

# Biochemical changes in Non-alcoholic fatty liver disease (NAFLD): A study in Nepalese Population

Pooja Maharjan<sup>1\*</sup>, PuspaRaj Khanal<sup>1\*</sup>, Narayan Prasad Parajuli<sup>1</sup>, Govardhan Joshi<sup>1</sup>, Hridaya Parajuli<sup>1</sup>, Santosh Khanal<sup>2</sup>, Bibek Bhatta<sup>3</sup>, Dipendra Raj Pandeya<sup>4</sup>

## Affiliations:

<sup>1</sup>Department of Laboratory Medicine, Manmohan Memorial Institute of Health Sciences, Kathmandu, Nepal

<sup>2</sup>Department of Clinical Biochemistry, Manmohan Memorial Community Hospital, Kathmandu, Nepal

<sup>3</sup>Department of Clinical Microbiology, Nobel College, Kathmandu, Nepal

<sup>4</sup>Department of Biochemistry, College of Medicine, Nepalese Army Institute of Health Sciences, Kathmandu, Nepal

\*These authors have contributed equally in this manuscript

## Correspondence to:

Dr. Dipendra Raj Pandeya

Department of Biochemistry,

College of Medicine,

Nepalese Army Institute of Health Sciences, Kathmandu

Email: [dipendra.pandey@gmail.com](mailto:dipendra.pandey@gmail.com)

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## Abstract

### BACKGROUND

Non-alcoholic fatty liver disease (NAFLD) has emerged as the most common liver problem in the western world and is a clinicopathologic entity increasingly recognized as a major health burden in developed countries. Different laboratory tests are extremely useful in achieving a better understanding of diseases, and thereby, allow making decision for better management. The examination of different biochemical parameters usually provides excellent clues to the cause of the disease. The present study was conducted with the aim to assess the biochemical markers in Non alcoholic fatty liver disease (NAFLD) patients in Nepalese population.

### METHODS

The biochemical parameters were investigated in 75 NAFLD patients, and 70 normal participants. The diagnosis of hepatic steatosis was established by abdominal ultrasound examination. All patients diagnosed as NAFLD were investigated for biochemical parameters and see the relationship between NAFLD and control was studied.

### RESULTS

The findings of all biochemical parameters were raised in NAFLD patients in comparison with non-fatty liver control group and the differences were found to be statistically (P value less than 0.005) significant.

### CONCLUSIONS

NAFLD is associated with changes in biochemical parameters in cases of NAFLD. Its early detection will help in modifying the disease course, delaying complications and will also play a major role in preventive cardiology.

**KEYWORDS:** Nonalcoholic Fatty Liver Disease (NAFLD), Lipid profile, Liver function test (LFT), Biomarker

## Introduction

Non-alcoholic fatty liver disease (NAFLD) is an appalling public health problem. It is considered the most common chronic liver disease in affluent societies, affecting 2-10% of the general population, encompassing a wide range of diseases from simple steatosis to non-alcoholic steatohepatitis (NASH) in both children and adults [1,2]. The liver cell damage that is observed in patients with NASH can lead to cirrhosis or even end-stage liver disease [3,4]. Absence of sign and symptoms, and deficiency of sensitive and specific diagnostic tests, limits the ability to estimate the prevalence of NAFLD. It has also been observed that with modernization, a sedentary lifestyle and a lack of exercise are tied in with an increased prevalence of diabetes mellitus (DM), obesity, hypertension and hypertriglyceridemia. These are considered to be important causes of non-alcoholic fatty liver disease (NAFLD). In the majority of patients, NAFLD is associated with metabolic risk factors such as obesity, diabetes mellitus, and dyslipidemia. Approximately 20-25% of the cases progress into cirrhosis with all its ramifications including hepatocellular carcinoma and the need for liver transplantation.

Biochemical tests are extremely useful for accomplishing a better understanding of the disease, and thereby allows thoughtful management decisions to be made. An ultrasound examination of the liver has relatively high sensitivity (60-95%) and specificity (88-95%) [5]. Therefore, the diagnosis of NAFLD has been made on liver ultrasound examination and the measurement of different biochemical parameters indicating liver injury or damage. Conflating the results into various scores may fortify the diagnosis [6]. However, researchers are still looking for simple diagnostic tools with greater sensitivity and specificity that could serve as a screening test for excessive fat accumulation in the liver. The data indicate that NAFLD may have male preponderance or an equal gender distribution and may even occur in the absence of diabetes

and obesity [7]. NAFLD can occur at all ages including childhood, though the highest prevalence is described in those between 40-50 years of age. With some limitations, both population and hospital-based studies from the west report that around 10-24 percent ecumenical population and 57-75 percent obese individual may have NAFLD [8]. Thus, in view of the above context, the present study was undertaken to assess the correlation of NAFLD with different biochemical parameters especially Liver Function Tests (LFT) and Lipid profile tests in Nepalese population.

## Methods

### Patients' characteristics

Seventy five Patients were enrolled in the current study. They were selected from the outpatient clinics of Internal Medicine department, Manmohan Memorial Community Hospital, Kathmandu, Nepal. Patients' consent was obtained according to the regulations of the Nepalese Ministry of Health and the study design was approved by the local ethics committee.

### Diagnosis of NAFLD

Nonalcoholic Fatty Liver Disease was diagnosed by noninvasive imaging liver ultrasound procedure. In addition, blood tests were performed to assess liver function and to exclude other causes of liver disease. The exclusion of significant alcohol intake was essential. Presence of abnormal fat accumulation in the liver found by X-rays and ultrasound images confirmed the diagnosis.

### The Inclusion criteria for all participants were:

- (a) age between 20–70 years (b) newly diagnosis of NAFLD (c) good general health condition.

### The exclusion criteria were:

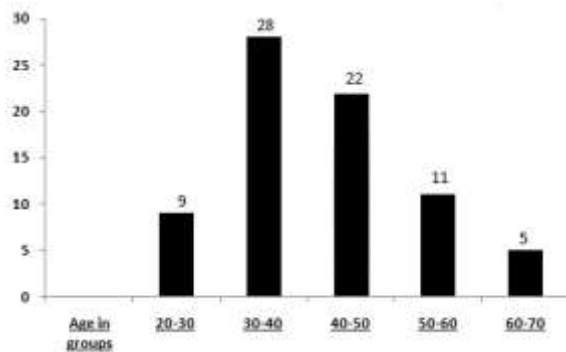
- (a) history of alcohol ingestion (b) malignancy (c) previous gastrointestinal tract surgery (d) smoking (e) presence of any liver disease that can cause fatty liver such as chronic hepatitis C, autoimmune liver disease (f) ingestion of drugs known to produce hepatic steatosis in the previous 6 months.

### Statistical analysis

The statistical analysis was under taken using SPSS version 20.0 software. All values are expressed as mean  $\pm$ SD. Student t- test was used to estimate the significant difference between the groups. The level of significance was considered when p value  $<0.05$ .

### Results

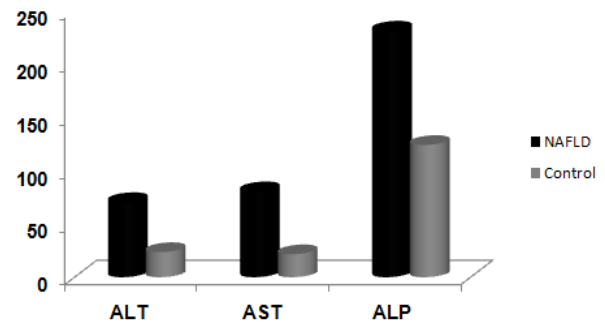
A total of 75 cases of NAFLD and 70 controls were included in this study. There were significant difference among control and NAFLD group considering age, the average age of the study group was  $43.61 \pm 12.43$  years and  $39.85 \pm 11.54$  years in control. Maximum numbers of patients were in 3<sup>rd</sup> and 4<sup>th</sup> decades of their life shown in the figure 1.



**Figure 1: Age-wise distribution of patients with Non alcoholic fatty liver disease**

The biochemical parameters including lipid profile and liver function tests (LFT) of all the cases of NAFLD and control groups are depicted in the table 1. In the present study, the average of all three markers (AST, ALT and ALP)

increased significantly when comparison with control groups (Figure 2). Elevated level of AST, ALT and ALP levels were noticed in 53.8%, 40.3% and 58.2% cases, respectively. As it is shown, the mean  $\pm$  SD of serum AST, ALT and ALP (IU/L) were  $80.81 \pm 54.79$ ,  $70.63 \pm 42.58$  and  $231.78 \pm 150.92$  were significantly higher in NAFLD patients as compared to control group AST ( $21.63 \pm 5.13$ ), ALT ( $23.67 \pm 6.01$ ) and ALP ( $124.33 \pm 29.60$ )  $p < 0.005$ .

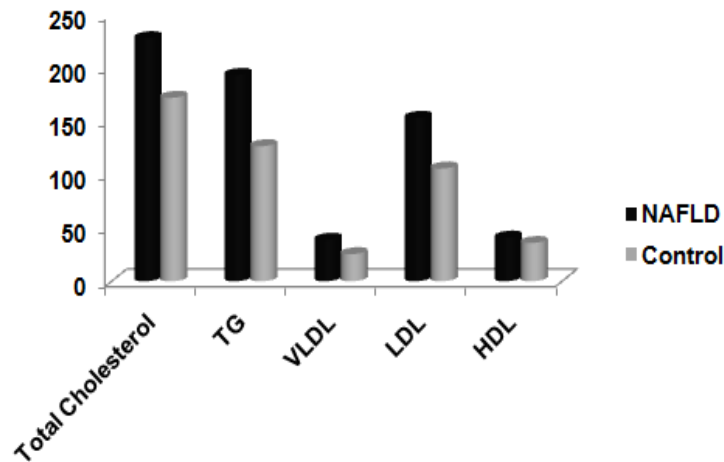


**Figure 2: Comparison of Liver Function Tests (LFT) between NAFLD and control group**

However, hyperlipidemia in 69.4% cases were observed. All the lipid profile parameters (mg/dl) total cholesterol ( $228.06 \pm 22.37$ ;  $p < 0.005$ ), triglyceride (TG) ( $193.57 \pm 99.41$ ;  $p < 0.005$ ), VLDL ( $38.91 \pm 12.3$ ;  $p < 0.005$ ) and LDL ( $153.34 \pm 47.07$ ; ( $p < 0.005$ ) were significantly higher in NAFLD patients as compared to non - NAFLD group (Figure 3) total cholesterol ( $172.09 \pm 22.33$ ), TG ( $126.71 \pm 19.48$ ), VLDL ( $25.38 \pm 16.11$ ) and LDL ( $105.74 \pm 19.51$ ). Paradoxically higher HDL ( $40.91 \pm 9.95$  Vs  $35.86 \pm 3.79$ ;  $p < 0.005$ ) was seen on non-NAFLD group.

**Table 1: Comparison of Biochemical Parameters in Control and NAFLD**

S.No.	Variable	Control (Mean+SD)	NAFLD(Mean+SD)	P-Value
1	Age	39.85 $\pm$ 11.54	43.61 $\pm$ 12.43	<0.005
2	Total Cholesterol(mg/dl)	172.09 $\pm$ 22.33	228.06 $\pm$ 2253.37	<0.005
3	Triglyceride(mg/dl)	126.71 $\pm$ 19.48	193.57 $\pm$ 99.41	<0.005
4	HDL Cholesterol (mg/dl)	40.91 $\pm$ 9.95	35.86 $\pm$ 3.79	<0.005
5	VLDL (mg/dl)	25.38 $\pm$ 16.11	38.91 $\pm$ 12.3	<0.005
6	LDL Cholesterol (mg/dl)	105.74 $\pm$ 19.51	153.34 $\pm$ 47.07	<0.005
7	ALT (IU/L)	23.67 $\pm$ 6.01	70.63 $\pm$ 42.58	<0.005
8	AST (IU/L)	21.63 $\pm$ 5.13	80.81 $\pm$ 54.79	<0.005
9	ALP (IU/L)	124.33 $\pm$ 29.60	231.78 $\pm$ 150.92	<0.005

**Figure 3: Comparison of Lipid Profile between NAFLD and control group**

### Discussion

Although NAFLD has emerged as the commonest liver problem worldwide and is found in up to one-third of the general population, [9, 10] there is little information on the true profile of patients with NAFLD in clinical practice. It has been well established that many biochemical abnormalities occur in chronic liver diseases. A number of studies have shown that NAFLD patients have significant increase in TG, total cholesterol, VLDL and LDL cholesterol, whereas decreased HDL was noticed. Similarly deranged

AST, ALT and ALP were observed in greater percentages in patients of NAFLD than those without NAFLD. The results of our study also support these observations. As is seen, increase in all the above mentioned biomarkers, which can be very important in treatment aspect. The recorded all three above markers levels changes were statistically significant.

In Nepalese population, the subjects with NAFLD had significantly higher values of triglycerides (193.57 $\pm$ 99.41), total cholesterol (228.06 $\pm$ 2253.37), LDL (153.34 $\pm$ 47.07), and VLDL (38.91 $\pm$ 12.3), whereas significantly lower HDL (35.86 $\pm$ 3.79) values were found than

controls and the variances between them were shows significant (P value <0.005) values. Bajaj et al[11] had also reported that the subjects with NAFLD had significantly higher values of total cholesterol and serum triglycerides. Increased lipid profile among NAFLD subjects had been reported in many studies. Clark et al[12] in USA in a cross-sectional study found that NAFLD subjects were higher in high triglycerides levels. In another cross-sectional study in Brazil, subjects with NAFLD had a higher triglyceride[13]. However, Lizardi-Cervera et al [14] in Mexico found that the high level of cholesterol was found in 63 percent of the NAFLD subjects. Similar findings were found also by other researchers [15,16]. Of note, the increased in TG in the patients was associated with insulin resistance. However, insulin resistance leads to hepatocytes fat deposition by two pathways; lipolysis and hyperinsulinemia [17]. Insulin resistance is recognized as a major determinant of steatogenesis and possibly of liver disease progression. We have observed abnormal values of serum AST, ALT and ALP levels in all NAFLD group than those without NAFLD. 75% and 63% (ALT and AST) had deranged in NAFLD group and a similar findings noticed by Bajaj et al and Ajay Duseja et al [18,19] respectively. Many studies during the recent years revealed that liver enzymes including AST and ALT can be useful to detect or predict NAFLD and its grading, but due to the high variability of liver enzymes, it does not seem that these enzymes have a definite role in the accurate diagnosis of fatty liver. Mikako

Obika also showed that liver enzymes do not appear to have any association with diagnose of NAFLD [20].

This Nepalese study showed that the majority of the patients were males, with the mean age of forty. This result is similar with different population base studies[21]. The ethnic differences were not included in this study. In Nepal, due to different caste/ethnic group recognized, it is an important subject to be investigated in NAFLD patterns in these groups. NAFLD is a multifactorial disease and many causes are related to the lifestyle, however, genetic predisposition also play a important role in the development of NAFLD. A limitation of our study is that the diagnosis of NAFLD was based on ultrasonography and was not confirmed by liver biopsy. Ultrasonography is by far the commonest method of diagnosing NAFLD in clinical practice.

### Conclusions

In conclusion our study revealed that there is deranged lipid profile and liver function tests in cases of NAFLD group. Higher values of these biochemical parameters play an important role in increasing the severity and progression of the disease. Early detection would help not only in modifying the disease course and also delaying its further complications.

### Conflict of interest

None declared.

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