases (4.8%).Assessment of comorbidities and relevant medical history revealed that none of the participants had diabetes mellitus, hypertension, tuberculosis, asthma, previous thyroid disorder, history of drug intake, drug allergy, or alcohol consumption at the time of enrolment. Clinical examination findings showed absence of pallor, jaundice, clubbing, cyanosis, and lymphadenopathy in all participants. The baseline vital parameters demonstrated a mean pulse rate of 84.7 ± 5.861 beats/minute, mean systolic blood pressure of 112.6 ± 3.628 mmHg, and mean diastolic blood pressure of 75.1 ± 3.067 mmHg. The mean respiratory rate was 15.1 ± 0.885 breaths/minute and mean SpO_2 was 97.5 ± 0.918%.Evaluation of liver function parameters revealed a mean AST (SGOT) level of 25.416 ± 12.721 IU/L and mean ALT (SGPT) level of 27.197 ± 6.518 IU/L. Mean total bilirubin was 0.671 ± 0.280 mg/dL, while direct bilirubin was 0.237 ± 0.104 mg/dL. Mean alkaline phosphatase (ALP) was 101.887 ± 24.443 IU/L, mean gamma-glutamyl transferase (GGT) was 25.661 ± 10.323 IU/L, and mean serum albumin was 4.276 ± 0.474 g/dL. Thyroid function profile showed a mean free T3 level of 2.42 ± 0.612 pg/mL, mean free T4 level of 1.29 ± 0.345 ng/dL, and mean thyroid stimulating hormone (TSH) level of 7.63 ±

2.181 µIU/mL. Based on severity classification, 49 participants (79.0%) had mild subclinical hypothyroidism, while 13 participants (21.0%) had moderate subclinical hypothyroidism. Screening for viral hepatitis showed that all participants were non-reactive for HBsAg and anti-HCV antibodies.Comparison of baseline vital parameters between mild and moderate subclinical hypothyroidism groups showed no statistically significant differences. Pulse rate, systolic blood pressure, diastolic blood pressure, respiratory rate, and oxygen saturation were comparable between the two groups with p-values greater than 0.05.Comparison of liver function parameters between mild and moderate subclinical hypothyroidism groups demonstrated statistically significant differences in direct bilirubin and alkaline phosphatase levels. Mean direct bilirubin was significantly higher in the moderate group compared to the mild group (0.300 ± 0.1155 mg/dL vs 0.220 ± 0.0957 mg/dL; $p = 0.013$). Mean alkaline phosphatase was significantly lower in the moderate group compared to the mild group (84.308 ± 13.5301 IU/L vs 106.551 ± 24.6501 IU/L; $p = 0.003$). Other liver function parameters including AST, ALT, total bilirubin, GGT, and serum albumin did not show statistically significant differences between the groups. Pearson's correlation analysis revealed several significant associations between thyroid profile and liver function parameters. AST showed a significant positive correlation with ALT ($r = 0.343$, $p < 0.01$), direct bilirubin ($r = 0.329$, $p < 0.01$), alkaline phosphatase ($r = 0.533$, $p < 0.001$), and free T4 ($r = 0.585$, $p < 0.001$). ALT demonstrated a weak but significant negative correlation with TSH ($r = -0.258$, $p < 0.05$). Direct bilirubin showed significant positive correlations with free T3 ($r = 0.364$, $p < 0.01$) and TSH ($r = 0.286$, $p < 0.05$). Alkaline phosphatase showed a positive correlation with free T4 ($r = 0.344$, $p < 0.01$) and a negative correlation with TSH ($r = -0.258$, $p < 0.05$). Free T3 and free T4 demonstrated a significant negative correlation with each other ($r = -0.438$, $p < 0.001$).Association between age group and severity of subclinical hypothyroidism showed a statistically significant relationship ($\chi^2 = 11.8$, $df = 4$, $p = 0.019$). Moderate hypothyroidism was relatively more frequent in the 36–40 years age group, whereas mild hypothyroidism predominated in younger age groups, particularly 26–30 years. However, comparison of mean age between mild and moderate hypothyroidism groups did not demonstrate statistical significance (29.6 ± 6.35 years vs 31.8 ± 6.90 years; $p = 0.268$).

Table 1: Demographic profile of study participants (N = 62)

Variable	Category	Count (n)	Percentage (%)
Age group (years)	18–25	15	24.2
	26–30	25	40.3
	31–35	5	8.1
	36–40	13	21.0
	>40	4	6.5
Sex	Female	48	77.4
	Male	14	22.6
Occupation	Housewife	34	54.8
	Teacher	11	17.7
	Student	8	12.9
	Business	6	9.7
	Farmer	3	4.8

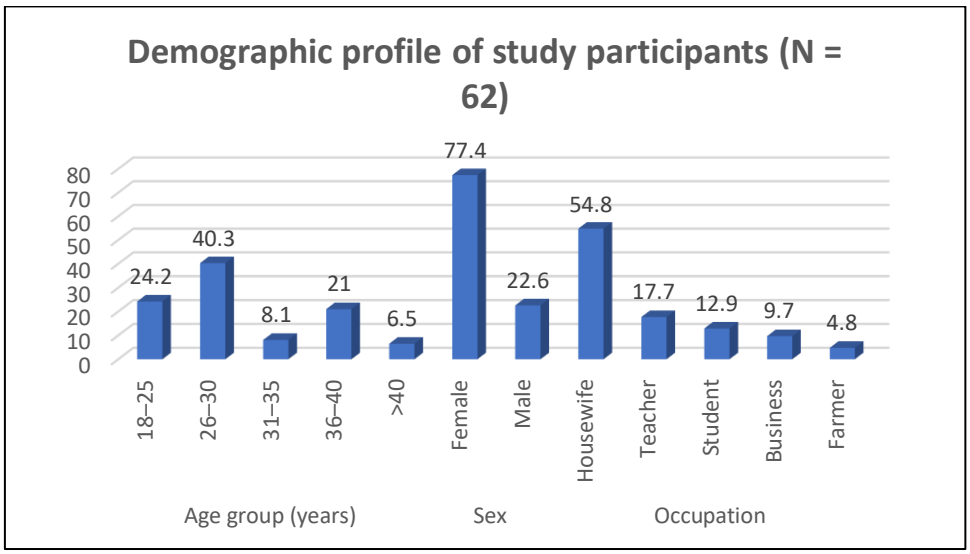

Figure 1 Demographic profile of study participants (N = 62)

Table 2: Baseline vital parameters and thyroid function profile of study participants (N = 62)

Parameter	Mean ± SD	Median	95% Confidence Interval
Pulse rate (/min)	84.7 ± 5.861	85.0	83.2–86.2

SBP (mmHg)	112.6 ± 3.628	112.0	111.7–113.5
DBP (mmHg)	75.1 ± 3.067	74.0	74.3–75.8
Respiratory rate (/min)	15.1 ± 0.885	15.0	14.8–15.3
SpO_2 (%)	97.5 ± 0.918	98.0	97.2–97.7
Free T3 (pg/mL)	2.42 ± 0.612	2.60	2.26–2.57
Free T4 (ng/dL)	1.29 ± 0.345	1.30	1.20–1.38
TSH (µIU/mL)	7.63 ± 2.181	7.34	7.07–8.18

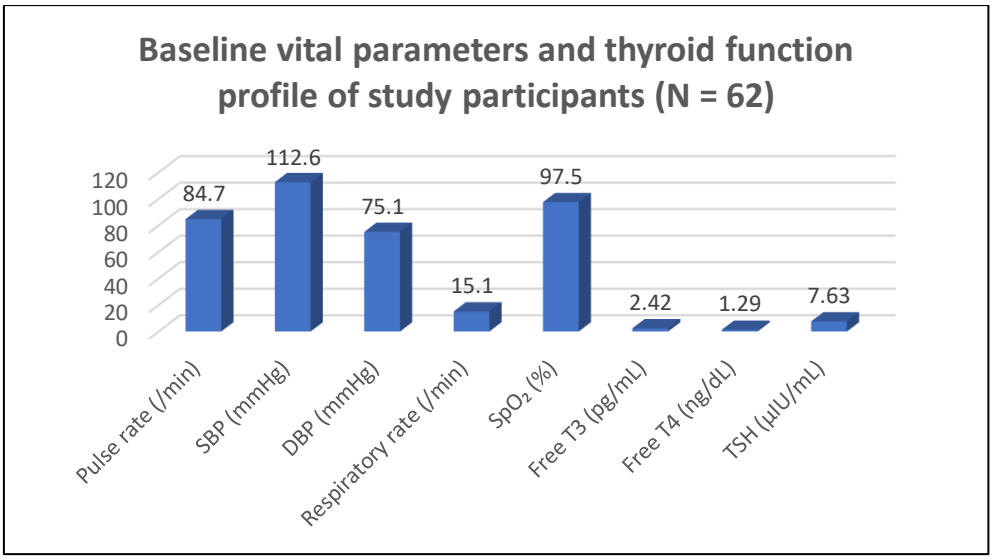

Figure 2 Baseline vital parameters and thyroid function profile of study participants (N = 62)

Table 3: Liver function test profile of study participants (N = 62)

Parameter	Mean ± SD	Median	95% Confidence Interval
AST (SGOT) (IU/L)	25.416 ± 12.721	23.500	22.186–28.647
ALT (SGPT) (IU/L)	27.197 ± 6.518	28.100	25.541–28.852
Total bilirubin (mg/dL)	0.671 ± 0.280	0.600	0.600–0.742
Direct bilirubin (mg/dL)	0.237 ± 0.104	0.200	0.211–0.264
Alkaline phosphatase (IU/L)	101.887 ± 24.443	98.000	95.680–108.095
GGT (IU/L)	25.661 ± 10.323	25.000	23.040–28.283
Serum albumin (g/dL)	4.276 ± 0.474	4.200	4.155–4.396

Table 4: Comparison of liver function parameters according to severity of subclinical hypothyroidism (N = 62)

Parameter	Mild SCH (n=49) Mean ± SD	Moderate SCH (n=13) Mean ± SD	t-value	p-value
AST (SGOT) (IU/L)	25.388 ± 13.479	25.523 ± 9.787	−0.034	0.973
ALT (SGPT) (IU/L)	27.916 ± 6.169	24.485 ± 7.326	1.714	0.092
Total bilirubin (mg/dL)	0.651 ± 0.304	0.746 ± 0.145	−1.090	0.280
Direct bilirubin (mg/dL)	0.220 ± 0.096	0.300 ± 0.116	−2.552	0.013*
Alkaline phosphatase (IU/L)	106.551 ± 24.650	84.308 ± 13.530	3.118	0.003*
GGT (IU/L)	25.959 ± 10.418	24.538 ± 10.284	0.438	0.663
Serum albumin (g/dL)	4.290 ± 0.503	4.223 ± 0.359	0.448	0.656

*Statistically significant p-value <0.05.

DISCUSSION

The present hospital-based prospective observational cross-sectional study was conducted to evaluate liver function profile abnormalities in patients with subclinical hypothyroidism (SCH) and to assess the biochemical relationship between thyroid dysfunction and hepatic function. The study demonstrated that even in the absence of overt liver disease and major systemic comorbidities, SCH patients exhibited subtle biochemical alterations in liver function parameters with significant thyroid–liver associations.In the present study, most participants belonged to the 26–30 years age group (40.3%), followed by 18–25 years (24.2%) and 36–40 years (21.0%). The mean age in mild and moderate SCH groups was 29.6 ± 6.35 years and 31.8 ± 6.90 years, respectively. Similar findings were reported by Fatma et al. (2024) [21], Thakur (2019) [22], and Maraikayar et al. (2023) [23], who observed that SCH commonly affects younger and middle-aged adults. In contrast, Li

et al. (2017) [24] evaluated an older study population, reflecting demographic differences.A marked female predominance was observed in the current study, with females constituting 77.4% of participants. Similar female preponderance was reported by Fatma et al. (2024) [21], Thakur (2019) [22], and Maraikayar et al. (2023) [23]. Biondi et al. (2019) [25] also highlighted that autoimmune thyroid dysfunction is more common in females. The predominance of housewives (54.8%) in the present study largely reflected the higher female representation. Strict exclusion criteria were applied to eliminate confounding hepatic and metabolic conditions. All participants were free from diabetes mellitus, hypertension, chronic liver disease, alcohol intake, and hepatotoxic drug exposure. Similar exclusion strategies were followed by Hegde et al. (2025) [3] and Gupta et al. (2018) [11]. Unlike the present study, Kolesnikova et al. (2025) [26] included patients with steatotic liver disease and hypertension, resulting in greater metabolic burden. Clinical examination findings were largely unremarkable in the present study, with absence of pallor, jaundice, cyanosis, clubbing, and lymphadenopathy. Similar findings were observed by Fatma et al. (2024) [21] and Thakur (2019) [22], suggesting that SCH patients often remain clinically asymptomatic despite biochemical abnormalities. Baseline hemodynamic parameters remained within normal physiological limits, with mean pulse rate of 84.7/min, systolic blood pressure of 112.6 mmHg, and diastolic blood pressure of 75.1 mmHg. Similar stable cardiovascular profiles were observed by Fatma et al. (2024) [21], Maraikayar et al. (2023) [23], and Biondi et al. (2019) [25]. However, Lee et al. (2019) [27] reported elevated blood pressure among obese adolescents with SCH, suggesting the influence of obesity and metabolic syndrome. The present study demonstrated mean AST and ALT levels of 25.416 ± 12.721 IU/L and 27.197 ± 6.518 IU/L, respectively, while mean ALP and GGT levels were 101.887 ± 24.443 IU/L and 25.661 ± 10.323 IU/L. Serum albumin and bilirubin levels remained largely within normal range, indicating preserved hepatic synthetic function. Similar mild hepatic enzyme alterations were reported by Fatma et al. (2024) [21] and Thakur (2019) [22]. Maraikayar et al. (2023) [23] observed comparatively higher enzyme levels among SCH patients with associated NAFLD, while Elshinshawy et al. (2023) [9] reported significantly elevated liver enzymes due to concomitant steatosis and insulin resistance. The relatively lower enzyme levels in the present study may be attributed to exclusion of major metabolic comorbidities.The thyroid profile confirmed biochemically stable SCH, with mean FT3 of 2.42 ± 0.612 pg/mL, FT4 of 1.29 ± 0.345 ng/dL, and mean TSH of 7.63 ± 2.181 μIU/mL. Similar hormonal patterns were documented by Fatma et al. (2024) [21], Maraikayar et al. (2023) [23], and Hegde et al. (2025) [3]. Kim et al. (2018) [2] further demonstrated that even mild elevation of TSH may contribute to hepatic metabolic dysfunction and NAFLD progression.In the present study, 79.0% participants had mild SCH while 21.0% had moderate SCH. All patients were negative for HBsAg and anti-HCV antibodies, ensuring that liver function alterations were related to thyroid dysfunction rather than viral hepatitis. Similar observations were reported by Li et al. (2017) [24] and Gupta et al. (2018) [11].Comparison of liver function parameters between mild and moderate SCH groups demonstrated significant differences in direct bilirubin and ALP levels. Direct bilirubin was significantly higher in moderate SCH ($p = 0.013$), whereas ALP was significantly higher in mild SCH ($p = 0.003$). Similar progressive biochemical alterations with increasing TSH levels were reported by Fatma et al. (2024) [21] and Hegde et al. (2025) [3]. In contrast, Elshinshawy et al. (2023) [9] and Kolesnikova et al. (2025) [26] observed more pronounced hepatic dysfunction due to associated fatty liver disease and metabolic syndrome.Correlation analysis in the present study demonstrated significant positive correlations between AST and ALT, AST and ALP, AST and FT4, and direct bilirubin with TSH. ALT showed a weak negative correlation with TSH. Similar associations between thyroid dysfunction and liver enzymes were reported by Fatma et al. (2024) [21], Maraikayar et al. (2023) [23], and Kim et al. (2018) [2]. However, Escudé et al. (2020) [28] did not identify thyroid dysfunction as an independent predictor of NAFLD, indicating variability among populations and study methodologies.A statistically significant association was observed between age group and SCH severity ($p = 0.019$), with moderate SCH occurring more frequently in older individuals. Similar age-related progression trends were reported by Fatma et al. (2024) [21], Thakur (2019) [22], and Biondi et al. (2019) [25].

CONCLUSION

The present study demonstrates that patients with subclinical hypothyroidism exhibit subtle but measurable alterations in liver function parameters despite the absence of overt liver disease or significant comorbidities. Significant correlations between thyroid profile and hepatic biochemical markers suggest an important early thyroid–liver interaction even at the subclinical stage. Mild to moderate subclinical hypothyroidism was associated with selective changes in cholestatic and hepatocellular markers while overall liver synthetic function remained preserved. These findings highlight the importance of routine liver function assessment in patients with subclinical hypothyroidism for early identification of metabolic and hepatic alterations and improved long-term clinical monitoring.

LIMITATIONS

The present study was a single-center cross-sectional study with a relatively small sample size, which limits the ability to establish causal relationships and reduces generalizability of the findings. Liver involvement was assessed only through biochemical parameters without imaging or histopathological correlation, and the absence of longitudinal follow-up prevented evaluation of progression or reversibility of hepatic changes over time.

REFERENCES

1. Christ-Crain M, Meier C, Puder J, Staub JJ, Huber PR, Keller U, et al. Changes in liver function correlate with the improvement of lipid profile after restoration of euthyroidism in patients with subclinical hypothyroidism. EXCLI J. 2004;3:1-9.

2. Kim D, Kim W, Joo SK, Bae JM, Kim JH, Ahmed A, et al. Subclinical hypothyroidism and low-normal thyroid function are associated with nonalcoholic steatohepatitis and fibrosis. Clin Gastroenterol Hepatol. 2018;16(1):123-131.
3. Hegde SL, Bhattam AK, Sequeira A, Kandimalla R, Siripuram C, Konka S, et al. Effect of hypothyroidism on lipid profile and liver enzymes: implications in non-alcoholic fatty liver disease. Clin Ter. 2025;176(5).
4. Ludwig U, Holzner D, Denzer C, Greinert A, Haenle MM, Oeztuerk S, et al. Subclinical and clinical hypothyroidism and non-alcoholic fatty liver disease: a cross-sectional study of a random population sample aged 18 to 65 years. BMC Endocr Disord. 2015;15(1):41.
5. Xu L, Ma H, Miao M, Li Y. Impact of subclinical hypothyroidism on the development of non-alcoholic fatty liver disease: a prospective case-control study. J Hepatol. 2012;57(5):1153-1154.
6. Baumgartner C, Da Costa BR, Collet TH, Feller M, Floriani C, Bauer DC, et al. Thyroid function within the normal range, subclinical hypothyroidism, and the risk of atrial fibrillation. Circulation. 2017;136(22):2100-2116.
7. Sheikhi V, Heidari Z. Association of subclinical hypothyroidism with nonalcoholic fatty liver disease in patients with type 2 diabetes mellitus: a cross-sectional study. Adv Biomed Res. 2022;11(1):124.
8. Deshmukh V, Behl A, Iyer V, Joshi H, Dholye JP, Varthakavi PK, et al. Prevalence, clinical and biochemical profile of subclinical hypothyroidism in normal population in Mumbai. Indian J Endocrinol Metab. 2013;17(3):454-459.
9. Elshinshawy S, Elhaddad H, Alem SA, Shaker O, Salam R, Yosry A, et al. The interrelation between hypothyroidism and non-alcoholic fatty liver disease, a cross-sectional study. J Clin Exp Hepatol. 2023;13(4):638-648.
10. Mishra AK, Anand R, Verma SP, Gupta KK. Study of impact of subclinical hypothyroidism on iron status and hematological profile. Int J Adv Med. 2018;5(2):446-451.
11. Gupta A, Aggarwal R, Yousuf S, Sharma T, Gupta AK. A study to find out the association between subclinical hypothyroidism/clinical hypothyroidism and NAFLD in subjects aged 18 to 65 years. JK Sci. 2018;20(4).
12. Cabral MD, Costa AJ, Santos M, Vaisman M. Lipid profile alterations in subclinical hypothyroidism. Endocrinologist. 2004;14(3):121-125.
13. Liu XL, He S, Zhang SF, Wang J, Sun XF, Gong CM, et al. Alteration of lipid profile in subclinical hypothyroidism: a meta-analysis. Med Sci Monit. 2014;20:1432.
14. Luo Y, Wu F, Huang Z, Gong Y, Zheng Y. Assessment of the relationship between subclinical hypothyroidism and blood lipid profile: reliable or not? Lipids Health Dis. 2022;21(1):137.
15. Humerah S, Siddiqui A, Khan HF. Pattern of altered lipid profile in patients with subclinical and clinical hypothyroidism and its correlation with body mass index. J Coll Physicians Surg Pak. 2016;26(6):463-466.
16. Verma SK, Kumar V, Tiwari P, Joge NK, Misra R. Thyroid profile in patients of cirrhosis of liver: a cross-sectional study. J Clin Diagn Res. 2017;11(12).
17. Caraccio N, Ferrannini E, Monzani F. Lipoprotein profile in subclinical hypothyroidism: response to levothyroxine replacement, a randomized placebo-controlled study. J Clin Endocrinol Metab. 2002;87(4):1533-1538.
18. Gupta G, Sharma P, Kumar P, Itagappa M. Study on subclinical hypothyroidism and its association with various inflammatory markers. J Clin Diagn Res. 2015;9(11):BC04-BC06.
19. Sert A, Pirgon O, Aypar E, Yilmaz H, Odabas D. Subclinical hypothyroidism as a risk factor for the development of cardiovascular disease in obese adolescents with nonalcoholic fatty liver disease. Pediatr Cardiol. 2013;34(5):1166-1174.
20. Liu L, Yu Y, Zhao M, Zheng D, Zhang X, Guan Q, et al. Benefits of levothyroxine replacement therapy on nonalcoholic fatty liver disease in subclinical hypothyroidism patients. Int J Endocrinol. 2017;2017:5753039.
21. Fatma R, Rani R, Kiran PU, Haria J. Hypothyroid patients visiting a tertiary care hospital evaluation of liver function tests in Moradabad region of Western Uttar Pradesh.
22. Thakur A. A hospital-based study for clinico-investigative profile of newly diagnosed patients of hypothyroidism. Endocrinol Metab Syndr. 2019;8(4):304.
23. Maraikayar T, Lokesh S, Maraikayar F, Halambar CJ. Burden of non-alcoholic fatty liver disease in subclinical hypothyroidism. J Clin Sci Res. 2023;12(4):262-266.
24. Li X, Zhen D, Zhao M, Liu L, Guan Q, Zhang H, et al. Natural history of mild subclinical hypothyroidism in a middle-aged and elderly Chinese population: a prospective study. Endocr J. 2017;64(4):437-447.
25. Biondi B, Cappola AR, Cooper DS. Subclinical hypothyroidism: a review. JAMA. 2019;322(2):153-160.
26. Kolesnikova OV, Radchenko AO, Zaprovalna OY. Metabolic, inflammatory and oxidative alterations in patients with steatotic liver disease: role of subclinical hypothyroidism. Med Res Arch. 2025;13(7).
27. Lee MK, Kim YM, Sohn SY, Lee JH, Won YJ, Kim SH, et al. Evaluation of the relationship of subclinical hypothyroidism with metabolic syndrome and its components in adolescents: a population-based study. Endocrine. 2019;65(3):608-615.
28. Escudé AM, Pera G, Arteaga I, Expósito C, Rodríguez L, Torán P, et al. Relationship between hypothyroidism and non-alcoholic fatty liver disease in the Spanish population. Med Clin (Engl Ed). 2020;154(1):1-6.