



## PREVALENCE AND RISK FACTORS OF NON-ALCOHOLIC FATTY LIVER DISEASE IN LEAN INDIVIDUALS: A HOSPITAL BASED STUDY.

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**ABSTRACT** **Introduction:** According to epidemiological studies, NAFLD affects 9% to 53% of India's general population, with a higher frequency among those who are overweight or obese, those who have diabetes, or those who have prediabetes. There is emerging evidence of NAFLD occurring in lean or normal weight individuals. Studies show that between 5 and 34% of lean people have NAFLD. The highest prevalence rates, which were above 30%, were seen in India. Furthermore, Asian men who are slender, healthy, and active have insulin resistance prevalence that is three to four times higher than that of men in the rest of the world. **Aim:** To access the prevalence and risk factors of NAFLD among lean individuals attending Gauhati Medical College & Hospital with diagnosed Fatty Liver Disease. **Materials and methods:** A Hospital based Cross sectional study was done. The Gastroenterology department was used to choose the study participants using a purposive sampling method. The sample was made up of all patients with fatty liver disease who visited the gastroenterology outpatient department. **Result:** The study found that the prevalence of NAFLD in lean individuals is 16.9%. Females are at higher risk ( $P=0.0313$  OR: 0.08316) of developing NAFLD in lean patients. Diabetes ( $P=0.0260$  OR: 3.667) and Hypertension ( $P=0.0149$  OR: 4.189) are significant risk factors. Altered bilirubin levels ( $P=0.0035$  OR: 5.829), lipid profile ( $P=0.0013$  OR: 7.367) and AST/ALT ( $P=0.0166$  OR: 4.321) levels is also associated with NAFLD in lean individuals. **Conclusion:** NAFLD affects 16.9% of lean people with a BMI under 23. Among the lean population, women have a higher chance of getting NAFLD than men. In the study population, important risk factors for NAFLD include diabetes and hypertension. Patients with NAFLD (BMI <23) are more likely to have abnormal lipid profiles, AST/ALT values and bilirubin levels than non-NAFLD fatty liver patients with BMI <23.

**KEYWORDS :** Non-Alcoholic Fatty Liver Disease, Lean Individuals, Hypertension, Diabetes

### Introduction:

Non-Alcoholic Fatty Liver Disease (NAFLD) is the most prevalent chronic liver disease in many nations, particularly India. NAFLD affects 9% to 53% of the general population in India, with a higher prevalence among those who are overweight or obese, those who have diabetes, or those who have prediabetes, according to epidemiological research. Due to the rising rates of diabetes and obesity around the world, the harmful effects of non-alcoholic fatty liver disease (NAFLD) are becoming a greater problem for public health. The development of obesity and insulin resistance, which causes an increase in hepatic free fatty acid flux and ultimately results in NAFLD, are the initiating events in the disease. The consensus guidelines defined overweight as those with BMI between 23.0–24.9 kg/m<sup>2</sup> and obesity as those having BMI  $\geq 25.0$  kg/m<sup>2</sup>. The international criteria for overweight and obesity define obesity as BMI either  $\geq 27.5$  kg/m<sup>2</sup> (WHO 2004) or  $\geq 30$  kg/m<sup>2</sup> (WHO universal cut-off). However, there is emerging evidence of NAFLD occurring in lean or normal weight individuals. Prevalence estimated using BMI (normal BMI as <25Kg/m<sup>2</sup> internationally and <23Kg/m<sup>2</sup> Asia Pacific) as lean individuals. According to several studies, NAFLD affects between 5 and 34% of lean people. India had the highest prevalence rates, which were over 30%. In addition, it has been shown that Asian men who are slim, healthy, and sedentary have an insulin resistance prevalence that is three to four times higher than that of males in the rest of the globe. This indicates that, for unknown reasons, a lean population may be particularly susceptible to NAFLD. Insulin resistance and increased visceral adiposity (most common cause) of NAFLD. Other causes may be genetic disorders like Abetalipoproteinemia, Cholesterol ester storage disease, Wilsons disease), infectious inflammatory diseases like Hepatitis C, HIV, Celiac Disease And small Intestinal Bacterial Overgrowth. The goal of this study is to shed light on the causes of NAFLD's progression and give evidence for its expanding burden. This study is intended to fill knowledge gaps about the hidden epidemic that the people of the Northeast are dealing with and implement effective interventions to prevent this disease at various levels.

**Aim:** To access the prevalence and risk factors of NAFLD among lean

individuals attending Gauhati Medical College & Hospital with diagnosed Fatty Liver Disease.

### Objectives:

1. To access the prevalence of NAFLD among lean individuals attending Gauhati Medical College & Hospital with diagnosed Fatty Liver Disease.
2. To access the risk factors associated with NAFLD in lean individuals.

### Methods:

#### Study design:

Hospital based cross sectional study.

#### Study Population:

Adult patients aged 18 or older attending the Department of Gastroenterology OPD GMCH with diagnosed fatty liver disease within the last 6 months from the beginning of the study.

#### Study Setting:

Gauhati Medical College, Department of Gastroenterology.

#### Study duration:

August 2021 to July 2022

#### Sample size and Sampling Technique:

A purposive sampling approach was used to recruit the study participants from the department of Gastroenterology. The sample constituted of all the patients attending Gastroenterology OPD with diagnosed fatty liver disease, based on the study purpose. A total of 268 patients with diagnosed fatty liver disease attended the gastroenterology OPD, out of which 8 patients did not meet the inclusion criteria. 260 Patients who fulfilled the required inclusion criteria and gave consent for the study were interviewed face to face with a pretested schedule. The Gastroenterology OPD was visited every Tuesday, Thursday, and Saturday throughout the study period.

**Inclusion criteria:**

- Adult Patients 18 years and above attending Gastroenterology OPD with diagnosed fatty liver disease.
- Patients who are willing to give an informed written consent.

**Exclusion criteria:**

- Patients with known cancer
- Terminally ill patients

**Ethical Clearance:**

Ethical clearance was obtained from the institutional ethics committee of Gauhati Medical College & Hospital.

**Consent:**

Written and Informed consent was taken from all patients.

**Statistical Analysis:**

The data collected was compiled in Microsoft Office Excel and analysed by using INSTAT GRAPH PAD.

For descriptive analysis, frequency distributions were computed for all categorical variables.

The Fisher's exact test was applied for data analysis and p value <0.05 was considered to be significant.

**Table 1: DISTRIBUTION OF FATTY LIVER PATIENTS (N=260)**

FATTY LIVER	NUMBER	PERCENTAGE
NAFLD with BMI ≥23	107	41.2%
NAFLD With BMI <23	44	16.9%
NON-NAFLD with BMI ≥23	90	34.6%
NON-NAFLD with BMI <23	19	7.3%

**TABLE 2: DISTRIBUTION OF NAFLD AND NON-NAFLD PARTICIPANTS WITH BMI <23 ACCORDING TO GENDER: (N=63)**

SEX	Lean (%) BMI <23 NAFLD	%	NON-NAFLD (%) BMI <23	%	TOTAL (%)	%	FISHERS EXACT TEST P=0.0313 OR: 0.08316 (0.08316 – 0.8859)
MALE	19 (57.6)	43.2	14 (42.4)	73.7	33 (100)	52.4	
FEMALE	25 (83.3)	56.8	5 (16.7)	26.3	30 (100)	47.6	
Total:	44 (69.8)	100	19 (30.2)	100	63(100)	100	

**TABLE 3: HYPERTENSION STATUS OF NAFLD AND NON-NAFLD PARTICIPANTS WITH BMI <23 (N=63)**

HYPERTENSION	Lean (%) BMI <23 NAFLD	%	NON-NAFLD (%) BMI <23	%	TOTAL		STATISTICAL TEST: FISHERS EXACT TEST P=0.0149 OR: 4.189 (1.325 – 13.243)
	FREQUENCY (%)		FREQUENCY (%)		FREQUENCY (%)	%	
YES	29 (82.9)	65.9	6 (17.1)	31.6	35 (100)	55.6	
NO	15 (53.6)	34.1	13 (46.4)	68.4	28 (100)	44.4	
TOTAL	44 (69.8)	100	19 (30.2)	100	63 (100)	100	

**TABLE 4: DIABETES STATUS OF NAFLD AND NON-NAFLD PARTICIPANTS WITH BMI <23 (N=63)**

Diabetes	Lean (%) BMI <23 (NAFLD)	%	NON-NAFLD (%) BMI <23	%	TOTAL		STATISTICAL TEST: FISHERS EXACT TEST P=0.0260 OR: 3.667 (1.188 – 11.317)
	FREQUENCY (%)		FREQUENCY (%)		FREQUENCY (%)	%	
YES	29 (82.9)	65.9	6 (17.1)	31.6	35 (100)	55.6	
NO	15 (53.6)	34.1	13 (46.4)	68.4	28 (100)	44.4	
TOTAL	44 (69.8)	100	19 (30.2)	100	63 (100)	100	

	Lean (%) BMI <23 (NAFLD)	%	NON-NAFLD (%) BMI <23	%	TOTAL	%	STATISTICAL TEST: FISHERS EXACT TEST P=0.0035 OR: 5.829 (1.811 – 18.762)
YES	32 (80)	72.7	8 (20)	42.1	40 (100)	63.5	
NO	12 (52.2)	27.3	11 (47.8)	57.9	23 (100)	36.5	
TOTAL	44 (69.8)	100	19 (30.2)	100	63 (100)	100	

**TABLE 5: DISTRIBUTION OF NAFLD AND NON-NAFLD PARTICIPANTS WITH BMI <23 ACCORDING TO ALTERED SERUM BILIRUBIN LEVELS. (N=63)**

BILIRUBIN LEVEL	Lean (%) BMI <23 (NAFLD)	%	NON-NAFLD (%) BMI <23	%	TOTAL		STATISTICAL TEST: FISHERS EXACT TEST P=0.0035 OR: 5.829 (1.811 – 18.762)
	FREQUENCY (%)		FREQUENCY (%)		FREQUENCY (%)	%	
ALTERED	34 (82.9)	77.3	7 (17.1)	36.8	41 (100)	65.1	
NORMAL	10 (45.5)	22.7	12 (54.5)	63.2	22 (100)	34.9	
TOTAL	44 (69.8)	100	19 (30.2)	100	63 (100)	100	

**TABLE 6: DISTRIBUTION OF NAFLD AND NON-NAFLD PARTICIPANTS WITH BMI <23 ACCORDING TO ALTERED AST/ALT LEVELS (N=63)**

AST/ALT	Lean (%) BMI <23 (NAFLD)	%	NON-NAFLD (%) BMI <23	%	TOTAL		STATISTICAL TEST: FISHERS EXACT TEST P=0.0166 OR: 4.321 (1.353-13.799)
	FREQUENCY (%)		FREQUENCY (%)		FREQUENCY (%)	%	
ALTERED	35 (79.5)	79.5	9 (20.5)	47.4	44 (100)	69.8	
NORMAL	9 (47.4)	20.5	10 (52.6)	52.6	19 (100)	30.2	
TOTAL	44 (69.8)	100	19 (30.2)	100	63 (100)	100	

**TABLE 7: DISTRIBUTION OF NAFLD AND NON-NAFLD PARTICIPANTS WITH BMI <23 ACCORDING TO ALTERED LIPID PROFILE LEVELS (N=151)**

LIPID PROFILE	Lean (%) BMI <23 (NAFLD)	%	NON-NAFLD (%) BMI <23	%	TOTAL		STATISTICAL TEST: FISHERS EXACT TEST P=0.0013 OR: 7.367 (2.225 – 24.393)
	FREQUENCY (%)		FREQUENCY (%)		FREQUENCY (%)	%	
ALTERED	34 (85)	77.3	6 (15)	31.6	40 (100)	63.5	
NORMAL	10 (43.5)	22.7	13(56.5)	68.4	23 (100)	36.5	
TOTAL	44 (69.8)	100	19 (30.2)	100	63 (100)	100	

**Results:**

Table 1 shows the prevalence of Non-Alcoholic Fatty Liver Disease (NAFLD) in lean individuals to be 16.9% (44 patients) out of total 260 fatty liver patients. Table 2 shows among the patients with BMI <23 with NAFLD, 83.3% are males. Female sex is significantly associated with NAFLD in patients with BMI <23 (P=0.0313 OR: 0.08316). In table 3 shows among the patients with BMI <23 with NAFLD, 82.9% has hypertension compared to 31.6% of individuals with hypertension in patients without NAFLD and BMI < 23. Hypertension is significantly associated with NAFLD in patients with BMI <23 (P=0.0149 OR: 4.189). In table 4 shows that among the patients with BMI <23 with NAFLD, 80% has diabetes compared to 42.1% of individuals with diabetes in patients without NAFLD and BMI < 23. Diabetes is significantly associated with NAFLD in patients with BMI <23 (P=0.0260 OR: 3.667). In table 5 shows that among the patients with BMI <23 with NAFLD, 82.9% has altered Bilirubin levels compared to 36.8% of individuals with altered bilirubin levels in patients without NAFLD and BMI < 23. Altered Bilirubin levels is significantly associated with NAFLD in patients with BMI <23 (P=0.0035 OR: 5.829). In table 6 shows that among the patients with BMI <23 with NAFLD, 79.5% has altered AST/ALT levels compared

to 20.5% of individuals with altered AST/ALT levels in patients without NAFLD and BMI < 23. Altered AST/ALT is significantly associated with NAFLD in patients with BMI <23 ( P=0.0166 OR: 4.321). In table 7 shows that among the patients with BMI <23 with NAFLD, 77.3% has altered Lipid Profile compared to 31.6% of individuals with altered lipid profile in patients without NAFLD and BMI < 23. Altered Lipid Profile is significantly associated with NAFLD in patients with BMI <23 (P=0.0013 OR: 7.367).

#### Discussion:

In our study the prevalence of NAFLD in lean individuals is 16.9% which is similar to the prevalence reported by several studies (5 to 34%). The prevalence of NAFLD in lean individuals within the NAFLD population in our study is 29.2% which is short of the global reported prevalence of 40%. In our study female sex shows significant association with NAFLD in lean individuals which is similar to findings by Younossi ZM et al in their study. Diabetes and Hypertension is also significantly associated with the patients with NAFLD (lean) which is similar to the findings by Younossi ZM et al in their study. Altered bilirubin levels, lipid profile and AST/ALT levels is also significantly associated with NAFLD in lean individuals which is similar to the findings by Wang AY et al in their systematic review.

#### Limitations of the study:

- 1) The findings of this study may not be extrapolated to general population because of selection bias associated with the use of a convenience sample from a medical college where most of the patients belonged to lower socioeconomic class.
- 2) The number of study participants were also less due to the COVID-19 pandemic at the time of the study.

#### Conclusion:

The prevalence of NAFLD in lean Individuals (BMI <23) is 16.9%. Females are at a higher risk of developing NAFLD in the lean population compared to males. Diabetes and hypertension are significant risk factors of NAFLD in the study population. Deranged lipid profile, Deranged AST/ALT, deranged bilirubin levels are more significantly seen in patients with NAFLD (BMI<23) compared to Non NAFLD fatty liver patients with BMI (<23).

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