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Relation of Blood Omentin-1 and Some Biochemical Parameters With Body Mass Index in Patients of Nonalcoholic Fatty Liver Disease

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Abstract

Nonalcoholic fatty liver disease (NAFLD) is a condition of increasing fat in liver of individuals who do not consume significant amount of alcohol. The study aimed to estimate Omentin-1, insulin, aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALk) , albumin, globulin, total protein, CRP, Triglyceride (TG), total cholesterol (TC), high density lipoprotein (HDL), low density lipoprotein (LDL), very low density lipoprotein (VLDL) in the serum of NAFLD patients, and find the relationship of variation in omentin-1 and Some Biochemical Parameters with body mass index(BMI) in Patients of NAFLD And comparing them with to the healthy ones.

Ninety people were involved in this study (60 were patients with NAFLD and 30 healthy individuals) from Al-Muqdudia General Hospital in Diyala province, Iraq, during the period 1/10/2021 to 30/12/2021. The ELISA Kit was used to detect serum omentin-1. A rapid quantitative assay HS-INSULIN-CHECK-1 is used to estimate the of insulin. The CRP-latex is a slide agglutination test for the quantitive and semi-quantitive detection of C-reacive protein (CRP) in human serum. in serum AST, ALT, ALP, Albumin Globulin, Total Protein, TG, TC and HDL tests were assessed using an Semi automated spectrophotometer (Humalyzer Primus).

Serum omentin-1 levels were higher in patients than in healthy subjects with significant differences ($p<0.05$). Serum levels of ALT , AST and CPR were increased significantly in

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patients compared with controls ($p<0.05$). The results ALP, LDL, albumin, total protein, insulin ,and globulin showed no significant increase($p>0.05$) in patients compared with controls. Serum cholesterol, TG and VLDL were significantly ($p<0.05$) elevated in patients in comparison to controls group, while HDL levels were decreased non significantly ($p>0.05$). Omentin-1 was positively correlated with cholesterol, TG, LDL, VLDL, insulin, ALP and globulin BMI. Serum omentin-1 concentrations were negatively correlated with HDL, ALT, AST, albumin and protein. All these correlations between serum omentin-1 and biochemical parameters were without significant different ($p>0.05$). The omentin-1 showed not significant association with the anthropometries measurements**.**

Keywords: Omentin-1, liver functions parameters, lipids profiles, C-RP and NAFLD**.**

علاقة الـ Omentin-1 وبعض العوامل الكيموحيوية في الدم بدالة كتلة الجسم في مرضى الكبد الدهني غير الكحولي

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الخلاصة

مرض الكبد الدهني غير الكحولي (NAFLD) هو حالة لزيادة الدهون في الكبد لدى الأفراد الذين لا يستهلكون كمية كبيرة من الكحول. هدفت الدراسة إلى تقدير Omentin-1، الأنسولين، aspartate aminotransferase (AST)، alanine aminotransferase (ALT)، alkaline phosphatase (ALk) ، الألبومين، الكلوبيولين، البروتين الكلي، CRP ، الدهون الثلاثية (TG) ، الكوليسترول الكلي (TC) ، البروتين الدهني عالي الكثافة (HDL) ، البروتين الدهني منخفض الكثافة (LDL) ، البروتين الدهني منخفض الكثافة جدًا (VLDL) في مصل مرضى NAFLD ، وبيان علاقة تغير مستوى كمية الـ omentin-1 وبعض العوامل الكيموحيوية مع مؤشر كتلة الجسم (BMI) في مرضى NAFLD مقارنة مع الأصحاء.

تم مشاركة تسعون شخصا في هذه الدراسة (60 مريضا بمرض الكبد الدهني غير الكحولي و 30 اصحاء) من مستشفى المقدادية العام في محافظة ديالى، العراق، خلال الفترة. 2021/10/1 إلى 2021/12/30. تم استخدام ELISA Kit لتقدير

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كمية الـ omentin-1في مصل الدم. يتم استخدام اختبار كمي سريع HS-INSULIN CHECK-1 لتقدير الأنسولين في مصل الدم. اختبار CRP-latex هو اختبار تراص الشرائح للكشف الكمي وشبه الكمي عن البروتين سي المتفاعل (CRP) في مصل الدم البشري. تم تقير كميات AST و ALT و ALP و Albumin Globulin و Total Protein و TG و TC و HDL في مصل الدم باستخدام مقياس الطيف الضوئي شبه الآلي (Humalyzer Primus).

كانت مستويات مصل omentin-1 أعلى في المرضى منها في الأشخاص الأصحاء مع وجود اختلافات معنوية (P <0.05). كما اثبتت النتائج وجود زيادة ذات قيمة معنوية في مستويات ALT و AST و CPR في المصل في المرضى مقارنة مع مجموعة التحكم (P <0.05). لم تظهر نتائج ALP و LDL والألبومين والبروتين الكلي والأنسولين والكلوبيولين زيادة ذات قيمة معنوية (p> 0.05) في المرضى مقارنة مع مجموعة التحكم. ارتفعت مستويات الكوليسترول في الدم ، TG و VLDL معنويا (p <0.05) في المرضى مقارنة بمجموعة التحكم ، بينما انخفضت مستويات HDL بشكل غير معنوي (p> 0.05). ارتبط Omentin-1 ارتباطًا إيجابيًا بالكوليسترول و TG و LDL و VLDL والأنسولين و ALP و BMI و globulin. ارتبطت تركيزات omentin-1 المصل ارتباطا سالبًا مع HDL و ALT و AST والألبومين والبروتين. كل هذه الارتباطات بين الـ omentin-1 والعوامل الكيوحيوية اعلاه كانت دون اختلاف ذو قيمة معنوية (p> 0.05). لم يكن لـ omentin-1 ارتباطات ذات قيمة معنوية بالقياسات الأنثروبومترية.

مستويات Omentin-1 زيادة ذات قيمة معنوية في مرضى NAFLD. ويزداد ارتفاع Omentin-1 بشكل ملحوظ مع زيادة مؤشر دالة كتلة الجسم BMI ، لذلك يكون هناك علاقة بين الارتفاع في omentin-1 ومرضى مرض الكبد الدهني غير الكحولي NAFLD وتزداد كمية Omentin-1 مع زيادة BMI لمرضى مرض الكبد الدهني غير الكحولي. omentin-1 . لذلك يمكن اعتبار الارتفاع في omentin-1 عامل ايجابي في تشخيص الـNAFLD وخصوصا في الاشخاص الذين لديهم بدانة ومصابين بمرض الكبد الدهني الغير كحولي . الـOmentin-1 يظهر علاقة ترابطية مع جميع العوامل المدروسة لكن بدون فروق معنوية (تحت الدراسة) الاخرى. يبدو أن Omentin-1 عامل حياتي مستقل في مرضى الـ NAFLD.

كلمات مفتاحية :

Introduction

Nonalcoholic fatty liver disease (NAFLD) is the most common liver disease worldwide [1]. NAFLD is an accumulate of triglycerides in the liver cells without damage to cells of liver for people who don’t consume significant amount of alcohol [2]. Fatty liver disease if not diagnosed in its primary stages will continue to cirrhosis of the liver and thus lead to death. Rottenly, NAFLD is linked with some other diseases such as diabetes, high blood pressure, obesity, metabolic syndrome and cardiovascular [3]. In NAFLD patients, insulin's ability to

limit glucose production is compromised, causing modest hyperglycemia, which promotes insulin secretion and leads to hyperinsulinemia. Fasting hyperglycemia and hyperinsulinemia are thus side effects of hepatic insulin resistance, and they are related to liver fat, even when BMI is not taken into account [4]. White adipose tissue (WAT) is found all throughout the body [5]. WAT is a secretory organ for particular chemicals with endocrine and paracrine [6]. Adipokines are tiny proteins substances released by adipocytes and are involved in the regulation of body weight. Adipokines such as resistin, Adipsin, Apelin, Omentin, RBP4 (retinol-binding protein 4), Vaspin and Visfatin are strongly linked to the activation of inflammatory processes [7, 8]. Adipokines are multiple regulatory proteins derived from adipose tissue with a diversity of local, peripheral and central functions [9]. Adipokines have an important role in fatty liver disease [10]. These adipokines are at different levels in patients with fatty liver disease compared to the control group. Omentin-1 is a hydrophilic 313 amino acid (35 kDa) adipokine , and appears in negative form as a glycated trimer with a molecular weight of 120 kDa [11] .Omentin-1 (also called intelectin-1) is a polypeptide hormone synthesized and secreted from visceral adipose tissue, these fatty tissues are located around the internal organs (liver, intestines, kidneys, etc) [12, 13]. Alteration of omentin-1 secretion has been associated with a number of chronic inflammatory diseases(14). Omentin-1 is increases insulin sensitivity and glucose uptake [15, 16]. Omentin-1 helps in the metabolism of fat [17]. The concentrations of glucose and insulin have an effect on the omentin-1 level [18,19]. The recent research has found that high or low levels of omentin-1 are associated with a wide range of chronic inflammatory disorders [20]. In this study we aimed to assess the levels of omentin-1 and some biochemical parameters in patients with non-alcoholic fatty liver disease compared to the control group, and we try to find if can use the alteration of omentin-1 as indicator in NAFLD patients.

Materials and Methods

Collection of Samples

Ninty (90) blood samples were collected for the time period from 1/10/2021 to 30/12/2021, at Al-Muqdudia General Hospital in Diyala Governorate. Sixty (60) samples of patients with

non-alcoholic fatty liver disease were collected after diagnosis by ultrasound by the specialist doctor, the number of males was (31) and females (29) within the age group is (30-69) years. The remaining (30) samples were collected from apparently healthy subjects of both sexes and used as a control group. The number of males was (15) and female (15) within the age group (30-69) who did not suffer from Non-alcoholic fatty liver disease, chronic disease nor from heart disease at the time of collecting the samples. The samples were collected by drawing venous blood, as (5 ml) of blood was withdrawn delete using plastic medical syringes. The drawn blood was placed in gel tubes and let to clot for 15-30mins, then the sera were separated by the centrifuge device for (5) minutes at a rate of (3000 rpm). The serum of each sample was divided into three parts; the first part used for estimation of Cholesterol, Triglyceride, HDL, CRP , AST, ALT, ALP, Albumin, Globulin, and Total Protein,; the second part used for insulin test; and the third part stored at -20℃ in deep freeze refrigerator until use(used for the omentin-1 ELISA analysis). Anthropometric measurements including age, weight, height, and waist. The Body Mass Index (BMI) is calculated delete using the equation of weight divided by the square of height.

Clinical laboratory analysis of groups

An ELISA kit was used to determine the quantities of omentin (Human comp. Germany). The kit is a sandwich enzyme-linked immune sorbent assay for in vitro quantitative measurement of Omentin-1 in human serum, plasma, tissue homogenates and other biological fluids. HS-INSULIN-CHECK-1 is a rapid quantitative assay for the detection of insulin in serum, was used to determination of insulin in the study. AST, ALT, ALP, Albumin, Globulin, and Total Protein were determined by use laboratory kits of Human Company(Germany). The serum TG, TC and HDL tests were assessed using an automated chemical analyzer COBS411, (Germany). LDL-C is calculated by the following equation: LDL-C = [TC] - [HDLDirect]-{[TG]/5}. VLDL-Cholesterol was estimated by using formula: VLDL-TC ={[TG]/5}

Ethical approval

Committee of Ethics in Al-Muqdudia General Hospital and Ethical Committee of University of Diyala gave their agreement to this study. All participants gave informed written agreement before the beginning of the study, and the research was done according to the Helsinki Declaration.

Statistical analysis

Statistical Packages for Social Sciences (SPSS) was used to conduct the statistical analysis (version 25). For numerical variables, the mean and standard deviation were used, and for categorical variables, the frequency/percentage was used. The significance of the difference between the typically numerical variables was further tested using an independent chi-square test and t-test. The significance level was chosen at $p<0.05$ and the Pearson correlation was determined using the t-test to examine the significance of correlation for the link between the two quantitative variables.

Results

Anthropometries of fatty liver patient groups and healthy subjects

The age of fatty liver patients group ranged (30-70) and the average of ages was (46.78 ±12.30) as shown in Table (1). The results demonstrated that non-alcoholic fatty liver disease increases with increase age for both gender , but this increase without significant differences ($P>0.05$), where the males are the most proportion of affected Non-alcoholic fatty liver patients.In regards to gender, patients were 53.3% male vs. 46.7% female. Respect to gender and age groups , the current results appeared the there is no significant differences ($P>0.05$) between gender and age groups with study groups. Based on body mass index levels, our results showed significant differences ($P\leq0.05$) among BMI levels among patients and healthy groups, it was found that the patients scored highest percentage within obese weight BMI (90.0%) compared to healthy that scored highest percentage within normal weight BMI (70.0%). Table (1) shows the above outcomes.

Table 1: Comparative Anthropometric Features of Participants Are Calculated By Chi-Square Test

PARAMETERS			GROUPS		TOTAL	P VALUE
			Patients	Healthy		
Gender	Male	N	32	15	47	p>0.05
		%	53.3%	50.0%	52.2%	
	Female	N	28	15	43	
		%	46.7%	50.0%	47.8%	
Age group (years)	30-39	N	15	18	39	p>0.05
		%	25.0%	60.0%	43.3%	
	40-49	N	13	6	19	
		%	21.7%	20.0%	21.1%	
	50-59	N	21	5	20	
		%	35.0%	16.7%	22.2%	
	60-70	N	11	1	12	
		%	18.3%	3.3%	13.3%	
BMI	Normal	N	6	21	15	P<0.05*
		%	10.0%	70.0%	16.7%	
	Obese	N	54	9	75	
		%	90.0%	30.0%	83.3%	

Relationship between age, body mass index (BMI) and waist in study groups

The present study shows significant differences (p<0.05) between personal characters (age, BMI, and waist) in study groups. The mean value of age, BMI, and waist were high in patients (46.78± 12.30, 31.79±5.72, and 108.33±16.48) respectively, than healthy (40.07 ± 10.05, 26.22 ± 5.57 , and 92.21 ± 11.41) as shown in table (2).

Table2: Relationship of Age, Bmi And Waist in Patients Compared to Control Group.

GROUPS		N	MEAN ± STD. DEVIATION	P VALUE
Age (years)	Patients	60	12.30 ± 46.78	p<0.05*
	Healthy	30	10.05 ± 40.07	
BMI (Kg/m2)	Patients	60	5.72 ± 31.79	P<0.05*
	Healthy	30	5.57 ± 26.22	
Waist (cm)	Patients	60	16.48 ± 108.33	p<0.05*
	Healthy	30	11.41 ± 92.21	

Comparison of age, body mass index and waist parameter according to BMI in study groups

The results of study illustrated that there is significant differences (p<0.05) between age and BMI waist parameter according to BMI levels of study groups. The mean value of age in obese

patients reached (46.50±12.23) a higher percentage than in Normal (49.33±13.78) than healthy. While the BMI in obese was (32.74±5.21) and at a higher level than in Normal (23.25±1.14) than healthy . where the waist in obese patients was (109.71±16.73) slightly higher than Normal (95.88±5.70) than healthy (table 3).

Table 3: Comparative Age, Bmi, and Waist Parameter According to Bmi in Studied Group

BMI		Patients	Healthy	P value
		Mean± SD	Mean± SD	
Age (years)	Normal	49.33±13.78	35.22±7.46	P<0.05* LSD=5.02
	Obese	46.50±12.23	42.14±10.45	
BMI (Kg/m2)	Normal	23.25±1.14	24.17±2.28	P<0.001*** LSD= 2.47
	Obese	32.74±5.21	28.81±4.41	
Waist (cm)	Normal	95.88±5.70	80.49±6.99	P<0.001*** LSD= 7.02
	Obese	109.71±16.73	97.23±8.99	

Comparative liver function parameters according to BMI of studied groups

The result of the current study shows there is significant differences (p<0.05) between ALT and AST parameter according to BMI levels of study groups. The mean value of ALT and AST parameter were highest for normal and obese patients (23.68±10.57 and 28.38±13.41, 26.62±6.20 and 31.64±11.17) respectively, than healthy. The ALK parameter show non-significant (p>0.05) between BMI levels of study groups table (4).

Table 4: Comparative Liver Function Parameter According To Bmi Of Study Groups Were Calculated By F Test

BMI		Patients	Healthy	P value
		Mean ± SD	Mean ± SD	
ALT (U/L)	Normal	23.68 ±10.57	16.06 ±5.19	P<0.001*** LSD= 6.41
	Obese	28.38 ±13.41	18.90 ±5.84	
AST (U/L)	Normal	26.62 ±6.20	21.27±3.24	P<0.001*** LSD=4.41
	Obese	31.64 ±11.17	23.82 ±7.80	
ALK (U/L)	Normal	176.20 ±28.58	187.11±45.19	p>0.05
	Obese	187.84 ±55.98	180.04±48.97	

Comparison of lipid profile parameters according to BMI of studied groups

The result of the current study shows there is significant differences ($p<0.05$) between cholesterol (TC), TG, and VLDL parameter according to BMI levels of study groups. The mean value of TC, TG, and VLDL parameter were highest for normal and obese patients (245.50±69.61 and 236.83±49.22, 369.50±145.88 and 334.07±153.67, 73.90±29.18 and 66.81±30.73) respectively, than healthy. The HDL and LDL parameter show non-significant ($p>0.05$) between BMI levels of study groups table (5).

Table 5: Comparative Lipid Profile Parameters According To Bmi Of Study Groups Were Calculated By F Test.

BMI		PATIENTS	HEALTHY	P VALUE
		Mean ± SD	Mean ± SD	
Cholesterol (mg/dl)	Normal	245.50 ± 69.61	185.67 ±30.77	P<0.001*** LSD= 21.30
	obese	236.83 ± 49.22	197.71 ±29.39	
TG (mg/dl)	Normal	369.50 ± 145.88	181.00 ±45.71	P<0.001*** LSD= 59.80
	obese	334.07 ± 153.67	203.86 ±39.57	
VLDL (mg/dl)	Normal	73.90 ± 29.18	37.04 ±10.31	P<0.05* LSD=12.55
	obese	66.81 ± 30.73	55.31 ±28.08	
HDL (mg/dl)	Normal	38.10 ± 4.47	41.90 ±5.46	p>0.05
	obese	36.96 ± 5.12	38.94 ±5.98	
LDL (mg/dl)	Normal	133.50 ± 50.83	106.72 ±31.30	p>0.05
	obese	132.18 ± 54.71	103.46 ±34.77	

Comparison RBS, insulin and omention-1 parameters according to BMI of studied groups

The result of the existing study shows there is no significant differences ($p>0.05$) between RBS, insulin parameter according to BMI levels of study groups. The mean value of omentin-1 parameter was highest for normal and obese patients (0.74±0.31 and 1.03±0.27) than healthy with significant differences ($p<0.05$) table (6).

Table 6: Comparative Rbs, Insulin, And Omentin-1 Parameters According To Bmi Of Study Groups Were Calculated By F Test.

BMI		Healthy	Healthy	P value
		Mean ± SD	Mean ± SD	
RBS (mg/dl)	Normal	134.65 ± 23.63	128.24 ± 20.46	P>0.05
	Obese	152.66± 82.35	166.86 ± 83.10	
Insulin (IU/ml)	Normal	25.52 ± 7.31	10.69 ± 4.14	p>0.05
	Obese	17.23 ± 4.64	19.12 ± 6.65	
Omentin-1 (ng/mL)	Normal	0.74 ± 0.31	0.26 ± 0.09	P<0.001*** LSD=0.17
	Obese	1.03 ± 0.27	0.42 ± 0.30	

Comparison of Protein , Globulin and Albumin according to BMI in studied groups

The result of the present study shows there is no significant differences (p>0.05) between Total proteins, globulin, Albumin parameter according to BMI of study groups table (7).

Table 7: Comparative Proteins, Globulin And Albumin Parameter With Bmi Of Study Groups Were Calculated By F Test.

BMI		Patients	Healthy	P value
		Mean± SD	Mean± SD	
Protein (g/dl)	Normal	0.08±7.92	0.21±7.92	p>0.05
	obese	0.18±7.93	0.22±7.83	
Globulin (g/dl)	Normal	0.50±4.65	0.28±4.06	P>0.05
	obese	0.71±4.62	0.48±4.25	
Albumin (g/dl)	Normal	0.43±3.27	0.19±3.87	p>0.05
	obese	0.67±3.31	0.37±3.58	

Comparison of C-Reactive protein in studied groups

The conducted study revealed significant difference (p<,0.05) between patients and healthy according to CRP. The CRP scored highest positivity (81.7%) in patients compared to healthy that scored low positivity (30.0%) table (8).

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Table 8: Comparative Crp Parameter Between Study Groups Were Calculated By Chi-Square Test.

CRP			Groups		P value
			Patients	Healthy	
CRP	Negative	N	11	21	P<0.001***
		%	18.3%	70.0%	
	Positive	N	49	9	
		%	81.7%	30.0%	

Correlation relationships among variables

Results of study showed that the omintin-1 not a significant correlation with all studied parameters. In contrast, ALT and AST showed high a significant positive correlation with each other (r= 0. 679**). Lipid profile have been significant correlation with each other. The correlation of studied parameters are shown in table (9) below.

Table 9: Correlation Relationships among Variables Are Calculated By Pearson Correlation Test

		ALT	AST	ALP	TC	TG	VLDL	HDL	LDL	Insulin	Omentin-1
Age (years)	R	-.457**	-.111	.072	-.138	-.094	-.094	.134	-.071	-.191	-.093
	P	.000	.396	.587	.292	.473	.473	.309	.592	.144	.481
ALT (U/L)	R	1	.679**	-.179	.082	.189	.189	-.034	-.042	-.080	-.034
	P		.000	.171	.532	.147	.147	.797	.753	.541	.799
AST (U/L)	R	.679**	1	.001	-.042	.167	.167	.088	-.157	-.135	-.047
	P	.000		.996	.751	.201	.201	.502	.232	.305	.723
ALP (U/L)	R	-.179	.001	1	-.181	.050	.050	.032	-.183	-.006	.246
	P	.171	.996		.168	.702	.702	.807	.162	.962	.058
Albumin (g/dl)	R	.322*	.244	-.195	.123	.072	.072	-.031	.074	.217	-.243
	P	.012	.061	.136	.350	.587	.587	.816	.573	.097	.061
TC (mg/dl)	R	.082	-.042	-.181	1	.290*	.290*	-.596**	.826**	.087	.046
	P	.532	.751	.168		.025	.025	.000	.000	.509	.730
TG (mg/dl)	R	.189	.167	.050	.290*	1	1.000**	-.204	-.285*	.084	.141

	P	.147	.201	.702	.025		0.000	.119	.027	.526	.283
VLDL (mg/dl)	R	.189	.167	.050	.290*	1.000**	1	-.204	-.285*	.084	.141
	P	.147	.201	.702	.025	0.000		.119	.027	.526	.283
HDL (mg/dl)	R	-.034	.088	.032	-.596**	-.204	-.204	1	-.528**	-.021	-.193
	P	.797	.502	.807	.000	.119	.119		.000	.872	.139
LDL (mg/dl)	R	-.042	-.157	-.183	.826**	-.285*	-.285*	-.528**	1	.044	.015
	P	.753	.232	.162	.000	.027	.027	.000		.737	.910
Protein (g/dl)	R	-.411**	-.163	-.124	-.048	-.050	-.050	.063	-.020	-.062	-.010
	P	.001	.213	.346	.716	.703	.703	.635	.879	.639	.939
Globulin (g/dl)	R	-.402**	-.268*	.153	-.127	-.079	-.079	.044	-.074	-.218	.226
	P	.001	.038	.244	.334	.546	.546	.738	.572	.094	.083
Insulin (IU/ml)	R	-.080	-.135	-.006	.087	.084	.084	-.021	.044	1	.023
	P	.541	.305	.962	.509	.526	.526	.872	.737		.864
BMI (Kg/m2)	R	-.092	.072	.154	.094	-.018	-.018	-.082	.109	-.110	.071
	P	.483	.585	.240	.476	.893	.893	.532	.406	.402	.591
WAIST	R	-.221	.040	.023	.039	-.050	-.050	-.032	.074	-.106	.000
(cm)	P	.089	.762	.862	.767	.703	703	.809	.574	.422	.997

Discussion

The results of the study demonstrated that non-alcoholic fatty liver disease increases with increasing age for both genders. The results were agreed with the results of Can et al., Frith J et al., and Shima et al, studies which showed that age is closely related to the development of non-alcoholic fatty liver disease [21-23].

Based on body mass index levels, the results showed significant differences ($P \leq 0.05$) among BMI levels between patients and healthy group and the average of BMI reached (31.79 ± 5.72) (26.22 ± 5.57)respectively, it was found that the patients scored highest percentage within obese weight BMI (90.0%) compared to healthy that scored highest percentage within normal weight BMI (70.0 %). This results agree with the study of Hamaguchi et al,. as well as the study of Fabbrini et al. Which showed a strong association between BMI and non-alcoholic fatty liver disease. The studies showed that the obesity increases the risk of developing non-alcoholic fatty

liver disease when the rate of fatty acid synthesis is greater than its oxidation and excretion (11,12). People with a body mass index higher than normal are more likely to have high blood pressure and non-alcoholic fatty liver disease. High body mass index can leads to metabolic disturbances and cardiovascular disease and increase risk of death (13).

comparing the mean waist of fatty liver patients (108.33 ± 16.48) with mean waist of control group (92.21 ± 1.41) shows significant difference ($P<0.05$), indicating an increase in the circumference of waist in patients with fatty liver. As shown in Tables (2,3). The results Are in agreement with the several previous studies of Zheng et al., Guaraldi et al., Wong et al., and Cerbere et al., which showed a close association between waist circumference and non-alcoholic fatty liver disease, and that patients with fatty liver disease have significant higher waist circumference compared to the control group (14-16,24). The reason for the increase in the green circumference of postmenopausal women may be due to hormonal changes as well as disorders in metabolism and fat accumulation within tissues. Anesthesia as a result of a low level of estrogen, which has a role in reducing the incidence of non-alcoholic fatty liver disease [24].

The results of the present study shows there is significant increase ($p<0.05$) between ALT and AST parameter according to BMI levels of study groups, while the ALK showed non-significant ($p>0.05$) increases between BMI levels of study groups. Bazick et al,. showed that Alkaline phosphatase increased in patients with fatty liver and cirrhosis [25]. The results of study agree with the results of Ali et al,. study which showed that Alkaline phosphatase is used as an independent biomarker for cirrhosis of the liver as well as for non-alcoholic fatty liver disease in obese people [26]. Numerous previous studies showed that liver enzymes are elevated in patients with high body mass index and non-alcoholic fatty liver disease [27-29].

The result of the current study shows there is significant differences ($p<0.05$) between cholesterol (TC), TG, and VLDL parameter according to BMI levels of study groups. The HDL and LDL parameters presented non-significant differences ($p>0.05$) between BMI levels of study groups. Study of Khamseh et al,. revealed a high association between triglycerides and non-alcoholic fatty liver disease [30]. Another study of Altparmak.et al., recorded that patients with liver disease have a higher cholesterol level compared to the control group [31]. The results

of exciting study agree with the study of Mirhafez et al ,.and Al-Hussein et al ,. as well as the study Sabry et al., that encoding of high-density lipoprotein is decreased in the metabolism of the fatty liver compared to the control group [32-34]. The results of Adiels et al,. study exhibited that very low-density lipoprotein has a strong association with non-alcoholic fatty liver disease [35]. The study of Tutunchi et al., displayed that the lipid profile is strongly linked with fatty liver disease, because the increase in the lipid profile increases cardiovascular disease, and this is the main cause of death among non-alcoholic fatty liver patients [36]. Also, Agrawal et al., showed in their study that the patients who suffer from obesity are more susceptible to non-alcoholic fatty liver disease, as they have an increase in the level of TG, cholesterol, LDL, and a decrease in the level of HDL [37].

The result of the existing study shows there is no significant differences ($p>0.05$) between RBS and insulin parameters according to BMI levels of study groups, the blood sugar level increases the risk of developing non-alcoholic fatty liver disease [38,39], study which showed that insulin resistance is closely related to non-alcoholic fatty liver disease [40,41]. low levels of insulin hormone indicate the development of fibrosis of the liver [42],while the value of omentin-1 parameter was highest with significant differences ($p<0.05$)for normal and obese patients compared with healthy. The results agreed with the study of Yimaz et al,. which showed increases the concentration of omentin-1 in the serum of patients with non-alcoholic fatty liver disease. This study showed a correlation in the level of omentin-1 and nonalcoholic fatty liver disease. It was also considered that omentin-1 is an independent indicator of hepatocyte hypertrophy [(43]. The results of Eisinger et al,. study showed that omentin-1 levels are higher in patients with cirrhosis of the liver compared to the control group [44]. Montazerifar et al., exposed that omentin-1 can be considered as a preventive factor in the occurrence of non-alcoholic fatty liver disease, especially in people with central obesity [45]. The results of the study do not match the study Alizadeh et al ,. which showed that the level of omentin-1 is lower in overweight and obese individuals compared to normal weight individuals [46].The results of Turrkan et al,. study displayed that omentin-1 levels are decreased in obese adolescents regardless of the presence of nonalcoholic fatty liver disease [47]. The results of the study are not the same as the study Jimber et al,. which showed that total Protein level is higher in patients

with cirrhosis of the liver compared to the control group [48]. that the level of Albumin that showed that encoding of high-density lipoprotein is decreased in the metabolism of the fatty liver compared to the control group [49]. Which showed that the concentration of Albumin is a new biomarker for early liver cirrhosis and disease progression in NAFLD [43].

The results of CRP are comparable to a study by Foroughi et al., and consistent with study of Cardoso et al., which observed that CRP is significantly associated with nonalcoholic fatty liver disease [50,51] . CRP is mainly produced in the liver, but it appears that it is also produced in adipose tissue. In addition, adipose tissue can act as an endocrine organ, secreting some inflammatory cytokines such as interleukin (IL)-6, thereby stimulating the liver to produce CRP. Overall, obesity appears to be one of the strongest determinants of serum CRP levels [52].

Conclusion

This study concluded that the level of omentin-1 increases significantly in NAFLD patients. The level of omentin-1 increased significantly with the increase of the body mass index of NAFLD patients, suggesting that the elevation of omentin-1 is associated with NAFLD and increases with increase BMI of patients of NAFLD. Therefore, the elevation omentin-1 can be considered as a positive indicator for the diagnosis of NAFLD especially in obese NAFLD patients.. Omentin-1 was the most effective parameter, but omentin-1 was not significantly ($P>0.05$) correlated with the parameters, lipid profile and other parameters studied in NAFLD. Omentin-1 appears to be an independent biomarker in NAFLD patients.

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