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Prevalence of Non-Alcoholic Fatty Liver in Type 2 Diabetes Patients

Asma Zagdod[1], Mohamed Kanah[1*], Nora AlNami[1]

[1] Department of Medical Laboratory, Medical Technology College, Nalut University, Nalut, Libya.

*Corresponding author: Mohamed Kanah | mohamed.kanah@gmail.com

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ABSTRACT

Non-alcoholic fatty liver is one of the most common liver diseases worldwide, and its occurrence is attributed to several factors, including diabetes. This study aims to determine the prevalence of non-alcoholic fatty liver among patients with type 2 diabetes in Nalut, as well as study the most important factors associated with it. During the study in Nalut, 128 people were enrolled in the diabetes clinic at Nalut Central Hospital, with 108 of them being type 2 diabetic patients and 20 randomly chosen as a control group.

All individuals were measured by biometric criteria such as FBS, HbA1C, CBC, and only 44 of the participants were screened for an ultrasound for fatty liver, and the questionnaire form was filled with information regarding sex, age, duration of diabetes, and type of treatment, as well as a BMI calculation for all study participants.

The results showed that 54% of diabetic patients and 45% of control group members had NAFLD according to the FIB-4 index, and that 86 % of diabetic patients and 100% of control group members had NAFLD according to the ultrasound examination result A statistical relationship was found between age (P=0.000), ALT, AST, and PLT (P=0.000), and NAFLD. No relationship was found between gender (P=0.270), BMI (P=0.507), FBS (P=0.514), and HbA1c (P=0.994) and NAFLD infection for diabetic patients participating in the study.

Keywords: NAFLD, T2DM, FIB-4 index, ultrasound.

مدى انتشار الكبد الدهني غير الكحولي لدى مرضى السكري النوع الثان

أسماء زغدود[1] ، محمد قانة[1*]، نورا النامي[1]

[1] قسم المختبرات الطبية، كلية التقنية الطبية، جامعة نالوت، نالوت، ليبيا.

*المؤلف المراسل: محمد قانة | mohamed.kanah@gmail.com

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ملخـــــص البحـــــث

يُعتبر الكبد الدهني غير الكحولي(NAFLD) واحدًا من أكثر أمراض الكبد شيوعًا حول العالم، ويُعزى ظهوره إلى عدّة عوامل من بينها مرض السكري، هدفت هذه الدراسة إلى تحديد مدى انتشار الكبد الدهني غير الكحولي بين مرضى السكري النوع الثان في مدينة نالوت، وكذلك دراسة أهم العوامل المرتبطة به، أُجريت هذه الدراسة في مدينة نالوت، شملت 128 شخص ممّن يتردّدون على عيادة السكري في مستشفى نالوت المركزي ، حيث كان 108 منهم من مرضى السكري النوع 2، و20 شخص تمّ اختيارهم عشوائيًا كمجموعة ضابطة، تمّ قياس المعايير الحيويّة لجميع الأفراد مثل (FBS وHbA1c وCBC وALT وAST)، تمّ فحص 44 شخص من المشاركين بالموجات فوق الصوتية للتأكّد من وجود الكبد الدهني، كما تمّ ملء نموذج الاستبانة بمعلومات تتعلّق بالجنس والعمر إضافةً إلى حساب مؤشّر كتلة الجسم لجميع

المشاركين في الدراسة. أظهرت النتائج أنّ 54% من مرضى السكري و45% من أفراد المجموعة الضابطة مصابون بـ NAFLD حسب مؤشّر FIB-4، وأنّ 86% من مرضى السكري و100% من أفراد المجموعة الضابطة مصابون بـ NAFLD حسب نتيجة الفحص بالموجات فوق الصوتية، حيث تمّ العثور على علاقة إحصائيّة بين كلٍ من العمر (P=0.000) وALT وAST وPLT (P=0.000) وبين الإصابة بـ NAFLD ولم يتمّ إيجاد علاقة بين كلٍ من الجنس (P=0.270) و BMI (P=0.507) وFBS (P=0.514) وHbA1c (P=0.994) والإصابة بـNAFLD وذلك بالنسبة لمرضى السكري المشاركين في الدراسة.

الكلمات المفتاحية: الكبد الدهني الغير كحولي، السكري النوع 2، مؤشّر FIB-4، الموجات فوق الصوتية.

1. Introduction

NAFLD is a medical condition that is recognized globally and encompasses multiple liver diseases, such as isolated steatosis and nonalcoholic fatty liver disease (NASH), which can result in liver fibrosis and ultimately hepatocellular carcinoma. [1]

NAFLD is a condition in which there is too much fat in the liver, which can result in steatosis in more than 5% of liver cells based on histological findings, and more than 5.6% of excess fat content measured by ultrasound imaging. [2]

The definition of NAFLD requires evidence of liver fatty degeneration, either via ultrasound or the 4-FIB index, and the absence of secondary causes of accumulated liver fat, such as alcohol consumption, chronic liver diseases, or genetic disorders. [3]

The prevalence of NAFLD in Western countries is between 24% and 42%, which is a rapid increase worldwide in parallel with the rise in obesity, and it is believed to be higher in patients with type 2 diabetes. Lifestyle, genetic factors, and metabolism also play a role in causing NAFLD. Several studies have shown that patients with NAFLD and T2DM are at an increased risk of developing more common liver diseases such as NASH, cirrhosis, and hepatocellular carcinoma. [1]

Numerous studies have demonstrated that NAFLD is responsible for nearly double the incidence of diabetes, and vice versa, regardless of obesity or other common risk factors. Early detection and treatment of diabetes can delay disease progression and prevent complications. Therefore, identifying individuals at risk for diabetes is essential for preventive strategies for this disease. [4]

This study was conducted to shed more light on the problem of fatty liver in diabetic patients, by determining its prevalence among this group and knowing the different degrees of fatty liver infection in the diabetic group and the control group, by calculating the FIB-4 equation, ultrasound imaging, in addition to studying the most important risk factors related to its occurrence.

2. Materials and Methods

The study involved 128 individuals who visited the diabetes clinic at Nalut Central Hospital in Nalut from November 2023 to April 2024. The sample included two types of cases: 108 samples of type 2 diabetes patients as the main group, and 20 random samples as the control group. The age range of the study group ranged from 14 to more than 66 years. Patients with type 1 diabetes were excluded from this study.

Three sections were included in this study:

1- Collect intravenous blood samples from all study members to perform FBS fasting blood sugar testing, HbA1c glycated hemoglobin, liver enzymes (ALT, AST), and CBC.

2- Complete the questionnaire form, which includes several aspects, such as gender, age, duration of diabetes, and type of treatment. The body mass index was determined using height and weight measurements, as well as blood test results and the 4-FIB equation.

3- Imaging the abdominal area with an ultrasound device (Ultrasound) to confirm the presence of non-alcoholic fatty liver disease and know its degree.

Data Analysis:

The data was analyzed statistically using Statistical Package for the Social Science (SPSS) version (25) to analyze the data to identify the results, P-value used to find the relationship between fatty liver and various variables

3. Results

Total of 128 individual were chosen in this study, there age from 14 to more than 60 years, males 32(29 %) diabetic group 5 (25%) control group, females 76(70.4%) diabetic group 15 (75%) control group as shown in table 1.

Table 1: Mean and Standard deviation of Age, Gender, BMI, FBS, HbA1c, ALT, AST, PLT, FIB-4 equation.

	Diabetic group		Control group	
	Mean	Standard deviation	Mean	Standard deviation
Age	2.81	0.648	2.70	0.571
Gender	1.70	0.459	1.75	0.444
Body mass Index (BMI)	3.54	1.123	3.40	1.465
Fasting blood sugar (FBS)	164.3	57.83	98.2	13.26
Hemoglobin A1c	8.5	2.151	5.7	0.863
Alanine amino transferase ALT	20.13	15.59	16.90	6.632
Aspartate Transaminase AST	19.50	10.98	20.50	6.786
Platelets Count PLT	239.52	67.82	247.40	52.64
FIB-4 equation	1.06	0.497	1.142	0.570

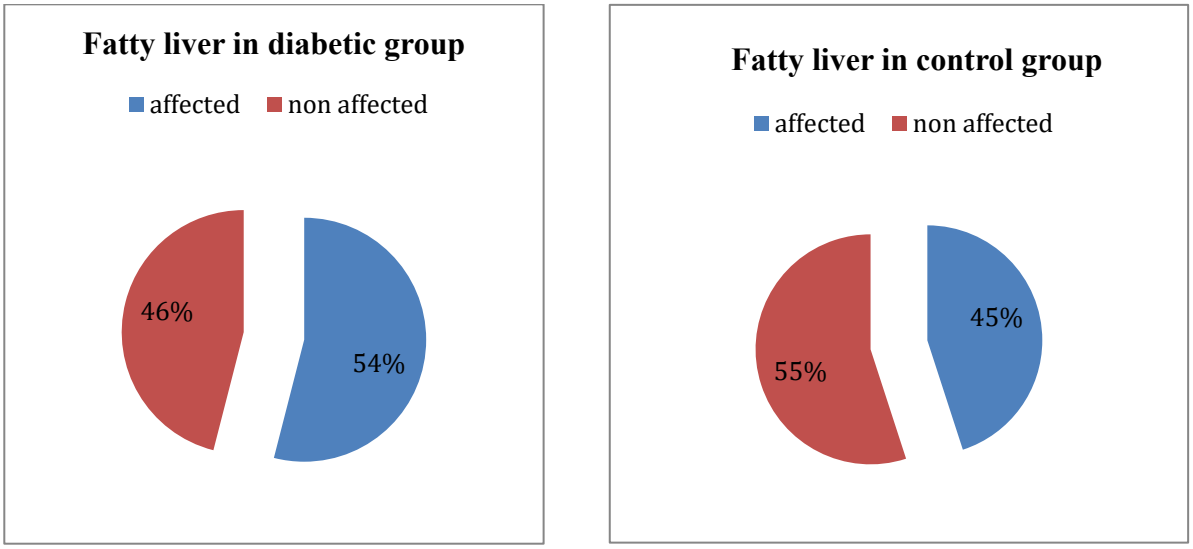

Figure 1: Prevalence of fatty liver according to the FIB-4 index in the diabetic group and the control group.

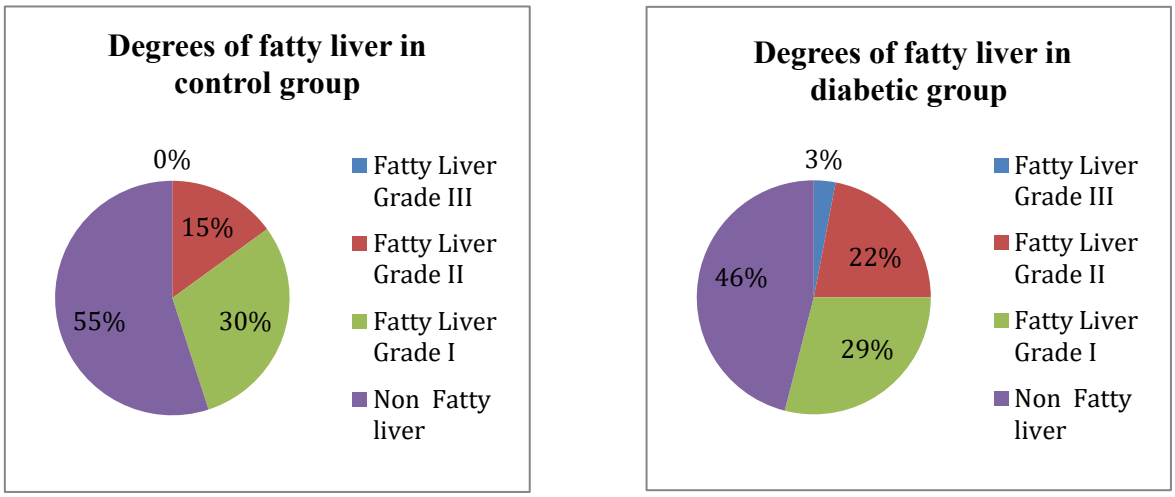

Figure 2: Distribution of fatty liver scores according to the FIB-4 index in the diabetic group and the control group.

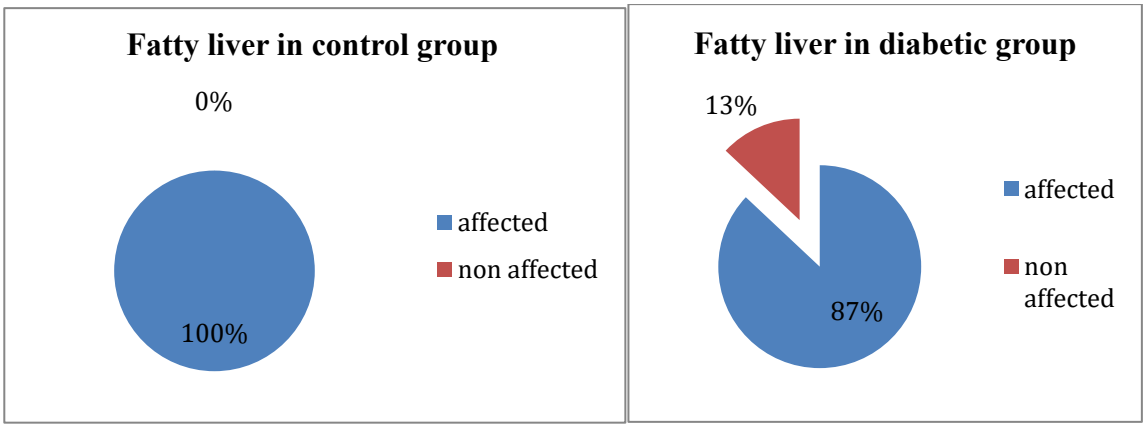

Figure 3: Prevalence of fatty liver according to the ultrasound image in the diabetic group and the control group.

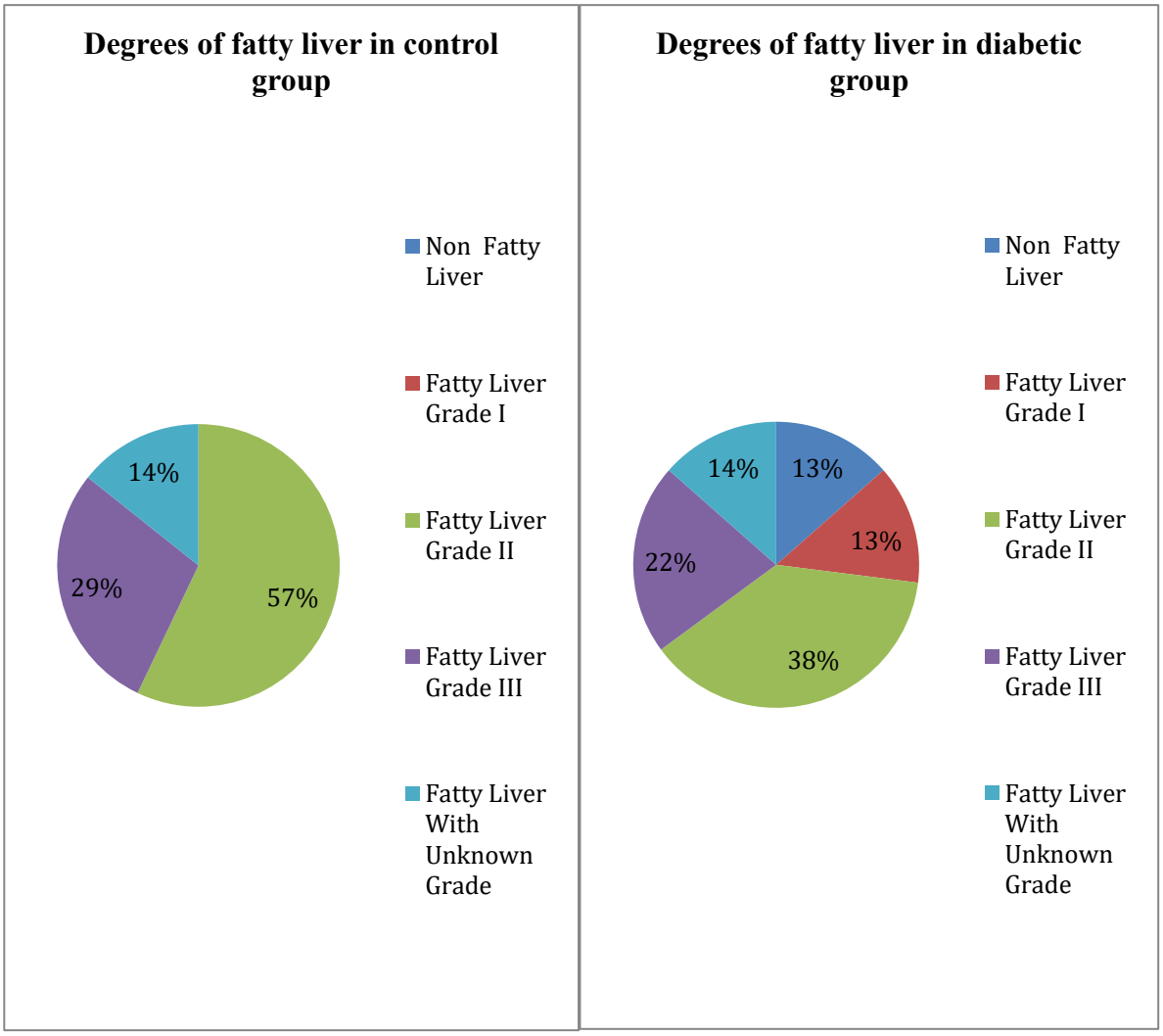

Figure 4: Percentage prevalence of fatty liver according to ultrasound imaging of the study sample.

Table 2: Testing the relationship between fatty liver disease and various variables in the study sample.

	Fatty liver prevalence			
	diabetic group		Control group	
variables	P-Value	correlation coefficient	P-Value	correlation coefficient
Gender	0.270	-	0.962	-
Age	0.000	0.343	0.034	0.477
Body mass index	0.507	-	0.226	-
Hemoglobin A1c	0.994	-	0,446	-

Fasting Blood Sugar	0.514	-	0.552	-
Alanine amino transferase	0.000	0.379	0.84	-
Aspartate transaminase	0.000	- 0.569	0.087	-
Platelets Count	0.000	-0.241	0.029	-0.489

From the previous table, there is a strong direct relationship between age, ALT, and the prevalence of fatty liver in diabetic patients (i.e., the older the age and the higher the ALT values, the greater the chances of developing NAFLD), while there is a strong inverse relationship between AST, PLT, and the prevalence of fatty liver in diabetic patients (i.e., the lower the AST and PLT values, the greater the chances of developing NAFLD).

As shown in the table 2, There is also a strong direct relationship between age and the prevalence of fatty liver (the older the age, the greater the chance of developing NAFLD), and a strong inverse relationship between PLT and the prevalence of fatty liver (the lower the PLT values, the greater the chance of developing NAFLD) in the control group.

4.Discussion

Having diabetes can increase the risk of developing NAFLD, as improper management of diabetes can worsen NAFLD along with blood lipid disorders, high blood pressure, and exposure of diabetics to cardiovascular disease, as prevention and early detection of the disease, enjoying an ideal weight, and controlling blood sugar levels are considered They serve as the main keys to preventing the problem of fatty liver from getting worse.

The study included 108 diabetics type 2 and 20 people as a control group. The incidence of non-alcoholic fatty liver disease (NAFLD) in diabetics was 54% as showing in figure 1, distributed as follows: 29% mild, 22% moderate, 3% severe from figure 2. As for the control group in the figure, the percentage was 45%, but it was limited to mild to moderate. These percentages were according to the FIB-4 equation as shown in figure 2.

Only 44 of all the participants included in the study agreed to undergo ultrasound imaging (Ultrasound) of the abdominal area to confirm the presence of fatty liver, as 37 of them were diabetics and 7 were members of the control group. The result of this examination was confirmation that 68% of diabetic patients who underwent ultrasound had non-alcoholic fatty liver disease. Of these patients, 13% had grade 1, 38% had grade 2, and 22% had grade 3, 14% of them were recorded as having fatty liver disease of unknown degrees as shown in figure 4.

This percentage is considered alarming when compared to the prevalence rates of fatty liver in other studies, as the prevalence rate of non-alcoholic fatty liver NAFLD)) in a local study held in southern Libya,[5] was 40%, where 56% of them were mild, 38% moderate, 6% severe, an Arab-Jordanian study, [6] showed the prevalence of NAFLD in 80.4% of the diabetic sample 53.3% of non-diabetics, scores for steatosis were distributed to 25%, 40.4%, 15% mild, moderate, and severe, respectively, for diabetics, and 24.4%, 21.1%, and 7.8% for non-diabetic participants.

The average age of the sample in this study was 58 years, between (49 and 66 years) in both diabetic patients and the control group. The values in table 2 showed a strong relationship between age and the

prevalence of fatty liver, it was (P=0.000) in both groups. This is a very strong relationship that indicates that the older the age, the greater the chance of developing NAFLD, as the average age of the group with NAFLD was 58.9 years for diabetics and 55.3 years for the control group.

This result is similar to the Jordan study, [6] where the average age of the study participants was 56.3 years for diabetics and 52.3 years for the control group, and there were statistically significant differences between participants with and without diabetes in terms of age, and the largest prevalence of NAFLD was in Age between 46-65 years.

The Japanese study, [7] showed the ages of the study participants ranged between 30-46 years, and the average age of the group infected with NAFLD was 52.9 years (P=0.03).

It was found that the percentage of females infected with NAFLD is greater than that of males by 56.6%. However, no statistically significant relationship was found between them, as (P>0.05) as shown in table 2.

Also, the Iran study, [8] included 272 diabetic patients, 68% of those infected with NAFLD were females. However, no relationship was found between NAFLD and gender. The Brazil study, [9] also evaluated 78 patients (59% female) and its results later showed no relationship between gender and NAFLD.

As for the BMI in the table 1, most cases were limited to overweight and first-degree obesity. The results of this study showed no relationship between BMI and the prevalence of NAFLD, as the value reached (P=0.507) with an average of 30 for diabetics and (P=0.226) with an average of 30.8 for normal people as shown in table 2. Only one study was consistent with the results of the current study, which is the Indian study, [10] where found that about 80% of patients are overweight or obese with an average of 26.24=BMI, and thus there is no relationship between BMI and the presence of NAFL.

As for the FBS test in table 1, the average in the study participants with diabetes was 164.3, which is considered a high and uncontrolled value, while in the control group, the average FBS was about 98.2, which is a normal value. The table 2 showed no relationship between the FBS variable and the prevalence of NAFLD, as the values of (P=0.514) and (P=0.552) were in both the diabetic group and the control group, respectively The Mosul study also indicated that fasting blood sugar level (FBS) was not associated with the presence of NAFLD, as the average FBS was about 183.6 in patients with NAFLD with a value of (P>0.05). The Bahrain study also did not find a relationship between FBS and NAFLD with a value of (P=0.68), as 50.5% of patients were unsupervised, while 49.5% They were under control with an average FBS for all patients of 187.7.

As for the HbA1c test results in table 1, this study noted that the diabetic patients participating in the study had an average increase in HbA1c values of 8.5, while in the control group, the HbA1c value indicated the pre-diabetic stage, where the average was 5.7. The study found no relationship between HbA1c and NAFLD with values of (P=0.994) and (P=0.446) in the two groups, respectively.

The Iran study also did not find a relationship between HbA1c and NAFLD, as HbA1c, which averaged 7.4, was higher in patients with NAFLD compared to those without it. These values are similar to the values of the Brazil study, [9] which found the average HbA1c reached 8.8 Which did not differ much in the group with and without NAFLD, with no relationship between it and NAFLD, the value was (P=0.605).

As for liver enzymes (ALT, AST), they are the most important variables on which this study was based, as they are one of the four parameters on which the FIB-4 index depends. The study found the relationship between them and NAFLD was very strong in the group of diabetic patients, reaching (P=0.000) for each of them as shown in table 2.

In Brazilian Study, [9] It was observed that the ALT value with an average of 21.8 and the AST value with an average of 18.9 were higher in patients with NAFLD compared to patients without NAFLD with a relationship of (P=0.006) and (P=0.002) respectively, also in Indian study noted that serum ALT and AST levels were significantly higher in NAFLD patients with a strong correlation between them and NAFLD (P<0.001). [11]

Platelet counts as one of the parameters of the 4-FIB index. The study found the relationship between it and NAFLD was very strong, reaching a value of (P=0.000) in the diabetic group and (P=0.029) in the control group as shown in table 2. Not many studies were dealt with the Platelets Count test, as only India study (10), which noted that the average Platelets Count reached 2.92 in diabetic patients with NAFLD (P=0.894), meaning that it did not find a relationship between PLT and the presence of NAFLD, and this is contrary to the results of the current study.

5. Conclusion

This study concluded the prevalence of non-alcoholic fatty liver disease among patients with type 2 diabetes reached 54%, with varying degrees of mild, moderate, and severe. This is a very dangerous rate, as it means that more than half of diabetics are at risk of developing fatty liver disease with increasing the age. Therefore, more attention and focus should be directed to this problem by raising awareness and education on this topic, which is considered one of the most important means of preventing fatty liver. It was found that all participants in this study had no idea about fatty liver. Paying attention to sugar levels, obtaining healthy food and weight, conducting periodic liver examinations, and providing specialists interested in this disease are also good factors for addressing this issue.

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