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Prevalence of Fatty Liver in Health Check-Up Populations: A Tertiary Care Center-Based Study from India

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ABSTRACT

Background:Non-alcoholic fatty liver disease (NAFLD) is increasingly being recognized as a major public health concern in India. Its detection during routine health check-ups has gained traction due to rising prevalence among asymptomatic individuals.**Objective**:To assess the prevalence of fatty liver in a health check-up population using ultrasound and liver function tests (LFTs) and to correlate it with demographic and biochemical parameters.**Methods**:This was a retrospective, cross-sectional study conducted at a tertiary care center in India between January 2024 and December 2024. Data of individuals undergoing health check-ups including abdominal ultrasonography and liver function tests were included. Subjects with significant alcohol intake, chronic liver disease, or viral hepatitis were excluded.**Results**:Out of 1,200 individuals screened, 354 (29.5%) had evidence of fatty liver on ultrasound. Among these, 218 (61.6%) had normal LFTs, while 136 (38.4%) had elevated ALT or AST. The prevalence of fatty liver was significantly higher in males (33.1%) than females (24.7%) ($p < 0.001$). Obesity (BMI > 25 kg/m²) was the strongest predictor of hepatic steatosis (OR 3.8, CI 2.9–4.9, $p < 0.001$).**Conclusion**:Nearly one-third of asymptomatic individuals undergoing routine health check-ups at a tertiary care hospital in India have evidence of fatty liver. A significant proportion of these individuals have normal liver enzymes, highlighting the need for routine ultrasound screening even in the absence of abnormal LFTs.

Keywords- Fatty liver, Ultrasonography, liver function tests,

INTRODUCTION Fatty liver disease, particularly non-alcoholic fatty liver disease (NAFLD), has emerged as a significant component of the metabolic syndrome in the Indian subcontinent. With rapid urbanization, sedentary lifestyles, and dietary transitions, the prevalence of NAFLD has risen dramatically—even among individuals who are ostensibly healthy.

Previous studies in India have reported NAFLD prevalence ranging between 9% and 45% in different population subsets. However, there is a paucity of data from health check-up populations in tertiary care settings, who often represent a self-selected, health-conscious demographic. This subgroup offers a valuable window into the early, asymptomatic phase of liver disease. Ultrasonography remains a non-invasive, cost-effective, and widely accessible method for detecting hepatic steatosis. When combined with routine liver function tests (LFTs), it can offer insights into both the prevalence and biochemical profile of fatty liver disease.

This study aims to assess the prevalence of fatty liver among health check-up attendees at a tertiary care hospital in India and to analyze its correlation with demographic and biochemical parameters.

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MATERIALS AND METHODS

Study Design and Setting This was a single-center, retrospective cross-sectional study conducted GMC Bhopal, a tertiary care referral hospital in [bhopal], India. The study was approved by the institutional ethics committee.

Study Population Electronic records of individuals undergoing executive or annual health check-ups between January 2024 and December 2024 were reviewed. Inclusion criteria:

- Age ≥ 18 years
- Underwent abdominal ultrasound and complete liver function tests
- No history of liver disease, alcohol intake >20 g/day (men) or >10 g/day (women), or known viral hepatitis

Data Collection Demographic data, anthropometry (BMI, waist circumference), blood pressure, LFTs, fasting glucose, and lipid profile were extracted. Ultrasound reports were reviewed for grading of fatty liver (Grade 1 to 3).

Definition of Variables

- Fatty liver on ultrasound: Increased echogenicity of the liver parenchyma compared to renal cortex
- Abnormal LFTs: ALT or AST > 40 IU/L
- Obesity: BMI ≥ 25 kg/m² (as per Asia-Pacific guidelines)

Statistical Analysis Data were analyzed using SPSS v26. Categorical variables were expressed as proportions and compared using chi-square tests. Continuous variables were expressed as mean ± SD and compared using t-tests. Logistic regression was performed to identify predictors of fatty liver. A p-value <0.05 was considered statistically significant.

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RESULTS

Baseline Characteristics of Study Population

Parameter	Total (n=1200)
Mean Age (years)	42.6 ± 11.3
Male: Female	710:490 (59.2% M)
Mean BMI (kg/m²)	25.4 ± 3.7

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Hypertension 236 (19.6%)

Diabetes Mellitus 142 (11.8%)

Abnormal ALT (>40 IU/L) 180 (15.0%)

Abnormal AST (>40 IU/L) 128 (10.7%)

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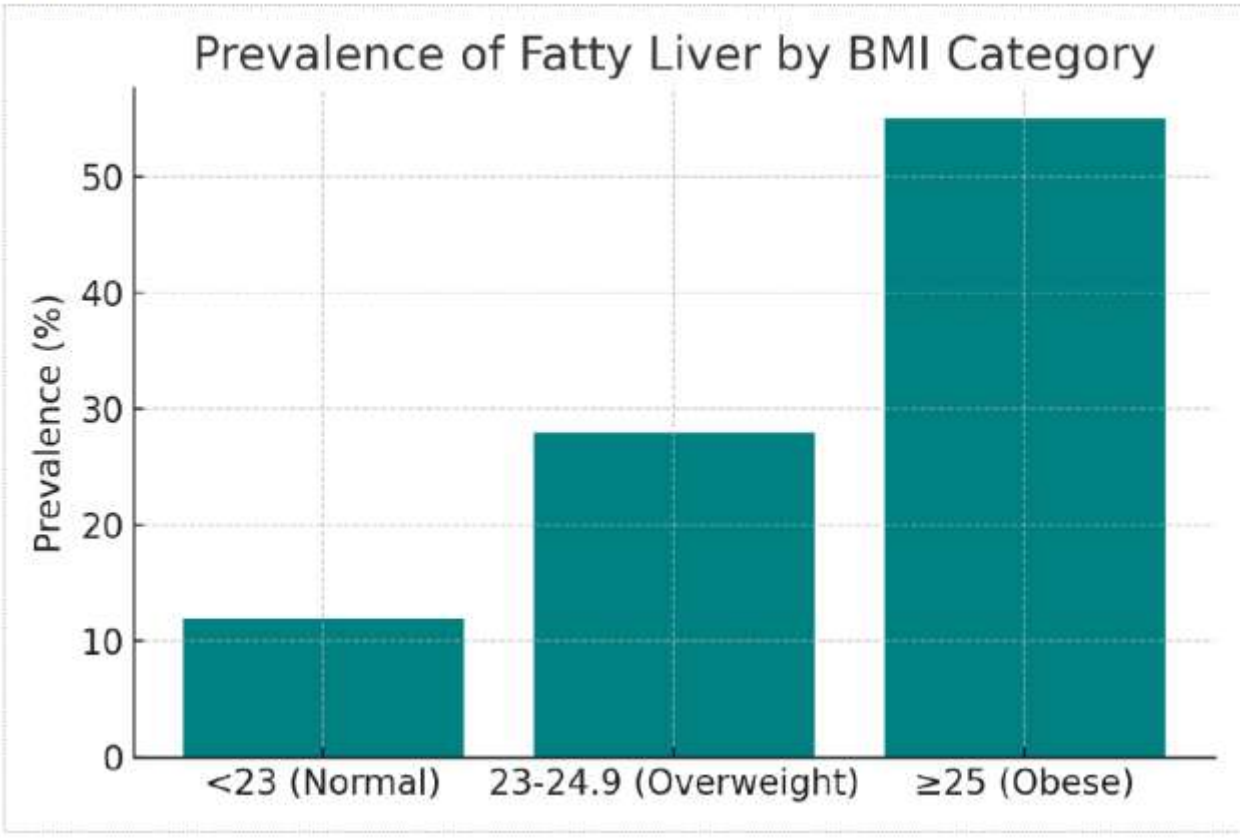
Prevalence of Fatty Liver on Ultrasound

Out of 1,200 individuals, 354 were found to have hepatic steatosis, yielding a prevalence of 29.5%.

Fatty Liver Grade	Number of Subjects	% of Total
Grade 1	214	17.8%
Grade 2	112	9.3%
Grade 3	28	2.3%

Figure 1: Prevalence of Fatty Liver by BMI Category



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Comparison Between Fatty Liver and Non-Fatty Liver Groups

Parameter	Fatty Liver (n=354)	No Fatty Liver (n=846)	p-value
Mean Age (years)	44.2 ± 10.7	41.8 ± 11.5	0.008
Male (%)	235 (66.4%)	475 (56.1%)	<0.001
Mean BMI (kg/m²)	27.6 ± 3.8	24.5 ± 3.2	<0.001
Abnormal ALT (%)	136 (38.4%)	44 (5.2%)	<0.00

Multivariate Logistic Regression: Predictors of Fatty Liver

Variable	Odds Ratio (OR)	95% CI	p-value
Male Gender	1.6	1.2 – 2.1	0.002
BMI ≥ 25 kg/m²	3.8	2.9 – 4.9	<0.001
Age > 45	1.4	1.1 – 1.9	0.015
ALT > 40 IU/L	4.2	3.0 – 5.8	<0.001

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Figure 2: Distribution of Fatty Liver Grades

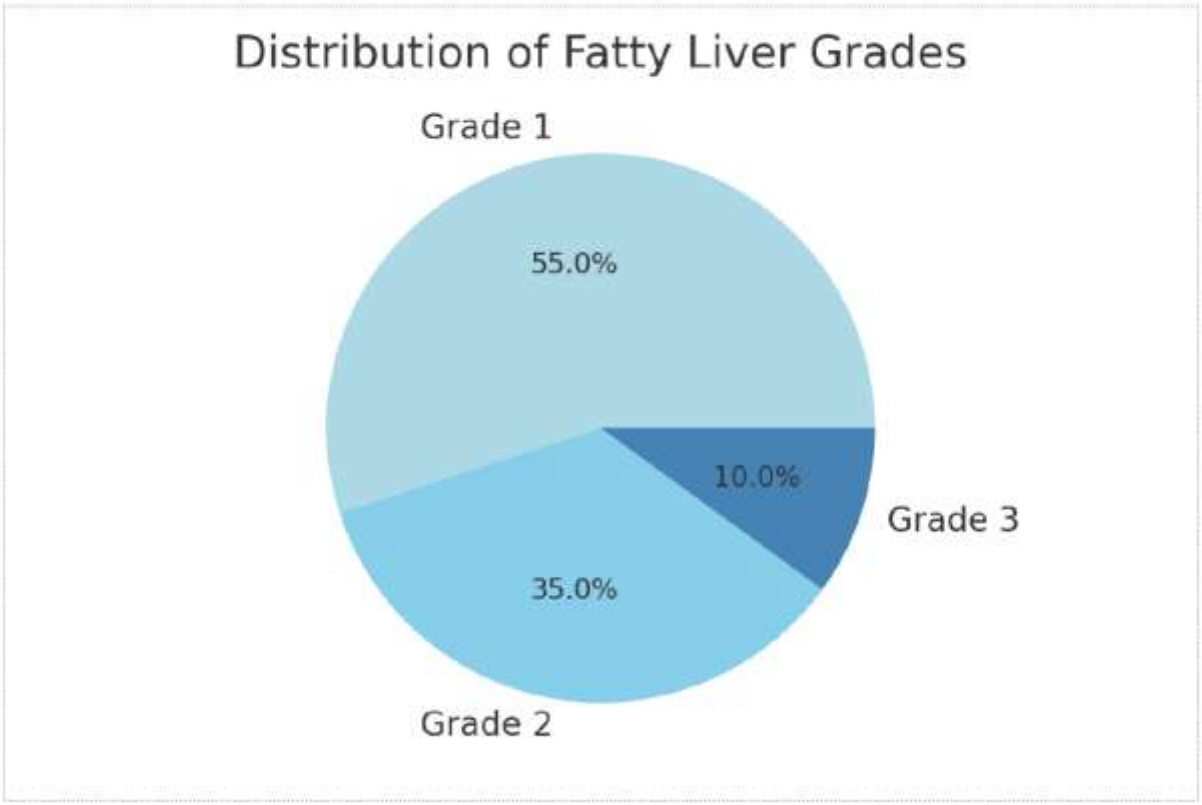

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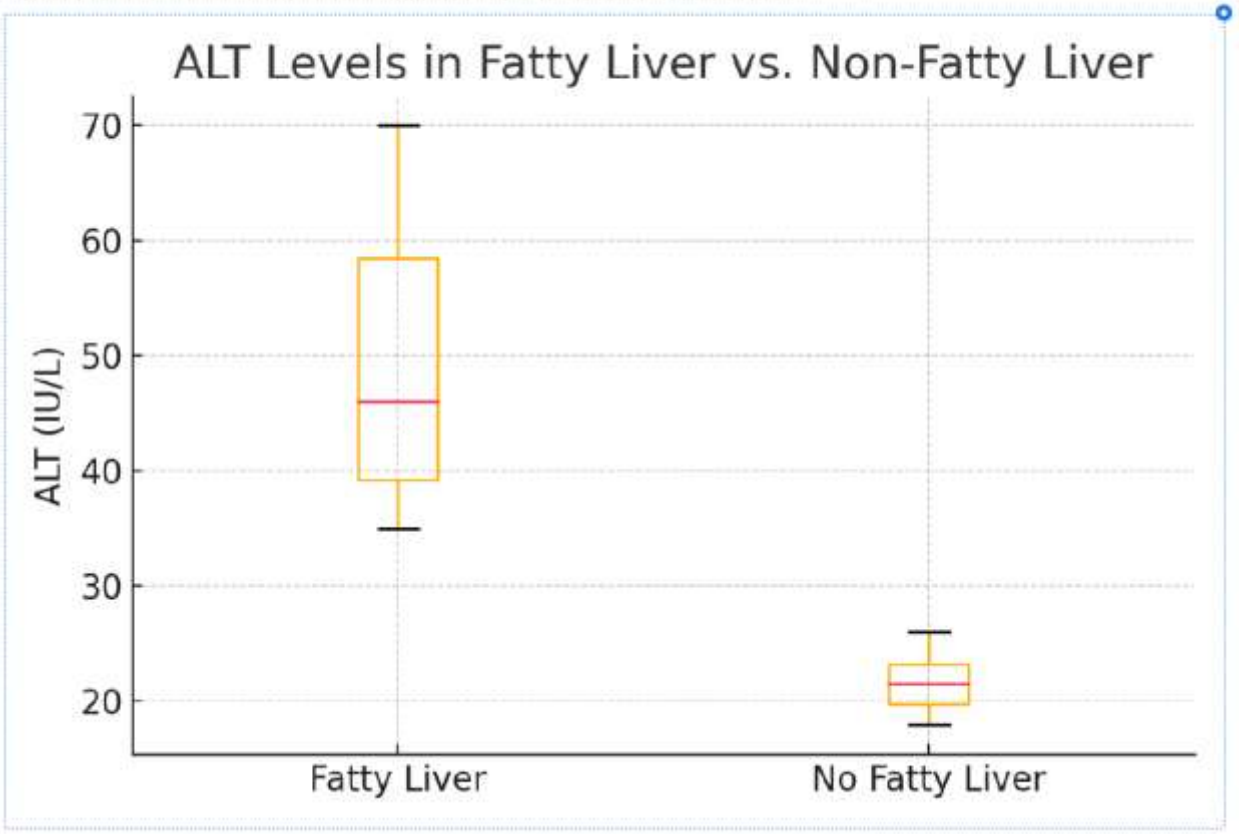
Figure 3: ALT Levels in Fatty Liver vs. Non-Fatty Liver



DISCUSSION

In this study, we found that the prevalence of fatty liver among individuals undergoing routine health check-ups at a tertiary care center in India was 29.5%, consistent with previous reports from urban Indian populations where prevalence ranges from 25% to 45%.[1][2] This suggests that even asymptomatic individuals are at significant risk of harboring hepatic steatosis, emphasizing the silent epidemic of NAFLD in India.

Gender and Obesity

The significantly higher prevalence among males (33.1%) compared to females (24.7%) aligns with multiple prior Indian studies[3]. This may reflect gender-based differences in body fat distribution, lifestyle patterns, and insulin resistance. Obesity was found to be the strongest independent predictor of fatty liver, with a nearly fourfold increase in risk among individuals with BMI ≥25 kg/m². Notably, 70% of those with fatty liver had BMI ≥25, reinforcing the central role of obesity in NAFLD pathogenesis.

Biochemical Correlates

Interestingly, 61.6% of individuals with fatty liver had normal ALT and AST, highlighting that normal LFTs do not exclude NAFLD. This finding underscores the limitations of relying solely on biochemical markers for screening liver

disease and supports the integration of routine ultrasonography in health check-up programs, especially for overweight or middle-aged individuals.

The correlation between elevated ALT and steatosis mirrors earlier data suggesting that mild transaminase elevation often reflects hepatocellular injury in early NAFLD[4]. However, the absence of enzyme elevation in the majority suggests that histologically significant disease may still go undetected unless imaging is performed.

Public Health Implications

Given India's large burden of type 2 diabetes and metabolic syndrome, and the natural history of NAFLD progressing to steatohepatitis, fibrosis, and even hepatocellular carcinoma, early detection during health check-ups can provide a critical opportunity for lifestyle intervention. Such screening may also reduce long-term healthcare costs associated with advanced liver disease and cardiovascular complications.

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STRENGTHS AND LIMITATIONS

Strengths:

- Large sample size of 1,200 participants
- Use of real-world data from a tertiary care hospital's routine health check-up unit
- Combination of ultrasound and LFTs provided a more comprehensive evaluation than either alone

Limitations:

- Retrospective design
- Lack of metabolic parameters such as HOMA-IR or hs-CRP
- Absence of fibroscan or liver biopsy data to distinguish simple steatosis from NASH
- Single-center data limits generalizability

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CONCLUSION

Nearly one-third of individuals undergoing health check-ups at a tertiary care hospital in India have ultrasound-detectable fatty liver, most of whom are asymptomatic and have normal liver enzymes. Male gender, obesity, and elevated ALT levels were significant predictors of hepatic steatosis. Our findings support the inclusion of ultrasonography as a routine part of health assessments, especially in high-risk individuals.

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ETHICAL APPROVAL

This study was conducted with permission from the Institutional Ethics Committee of [Your Institute Name]. All patient data were anonymized prior to analysis, and the study adhered to the principles of the Declaration of Helsinki.

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FINDING

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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ANNEXURES

Annexure 1: Interpretation of Liver Function Tests

Parameter	Normal Range	Interpretation
ALT	5–40 IU/L	Marker of hepatocellular injury
AST	10–40 IU/L	Less specific than ALT
ALP	40–129 IU/L	Elevated in cholestasis
Bilirubin	0.3–1.2 mg/dL	Elevated in hepatobiliary dysfunction

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Annexure 2: Ultrasound Grading of Fatty Liver

Grade	Description
Grade 1	Slightly increased echogenicity, normal vessels visible
Grade 2	Diffuse increased echogenicity, impaired vessel visualization
Grade 3	Marked echogenicity, poor visualization of diaphragm and vessels

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Annexure 3: Suggested Lifestyle Recommendations for Positive Cases

- Caloric restriction: ~20% deficit
- Physical activity: ≥150 minutes/week aerobic + resistance training
- Avoid sugar-sweetened beverages
- Annual follow-up with LFTs and ultrasound