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TO DETERMINE THE FREQUENCY OF FATTY LIVER DISEASE AND ITS ASSOCIATED RISK FACTORS ON ULTRASOUND IN MAQSOOD MEDICAL COMPLEX, PESHAWAR

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Abstract

Background: *Understanding the frequency and risk factors of Fatty Liver Disease is essential for developing targeted public health interventions and strategies to reduce its burden, as it has become one of the most prevalent liver disorders in the world and has a significant impact on public health due to its association with obesity, diabetes, and metabolic syndrome.*

Aims and objectives: *To determine frequency of Fatty Liver Disease and its associated Risk Factors.*

Material and Methods: *A descriptive cross-sectional study were conducted in a hospital setting to find out the frequency and risk factors of Fatty Liver Disease (FLD) among patients visited for abdominal ultrasound at Maqsood Medical Complex General Hospital Peshawar. About 377 participants of age 25 years and above irrespective of gender were enrolled using non-probability convenience sampling technique. Those participants who were unwilling to give consent were excluded from the study.*

Results: *In our study, total patients were 377 in which 173 (45.9%) patients were diagnosed with Fatty Liver Disease (FLD) and 204 (54.1%) were having no signs of Fatty Liver Disease (FLD).*

Conclusion: *It is concluded that every second person in our study have FLD and majority of them were females (82.6%). Our study revealed that most of the patients diagnosed with FLD had no associated Risk Factors. While the most*

common risk factors were obesity and hypertension. Therefore, individuals who are at high risk of Fatty Liver Disease can take preventive approaches by performing screening Ultrasonography and by practicing interventions such as lifestyle adjustment, maintenance of a healthy weight, prevention of obesity, treatment of dyslipidemia, and adequate glycemic control.

Introduction:

The liver is a crucial organ, vital for systemic homeostasis, weighing around 1.5 kg or 2% of body weight. It has a dual blood supply from the hepatic artery and portal vein, receiving 25% of cardiac output, primarily from the portal vein. Located mainly in the right hypochondriac region, the liver comprises right and left lobes, with additional quadrate and caudate lobes. It is essential for metabolism, regulating blood glucose, synthesizing plasma proteins and bile, and detoxifying substances. Liver diseases such as hepatitis, cirrhosis, and fatty liver represent significant global health issues, particularly viral hepatitis and alcohol-related diseases (2).

Ludwig's 1980 description advanced the histopathological understanding of fatty liver disease (FLD), building on earlier observations. FLD is now recognized as having a bidirectional relationship with metabolic syndrome. Emerging evidence also links FLD with hepatocellular carcinoma and other extra hepatic malignancies, shaping modern clinical guidelines and management strategies (3).

Fatty liver disease involves hepatic fat accumulation without significant injury and is often asymptomatic, occasionally causing fatigue, nausea, or right upper quadrant discomfort (4).

Fatty liver disease (FLD) is a leading cause of chronic liver disease. Abdominal ultrasonography is commonly used to evaluate asymptomatic individuals with elevated liver enzymes, although it has limited sensitivity in detecting mild hepatic steatosis (5).

Fatty liver disease (FLD) is the most common liver disorder globally and is present in 55–80% of individuals with type 2 diabetes. Undiagnosed FLD can lead to hepatocellular carcinoma, cardiovascular disease, extra-hepatic malignancies, and increased mortality. Ultrasound remains the primary imaging tool for assessment (6).

Ultrasound use in clinical practice is expanding, with an estimated 34% of individuals affected by fatty liver disease (FLD). As obesity rates continue to rise, the prevalence of FLD, closely linked to metabolic syndrome, is expected to increase (7, 8).

Fatty liver disease (FLD) is the leading cause of abnormal liver tests in the US, defined by steatosis in ≥5% of hepatocytes. While most FLD cases follow a benign course, a subset may progress to nonalcoholic steatohepatitis (NASH), which carries a risk of developing cirrhosis (9).

Fatty liver disease (FLD) encompasses asymptomatic steatosis, nonalcoholic steatohepatitis (NASH), and cirrhosis. Hepatic steatosis results from free fatty acid accumulation linked to insulin resistance and metabolic syndrome. Noninvasive methods, such as abdominal ultrasonography, can safely detect steatosis (10).

Most patients with fatty liver disease (FLD) do not progress to NASH and have a low risk of complications. Ultrasound is currently recommended as the primary noninvasive screening tool to detect hepatic steatosis in at-risk populations (11).

Hepatic steatosis, the earliest stage of fatty liver disease (FLD), results from lipid accumulation within hepatocytes and affects up to 90% of obese individuals and 30% of the US population. Although widely used, liver ultrasound has limited sensitivity, and while combining echo-graphic measures improves diagnostic accuracy, it remains only partially effective for monitoring treatment response (12, 13).

Non-alcoholic fatty liver disease (NAFLD) was rapidly surpassing alcohol-associated liver disease as the leading cause of chronic liver disease in the Western world due to rising obesity and type-2 diabetes. While often presenting as simple steatosis, NAFLD can progress to non-alcoholic steatohepatitis (NASH), which may lead to cirrhosis and complications, including hepatocellular carcinoma (14).

Liver biopsy is crucial for assessing hepatic pathology, distinguishing chronic liver disease stages, and evaluating fibrosis in FLD and NASH, making it the gold standard for histopathological assessment. However, its invasive nature limits routine use for FLD diagnosis (15).

Computed tomography (CT) is used to assess fatty liver disease (FLD), although its role and limitations are less well-defined. CT can help diagnose FLD and is valuable because its accuracy is generally unaffected by individual demographic or histopathology variations (16).

Liver biopsy is crucial for assessing hepatic pathology, distinguishing chronic liver disease stages, and evaluating fibrosis in FLD and NASH, making it the gold standard for histopathological assessment. However, its invasive nature limits routine use for FLD diagnosis (17).

Ultrasound imaging is increasingly used in clinical practice for detecting fatty liver disease. It is a noninvasive, convenient method that identifies hepatic steatosis through features such as increased echogenicity and liver enlargement, particularly when fat accumulation exceeds 33% (18, 19).

Treatment of fatty liver disease (FLD) typically involves lifestyle modifications, weight loss, and pharmacological interventions, addressing components of metabolic syndrome. A multimodal strategy targets various factors contributing to disease progression (20). To determine frequency of fatty liver disease and its associated risk factors was the objective.

Materials and Methods:

The study was conducted at MMC General Hospital, Peshawar, Pakistan, and included all patients referred for abdominal ultrasonography during the study period. A descriptive cross-sectional design was employed, with non-probability convenience sampling used to select participants. The sample size was 377. Data were analyzed using SPSS version 22, with descriptive statistics such as frequencies and percentages calculated, and results presented in tables and graphs, including bar charts and pie charts.

Patients aged 25 years and above, of any gender, referred for liver ultrasonography were included, while those who were uncooperative, pregnant, or suffering from life-threatening conditions were excluded. Ethical approval was obtained from the NCS University System Institutional Research Committee, and permission for data collection was granted by the university director. Eligible patients were approached and provided informed consent before participation. Data were collected using a structured questionnaire administered by the researchers, and the information was subsequently compiled and analyzed to address the study objectives.

Results:

Table 4.1 presents the demographic characteristics, mean age, prevalence, and grading of fatty liver disease among the study participants. A total of 377 patients were included in the study with an average age of 42 years among FLD patients. Females constituted the majority of the sample 258 (68.4%), while 119 (31.6%) were males. Most participants belonged to urban areas (90.7%), with only 9.3% from rural areas. Fatty liver disease was diagnosed in 173 (45.9%) patients, whereas 204 (54.1%) had no evidence of FLD. Among the diagnosed cases, Grade I fatty liver was the most common (70.5%), followed by Grade II (29.5%), while no cases of Grade III or Grade IV were observed.

Table 4.1: Demographic Characteristics, Mean Age, Prevalence, and Grades of Fatty Liver Disease (n = 377)

Variable	Category	Frequency (n)	Percentage (%)
Total Participants	—	377	100
Mean Age of FLD Patients	42 years	—	—
Gender	Male	119	31.6
	Female	258	68.4
Residence	Urban	342	90.7
	Rural	35	9.3
Fatty Liver Diagnosis	Yes	173	45.9

	No	204	54.1
Grades of Fatty Liver (n = 173)	Grade I	122	70.5
	Grade II	51	29.5
	Grade III	0	0
	Grade IV	0	0

Table 4.2 shows the distribution of risk factors associated with fatty liver disease among the study participants. Obesity and high blood pressure were the most frequently observed individual risk factors, each present in 30 (8%) patients, while diabetes was present in 14 (3.7%) patients. Combined risk factors included obesity with hypertension in 19 (5%) patients, obesity with diabetes in 7 (1.9%) patients, and diabetes with hypertension in 14 (3.7%) patients. Additionally, 17 (4.5%) patients had all three risk factors. A notable proportion of patients, 42 (11.1%), were diagnosed with fatty liver disease without any identifiable cause.

Table 4.2: Distribution of Risk Factors among Study Participants (n = 377)

Risk Factors	Frequency (n)	Percentage (%)
No Risk Factor	204	54.1
Obesity	30	8.0
Diabetes	14	3.7
High Blood Pressure	30	8.0
Obesity & Diabetes	7	1.9
Obesity & BP	19	5.0
Diabetes & BP	14	3.7
All Risk Factors	17	4.5
Without Cause	42	11.1
Total	**377**	**100**

The prevalence of fatty liver disease (FLD) among the study participants. Out of a total of 377 patients, 173 (45.9%) were diagnosed with FLD, while 204 (54.1%) did not have fatty liver disease. The chart compares the frequency distribution of FLD presence and absence within the study population. Statistical analysis using the Chi-square test showed a significant association ($p < 0.001$), indicating that the observed distribution is statistically significant. This result highlights a considerable proportion of patients affected by fatty liver disease within the studied sample.

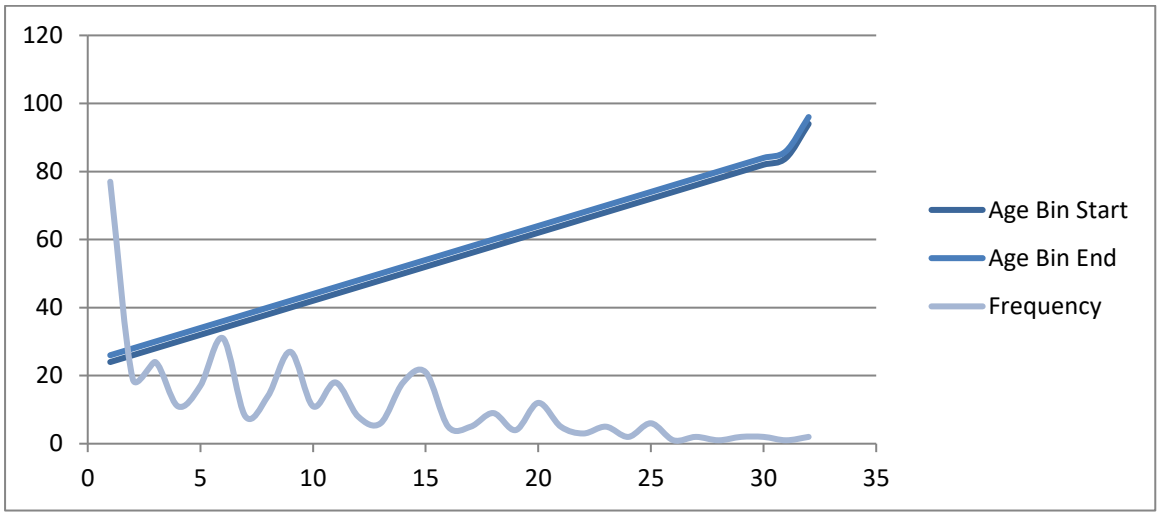

Figure 2: Average Age of Patients

The figure shows the distribution of participants across age groups and their frequencies. The Age increases from approximately 24 years to about 85 years, while the Age ranges from around 26 years to 95 years, indicating progressively increasing age intervals. The frequency line shows the highest count of about 77 participants in the youngest age group. Frequencies then fluctuate between approximately 5 and 30 participants across the middle age groups, before declining to 1–5 participants in the oldest groups. Overall, the pattern indicates that most participants belong to younger age categories, with substantially fewer individuals in older age groups.

Discussion:

Fatty liver disease (FLD) is defined as the accumulation of fat within the liver parenchyma detected through imaging or histology. In the absence of hepatocyte ballooning, it is classified as simple FLD. Patients may present with nonspecific symptoms such as right upper quadrant pain, fatigue, and nausea (4).

The present study assessed the prevalence and risk factors of FLD among patients undergoing abdominal ultrasonography at MMC General Hospital, Peshawar. The overall prevalence was 45.9%, indicating a high disease burden. A considerable proportion of patients 24.2% had no identifiable cause. Among recognized risk factors, obesity and hypertension were the most frequent, each accounting for 17.3% of cases.

Similar findings were reported in a study conducted in Okara, Punjab, Pakistan, by Iftikhar and Raheel, which documented a prevalence of 45.2%, closely matching our results. In contrast, a population-based study by Abbas Z and Zaheer R reported a lower prevalence of 15% in the general population, attributing the rise in FLD to increasing obesity, sedentary lifestyle, and limited health awareness. While obesity was a significant factor in our study, the high proportion of patients without a known cause suggests the possible role of additional metabolic or environmental factors (28, 29).

A Canadian study by Da Silva, Hannah E demonstrated that low physical activity, higher body mass index (BMI), and insulin resistance were strongly associated with FLD, particularly among individuals consuming a Western diet. These findings align with our study, where obesity and reduced physical activity were common among affected patients (30).

Regarding diagnostic modalities, Saadeh, Sherif reported that imaging techniques primarily reflect the degree of steatosis and that ultrasonography remains the preferred modality due to its accessibility and cost-effectiveness, consistent with our methodology. Large-scale research by Maev, Igor V found a prevalence of 42.0%, with a higher proportion of female patients, similar to our findings (45.9% prevalence; 82.6% females). Likewise, Yılmaz, Yusuf reported a prevalence of 48.3% in Turkey, further supporting the growing regional and global burden of FLD (22,31,32).

Conclusions and Recommendation:

In this study, fatty liver disease (FLD) was identified in nearly half of the participants, with 82.6% of cases occurring in females. The mean age of FLD-positive patients was 42 years. Most cases had no clearly identifiable etiology; however, hypertension and obesity were the most common associated risk factors, likely related to physical inactivity and high consumption of fatty foods. In contrast to findings from other regions, type 2 diabetes mellitus (DM2) was relatively uncommon among FLD patients in Khyber Pakhtunkhwa, indicating a weaker association in this population.

Early detection through ultrasonography and preventive strategies including lifestyle modification, weight management, treatment of dyslipidemia, and glycemic control are important for reducing FLD risk. Individuals who are overweight, hypertensive, or over 40 years of age should be encouraged to adopt healthier lifestyles. Annual abdominal ultrasonography, public awareness initiatives, and physician education may further support early detection and prevention.

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