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Evaluates the Nutritional Status of Adult Patients with Nonalcoholic Fatty Liver Disease, Cross-Sectional Study

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ABSTRACT:

Nonalcoholic Fatty liver disease (NAFLD) can be harmful to the body to varying degrees, and over a prolonged period, patients may develop steatotic cirrhosis or even develop liver cancer. The objective was to evaluate the nutritional status of patients with nonalcoholic fatty liver in Tamiya General Hospital. A total of 200 participants (100 females and 100 males) were involved in this study, with a range of ages 40-55 years. Body weight and body fat were assessed. The mean value of regular food intake was estimated through a 24-hour recall for three days. Also, vital biochemical parameters were determined (i.e., albumin, total bilirubin, triglyceride, liver enzymes, cholesterol, creatinine, and hemoglobin). Results showed that the weighted excess, by the body mass index and excess of abdominal fat, was associated with NAFLD ($p \leq 0.05$). A positive profile was found with the diet component, especially the energetic component. Females significantly had factors that caused NAFLD than the men group. Increasing the mean levels of tested biochemical parameters except for hemoglobin, albumin, and High-Density lipoprotein (HDL). For that, it could be concluded that the studied group presents a health risk situation, considering the nutritional status markers. The regular diet appeared to be inadequate, showing excess sodium, low fiber, and high caloric component intake. From that, NAFLD led to an increasing lipid profile, liver enzymes, and some kidney functions, which were linked with obesity, hyperinsulinemia, peripheral insulin resistance, diabetes mellitus, dyslipidemia, and high blood pressure.

Keywords: *NAFLD, biochemical parameters, 24recall, anthropometric measurements*

INTRODUCTION

Nonalcoholic Fatty liver disease (NAFLD) represents the most common liver disorder in Western countries, with 17–46% prevalence among adults. In Egypt, the prevalence of NAFLD is rising owing to rising prevalence of obesity. NAFLD was found in 57.65% of a cohort of obese Egyptian adolescents. NAFLD is a chronic broad-spectrum clinical syndrome that starts from simple hepatic steatosis and can gradually develop into nonalcoholic

steatohepatitis and finally develop into liver cirrhosis and even hepatocellular carcinoma [1,2]. Studies have found that NAFLD patients tend to be obese, have insulin resistance, type 2 diabetes, dyslipidemia, hyperglycemia three hyperemia, hyperuricemia, polycystic ovary syndrome and hypertension, which are also risk factors for cardiovascular diseases. There are several causes that may trigger or aggravate the development of NAFLD, including hepatitis C infection, drugs, hypothyroidism and others, which are termed as secondary NAFLD. NAFLD is estimated to affect up to 70%–90% of people with either obesity or type 2 diabetes (T2DM] [3]. Within the next decade, NAFLD is expected to surpass hepatitis C as the number one cause for liver transplantation A combination of genetic and environmental factors contributes to the development of this disease. NAFLD is the most common cause of liver function enzymatic abnormalities and chronic liver disease. It is a common clinical cause of abnormal liver function or chronic liver disease [4] NAFLD is often very mild in its early stage, but it is very harmful. About 80.0% of NAFLD is simple fatty liver, most of which are found during physical examination, and the symptoms are relatively mild, because they are not specific, so they are ignored by people. If the disease is further aggravated, severe types of steatohepatitis can occur, and these patients will have chronic hepatitis manifestations such as liver pain, abdominal distension, fatigue, and poor appetite. This condition progresses to the intermediate stage of liver cirrhosis and hepatocellular carcinoma [5].

Clinically, NAFLD is a silent disease. The symptoms, when present, are hardly related with the seriousness of the condition and may suggest other affections. The most common clinic findings are fatigue, right chest pain, hepatomegaly, obesity and acanthosis. Some biochemical exams may be useful in the diagnosis, such as measuring out alanine-aminotransferase (ALT), aspartate-aminotransferase (AST), calculating the AST/ALT rate, gamma-glutamyl-transpeptidase (**γ**-GT), alkaline phosphatase, prothrombin time, albumin and bilirubin. Nevertheless, the advanced liver disease may show normal or altered hepatic enzyme levels from 1.5 to 3 times over the reference limits. Also, High body mass index (BMI) and waist circumference (WC) have positive associations with NAFLD. [6,7,8]

Dietary patterns rich in sugar and fat such as red meat, fast food, sweets, refined grains, and soft drinks had a positive association with the risk of NAFLD. However, modification the dietary pattern, is one of the most important factors in preventing and treating NAFLD, by balanced diet (Food groups which are rich in antioxidants, vitamins, minerals, n-3 PUFA, and dietary fiber), frequent meals and late-evening snack, alcohol withdrawal, oral nutritional supplements

(complete formulas), artificial nutrition (enteral nutrition as first choice). [9,10,11]

The primary objective of this study was to assess the correlation between NAFLD and dietary components and to examine their impact on anthropometric indices and selected biochemical markers within a specific cohort of patients with fatty liver who sought treatment at Tamiya General Hospital.

SUBJECTS AND METHODS

SUBJECTS

Descriptive research design was utilized in this study. The study was conducted in the Tamiya General Hospital from January 2021 to May 2021. Random two hundred adult patients (100 female and 100 male), patient's age from 40 years to 50 years. The following inclusion criteria were used: Fatty liver based on clinical symptoms, imaging studies, and transient elastography and no extrahepatic, acute, or chronic disease affecting the nutritional status. The diagnosis was established based on clinical data, imaging, and laboratory results [12]. Patient assessment sheet was developed by the researcher after reviewing of literature; it consisted of three parts: Part (1): Socio-demographic characteristics, Part (2): Anthropometric measurements, Part (3): Biochemical measurements.

METHODS

The patient was interviewed weekly and followed up at the Nutrition Clinic at Tamiya General Hospital for 5 months. Data was collected from patients using a predesigned structured questionnaire (13)

Socio-demographic data: Including sex, marital status, job, level of education, residence. (14)

Anthropometric assessment: Including body weight and body height which were measured in kg and cm using beam balance (Beurer BG42] scale by bioelectric impedance technique with minimum clothing without shoes, reading we taken to the nearest 0.5 kg(15]. Body Mass Index (BMI) was calculated according to the following equation, weight in (kg) / height in metre2 (kg/m2). The participant was considered underweight when BMI <18.5kg/m2, normal weight when BMI was 18.5-24.9kg/m2, overweight when BMI >25-29.9kg/m2 , obese class 1 when BMI was 30-34.9kg/m2, obese class 2 when BMI was 35- 39.9kg/m2 and morbid obese when BMI was ≥ 40kg/m2 [16].Body composition: Body fat percentage was documented before treatment and after treatment using bioelectric impedance analysis In Body 170 [17]. The waist circumference (WC) was measured [18].

Dietary assessment: The 24-hour recall method was used to recall the amounts of foods and beverages (in household measures) consumed in the past 24 hours (in household measures). All foods and drinks were converted into grams. The 24-hour recall was used for three consecutive days. [19]

Biochemical analysis: Serum samples were analyzed for the determination of the following parameters: Triglycerides, total cholesterol, and high-density lipoprotein (HDLc) according to the methods given by Fassati and Principe [20]; Allain [21] and Lopez, [22] respectively. Meanwhile, very low-density lipoprotein (VLDL-c) and Low-density lipoprotein (LDL-c) were calculated by equations given by Lee and Nieman [23]. Albumin (Alb) and creatinine were determined by methods given by Srivastava et al. [24] and Henry [25] respectively. The serum iron (Fe) and calcium (Ca) were determined according to methods described in Nicoli and Diana [26]. The aspartate amino transaminase (AST), alanine aminotransferase (ALT), and alkaline phosphatase (ALP) were determined by the methods of Reitman and Frankel [27] and I.F.C.C [28] respectively. Finally, hemoglobin and total bilirubin concentrations were determined using methods of Drabkin [29] and Robinson [30] respectively.

Statistical analysis of data: The statistical package for social sciences (SPSS version 17.0] 28 was used to analyze collected data. Results were expressed as the arithmetic mean and standard deviation (SD). Also, the frequency distribution and percentage were used for string variables. An independent sample t-test determined the significant level between males and females; the differences were considered significant at $P<0.05$ or less [31].

RESULTS AND DISCUSSION

In table (1 and 2), the majority of the study groups (female and male) were married, read and write, worker for male and housewife for female ,from rural areas and their age 45.06±3.95 as a mean±SD for male and 45.72±7.09 for female with nonsignificant differences. The mean values of monthly income were 2850.76±12.97 EGP for male and 2730.87±20.87 for female with significant differences and the amount of money as mean values which spend on food were 1250±10.87 EGP for male and 750±13.93 EGP for female with significant differences. With aging, the function of mitochondria decreases, and if it is accompanied by metabolic syndromes and fatty liver which were increased. NAFLD and progressive liver disease. data showed that long working hours are associated with higher odds of NAFLD in workers without previous liver disease or heavy alcohol drinking habits. Excessive working hours pose a serious danger to the health of workers. Concerns about the health status of workers are increasing, as many negative effects of long working hours are continuously being reported. As regard the level of education, the majority were read and write [32,33]. These findings are consistent with Sharif, [34] who reported that more than half of the study patients were read and write. In relation to patient's residence, the results of the present study agreed with study by Chalasani et al., [35]. who reported that, in Egypt, liver diseases were more

common in rural than urban regions because rural regions presented a suitable environment for unhealthy food and chronic disease as diabetes and obesity.

Table (1): Mean values and standard division of age, monthly income and the money spend on food of studied patients (n=200)

Variable	Male (n=100) Mean±SD	Female (n=100) Mean±SD
Age	45.06±3.95 a	45.72±7.09 a
Monthly income (EGP)	2850.76±12.97 a	2730.87±20.87
Money spend on food(EGP)	1250±10.87	750±13.93

All results are expressed as mean ± SD. The differences were considered significant at P<0.05 or less

Table (2):Frequency distribution of studied patients (n=200) according to socio-demographic characteristics

Socio-demographic characteristics	Male (n=100)		Female (n=100)	
	Frequency	Percentage	Frequency	Percentage
Marital Status				
Single	0	0.0	0	0.0
Married	89	89.0	67	67.0
Widow	11	11.0	33	33.0
Level of education				
Illiterate	22	22.0	35	35.0
Read and write	36	36.0	39	39.0
Basic education	11	11.0	15	15.0
Secondary/ deplume	21	21.0	11	11.0
University	10	10.0	0	0.0
Job status				
Housewife	0	0.0	47	47.0
Worker	43	43.0	23	23.0
Farmer	22	22.0	11	11.0
Unemployed	0	0.0	3	3.0
Retired	02	2.0	1	1.0
Employee	33	33.0	15	15.0
Residence				
Urban	23	23.0	15	15.0
Rural	77	77.0	85	85.0

Table (3) Clarifies the mean value of anthropometric measurements of male and female patients with fatty liver. Female patients had higher than male patients in weight, WC and body fat while it is lower than male patients in height. Among the main findings of the present study, the significance of both waist circumference and body fat as markers of fatty liver. Both waist circumference and

body fat are indirect anthropometric markers which usually correlated with the volume of visceral fat [36]. BMI is the most widely anthropometric marker in daily clinical practice which was significant only among individuals with steatohepatitis. From the obtained results, both of gender patients presented weighted excess, according to the BMI categorized by Lipschitz [37], with worst situation among women. The results of this research coincide with Arns et al., [38] study, who reported that most of the male presented overweight (31.75%) and female resented more prevalence of overweight/obesity. The prevalence of high waist circumference values was detected, mainly in female as 57.5%, and 40.8% for male and this led to complicate aging, contribute to the emerging of dyslipidemias, heart diseases, type 2diabetes mellitus and high blood pressure.

Table (3): Anthropometric indicator of studied patients (n=200).

Anthropometric indicator	Male (n=100) Mean±SD	Female (n=100) Mean±SD
Weight (kg)	91.76±8.95 b	98.79±5.23 a
Height (cm)	169.65±10.23 a	159.43±9.23 b
Body Mass index (BMI)	31.75±3.06 b	38.59±7.91 a
Waist circumference(cm)	112.45±10.43 b	128.93±8.44 a
Body fat(%)	32.89±4.71 b	39.81±6.02 a

All results are expressed as mean ± SD. The differences were considered significant at P<0.05 or less

This table, Table 4, shows that the most common nutrients lower than the daily references intake for both groups except protein, fat, carbohydrates, total calories, sodium, saturated fatty acid and cholesterol while P, Se recorded higher mean value in male than female. Male had high mean values of nutrients as compared with female group except in fat, Mg, vitamins B1&2, saturated fatty acid and cholesterol. The nutritional status findings concern, because it shows a high weighted excess and body fat, with accumulation of abdominal fat, which are risk factors for chronic diseases such as lipidemia, heart diseases, type 2 diabetes mellitus and high blood pressure. Regarding to the dietary intake found in the population studied, it was observed that a majority of two groups presented a high average consumption of calories (about 105 and 123% for male and female respectively). Considering the percentages of energetic contribution of carbohydrates, proteins and lipids that were about 62%, 10% and 28% respectively and comparing such distribution with the dietary pattern of Brazilian population that presented 59.0%, 12.0% and 29.0% respectively for carbohydrates, proteins and lipids, it could be observed a nearly in the above

nutrient's percentage. The same classification is maintained when considering sex [39] refer that the regular diet of NAFLD patients is associated with an unhealthy dietary pattern, similar to the occidental dietary pattern, which is characterized by the elevated consumption of fructose, sweet beverages, meat, saturated fat and cholesterol and low consumption of fibers, fish, Omega 3, poly unsaturated fat and some vitamins, which could indicate an undertake of vegetables. It is important to point out the elevated sodium intake, with a daily average of 4.2g; higher than the patterns of the Dietary Guide, which establishes 2.4g/day. This high sodium intake was also found in national studies carried out with this age range and also with other age ranges. Nevertheless, this is an important finding in the age range evaluated, considering this is a hypertensive population, which could increase the risk of complications associated to this disease [40,41].

Table (4): Daily dietary intake of studied patients (n=200).

Nutrients	Male (n=100) Mean±SD	*%DRI	Female (n=100) Mean±SD	*%DRI
Protein (g)	70.87±13.87 a	126.55	61.34±3.86 b	133.35
Fat (g)	85.76±9.56 b	130.93	90.11±4.86 a	160.01
Carbohydrates (g)	411.56±17.76 a	167.98	353.08±12.86 b	156.92
Total calorie Kcal	2701.56±23.65 a	105.34	2468.67±9.04 b	123.43
Fiber (g)	10.07±2.74 b	43.78	12.94±2.93 a	51.76
Sodium (mg)	3785.76±22.98 a	164.59	3315.08±7.91 b	144.13
Potassium (mg)	1783.63±15.87 a	68.60	1467.78±15.87 b	56.54
Calcium (mg)	592.71±8.92 a	59.27	486.72±2.96 b	40.56
Phosphorous (mg)	823.43±6.03 a	117.63	611.95±2.75 b	87.42
Magnesium (mg)	201.86±11.75 b	64.05	223.84±6.82 a	69.95
Iron (mg)	15.59±2.05 a	75.64	13.34±0.94 b	69.5
Zinc (mg)	9.85±1.04 a	89.54	6.33±0.45 b	79.13
Cobber mcg	1.09±0.03 a	77.85	0.94±0.11 b	85.45
Vit.Amcg	753.22±18.92 a	83.69	543.05±5.34 b	77.58
Vit.C mg	41.80±3.76 a	54.77	37.92±6,01 b	50.56
Vit. B1(mg)	0.77±0.11 b	32.08	0.82±0.07 a	74.54
Vit.B2(mg)	0.66±0.04 b	60.001	0.72±0.04 a	65.45
Cholesterol (mg)	276.02±17.54 b	138.01	299.38±17.54 a	149.69

All results are expressed as mean ± SD. The differences were considered significant at P<0.05 or less. DRI: Dietary references intake.
** Dietary Reference Intake*

Table (5) shows that both of male and female patients had low value in serum hemoglobin, albumin and HDL-c and had higher values in other serum biochemical parameters. Sahar et al. [42] observed that, among Chinese women, fatty liver disease had strong relationship with high levels of triglycerides and low levels of

HDL and decline in serum albumin concentration is a predictor of serious events in nonalcoholic fatty liver disease. Cross-sectional study shows that serum bilirubin levels are inversely associated with NAFLD and the serum calcium can reach very high levels. The most common abnormal laboratory test results are elevated alanine transaminase (ALT) and aspartate transaminase (AST), usually one to four times the upper limits of normal. Also, circulating hemoglobin (Hb) concentration is significantly lower in people with NAFLD, compared to healthy patients [43,44, 45].

Table (5) Biochemical measurements of studied patients (n=200).

Biochemical measurements	Male (n=100)			Female (n=100)		
	Mean ±SD	Normal range	% Normal	Mean ±SD	Normal range	% Normal
Albumin (g/dl)	2.54±0.86 a	3.4 -5.4	57.72	2.35±0.45 b	3.4 -5.4	53.41
Total bilirubin (mg/dl)	1.95±0.07 b	0.1 - 1.2	162.5	2.15±0.32 a	0.1 - 1.2	179.16
Serum calcium (mg/dl)	15.76±2.37 b	8.7-10.2	150.09	13.86±0.12 a	8.7-10.2	132.01
Creatinine (mg/dl)	1.53±0.64 b	0.7 - 1.3	117.69	1.62±0.24 a	0.6 - 1.1	147.27
ALT (IU/L)	57.54±5.81 b	29 - 33	143.85	62.54±7.32 a	19 -25	156.35
AST (U/L)	65.93±5.04 b	14 - 20	164.82	79.65±8.44 a	10 - 36	199.13
ALP (U/L)	165.32±6.94 a	44 - 147	112.46	159.04±11.93 b	44 -147	108.19
Serum iron (mcg/dl)	120.56±4.92 a	70 - 175	104.83	114.86±6.34 b	50 - 170	102.55
Hemoglobin (g/dl)	12.34±2.65 a	14 - 18	77.13	10.43±4.85 b	12 - 16	74.50
Total cholesterol (mg/dl)	298.67±10.65 b	below200	150.67	301.94±20.75 a	below200	155.63
Triglycerides (mg/dl)	289.45±17.84a	40-160	192.96	293.56±21.87 a	35-135	195.70
LDL-c(mg/dl)	205.06±22.75 b	below130	205.06	211.48±15.83 b	below130	211.48
VLDL-c(mg/dl)	57.89±5.63 a	2 - 30	289.45	58.71±8.11 a	2 - 30	293.55
HDL. -c(mg/dl)	35.72±6.22 a	above 40	89.3	31.75±7.73 b	above 50	79.38

All results are expressed as mean ± SD. The differences were considered significant at P<0.05 or less. AST: Aspartate aminotransaminase, ALT: Alanine aminotransferase, ALP: alkaline phosphatase, LDL-c: Low density lipoprotein cholesterol, VLDL-c: Very low-density lipoprotein cholesterol, HDL-c: high density lipoprotein cholesterol

CONCLUSION

From the obtained results , it could be concluded that the diet for fatty liver disease should be included high fiber like fruits, vegetables, legumes and whole grains, reducing intake of beverages including those high in added sugar, salt, refined carbohydrates, and saturated fat . Replace saturated fats with healthier unsaturated fats, like those in fish, flaxseeds, and walnuts

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التغذية وعلوم الاطعمة

تقييم الحالة الغذائية لمرضى الكبد الدهنى اللاكحولى

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الملخص العربى:

مرض الكبد الدهنى اللاكحولى يمكن أن يكون ضارًا للجسم بدرجات متفاوتة ، وعلى مدى فترة طويلة ، قد يصاب المرضى بتليف الكبد أو حتى يصابوا بسرطان الكبد بسبب تليف الكبد. كان الهدف هو تقييم الحالة الغذائية لمرضى التدهن الكبدى فى مستشفى طامية العام. شارك 200مريض (100 أنثى و 100 ذكر) فى هذه الدراسة ، تراوحت أعمارهم بين 40-55 سنة ،خلال الفترة من يناير 2021 إلى مايو 2021. تم إجراء تقييم القياسات الجسميه وتقييم الدهون فى الجسم. تم تقدير متوسط قيمة المأخوذ الغذائى اليومى من خلال استبيان مدته 24 ساعة لمدة3 أيام. كما تم قياس بعض المتغيرات البيوكيميائية مثل الألبومين ، البيليروبين الكلى ، الدهون الثلاثية ، الكوليسترول ، الكرياتينين ، الهيموجلوبين إلخ. وأظهرت النتائج أن هناك زيادة فى مؤشر كتلة الجسم ودهون البطن الزائدة فى مرضى الكبد الدهنى غير الكحولى بفروق معنويه خلال الفئتين،هناك تزايد العناصر الغذائية المعطية للطاقة لهؤلاء المرضى .كانت الاناث لديها العوامل التى تسبب مرض الكبد الدهنى غير الكحولي معنويا عن مجموعة الرجال. زيادة متوسط مستويات القياسات البيوكيميائية المختبرة باستثناء الهيموجلوبين و الألبومين و الكوليسترول عالى الكثافه. لذلك ، يمكن التوصل الى أن المجموعة موضع الدراسة تمثل حالة خطر صحيا ، مع الأخذ فى الاعتبار مؤشرات الحالة التغذوية. حيث بدا أن النظام الغذائي المتناول غير كافٍ ، حيث أظهر زيادة فى الصوديوم وانخفاض الألياف ومكونات عالية من السعرات الحرارية. و أدى الكبد الدهنى الغير كحولى إلى زيادة مستوى الدهون وأنزيمات الكبد وبعض وظائف الكلى التى ارتبطت بالسمنة وفرط أنسولين الدم ومقاومة الأنسولين المحيطية وداء السكري وخلل الدهون وارتفاع ضغط الدم.

الكلمات الكاشفة: التدهن الكبدى-القياسات البيوكيميائية- استرجاع 24 ساعة- المقاييس الجسمانية