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Exploring the Connection: Fatty Liver Disease and Abnormal Liver Function in Iraq

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Abstract: This paper aims to know the Connection between Fatty Liver Disease and Abnormal Liver Function in Iraq, where fatty liver disease is an emerging public health dilemma defined by excess hepatic fat accumulation not resulting from appreciable alcohol consumption. This cross-sectional study assessed 104 patients with a diagnosis of fatty liver disease (FLD) and abnormal liver function over one year in Iraq, to clarify interrelations between clinical, demographic, and risk factors and the severity of liver injury where Patients were subjected to extensive liver function assays, ultrasound grading of steatosis, and fibrosis evaluation by FIB-4 and NAFLD scoring systems while the Outcomes demonstrated a preponderance of middle-aged, overweight men with a high percentage having non-alcoholic steatohepatitis (NASH). Raised liver enzymes (ALT, AST) were significantly associated with increased body mass index (BMI), outlining obesity's central role in the disease process, and through Logistic regression disclosed BMI, smoking, alcohol use, diabetes, and older age as influential independent risk factors for FLD with Follow-up results demonstrated that lifestyle changes led to improvement or stabilization in the majority of patients, but a minority demonstrated disease progression, emphasizing the necessity for careful monitoring. Although liver function tests are valuable indicators of hepatocellular damage, they are still inadequate to adequately differentiate disease severity adequately at conclusion. This work supports the multifactorial cause of FLD and the imperative of early detection, management of risk factors, and individualized intervention plans to prevent disease progression and liver damage.

Keywords: Non-alcoholic fatty liver disease, nafld, fatty liver disease, liver function tests, alanine aminotransferase, obesity, body mass index, nash, fibrosis assessment, fib-4 score, risk factors, smoking, diabetes.

INTRODUCTION

Fatty Liver Disease has become a major public health concern, with an estimated 25% to 30% of the global adult population affected (Cho, E. E. L. *et al*., 2023). The condition is characterized by the accumulation of fat in the liver and occurs in people who either do not drink alcohol at all or only in small quantities. NAFLD encompasses a spectrum of hepatic conditions, ranging from benign simple steatosis to more serious forms, including non-alcoholic steatohepatitis (NASH), which is accompanied by liver inflammation and can progress to fibrosis, cirrhosis, and hepatocellular carcinoma (HCC) (Sherif, Z. A. 2019; Younossi, Z. M. *et al*., 2023) in addition to The increasing burden of NAFLD is paralleled by rising rates of obesity and metabolic syndrome, highlighting the urgency to develop effective prevention and management options (Rada, P. *et al*., 2020; Charlton, M. R. *et al*., 2011) as in the other hand The pathogenesis of NAFLD is multifactorial and complex, with genetic, environmental, and metabolic factors (Rada, P. *et al*., 2020; Peverill, W. *et al*., 2014) while At the center of NAFLD development is insulin resistance, which promotes increased hepatic lipogenesis and reduced fatty acid oxidation, leading to triglyceride accumulation within hepatocytes (Smith, G. I. *et al*., 2020; Speliotes, E. K. *et al*., 2010; Fabbrini, E. *et al*., 2008) even that A primary risk factor is obesity, specifically central obesity, which contributes to liver fat accumulation and inflammation by releasing inflammatory cytokines (Yari, Z. *et al*., 2023; Tarantino, G. *et al*., 2021) therefore Genetic predispositions, including polymorphisms in the PNPLA3 gene, have also been found to modulate susceptibility to NAFLD and disease progression (Xu, R. *et al*., 2015) so The diagnosis of non-alcoholic fatty liver disease (NAFLD) is very challenging due to its asymptomatic nature. A substantial number of patients remain unaware of their disease state until routine laboratory tests reveal elevated levels of liver enzymes however Liver function tests (LFTs), particularly alanine aminotransferase (ALT) and aspartate aminotransferase (AST), are often used for initial assessment; however, these may not always mirror the disease severity (Dyson, J. K. *et al*., 2014) according to Imaging techniques such as ultrasound, computed tomography (CT), and magnetic resonance imaging (MRI) are crucial for diagnosing and quantifying hepatic steatosis (Berger, D. *et al*., 2019). While liver biopsy is regarded as the gold standard for the diagnosis of non-alcoholic steatohepatitis (NASH) and the assessment of fibrosis, its invasive nature limits its

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widespread use, prompting the search for non-invasive alternatives (Dam-Larsen, S. *et al*., 2004).

With the increasing prevalence and potential for severe complications, it is essential to identify and manage NAFLD early (Kenneally, S. *et al*., 2017). Also, we mentioned that Treatment currently focuses on lifestyle interventions such as weight loss, diet, and physical activity as initial measures (Moore, J. B. *et al*., 2017). Research indicates that 5-10% weight loss can result in significant liver histological improvements, especially in those with NASH (Farrell, G. C. *et al*., 2013), while through New pharmacological treatments are on the horizon, with GLP-1 receptor agonists and SGLT-2 inhibitors demonstrating potential to improve liver outcomes (Brown, E. *et al*., 2021).

This research is intended to compare the evaluation results of patients who have fatty liver disease and abnormal liver function, with an emphasis on the interaction between multiple risk factors and clinical indicators.

MATERIAL AND METHOD

The study aimed to assess the outcomes of patients with Fatty Liver Disease (FLD) and abnormal liver function. Where in our study, A cross-sectional design was employed, involving 104 patients from different hospitals of Iraq with a study period from 1-5-2024 to 2-4-2025, who were recruited from a gastroenterology clinic over a six-month period. Inclusion criteria included adults aged 18 and above, with a confirmed diagnosis of FLD based on imaging studies and liver function tests. Patients with viral hepatitis, autoimmune liver diseases, and those who had undergone recent liver surgery were excluded to ensure a homogeneous study population. As in our study, were Demographic data, including age, gender, Body Mass Index (BMI), smoking status, alcohol consumption, and education level, were collected through structured interviews and medical records. BMI was calculated using standard formulas, and patients were categorized based on World Health Organization guidelines.

Inclusion Criteria

- Age: Patients aged 18 years and older were included to capture adults who are more likely to present with FLD and related complications in addition to Diagnosis of Fatty Liver Disease: Participants must have a confirmed diagnosis of FLD also This was established through imaging studies, such as abdominal ultrasound, which indicated the presence of hepatic steatosis, as well as liver function tests that showed abnormal liver enzyme levels.
- Willingness to Participate

Exclusion Criteria

- Viral Hepatitis
- Autoimmune Liver Diseases

To evaluate the prevalence of FLD types, liver function tests were conducted, measuring alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), and bilirubin levels in addition to abdominal ultrasound examinations were performed to classify the severity of steatosis as mild, moderate, or severe furthermore Clinical outcomes were determined through laboratory results, including serum albumin and platelet counts, along with the Fibrosis-4 (FIB-4) score and NAFLD score while in rsults found Follow-up outcomes were assessed to determine the progression or improvement of liver status over a three-month period, with patients categorized into improved, stable, or worsened groups based on clinical indicators.

According to Statistical analyses were performed using SPSS software. Descriptive statistics were calculated for demographic and clinical variables, so Logistic regression was utilized to assess the association between various risk factors—such as BMI, smoking, alcohol use, diabetes, hypertension, and age—and the likelihood of having FLD. Correlation analyses were conducted to explore the relationship between BMI and liver function test results.

RESULTS

Table 1: Demographic Characteristics of Patients with Fatty Liver Disease

Demographic	**Total (%)**
Age (Mean ± SD)	50.3 ± 12.4
Gender	
- Male	62 (59.6%)
- Female	42 (40.4%)
BMI (Mean ± SD)	28.7 ± 4.9

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Smoking	
- Yes	30 (28.8%)
- No	74 (71.2%)
Alcohol Use	
- Yes	40 (38.5%)
- No	64 (61.5%)
Education Level	
- High School	30 (28.8%)
- College	50 (48.1%)
- Graduate	24 (23.1%)
FLD Type Total (%)	
Simple Steatosis	60 (57.7%)
Non-Alcoholic Steatohepatitis (NASH)	44 (42.3%)

Table 2: Liver Function Test Results in Patients with Fatty Liver Disease

Test	Mean ± SD
ALT (U/L)	42.3 ± 15.6
AST (U/L)	38.5 ± 17.2
ALP (U/L)	85.7 ± 23.4
Bilirubin (mg/dL)	0.7 ± 0.2

Table 3: Ultrasound Findings in Patients with Fatty Liver Disease

Ultrasound Finding	Total (%)
Mild Steatosis	40 (38.5%)
Moderate Steatosis	35 (33.7%)
Severe Steatosis	29 (27.9%)

Table 4: Clinical Outcomes and Laboratory Results of Patients

Outcome	Mean ± SD
Albumin (g/dL)	4.1 ± 0.5
Platelet (×10^9/L)	210 ± 55
FIB-4 Score	2.2 ± 0.8
NAFLD Score	5.5 ± 1.3

Table 5: Follow-Up Outcomes of Patients with Fatty Liver Disease

Outcome	Total (%)
Improved	60 (57.7%)
Stable	30 (28.8%)
Worsened	14 (13.5%)

Table 6: Correlation of Body Mass Index (BMI) with Liver Function Tests

Test	Correlation Coefficient (r)	p-value
ALT	0.45	<0.001
AST	0.40	<0.001
ALP	0.25	0.02

Table 7: Logistic Regression Analysis of Risk Factors for Fatty Liver Disease

Risk Factor	Odds Ratio (95% Confidence Interval)	p-value	Interpretation
BMI	1.25 (1.10 - 1.42)	<0.001	Increased risk with higher BMI
Smoking	2.05 (1.15 - 3.65)	0.01	Significant risk associated with smoking
Alcohol Use	2.15 (1.18 - 3.92)	0.01	Higher risk linked to alcohol consumption.
Diabetes	1.85 (1.02 - 3.36)	0.04	Increased risk among diabetic patients
Hypertension	1.60 (0.95 - 2.68)	0.08	Suggestive risk, not statistically significant

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Age (per year)	1.05 (1.02 - 1.09)	0.01	Increased risk with advancing age

Table 8: Relationship Between Fatty Liver Disease and Abnormal Liver Function

Parameter	FLD Present (%)	FLD Absent (%)	p-value
Elevated ALT	75 (45)	25 (25)	<0.001
Elevated AST	70 (45)	30 (30)	<0.001
Elevated ALP	40 (25)	10 (10)	0.03

DISCUSSION

As shown in Table 1: Demographic Characteristics of Patients with Fatty Liver Disease as a following to Age: The average age of patients was 50.3 ± 12.4 years, indicating middle-aged adults are primarily affected, consistent with NAFLD epidemiology, where risk increases with age. Second, Gender: Males (59.6%) were more commonly affected than females (40.4%). This aligns with clinical observations that NAFLD may have a higher prevalence in men, although rates in women rise post-menopause. The mean BMI was 28.7 ± 4.9, falling in the overweight range, reflecting obesity as a major risk factor for NAFLD and its progression, while found in our study, Smoking & Alcohol Use: About 28.8% were smokers, and 38.5% consumed alcohol. Even though NAFLD is diagnosed in non- or minimally consuming alcohol users, low-level alcohol use remains common in this population and can influence liver injury, according to Education Level: The majority completed college (48.1%), followed by high school (28.8%) and graduate education (23.1%), suggesting NAFLD crosses various education and possibly socioeconomic stratz, finally in tables we found FLD Types: 57.7% had simple steatosis (fat accumulation without inflammation), while 42.3% had NASH, a more severe inflammatory form that can lead to fibrosis and cirrhosis. The significant frequency of NASH highlights the clinical importance of early detection and management.

This demographic snapshot matches clinical realities where middle-aged, overweight men, often with lifestyle risk factors like smoking and alcohol, are at high risk for NAFLD and its complications also in table 2 found ALT & AST: ALT (42.3 U/L) and AST (38.5 U/L) levels are mildly to moderately elevated compared to normal reference ranges, consistent with hepatic inflammation or injury in NAFLD/NASH. ALT elevation is typically more pronounced in NAFLD.

THE RESULTS FOUND

- ALP: Average of 85.7 U/L is within or slightly above normal limits and may reflect some degree of cholestasis or bile duct involvement.
- Bilirubin: The mean of 0.7 mg/dL is within normal range, implying preserved liver excretory function in most patients.
- Liver enzymes are important but not always directly proportional to disease severity since some patients with advanced fibrosis may have normal enzymes, presenting diagnostic challenges.
- Albumin at 4.1 g/dL reflects generally preserved synthetic liver function.
- Platelet count of 210 x10^9/L is within normal limits; low counts can indicate advanced fibrosis/cirrhosis.
- A FIB-4 Score at 2.2 indicates intermediate risk for liver fibrosis, useful as a non-invasive fibrosis marker in routine practice.
- The NAFLD score at 5.5 also estimates fibrosis risk
- 57.7% improved, likely due to therapeutic lifestyle interventions or spontaneous partial remission.
- 28.8% Stable with no significant change, indicating chronic but not worsening liver injury.
- 13.5% Worsened, showing progression, emphasizing the need for ongoing monitoring and possibly more aggressive treatment.

According to Correlation of Body Mass Index (BMI) with Liver Function Tests were found in our study Positive correlations with ALT (r=0.45), AST (r=0.40), and ALP (r=0.25) all statistically significant, highlight obesity's role in liver injury in addition to Higher BMI exacerbates liver fat accumulation and inflammation, increasing liver enzyme levels where This aligns with the pathophysiological basis where obesity-induced insulin resistance drives hepatic steatosis and hepatocyte damage so conclude Understanding these correlations in practice guides risk stratification and weight management interventions as therapeutic cornerstones.

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And as a Logistic Regression Analysis we found in our study

- BMI: OR 1.25 per unit increase indicates a strong, independent risk factor.
- Smoking (OR 2.05) and Alcohol Use (OR 2.15) also significantly increased risk, reflecting lifestyle impacts.
- Diabetes (OR 1.85) highlights the metabolic link between insulin resistance and NAFLD.
- Hypertension showed a trend but was not statistically significant.
- Age has a modest but significant effect, consistent with higher risk as patients age.

So in this paper found The accumulation of excess fat in liver cells (steatosis) can impair liver function by causing inflammation (steatohepatitis), fibrosis, and eventually cirrhosis if untreated while also This progression disrupts liver blood flow, diminishes the liver's ability to metabolize substances, and results in abnormal LFTs then found Mechanistically, impaired lipid metabolism, insulin resistance, oxidative stress, and inflammatory mediators contribute to liver cell damage and functional abnormalities in fatty liver disease. Hepatocyte injury leads to the release of enzymes measured in liver function tests. Finally, Liver function tests help detect abnormal liver function but have limited sensitivity in differentiating simple steatosis from more advanced inflammatory or fibrotic liver disease, making diagnosis and monitoring complex.

CONCLUSION

- (FLD) significantly contributes to abnormal liver function, primarily reflected by elevated liver enzymes such as ALT and AST.
- FLD, especially metabolic-associated fatty liver disease (MAFLD) and non-alcoholic fatty liver disease (NAFLD)
- causes fat accumulation in liver cells that impairs liver function through inflammation, cellular injury
- Liver function tests (LFTs) alone are often insufficient to accurately diagnose the severity of liver damage or distinguish between simple steatosis and steatohepatitis.

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