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# Risk Factors for Nonalcoholic Fatty Liver Disease among Patients Referred to Radiological Departments at Hail Hospitals, KSA

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## Abstract

***Background*:** Nonalcoholic fatty liver disease (NAFLD) incidence and prevalence have increased globally. The gravity of this chronic disease comes from its ability to progress to cirrhosis and hepatocellular carcinoma, which are rising rapidly. Genetic, demographic, environmental, and clinical factors are significant in the occurrence of NAFL. This study aimed to assess risk factors that affect the occurrence of NAFLD.

***Methods and Results*:** This cross-sectional study was carried out at hospitals in the Hail Region, KSA. It included 160 patients: 76 were considered as control (normal liver), and 84 suffered from fatty liver (according to a US image). Sonography was carried out using a US scanner with curvilinear transducers having a frequency of 3.5MHz. The following data were obtained: age, BMI, clinical history, including long-term medication of more than 3 months (oral antidiabetic medications, hormone replacement therapy for hyperthyroidism, and antihypertensive drug), type 2 diabetes (T2D), viral hepatitis, liver span, lipidemia, metabolic disorders, and weight loss. The prevalence of NAFLD increases significantly among patients taking medications for a long time and T2D patients ($P$<0.001). Hepatomegaly is one of the most common physical examination findings of NAFLD ($P$<0.001).

***Conclusion***: A periodic US examination is helpful because it can reveal fatty infiltration of the liver in the early stages to avoid fatal complications, especially for patients with long-term medication or T2D. Other studies with larger sample sizes and different known risk factors are needed to discover all risk factors for the KSA population. (**International Journal of Biomedicine. 2023;13(3):101-104.**)

**Keywords:** nonalcoholic fatty liver disease • risk factors • ultrasound

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## Abbreviations

**BMI**, body mass index; **HRT**, hormone replacement therapy; **LS**, liver span; **NAFLD**, nonalcoholic fatty liver disease; **NW**, normal weight; **T2D**, type 2 diabetes; **US**, ultrasound.

## Introduction

Nonalcoholic fatty liver disease (NAFLD) incidence and prevalence have increased globally.[1] The prevalence in Asia is equal to that in the West. The gravity of this chronic disease comes from its ability to progress to cirrhosis and hepatocellular carcinoma, which are rising rapidly.[2-4] Genetic, demographic, environmental, and clinical factors are significant in the occurrence of NAFLD.[1] Certain genetic factors have revealed their role in the occurrence of NAFLD, e.g., patatin-like phospholipase domain-containing 3 (*PNPLA3*) gene, sorting and assembly machinery component 50 (*SAMM50*) gene, and centrosomal protein of 192 kDa (*CEP192*) gene.[1,4] An unhealthy lifestyle, obesity, and weight loss are major risk factors. The tendency to contract NAFLD increases with age, reaching a peak at the age of 60, and is higher among males than females. The global increase in the incidence of NAFLD is associated with rising obesity, T2D, and metabolic syndrome.[1,5]

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Different noninvasive modalities are used to detect NAFLD, like US and MRI.[6] US is the method of choice because of its low cost and availability. Different techniques have been developed nowadays to increase the accuracy of this modality. Quantitative US and US with artificial intelligence are new techniques for identifying NAFLD in high-risk patients.[6,7] Sonographically, fatty liver disease is characterized by increased echogenicity, vascular blurring, and enlargement.[8] During clinical examinations. it has been observed that NAFLD is discovered suddenly, and many patients are suffering from fatty liver without knowing it.

This study aimed to assess risk factors that affect the occurrence of NAFLD.

## Materials and Methods

This cross-sectional study was carried out at hospitals in the Hail Region, KSA, on 160 patients who came to the radiological departments for an abdominal ultrasound. Sonography was carried out using a US scanner with curvilinear transducers having a frequency of 3.5 MHz. US scanning was performed according to AIUM guidelines for an abdominal ultrasound.[9]

The following data were obtained: age, BMI, clinical history, including long-term medication of more than 3 months, T2D, viral hepatitis, liver span, lipidemia (the level of cholesterol more than 240 mg/dL or triglycerides more than 240 mg/dL), and weight loss. In addition, the presence of sickle cell anemia, cystic fibrosis, maple syrup urine disease, Gaucher's disease, or hemochromatosis was assessed. These data were retrieved from the PACS.

A designed data collection sheet containing all the study variables was used. This study included 160 patients: 76 were considered as control (normal liver), and 84 suffered from fatty liver (according to a US image).

The sonographic diagnosis of fatty liver depends on parenchymal brightness (increased echogenicity than the normal liver). There are three patterns: diffuse, characterized by overall hyperechogenicity (n=77); focal, characterized by focal hyperechogenicity (n=5); and focal fatty sparing, characterized by hypoechoic areas within hyperechoic parenchyma (n=2). In addition, the LS (≤13 cm or >13cm) was assessed.

Statistical analysis was performed using the statistical software package SPSS version 23.0 (SPSS Inc, Armonk, NY: IBM Corp). Baseline characteristics were summarized as frequencies and percentages for categorical variables. Continuous variables with normal distribution were presented as mean and standard deviation (SD). The frequencies of categorical variables were compared using Pearson's chi-squared test. A probability value of $P<0.05$ was considered statistically significant.

## Results

Table 1 shows the age, BMI mean, and standard deviation. Patients were classified into three groups according to age; 18-30 years, 31-60 years, and 61-97 years. The sample was classified into three groups according to BMI: normal weight (NW), overweight and obese. The association between age groups, BMI, liver span, and NAFLD were assessed using a chi-square test (Tables 2-4).

***Table 1.***

***Basic characteristics.***

| Variable | Minimum | Maximum | Mean | SD |
|---|---|---|---|---|
| Age | 16.00 | 97.00 | 47.5250 | 20.81121 |
| BMI | 18.50 | 81.00 | 39.4100 | 13.99385 |

***Table 2.***

***Association between age and BMI, and NAFLD***

| | Age groups ($P$=0.160) | | | BMI groups ($P$=0.145) | | |
|---|---|---|---|---|---|---|
| | 1-30 yr. | 31-60 yr. | 61-97 yr. | NW | Overweight | Obese |
| Normal | 20 | 40 | 16 | 8 | 10 | 58 |
| Fatty liver | 26 | 32 | 26 | 14 | 18 | 52 |
| Total | 46 | 72 | 42 | 22 | 28 | 110 |

***Table 3.***

***Association between known risk factors and the presence of NAFLD.***

| | | Normal | Fatty liver | Total | $P$-value |
|---|---|---|---|---|---|
| Long-term medication | Yes | 4 | 30 | 34 | 0.000 |
| | No | 72 | 54 | 126 | |
| T2D | Yes | 0 | 18 | 18 | 0.000 |
| | No | 76 | 66 | 142 | |
| Viral hepatitis | Yes | 4 | 8 | 12 | 0.307 |
| | No | 72 | 76 | 148 | |
| Lipidemia | Yes | 2 | 4 | 6 | 0.771* |
| | No | 74 | 80 | 154 | |

* *Pearson's chi-squared test with the Yates' correction*

***Table 4.***

***Association between liver span and NAFLD.***

| Liver span, cm | Normal | Fatty liver | Total | $P$-value |
|---|---|---|---|---|
| ≤ 13 | 76 | 62 | 138 | 0.000 |
| >13 | 0 | 22 | 22 | |
| Total | 76 | 84 | 160 | |

Figure 1 shows the distribution of risk factors among patients with NAFLD. There were five patients with a high level of cholesterol and one with a high triglyceride level.

No patients suffered from sickle cell anemia, cystic fibrosis, Gaucher's disease, or hemochromatosis (Figure 2).

There were 34 patients who had been taking medication for a long time (antidiabetic medications - 16, hormone replacement therapy (HRT) for hyperthyroidism - 10, and antihypertensive drug - 8).

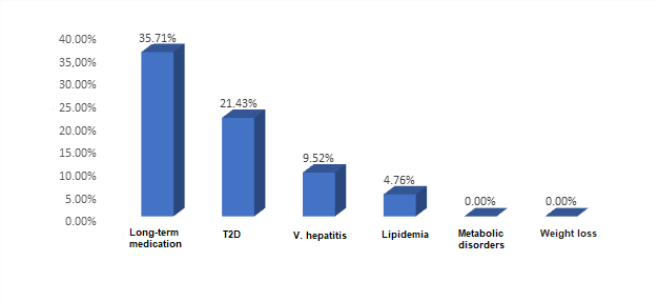


***Fig. 1.*** *Distribution of NAFLD risk factors*

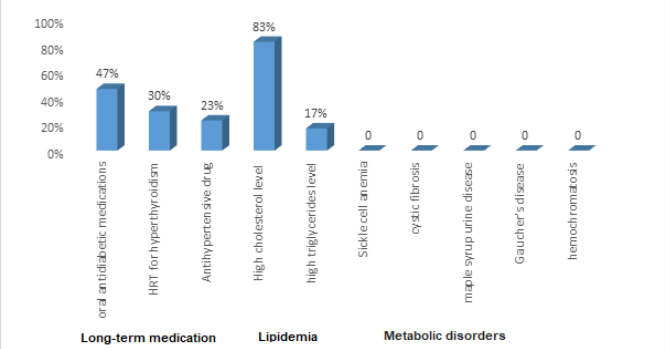


***Fig. 2.*** *Long-term medication, lipidemia and metabolic disorders.*

## Discussion

Different studies have been carried out to assess risk factors in certain populations or regions. For example, a previous study found that increased BMI is the main risk factor.[10] Another study found that risk factors include gender, hypertension, body fat ratio, blood triglycerides, and fasting blood glucose.[11] In this study, the ages of patients ranged between 16 and 97 years. Patients between 31-60 years had the highest prevalence of the disease. The results show no significant association between the disease and age ($P$=0.160). The prevalence of obesity (BMI >30 kg/m$^2$) among all patients (sample) was higher (68.75%) than the other BMI groups, and these patients had the highest prevalence (61.9%) of NAFLD; however, there was no significant association ($P$=0.145). The study found that taking medications for a long time and T2D were the main factors affecting NAFLD ($P$<0.001).

Previously, it was shown that some long-term medications induce fatty liver. These medications include corticosteroids, antidepressants and the antipsychotic medications tamoxifen, amiodarone, and methotrexate.[12] In this study, long-term medications included oral antidiabetic medications, HRT for hyperthyroidism, and antihypertensive drugs. This study also showed the relationship between long-term medications and NAFLD. T2D is usually present together with NAFLD[13] which was also confirmed by this study. Lipidemia was not associated with NAFLD, apparently due to insufficient samples in this study.

One of the clinical and sonographic manifestations of fatty liver is hepatomegaly. With US, hepatomegaly is assessed by measuring LS. LS differs according to region and population. According to a study conducted in Saudi Arabia, the LS was 12.5 cm among males and 11.9 cm among females.[14] In this study, 13 cm was the cutoff point,[15] used as an upper limit for normal LS. The study showed a significant association between fatty liver and hepatomegaly ($P$<0.001).

## Conclusion

The prevalence of NAFLD increases significantly among patients taking medications for a long time (oral antidiabetic medications, HRT for hyperthyroidism, and antihypertensive drug) and T2D patients. NAFLD is discovered suddenly, and in this regard, a periodic US examination is helpful because it can reveal fatty infiltration of the liver in the early stages to avoid fatal complications, especially for patients with long-term medication or T2D. Hepatomegaly is one of the most common physical examination findings of NAFLD. Other studies with larger sample sizes and different known risk factors are needed to discover all risk factors for the KSA population.

## Competing Interests

The Author declares that there is no conflict of interest.

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