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# ASSOCIATION OF LIFESTYLE MODIFICATION WITH LIVER HEALTH AMONG PATIENTS WITH NON-ALCOHOLIC FATTY LIVER DISEASE AT A TERTIARY CARE HOSPITAL IN QUETTA

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## ABSTRACT

**Objective:** To determine lifestyle modification practices (dietary habits, physical activity and weight management) among patients having non-alcoholic fatty liver disease (NAFLD) and to evaluate their relation to the current health status of liver in a tertiary care hospital of Quetta.

**Background:** Non-Alcoholic Fatty Liver Disease (NAFLD) , the most common chronic liver disease worldwide, is closely connected to a sedentary lifestyle and a poor dietary routine, obesity. NAFLD affects almost 30% of adult population in Pakistan and significantly higher percentage adults, with metabolic comorbidities like diabetes and hypertension. Lifestyle modification is the mainstay of NAFLD management and data on practices and liver health outcomes among the population in the area particularly Balochistan province of Pakistan is limited.

**Department & Place of Study:** Department of Medicine, Sandeman Provincial Hospital / Bolan Medical College, Quetta starting from April 10, 2026 to July 11, 2026.

**Methodology:** This was a descriptive cross-sectional study that included 196 patients with ultrasound findings that were compatible with NAFLD using non-probability consecutive sampling. An interviewer administered questionnaire was used to assess adherence to dietary recommendations, physical activity and weight management. Normal, mild, moderate or severe liver health was determined according to the serum ALT values, steatosis grade on ultrasound, BMI and WC. SPSS version 23 was used for data analysis.

**Results:** The mean age was 42.6 ± 11.8 years; 58.7% were male. Only 28.1% scored good on the dietary adherence and 22.4% scored good on the physical activity adherence. Liver health was normal in 18.9%, mild in 33.7%, moderate in 31.6% and severe in 15.8% of patients. An adequate diet adherence was strongly associated with liver health ($p<0.001$). Mean serum ALT levels showed a gradual rise (28.6 ± 7.2 U/L in the normal group to 89.4 ± 22.7 U/L in severe group, $p< 0.001$).

**Conclusion:** NAFLD patients of Quetta showed high prevalence of poor dietary adherence and the high prevalence of physical inactivity was linked significantly with poor liver health. A need of the hour is to incorporate targeted lifestyle counselling as a routine part of NAFLD management, to minimise this burden of the disease in this population.

**KEYWORDS:** Non-alcoholic fatty liver disease, Lifestyle modification, Dietary adherence, Physical activity, Liver health, Quetta

## INTRODUCTION

Non-alcoholic fatty liver disease (NAFLD) is the most prevalent chronic liver disease in the world today, and is associated with significant liver-related morbidity and mortality [1]. Current estimates suggest approximately 32.4% of the global adult population is affected (95% CI, 29.9-34.9) and prevalence has increased significantly over the past 20 years, corresponding with the increase in the global prevalence of obesity and sedentary behaviour which has reached epidemic proportion [2]. More male than females (39.7% vs 25.6%) are affected and the incidence is estimated at 46.9/1000 person-years [2].

A recent meta-analysis conducted in Pakistan found that around 29.8% (95% CI 21.4 – 39.0) of adults are suffering from NAFLD, where there were significantly higher prevalence rates in adults with diabetes (58.5%), hypertension (74.1%) and obesity (47.4%) [3]. The situation of the high burden is further confirmed by local hospital-based studies, which showed that out of 512 adult subjects studied, 38.9% of them were diagnosed with

NAFLD with mean BMI being significantly higher in those diagnosed with NAFLD as compared with normal adults (31.04 ± 4.67 vs 25.34 ± 4.71 kg/m2; $p < 0.001$) [4].
Adopting lifestyle change is the cornerstone of managing NAFLD; diets and exercise together decreases around 13 U/L of ALT and around 7 U/L of AST, HOMA-IR (≈−2.1) and even just a 7–10% weight loss would provide improved hepatic steatosis and early fibrosis [5,6]. Although the trend of NAFLD in Balochistan has increased, information on lifestyle and liver health outcomes is still limited in Quetta [7]. The purpose of this study was to assess the practices of lifestyle modifications and its association with current liver health of the patients suffering from NAFLD at a tertiary care hospital of Quetta.

## MATERIALS AND METHODS

### Study Design and Setting

The study was descriptive cross sectional study carried out in the out-patient department of Medicine, Sandeman Provincial Hospital / Bolan Medical College, Quetta for the time period of April 10, 2026 to July 11, 2026. Patients with known NAFLD who presented to the OPD, after taking informed consent, were included in the study.

### ETHICAL APPROVAL

Approval of the Research Evaluation Unit (REU), CPSP (Ref: CPSP/REU/MED-2022-001-19357, dated April 9, 2026) and approval from the ethical review committee of Sandeman Provincial Hospital / Bolan Medical College, Quetta was obtained before the study was conducted. All participants signed written informed consent before entering the study.

### Sample Size and Sampling Technique

A total of 196 patients with NAFLD were enrolled in the study. The number of samples was determined by using WHO single-proportion formula [15] ranging at the level of significance of 0.05, a prevalence of the fatty liver (mild ultrasound grade) of 33.7 % [4] and a margin of error of 7 %; 176 was obtained as the number of samples with an additional 10 % adjustment for attrition, resulting in 196. Non-probability consecutive sampling was used.

### Inclusion Criteria

- Adult patients (male and female) between 18-70 years of age.
- NAFLD diagnosed by ultrasound in abdomen.
- Attending the OPD of Sandeman Provincial Hospital, Quetta.

### Exclusion Criteria

- Other chronic liver diseases such as viral hepatitis (HBV / HCV), autoimmune hepatitis, Wilson's disease, alcoholic liver disease, HCC or liver transplantation.
- Individuals with complicated chronic liver disease (ascites, variceal bleeding, hepatic encephalopathy or jaundice).
- Pregnant women – due to pregnancy related physiological changes that can individually affect the liver and lifestyle habits.

### Operational Definitions

Liver health status was classified as:

- **Normal** (ALT ≤40 U/L and no steatosis by ultrasound, BMI <23kg/m², no central obesity)
- **Mild liver health impairment** (if some of the following factors exist: mild steatosis by ultrasound, BMI 23.0-24.9kg/m² or central obesity and normal ALT)
- **Moderate liver health impairment** (ALT >40 U/L and moderate steatosis by ultrasound or BMI ≥25kg/m2 or central obesity)
- **Severe liver health impairment** (moderate or severe steatosis by ultrasound or ALT >80 U/L with obesity).

Dietary adherence was categorized as: good (≥80%), fair (50-79%) or poor (<50%). Physical activity adherence also was classified as good (≥80% of the target sessions), fair (50–79%) or poor/none (<50%).

### Data Collection Procedure

Data on dietary habits, physical activity, weight management, co-morbidities and demographics was obtained using a pre-designed interviewer administered structured questionnaire in a confidential environment of the OPD. Anthropometric measurements (weight, height, BMI, waist circumference), laboratory values (ALT, AST, GGT, fasting glucose, lipids) and ultrasound steatosis grade were recorded from clinical records.

### Statistical Analysis

Analysis of the data was carried out by SPSS 23. For quantitative data, mean ± SD or median (IQR) were used. Qualitative variables were reported in terms of frequencies and percentages. Chi-square and Fisher's exact test were carried out to determine the relationship between the health status of the liver and lifestyle practices. Logistic regression was conducted to evaluate independent association with unfavourable liver health and was controlled

for age, sex, BMI, diabetes, hypertension, dyslipidaemia and use of medicines. A p-value of ≤0.05 was considered statistically significant.

**RESULTS**

The number of enlisted patients with NAFLD was 196. The mean age was 42.6 ± 11.8 years; 58.7% (n=115) were male. In the patients there was a prevalence of diabetes of 44.9%, of hypertension of 38.8% and of dyslipidaemia of 51.5%. Demographic and clinical characteristics are shown in Table 1. The mean BMI was 29.8 ± 5.1 kg/m²; the mean waist circumference was 96.4 ± 11.2 cm.

**Table 1: Demographic and Clinical baseline data of study population (n=196).**

| Variable | Frequency / Mean ± SD | Percentage |
|---|---|---|
| Mean age (years) | 42.6 ± 11.8 | — |
| Male gender | 115/196 | 58.7% |
| Urban residence | 122/196 | 62.2% |
| Diabetes mellitus | 88/196 | 44.9% |
| Hypertension | 76/196 | 38.8% |
| Dyslipidaemia | 101/196 | 51.5% |
| Mean BMI (kg/m²) | 29.8 ± 5.1 | — |
| Mean waist circumference (cm) | 96.4 ± 11.2 | — |
| Mean ALT (U/L) | 52.4 ± 24.8 | — |
| Ultrasound steatosis grade S1 | 66/196 | 33.7% |
| Ultrasound steatosis grade S2 | 71/196 | 36.2% |
| Ultrasound steatosis grade S3 | 59/196 | 30.1% |

In lifestyle practice, only 28.1% (n=55) of patients reported good dietary adherence, 38.3% (n=75) to report fair adherence, and 33.7% (n=66) reported poor adherence to this. Twenty-two point four percent (n=44) of those had good adherence to physical activity and 41.8% (n=82) had poor or no adherence. 39.8% (n=78) of patients practiced portion control and 31.1% (n=61) monitored their weight regularly, respectively [8,9].

Liver health classification showed that 18.9% (n=37) were normal, 33.7% (n=66) had mild impairment, 31.6% (n=62) had moderate impairment and 15.8% (n=31) had a severe impairment. Liver health was highly significantly related to good dietary adherence (p<0.001) as shown in Figure 1.

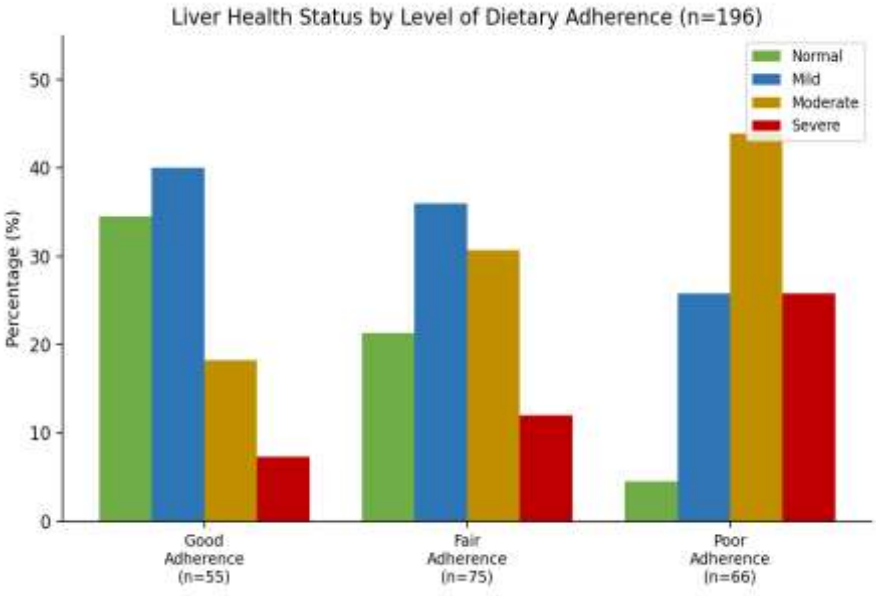


**Figure 1. Distribution of liver health status in response to dietary adherence level (n=196).**

ALT levels rose sequentially and significantly between the groups according to liver health: 28.6 ± 7.2 U/L in normal; 42.8 ± 11.4 U/L in mild; 61.3 ± 18.9 U/L in moderate and 89.4 ± 22.7 U/L in severe ($p<0.001$ in all groups) (Figure 2).

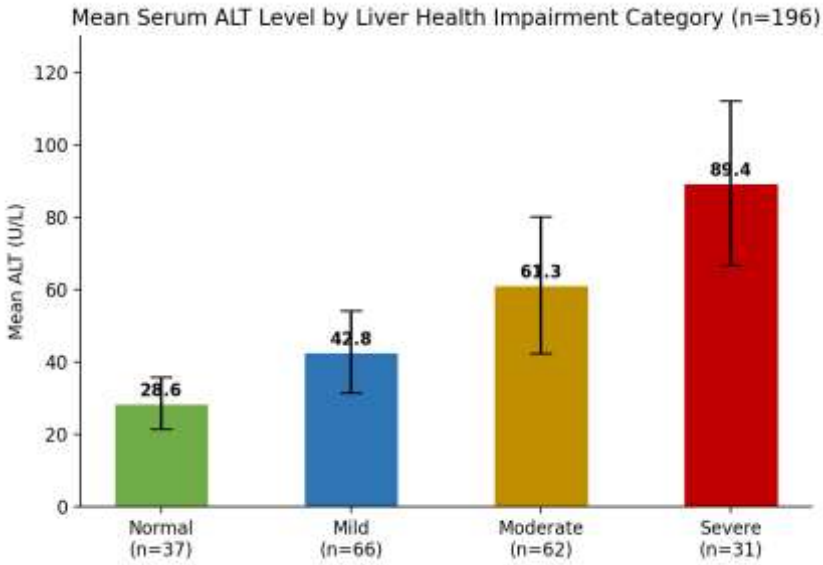


**Figure 2. The mean serum ALT level stratified by Liver Health Impairment category (n = 196).**

On logistic regression, poor dietary adherence (OR 3.82; 95% CI: 2.01–7.26; $p<0.001$), poor physical activity adherence (OR 2.64; 95% CI: 1.43–4.88; $p=0.002$), diabetes (OR 2.18; 95% CI: 1.19–3.98; $p=0.011$) and BMI ≥25 kg/m² (OR 3.11; 95% CI: 1.68–5.74; $p<0.001$) were independent predictors of unfavourable liver health (moderate or severe impairment), after adjusting for age, sex, hypertension and dyslipidaemia. These associations are summarised in Table 2.

**Table 2: Logistic Regression --Independent Predictors of Unfavourable Liver Health (moderate or severe impairment) (n=196).**

| Variable | Adjusted OR | 95% CI | p-value |
|---|---|---|---|
| Poor dietary adherence | 3.82 | 2.01–7.26 | <0.001 |
| Poor physical activity adherence | 2.64 | 1.43–4.88 | 0.002 |
| BMI ≥25 kg/m² | 3.11 | 1.68–5.74 | <0.001 |
| Diabetes mellitus | 2.18 | 1.19–3.98 | 0.011 |
| Hypertension | 1.74 | 0.96–3.16 | 0.069 |
| Age ≥50 years | 1.61 | 0.89–2.91 | 0.114 |

**DISCUSSION**

Only 28.1% had good adherence to diet and 22.4% had good adherence to physical activity and in this study, poor adherence to diet and poor adherence to physical activity were independently associated with worse liver health. These findings are similar to those of Fernandez et al., who found that a combination of diet and exercise yielded the most beneficial reductions in ALT, AST and HOMA-IR in NAFLD patients; and that even a loss of 7–10% of weight was important for the reduction in hepatic steatosis and fibrosis [5]. This dose-response relationship between adherence to the lifestyle and the hepatocellular injury is highlighted by the progressive increase in ALT from 28.6 U/L in the normal liver category to 89.4 U/L in the severely impaired liver category [4,8].

This high metabolic comorbidity burden, diabetes (44.9%), hypertension (38.8%) and dyslipidaemia (51.5%) as observed is similar to the Pakistan based NAFLD cohort as reported by Hassan et al [3]. Any association of diabetes with unfavourable liver health is independent of any of the above associations, the OR being 2.18, and this is consistent with the evidence, as insulin resistance accelerates steatosis and progression to NASH [10,11]. Even simple lifestyle interventions can make a difference: In a cohort of Pakistanis with metabolic-associated fatty liver disease, significant improvement in liver parameters was achieved after structured lifestyle guidance by Altaf et al. [6]. In addition, Vilar-Gomez et al. found that ≥7% sustained weight loss by lifestyle support was linked to histological resolution of NASH in 90% of the participants who achieved the target weight loss level

[12].These findings align with the EASL and AASLD practice guidelines, which strongly advocate structured lifestyle interventions as the primary therapeutic modality for NAFLD [13, 14].

**Limitations of the Study**

This study is a one-centre study, which may have restricted generalisability. Because of the cross-sectional design it is difficult to draw causal conclusions. Lifestyle adherence was self-reported, and prone to recall error. Liver biopsy for evaluation of the severity of NAFLD was not undertaken. Lifestyle programmes for clinical practice guidelines would be more validly developed with future prospective interventional studies with structured lifestyle programmes, and with longitudinal follow up.

## CONCLUSION

NAFLD patients in this tertiary care hospital in Quetta had high prevalence of poor dietary adherence and physical inactivity, which were independently associated with poor liver health. Structured lifestyle counselling, dietary counselling and regular physical activity recommendations should be routinely incorporated into the management of NAFLD to decrease the rising burden of hepatic and metabolic diseases in Balochistan [13,14].

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