

# FREQUENCY OF NON-ALCOHOLIC FATTY LIVER DISEASE (NAFLD) AND ITS ASSOCIATION WITH DIABETES MELLITUS, HYPERTENSION AND CHOLELITHIASIS AMONG PATIENTS UNDERGOING ROUTINE ULTRASONOGRAPHY.

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## Abstract

**Objective:** To find the frequency of non-alcoholic fatty liver disease (NAFLD) and its association with diabetes mellitus, hypertension and cholelithiasis.

**Methods:** This was a cross-sectional study conducted in department of radiology, Sughra Shafi Medical Complex, Narowal. About 545 subjects who fulfilled the inclusion criteria were included through nonprobability/ convenient sampling technique. Abdominal ultrasound of every participant was conducted to determine frequency of NAFLD among sample size. A structured questionnaire consisting of demographic details and comorbidities was designed. Diabetic, and hypertensive status was determined on patient's history and choleli-thiasis was assessed on ultrasonography. Data were entered in SPSS 21 software and presented as frequency and percentages.

**Results:** Among 545 patients there were 282 (51.7%) male and 263 (48.3%) female participants with mean age of  $48.56 \pm 3.67$  years SD. The overall frequency of NAFLD in the sample size was 39.8%. Diabetes was found in 115 (21.1%) participants, NAFLD was present in 44(64.7%) diabetic males and 29 (25.2%) diabetic females. Hypertension was found in 92 (16.9%) participants, NAFLD was present in 30(32.6%) hypertensive males and 24 (61.5%) hypertensive females. Cholelithiasis was found in 18 (8.0%) patients NAFLD was present in 30(32.6%) hypertensive males and 24 (61.5%) hypertensive females. There was no statistical significant difference among gender and presence of NAFLD. ( $P>0.05$ )

**Conclusion:** It is concluded that on ultrasound NAFLD is a common finding and it is associated with diabetes mellitus, hypertension and cholelithiasis.

**Key Words:** Cholelithiasis, Diabetes Mellitus, Hypertension, NAFLD, Ultrasound.

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**H**epatic steatosis is the intra hepatic triacylglycerols (TAGs) in at least 5% of total weight of liver in the absence of alcoholism, previous or current viral

infection and drug therapy. Its grades are based on the amount (in percentage) of the accumulated TAGs in liver cells: Grade 0 is healthy (<5%), grade 1 is mild steatosis (5% to 33%), grade 2 is moderate steatosis (34%-66%) and grade 3 is a severe form of steatosis (>66%).<sup>1</sup> Hepatic steatosis is usually linked with deranged lipid profile, diabetes mellitus, obesity, hypertension and metabolic syndrome.<sup>2</sup> Non-alcoholic fatty liver disease (NAFLD) is divided into two categories, hepatic steatosis and steatohepatitis, in presence or absence of liver fibrosis.<sup>3</sup> Hepatic steatosis is a benign condition but carries a risk of liver cirrhosis in up to 1% of patients.<sup>4</sup> It carries a risk of progression to Non-Alcoholic Steato-

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hepatitis (NASH) if there is an initiation of necro-inflammation, which in turn can lead to risk of cirrhotic.<sup>5</sup> It can give rise to numerous complications such as ascites, encephalopathy and variceal bleed. Liver cirrhosis can occur in up to 20% of such patients within 10 years.<sup>6</sup> A follow up of 247 patients with NASH and advanced liver disease for 85 months, when compared with 264 individuals with hepatitis C who had similar Child Pugh scores, demonstrated that NASH causes less liver related complications than the later but with same overall mortality.<sup>7</sup> Hepatic steatosis also leads to systemic inflammation and the risk of hepatocellular is also increased.<sup>8,9,10</sup> Nearly 14% of patients with NASH-induced cirrhosis can develop HCC.<sup>11</sup>

The prevalence of NAFLD is 28 to 46 % in USA and it is found to be 6 to 35% across the globe.<sup>12</sup> Furthermore, its prevalence is on rise as a study suggests that nearly 95% of the adult population in US are physically inactive.<sup>13</sup> A study on hepatic diseases suggest that weight loss up to 5% of total body weight by dietary measures and exercise can reduce hepatic steatosis and weight loss to nearly 10% can aid in improvement of other components of NASH.<sup>14</sup> Hepatic steatosis causes significant fibrosis and even cirrhosis in patients of Hepatitis C virus infection and Pakistan ranks in the intermediate prevalent area for this viral infection.<sup>15</sup>

## METHODS

A cross-sectional study was conducted in the Department of Radiology, Sughra Shafi Medical Complex, Narowal. The study duration was five months, with in the time frame of April 2021 to August 2021 after the approval from ethics review committee number SMC/1511. Demographic data was collected using a structured questionnaire which included patients name, gender and age, finding of NAFLD on abdominal ultrasonography, history of type 2 diabetes mellitus, hypertension and Cholelithiasis and medication history for these comorbidities. For qualitative variables like hypertension, type 2 diabetes mellitus and cholelithiasis, frequency (percentage) was calculated and for quantitative variables like age, mean was determined. Sample size of 545 was estimated by using online Raosoft

calculator,<sup>16</sup> by estimating a proportion of population with relative precision at confidence level of 95% and relative error 3.5%, with anticipated population proportion of 76.7%. Through non-probability convenient sampling technique all patients undergoing abdominal ultrasound of either gender and age range of 20 – 75 years, who were willing to participate, vitally stable and well oriented in time, space and person, and having no history of chronic liver disease, use of hepatotoxic agents including drugs and non-alcoholics were included. Patients who were either vitally, or neurologically unstable, and with a history of alcohol consumption, chronic liver disease and a history of use of hepatotoxic agents were excluded. Pregnancy and breastfeeding women were also excluded. The ultrasounds of every participant were carried out by the same doctor on duty to avoid variations of findings among subjects. Ultrasound machine HONDA HS-2200 was used for the ultrasound of the participants. Non-Alcoholic fatty liver disease was defined as:

- 1) Evidence of hepatic steatosis either by imaging or histology
- 2) No competing factor contributing to hepatic steatosis
- 3) No alcohol consumption
- 4) No co-existing cause of chronic liver disease<sup>17</sup>

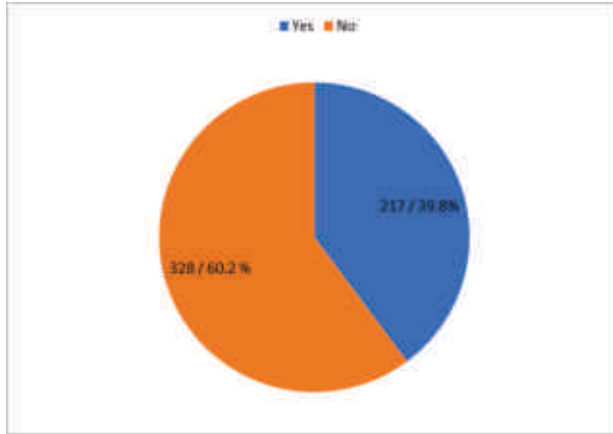
Normal echogenicity of the liver was defined as the same echogenicity of the liver as of renal cortex. Hepatic steatosis was defined as the ultrasonographic finding of a light diffuse increase in the liver echogenicity with prominent visualization of vessel membranes and liver walls (Grade 1); a diffuse increase in the liver echogenicity with darkening of the vessel walls of liver and diaphragm (Grade 2); an increase in liver echogenicity with poor visualization of vessel walls and diaphragm (Grade 3)<sup>18</sup>. SPSS software version 21 was used for data entry and analysis. Cross tabulation was done for gender and risk factors chi-square test was used to assess significance with  $p < .05$  as statistically significant.

## RESULTS

Out of these 545 patients, there were 282 (51.7%)

males and 263 (48.3%) female participants. Their age ranged from 20 to 75 years. The mean age of sample size was  $48.56 \pm 3.67$ .

217(39.8%) were found to be having non-alcoholic fatty liver on ultrasonography. Among these 217 patients, 121 (55.8%) patients were male and 96 (44.2%) were females. Gender specific NAFLD frequency was 42.9% among males and 36.5% among females (Graph no: 1 & Table 1).



**Fig. 1** NAFLD among subjects

Among 545 patients diabetes mellitus was found in 115(21.1%) participants, NAFLD was present in 44

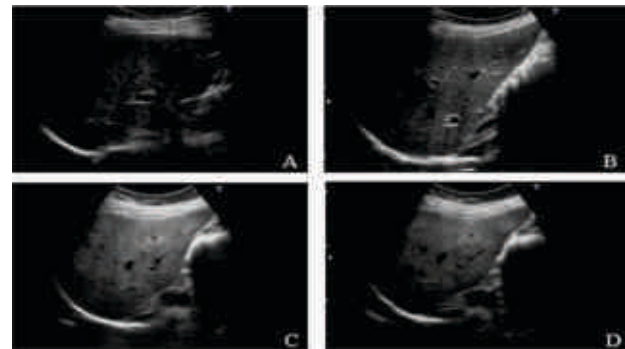
**Table 1:** Frequency of NAFLD and gender distribution:

Gender n=545	NAFLD		Total	Chi-square p value
	Yes	No		
Male	121 42.9%	161 57.1%	282 100.0%	X <sup>2</sup> = 2.330 P = 0.127
Female	96 36.5%	167 63.5%	263 100.0%	
Total	217 39.8%	328 60.2%	545 100.0%	

(64.7%) diabetic males and 29 (25.2%) diabetic females. Hypertension was found in 92(16.9%) participants, NAFLD was present in 30(32.6%) hypertensive males and 24 (61.5%) hypertensive females. Cholelithiasis was found in 18 (8.0%) patients NAFLD was present in 30(32.6%) hypertensive males and 24(61.5%) hypertensive females. There was no statistical significant difference among gender and presence of NAFLD ( $P > .05$ ). (Table no: 2).

**Table 2:** NAFLD among patients with risk factors and gender distribution

Variables n=225		NAFLD		Total	Chi-square p value
		Yes (n=135)	No (n=90)		
Diabetes n=115	Male	44	24	68	X <sup>2</sup> = 0.108 P = 0.742
		64.7%	35.3%	100.0%	
	Female	29	18	47	
		25.2%	15.7%	100.0%	
Hypertensi on n=92	Male	30	23	53	X <sup>2</sup> = 0.226 P = 0.635
		32.6%	25.0%	100.0%	
	Female	24	15	39	
		61.5%	38.5%	100.0%	
Cholelithi sis n=18	Male	3	4	7	X <sup>2</sup> = 0.012 P = 0.914
		42.8%	57.2%	100.0%	
	Female	6	5	11	
		54.5%	45.5%	100.0%	



**Fig. 2:** Liver Ultra-Sonographic Images showing the Comparison between the Normal Liver of Male and Female Gender (A, B) with the NAFLD Male and Female Liver (C, D).

## DISCUSSION

Our study shows the overall prevalence of NAFLD to be 39.8%, with gender specific disease prevalence rate being more males i.e. 42.9% as compared to females i.e., 36.5%. (Table no: 1). A study conducted in Peshawar by Shah et al showed the prevalence of NAFLD to be 47%.<sup>19</sup> A study conducted by Ghani et al in 2017 at Rawalpindi found the overall prevalence of NAFLD to be 14.8% among total study cohort, with gender specific prevalence rate as 16.1% and 13.4% among males and females respectively.<sup>20</sup>

Our studies showed that using the ultra-sonographic criteria, the prevalence of NALFD was 63.5% among type 2 diabetics and 36.5% of diabetics didn't

have NAFLD (Table 2). This frequency of NAFLD was found to be quite similar to a study conducted in 2016 by Zubair et al in Karachi which showed that 67.8% of diabetics had fatty liver.<sup>21</sup> A study conducted at Nishtar Hospital Multan by Taseer et al; in 2009 showed that 51% of type 2 diabetic patients had fatty liver.<sup>22</sup> Another study by Almahmoud et al; at Jordan in 2021 showed the prevalence of NAFLD to be 80.4% and 53.3 % among diabetic and non-diabetic patients.<sup>23</sup>

In our study, 58.7% of hypertensive patients had NAFLD. (Table 02). A study conducted by Katharina Lai in 2010 showed that hepatic steatosis was associated with systolic as well as diastolic hypertension and chances of hypertension at baseline and follow up was three folds higher as compared to patients without NAFLD.<sup>24</sup> Another study conducted by Alejandro in 2011 showed that 49.5% of the patients with NAFLD were hypertensive.<sup>25</sup>

This study found that 44.7% patients with cholelithiasis had NAFLD. This finding was found to be different with the results of a research in 2014 by Yen Chun Lee et al; which showed that 19.7% of the individuals with mild to moderate fatty liver disease had cholelithiasis.<sup>26</sup>

## CONCLUSION

It is concluded that NAFLD is a frequent finding on ultrasonography. Patients should be advised life style modifications which include a low-calorie diet and a moderate physical activity as it can not only prevent NAFLD but also improves diabetes mellitus, hypertension and lessens risk for developing gallstones.

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