

# Non-Alcoholic Fatty Liver Disease (NAFLD) Among Obese Patients in A Tertiary Care Hospital

Shubhrangshu Banerjee Shuvro<sup>1\*</sup>, Manabendra Bhattacharjee<sup>2</sup>, Uttam Kumar Sarker<sup>3</sup>, Shitangshu Banerjee<sup>4</sup>

<sup>1,2,3</sup> Mymensingh Medical College Hospital, Bangladesh

<sup>4</sup> Rajshahi Medical College Hospital, Bangladesh

## Keywords:

Non-alcoholic fatty liver disease  
NAFLD  
Obesity,  
Public health

## \*Corresponding author:

Dr. S. B. Shuvro  
Mymensingh Medical College Hospital,  
Bangladesh  
E-mail:  
drshubhrangshummch@gmail.com

## Date of Acceptance:

01 Sep 2023

## DOI:

10.55489/njmr.13032023944

## ABSTRACT

**Background:** Non-alcoholic fatty liver disease (NAFLD) commonly results in cirrhosis and liver related death. Obesity is associated with an increased risk of non-alcoholic fatty liver disease. NAFLD has become an important public health problem throughout the globe. The aim of this study was to see frequency of NAFLD among obese patients admitted at the Department of Medicine of Mymensingh Medical College Hospital.

**Methods:** A total of 100 obese patients having BMI  $\geq 25$  kg/M<sup>2</sup> were included in this cross-sectional study. Patients' characteristics, laboratory and face-to-face interview data were analyzed.

**Results:** Mean age of the patients was 52.61 (SD  $\pm$  7.02) years. It was found that more patients were from 51-60 years age group (39%); followed by 41-50 years age group (28%). NAFLD was found in 79% of obese adult patients. Laboratory parameters including TG, HDL, FBG and high blood pressure were compared between NAFLD and normal obese groups. There were no significant differences between the two groups except for FBG. NAFLD patients suffered more from high blood sugar than normal obese patients. Higher intake of meat, increased smoking, lower intake of fish, higher intake of soft drinks & FBG value over 6.1 mmol/L were identified as risk factors for the development of NAFLD.

**Conclusion:** NAFLD is emerging as one of the most common liver disorders claiming urgent attention of the public, clinicians and researchers. Further in-depth, large scale prospective studies are necessary to dig out more information in this topic.

## INTRODUCTION

Non-alcoholic fatty liver disease (NAFLD) is the most common liver disease worldwide.[1] It represents a spectrum of liver diseases encompassing simple fatty infiltration (steatosis), fat and inflammation (Non-alcoholic steatohepatitis NASH) and cirrhosis in the absence of excessive alcohol consumption.[2] NAFLD is defined as fatty liver (Liver fat > 5-10% of liver weight) which is not due to excess alcohol or other cause of steatosis. It is associated with obesity, metabolic syndrome, dyslipidemia, insulin resistance (IR) and type 2 diabetes.[3] NAFLD is now recognized as the most common cause of Cryptogenic cirrhosis.[4]

The prevalence of NAFLD is influenced by age, gender, ethnicity and the presence of sleep apnea and endocrine dysfunction (hypothyroidism, hypopituitarism, hypogonadism and polycystic ovarian syndrome).[5,6] NAFLD is strongly associated with obesity, dyslipidemia, insulin resistance and type 2 (non-insulin dependent diabetes mellitus) and so may be considered to be the hepatic manifestation of the metabolic syndrome.[2] It affects approximately 15-40% of general population and its prevalence is increasing worldwide.[7,8,9] Its prevalence is increasing in adults and children and has been described by World Health Organization as a global epidemic with an estimated 500 million obese adult and 1.5 billion overweight or obese individual worldwide. [10,11]

NAFLD is strongly linked to obesity, with a reported prevalence as high as 80% in obese patients and only 16% in individuals with a normal BMI and without metabolic risk factors. [12,13] Patients are usually asymptomatic but commonly have feature of the metabolic syndrome such as high BMI, hypertension, dyslipidaemia and impaired glucose tolerance. [14] The complication of NASH include cirrhosis and hepatocellular carcinoma.[15] There are few studies to evaluate risk factors of NAFLD but no adequate study on association of obesity with NAFLD. By early notification of risk factors NAFLD events may be prevented. Non-alcoholic fatty liver disease commonly results in cirrhosis and liver related death. Obesity is associated with an increased risk of non-alcoholic fatty liver disease.

NAFLD has become an important public health problem because of its high prevalence potential progression to severe liver disease and association with serious cardio-metabolic abnormalities include type-2 diabetes mellitus (T2DM), metabolic syndrome and coronary heart disease (CHD). Therefore, it is important to prevent these events from

happening and for this a sound understanding of the risk factors for this devastating illness is necessary. There are few studies to evaluate risk factors of NAFLD but no adequate study on association of abdominal obesity in terms of body mass index with NAFLD patient. NAFLD is preventable by early notification of risk factors. So, this study would help for better understanding of risk factors and NAFLD prevention. The aim of the study was to see frequency of non-alcoholic fatty liver disease (NAFLD) among obese patients admitted in MMCH.

## MATERIALS AND METHODS

The study was conducted at the department of Medicine & department of Hepatology, Mymensingh Medical College Hospital, Mymensingh during March 2016 to August 2016.

It was a cross-sectional observational study. All obese patient whose BMI >25 kg/m<sup>2</sup> who were admitted in MMCH during the period of data collection were the study population.

**Sample size:** The Guilford and Frucher's formula was used to determine the required sample size:

$$n = \frac{z^2 pq}{D^2}$$

Where,

n = minimum number of samples to be studied

p = prevalence

q = 1-p

z = standardized normal value usually set at 1.96 which corresponds to 95% CI.

D= degree of error. 0.05 at 5% confidence level.

From hospital registration it was known that around 8% of admitted patients were obese.

So, p=8% or 0.08 and q=1-0.08=0.92

Putting these values in the above equation the sample size n was estimates as 113

But finally, 100 patients were included in the study

### Inclusion and exclusion criteria

The inclusion criteria were aged >16 years, sex – both, obese patient with BMI> 25kg/m<sup>2</sup>, give informed written consent and the exclusion criteria were patient taking alcohol, pregnancy, patient admitted with hepatic encephalopathy, HCV infection and autoimmune diseases. The purposive type non probability sampling technique was applied in this study.

## Definition of variables

### Non-alcoholic fatty liver disease (NAFLD)

Bright hepatic echoes, increased hepatic echogenicity and vascular blurring of portal or hepatic vein have been classical as unique sonographic feature of NAFLD.[16]

### Obesity

Body Mass Index (BMI) is a person's weight in kilograms divided by the square of height in meters. A high BMI can be an indicator of high body fatness. In the current study obesity was defined by a body mass index (BMI)  $>25 \text{ kg/m}^2$ . [17]

### Metabolic syndrome

It is a clustering of at least three of five of the following medical condition. Central obesity, hypertriglyceridemia [Triglyceride  $>150 \text{ mg/dl}$ ], Low HDL cholesterol [40 mg/dl], hypertension; blood pressure  $> 130 \text{ mmHg}$  systolic or  $> 85 \text{ mmHg}$  diastolic, fasting blood sugar  $> 100 \text{ mg/dl}$ . [18]

### Sedentary worker

A sedentary job is defined as one which involves sitting, a certain amount of walking and standing is often necessary in carrying out job duties. Although sitting is primarily involved in a sedentary job, walking and standing should be required only occasionally. A sedentary worker refers to a worker who works in a seated position. They work for long hours at the office.[19]

**Laborious job:** "involves lifting no more than 100 pounds at a time with frequent lifting or carrying of objects weighing up to 50 pounds. It is characterized by effort to the point of exhaustion, especially physical effort.[19]

### Measuring methods laboratory parameters

Blood sample of all patients were obtained from suitable site to perform liver function tests. Fasting lipid profile and ultrasonographic imaging of hepato-biliary system were performed. Patients with  $\text{BMI} > 25 \text{ Kg/m}^2$  and ultrasonographic findings of increased echogenicity exceeds that of renal cortex and spleen, high CRP and mild elevated ALT, consistent with NAFLD.

### Ethical consideration

The name of ethical committee was Mymensingh Medical College. Approval number was 37 and date was 10<sup>th</sup> August, 2016. Prior to the commencement of the study, the protocol was approved by the local research approval committee. The aims & objectives of the study were explained to each patient

& then informed written & verbal consent was taken from them. They were assured that all information & records would be kept confidential and be used for research purpose only.

### Statistical analysis

Data were entered into computer, with the help of SPSS for Windows (IBM SPSS Statistics for Windows, version 22.0, Armonk, NY, IBM Corp.) An analysis plan was developed keeping in view with the objectives of the study. Statistical analyses were done by using appropriate statistical tool. Data were expressed in means with standard deviations for continuous variables and categorical variables were presented as frequency. Qualitative data were compared by Chi-squared test and Quantitative data were analyzed by using independent sample "t" test. Binary logistic regression was performed to find out the odds ratio (OR) in the analysis of risk factors. Statistical significance was assessed at the 0.05 level for all analyses.

## RESULTS

39 female and 69 males were enrolled in this study. Mean age of the patients was 52.61 (SD  $\pm 7.02$ ) years. It is evident that more patients were from 51-60 years age group (39); next leading age group was 41-50 years with 28 representations. Out of 100 patients 29 patients were above 60 years of age (table 1). Most of the obese patients 79 patients were suffering from NAFLD and 21 obese patients were otherwise normal.

No significant differences were found between the above two groups with regard to waist circumference. Laboratory parameters including TG, HDL, FBG and high blood pressure were compared between NFLD and Normal obese groups. There were no significant differences between the two groups except for FBG. NFLD patients suffered more from high blood sugar than normal obese patients ( $p < 0.05$ ) (Table 2).

**Table 1: Age group distribution of the patients (n=100)**

Age group	Frequency
$\leq 40$	4
41-50	28
51-60	39
61-70	26
$> 70$	3
Total	100

**Table 2: Components of metabolic syndrome in NAFLD and normal obese (n=100)**

Variables	NAFLD (n=79)	Normal Obese (n=21)	p-value
WC (mean ± SD), cm	83.11 (11.03)	82.68 (11.51)	0.467
TG (mean ± SD), mg/dL	187.27 (35.03)	183.98 (38.52)	0.450
HDL (mean ± SD), mg/dL	37.65 (5.01)	37.13 (5.05)	0.379
FBG (mean ± SD), mmol/L	7.92 (1.26)	5.74 (1.09)	0.048
Hypertension (+/-)	23/56	3/18	0.246

NAFLD: Non-alcoholic liver disease WC: waist circumference; TG: Triglycerides; HDL: High density lipoprotein; FBG: Fasting blood glucose; p < 0.05 was selected as a significant level; p-values were reached by independent sample "t" test.

**Table 3: Comparison of risk factors of NAFLD between the two groups (n=100)**

Variables	NAFLD (n=79)	Normal Obese (n=21)	$\chi^2$	p-value
<b>Soft drinks</b>				
Frequent intake	45 (57%)	14 (67%)	0.646	0.422
Infrequent intake	34 (43%)	7 (33%)		
<b>Meat</b>				
Frequent intake	62 (78%)	15 (71%)	0.466	0.495
Infrequent intake	17 (22%)	6 (29%)		
<b>Fish rich in omega-3</b>				
Frequent intake	66 (84%)	18 (86%)	0.058	0.809*
Infrequent intake	13 (16%)	3 (14%)		
<b>Smoking habit</b>				
Smoker	30 (38%)	7 (33%)	0.153	0.695
Non-smoker	49 (62%)	14 (67%)		

NAFLD: Non-alcoholic liver disease; \*Fisher's Exact test; p < 0.05 was selected as a significant level.

**Table 4: Binary logistic regression analysis of risk for NAFLD**

Risk of NAFLD	Odds Ratio (OR)	95% CI	
		Lower	Upper
Higher intake of meat	2.10	1.12	4.01
Smoking	2.04	1.10	4.05
Lower intake of fish	1.57	0.72	3.21
Higher intake of soft drinks	1.52	0.69	3.17
FBG	1.66	0.87	3.27

NAFLD: Non-alcoholic liver disease; CI: Confidence Interval; FBG: Fasting blood sugar

Face-to-face interview data such as higher intake of soft drinks & meat, lower intake of fish rich in omega-3 and tobacco smoking were compared between NAFLD and normal obese groups. However, none of the variable was found to have significant difference between the two groups (Table 3).

Binary logistic regression analysis of risk for NAFLD was showed that higher intake of meat was associated with increased risk of NAFLD (OR: 2.1). This was also true for increased smoking and lower intake of fish with 2.04 and 1.57 OR respectively. Higher intake of soft drinks & FBG value above 6.1 mmol/L were also identified as risk factors for the development of NAFLD (OR: 1.52 & 1.66 respectively) (Table 4).

## DISCUSSION

In our study mean age of the patients was 52.61 (SD ± 7.02) years. It was found that more patients were from 51-60 years age group (39); followed by 41-50 years age group (28). In a study by Agarwal et al. [20] maximum numbers of patients were between 3<sup>rd</sup> and 4<sup>th</sup> decades of life and mean age was found 42.70 ± 10.09. Almost similar finding was observed by Adam et al. [21] who reported mean age 45.0 ± 11.0 with the range of 19 - 65 years. Male patients were found to be prevalent in the study (65) than female (35). Acharya et al. [22] also reported the male predominance (91%) in his study.



Waist circumference (WC), which is an indicator of central obesity, was found to be increased in 76 (90.5%) of males and 92 (95.5%) of female patients in the study by Agarwal et al. [20], Timothy et al. [23] also reported strong association of central adiposity (waist circumference) with NAFLD. However, in the current study no significant differences were found between the two groups with regard to WC.

Laboratory parameters including TG, HDL, FBG and high blood pressure were compared between NAFLD and normal obese groups. There were no significant differences between the two groups except for FBG. NAFLD patients suffered more from high blood sugar than normal obese patients ( $p < 0.05$ ). In a study mean fasting glucose was found to be  $113.56 \pm 18.9$  and mean post prandial was found to be  $148.60 \pm 40.63$  mg/dL. [20]

Face-to-face interview data such as higher intake of soft drinks & meat, lower intake of and tobacco smoking were compared between NAFLD and normal obese groups. However, none of the variable was found to have significant difference between the two groups.

On binary logistic regression analysis of risk for NAFLD higher intake of meat was associated with increased risk of NAFLD (OR: 2.1). This was also true for increased smoking and lower intake of fish with 2.04 and 1.57 OR respectively. Higher intake of soft drinks & FBG value above 6.1 mmol/L were also identified risk factors for the development of NAFLD (OR: 1.52 & 1.66 respectively).

NAFLD was found in 79% of obese adult patients. In a study conducted in India about 87% of the NAFLD patients were found to be obese. [20] These percentages were high providing that all studied subjects were apparently healthy. NAFLD is a health problem worldwide. The size of this problem in our country is not well determined. The disease is so dangerous because it is what the National Institutes of Health refers to as a "silent disease". [24] Non-alcoholic fatty liver disease develops over a long period of time, but many people experience few, if any, symptoms until the condition worsens to non-alcoholic steatohepatitis (NASH) or cirrhosis.

A complete diagnosis of fatty liver disease should ideally define the histology, the stage and grade of the disease and its etiology. In Bangladesh, NAFLD has never been sufficiently addressed by the medical community. It is alarming and appropriate measures should be taken in this regard.

## LIMITATIONS

The current study had following limitations that's where the study included only a single center with a relatively small sample size which limits generalizability and in the study gamma-glutamyl transpeptidase tests were not performed to differentiate nonalcoholic steatohepatitis from non-alcoholic steatohepatitis fatty liver. The observational study design was also weak to extract underlying information correctly.

## CONCLUSION

It was concluded that NAFLD patients suffered more from high blood sugar than normal obese patients. Higher intake of meat, increased smoking, lower intake of fish, higher intake of soft drinks & FBG value over 6.1 mmol/L were identified as risk factors for the development of NAFLD. NAFLD is emerging as one of the most common liver disorders claiming urgent attention of the public, clinicians and researchers.

## REFERENCES

1. Mavrogiannaki AN, Migdalis IN. Non-alcoholic Fatty liver disease, diabetes mellitus and cardiovascular disease newer data. *Int J Endocrine*. 2013;450-639.
2. Anstee QM, Jones DEJ. Liver and biliary tract disease. In: Walker BR, Colledge NR, Ralston SH, Penman ID, editors. *Davidson's Principles and Practice of Medicine*. 22<sup>nd</sup> ed. Churchill Livingstone Elsevier; 2014.
3. Kotronen A, Yki-Jarvinen H, Mannisto S, Saarikoski L, Korpi-Hyovalti E, Oksa H, et al. Non-alcoholic and alcoholic fatty liver disease - two diseases of affluence associated with the metabolic syndrome and type 2 diabetes: the FIN-D2D survey. *BMC Public Health* 2010; 10: 237.
4. Clark JM, Diehl AM. Non-alcoholic Fatty liver disease an Unrecognized cause of Cryptogenic cirrhosis. *JAMA*. 2003; 289(22):3000-4.
5. Loria P, Carulli L, Bertolotti M, Lonar do A. Endocrine and liver interaction; the role of endocrine pathways in NASH. *nat rev Gastroenterol Hepatol*. 2009; 6:236-247.
6. Vernon G, Baranova A, Younossi ZM, Systematic Review: the epidemiology and natural history of non-alcoholic fatty liver disease and non-alcoholic Steatohepatitis in adults. *Aliment Pharmacol Ther*. 2011; 34: 274-285.
7. Kistler KD, Brunt EM, Clark JM, Diehl AM, Sallis JF, Schwimmer JB. Physical activity recommendations, exercise intensity, and histological severity of nonalcoholic fatty liver disease. *Am J Gastroenterol* 2011; 106: 460-468.
8. Schuppan D, Gorrell MD, Klein T, Mark M, Afdhal NH. The challenge of developing novel pharmacological therapies for non-alcoholic steatohepatitis. *Liver Int* 2010; 30: 795-808.

9. Hou XH, Zhu YX, Lu HJ, Chen HF, Li Q, Jiang S, et al. Non-alcoholic fatty liver disease's prevalence and impact on alanine aminotransferase associated with metabolic syndrome in the Chinese. *J Gastroenterol Hepatol* 2011; 26: 722-30.
10. Obesity: preventing and managing the global epidemic. Report of a WHO consultation. *World health organ tech, Rep ser* 2000; 894 I-XII, 1-253.
11. Finucane MM, Stevens GA, Cowas MJ, Riley LM, Ezzati M. National, regional, and global trends in body mass index since 1980: Systematic analysis of health examination surveys and epidemiological studies with 960 country-years and 91 million participants. *Lancets*. 2011; 377: 557-567.
12. Williams CD, Stengel J, Asike MI, Harrison SA. Prevalence of nonalcoholic fatty liver disease and nonalcoholic steatohepatitis among a Ultrasound and liver biopsy; prospective study. *Gastroenterology*. 2011; 140:124-131.
13. Bellentani S, Saccoccio G, Masutti F, Prevalence of and risk factors for hepatic Steatosis in Northern Italy. *Ann Intern Med*. 2000; 132:112-117.
14. Azad MAK, Quayum SL, Mohammad H. Non- alcoholic Fatty liver disease. *A disease of New Era: J Medicine*. 2007; (8): 17-27.
15. Matteon CA, Younossi ZM, Gramlich T, Boparai N, Liu YC, Mccullough AJ. Non-alcoholic Fatty liver disease: a spectrum of clinical pathological severity. *Gastroenterology*. 1999; 116(6):1413-1419.
16. Bedside ultrasound in the diagnosis of nonalcoholic fatty liver disease. *World j Gastroenterol*. 2014;2(22):6821-6825.
17. Douglas G, The general examination, IN Fione Nicol, macleods clinical examination.12 edition. churchill livingstone. 2009.
18. National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). *Circulation* 2002; 106(25):3143-421.
19. American Heritage dictionary of English language. [Internet]. 4th ed. Boston, Massachusetts: Houghton Mifflin Harcourt; 2015. laborious; p.229 -30. [cited 2016 Oct 27]. Available from: [http:// https://ahdictionary.com/](http://https://ahdictionary.com/)
20. Agrawal R, Mishra S, Dixit VK, Rai S. Association of Non-Alcoholic Fatty Liver Disorder with Obesity. *Indian J Prev Soc Med*. 2009;40 (3):126-129.
21. Adams LA, Sanderson S, Lindor KD, Angilo P. The histological course of non alcoholic fatty liver disease. A longitudinal study of 103 patients with sequential liver biopsies. *J hepatal*. 2005;42:132 -138.
22. Acharya, Madam. Clinical, biochemical and histological profile of patients with nonalcoholic steatohepatitis (NASH) from Northern India. *Proceeding of first consensus meet on NAFLD*. 2005. 86.
23. Timothy C, Jennifer KL. Association of Cardio respiratory fitness, Body mass index and waist circumference to non alcoholic Fatty liver disease. *Gastroenterology*. 2006; 130: 2023-2030.
24. E Expert Panel on Detection. Executive Summary of the Third Report of the National Cholesterol Education Program (NCEP). *JAMA*. 2001;285 (19):2486-2497.