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SHORT COMMUNICATION

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Serum Biomarkers in Sudanese Patients with Nonalcoholic Fatty Liver Disease

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Abstract

Background: Nonalcoholic fatty liver disease (NAFLD) is the most common liver disorder. Its pathogenesis is multifactorial, and different pathogenic mechanisms cause differences in its course and outcomes at different clinical stages. This study evaluated serum levels of alpha-fetoprotein (AFP), lipids, and liver enzymes in Sudanese patients with NAFLD.

Methods and Results: This study was conducted at the Advance Diagnostic Center, Bihari Hospital, Khartoum State, Sudan, from September 2021 to November 2022. A total of 80 participants (56 women and 24 men) were divided into two groups: The main group included 40 patients diagnosed with NAFLD, and the control group comprised 40 healthy individuals. All patients underwent an ultrasound examination. The serum levels of AST, ALT, triglycerides (TG), and total cholesterol (TC) were measured using a spectrophotometric method, while AFP levels were assessed using an enzyme-linked immunosorbent assay (ELISA).

Our study revealed a significant increase in the levels of AST, ALT, TG, and AFP in NAFLD patients compared to the control group (P<0.01 in all cases); however, TC levels were not statistically different (P=0.629). Changes in the studied markers did not depend on gender. The correlation analysis showed a moderate positive correlation between TG and AFP (r=0.527, P=0.000) and a weak negative correlation between age and AFP (r=-0.316, P=0.047). The relationship between TC and AFP was statistically insignificant (r=0.246, P=0.126).

Conclusion: Patients with NAFLD exhibit elevated levels of AFP and TG compared to individuals without fatty liver changes. A statistically significant positive correlation between TG and AFP indicates the complexity of the NAFLD pathogenesis. **(International Journal of Biomedicine. 2024;14(3):520-523.)**

Keywords: nonalcoholic fatty liver disease • alpha-fetoprotein • triglycerides • liver enzymes

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Abbreviations

AFP, alpha-fetoprotein; **ALT**, alanine transaminase; **AST**, aspartate transaminase; **HCC**, hepatocellular carcinoma; **NAFLD**, nonalcoholic fatty liver disease; **TC**, total cholesterol; **TG**, triglycerides.

Introduction

Nonalcoholic fatty liver disease (NAFLD) is a very common disorder and one of the major causes of cirrhosis in Western populations.[1] NAFLD is mainly associated with obesity and metabolic disorders.[2] Obesity and NAFLD have become an epidemic around the world, affecting 30% or more of the adults in the United States of America[3] and about 15-30% of the general adult population in Asia.[4] In the great majority of patients, NAFLD develops in association with metabolic syndrome. Although NAFLD may remain asymptomatic, it also may insidiously progress to cirrhosis and end-stage liver disease,[5,6] as well as is characterized by liver cell injury and inflammation.[7] NAFLD is considered one of the major cases of hepatocellular carcinoma (HCC).[8,9,10] Careful monitoring of patients with NAFLD using diagnostic and prognostic biomarkers is very important. Serum biomarkers, including total cholesterol, triglycerides, alanine

transaminase (ALT), and aspartate transaminase (AST), have been used for many years. Studies performed by Xu et al.[11] and Chen et al.[12] showed a significant association between alpha-fetoprotein (AFP) and metabolic syndrome. Alpha-fetoprotein, an oncofetal glycoprotein, is a well-established tumor marker for HCC,[13,14] and recent studies have explored the potential association between AFP and NAFLD.[15,16] Because NAFLD can progress to HCC, monitoring serum AFP levels to screen for HCC in NAFLD patients has important clinical implications.

This study evaluated serum levels of AFP, lipids, and liver enzymes in Sudanese patients with NAFLD.

Material and Methods

This study was conducted at the Advance Diagnostic Center, Bihari Hospital, Khartoum State, Sudan, from September 2021 to November 2022. A total of 80 participants (56 women and 24 men) were divided into two groups: The main group included 40 patients diagnosed with NAFLD, and the control group comprised 40 healthy individuals. Both groups were age-matched, ranging from 28 to 85, with a mean age of 49 years. Patients with liver disorders other than NAFLD and those with testicular cancer were excluded from the study.

After obtaining informed consent, demographic and clinical data were collected from each participant using a structured questionnaire. All patients underwent an ultrasound examination.

Venous blood samples (5 mL) were collected under aseptic conditions in plain blood containers, centrifuged at 3000 rpm for 15 minutes, and stored at -20°C until further analysis. The serum levels of AST, ALT, triglycerides (TG), and total cholesterol (TC) were measured using a spectrophotometric method, while AFP levels were assessed using an enzyme-linked immunosorbent assay (ELISA).

Statistical analysis was performed using the statistical software package SPSS version 16.0 (Chicago, SPSS Inc.). For the descriptive analysis, results are presented as mean (M) ± standard deviation (SD). Inter-group comparisons were performed using Student's t-test. Pearson's correlation coefficient (r) was used to determine the strength of the relationship between the two continuous variables. A probability value of $P<0.05$ was considered statistically significant.

Results and Discussion

Our study revealed a significant increase in the levels of AST, ALT, TG, and AFP in NAFLD patients compared to the control group ($P<0.01$ in all cases); however, TC levels were not statistically different ($P=0.629$) (Table 1). Changes in the studied markers did not depend on gender. The correlation analysis (Figure 1) showed a moderate positive correlation between TG and AFP (r=0.527, $P=0.000$) and a weak negative correlation between age and AFP (r=- 0.316, $P=0.047$) (Figure 2). The relationship between TC and AFP was statistically insignificant (r=0.246, $P=0.126$) (Figure 3).

Table 1.

Serum biomarkers in study groups.

Variable	Main group	Control group	*P*-value
TC, mg/dL	152.18±44.34	156.25±29.19	0.6291
TG, mg/dL	140.90±66.97	98.80±29.34	0.0005
AST, U/L	65.93 ± 25.00	31.30 ± 6.15	<0.0001
ALT, U/L	84.59 ± 29.11	32.50 ± 6.46	<0.0001
AFP, ng/mL	4.745±2.06	3.650±1.05	0.0037

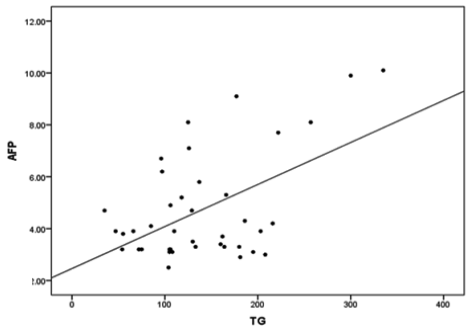

Fig. 1. *The correlation between serum AFP and TG (r=0.527, P=0.000)*

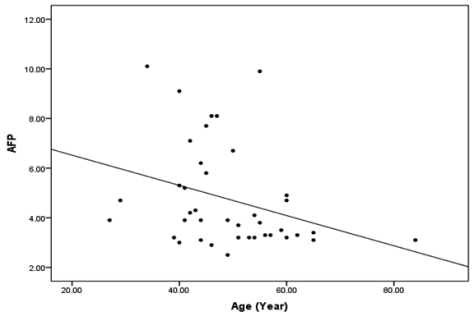

Fig. 2. *The correlation between serum AFP and patients' age (r=0.316, P=0.047)*

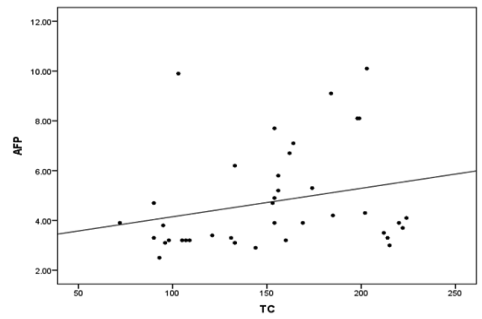

Fig. 3. *The correlation between serum AFP and TC (r=0.246, P=0.126)*

The results revealed significantly higher levels of AFP in NAFLD patients than in the control group, which could be caused by hepatic inflammation and fibrosis. Our results are

consistent with the data of Xu et al.[11] In a study by Babalı et al.,[16] AFP was correlated with NAFLD grade, and serum AFP levels were independent of the other factors (ALT and AST). At the same time, the study by Kara et al.[15] did not reveal an increase in serum AFP in NAFLD patients. The elevated TG levels we found compared to controls indicate characteristic lipid disturbances in NAFLD.[16,17] Our study did not detect the increase in TC, which is characteristic of NAFLD, possibly due to the small sample size. The main limitation of this study was the lack of histopathological confirmation for NAFLD. Although histopathological evaluation of biopsy specimens remains the gold standard for diagnosing NAFLD, a liver biopsy is an invasive procedure with rare but potentially severe complications. Transabdominal ultrasound is the primary imaging modality in patients with suspected NAFLD. The sensitivity of B-mode ultrasound to detect hepatic steatosis varies between 53%–76%, and the specificity is between 76–93%. However, the sensitivity of B-mode sonography is poor in the case of mildly pronounced steatosis (<20%–30%).[18] However, especially in obese NAFLD patients, this method has potential limitations, and in cases of suboptimal imaging quality, CT or MRI are recommended.

It should be noted that people with NAFLD have extrahepatic complications, in particular, an increased risk of hepatocellular carcinoma, cardiovascular disease, chronic kidney disease, colorectal cancer, and endocrinopathies,[19-24] requiring regular monitoring and comprehensive examination of people diagnosed with NAFLD.

In conclusion, patients with NAFLD exhibit elevated levels of AFP and TG compared to individuals without fatty liver changes. A statistically significant positive correlation between TG and AFP indicates the complexity of the NAFLD pathogenesis.

Ethical Considerations

The study protocol was reviewed and approved by the Ethics Committee at Advance Diagnostic Center, Bihari Hospital, Sudan. Written informed consent was obtained from all participants.

Competing Interests

The authors declare that they have no competing interests.

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