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Original Research Article

Prevalence of Non Alcoholic Fatty Liver Diseases in General Population, Khartoum –Sudan

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Abstract

Study of the prevalence of NAFLD and identifying its risk factors would be critically important due to the spread of these diseases worldwide. But, the prevalence of NAFLD in Sudan remains uncertain, due to lack of studies and there are no national surveys have been conducted, for that this study conducted to determine the prevalence of and factors associated with NAFLD with Sudanese populations using unenhanced CT scans as diagnostic tools. About 292 adult participants aged 18 ~ 88 years old, were enrolled in this study. The participants were selected from patients that scheduled to undergo abdominal CT scan. .the following information was collected for each patient on a well-structured questionnaire including sex, age, height; body weight (WT), BMI, Waist circumference, medical history and abdominal CT scan. Those who had a history of alcohol consumption, hepatic mass, viral hepatitis and liver cirrhosis, were excluded. Liver-to-spleen ratio (L/S) <1.0 was used to diagnose the presence of liver fat. The overall prevalence of nonalcoholic fatty liver in this study was (43) 14.7%. There was no prevalent difference between males and females (15.5 vs 14 %). Nonalcoholic fatty liver in our population was 24.2% in obese participants (BMI >30), 20.4% and 10.3% in hypertensive and diabetic participants, respectively. Patient with NAFLD were older than other (P=0. 022) and there is a significant relation between body weight and NAFLD (p=. 031).

Keywords: Prevalence, Risk factors, Nonalcoholic fatty liver, computed tomography, liver to spleen ratio.

INTRODUCTION

Nonalcoholic fatty liver disease (NAFLD) is defined as the presence of fat in the liver (hepatic steatosis) either on imaging or on liver histology after the exclusion of secondary causes of fat accumulation in the liver (e.g., significant alcohol consumption, certain medications, and other medical conditions) [1]. NAFLD comprises a wide spectrum of liver damage, ranging from simple macrovesicular steatosis to steatohepatitis, advanced fibrosis, and cirrhosis [2]. Subsets of NAFLD which progress to cirrhosis are being increasingly recognized as a major cause of liver-related morbidity and mortality with the potential to progress to liver failure. Significant research endeavors are being directed toward understanding the pathogenesis of NAFLD and designing therapeutic strategies [3]. NAFLD often has no symptoms and In the majority of patients, NAFLD is associated with metabolic risk factors such as obesity, diabetes mellitus, and dyslipidemia [4]. The reported prevalence of NAFLD when defined by liver ultrasound ranged between 17% and 46% depending on the population studied [5] .and is as high as 57.5% to 74% in those who are obese [2]. In Sudan, there is lack in the study, there are two studies and the prevalence has been reported to be 15% to 20% [6, 7]. The main aim of this study was to determine the prevalence of NAFLD and its risk factors in a sample of adult Sudanese in Khartoum (capital of Sudan).

Liver biopsy and histological analysis is considered the diagnostic reference standard for the assessment of fatty liver. However, fatty liver also can be diagnosed with the use of cross-sectional imaging [8]. Imaging studies like computed tomography (CT), magnetic resonance imaging and ultrasonography can show characteristic features of fatty liver [9]. CT scans have proven to be useful in diagnosing the presence and quantifying the severity of liver fat noninvasively. The Hounsfield Unit (HU) attenuation of liver on CT scans is usually higher than the spleen; when this ratio is reversed, this can be used to diagnose the presence of liver fat [10]. Liver-to-spleen ratio (L/S) <1.0 can be used effectively to diagnose the presence of liver fat [11, 12]. Studies have also shown liver HU attenuation <40 HU to reliably represent >30% of liver fat content [13].

MATERIALS AND METHODS

A prospective, cross-sectional study was conducted at Alneelain and Antaya medical centers in Khartoum, Sudan during the period from January 2016 to April 2018. The study was approved by the Research Ethics Committee of the Research council, college of medical radiological a science Verbal consent was obtained from all participants. About 292 adult participants, aged 18 ~ 88 years old, were enrolled in the study the participants were selected from patients that scheduled to undergo a CT scan of the abdomen. The following information was collected for each patient on a well-structured questionnaire including sex, age, height; body weight (WT), BMI, Waist circumference, medical history, medical history and abdominal CT scan. Weight, standing height and waist circumference (WC) were measured in a standardized fashion. WC measurement was made midway between the last rib and the iliac crest. The standing height and WC measurement were made at minimal inspiration to the nearest 0.1cm. Body mass index was calculated by dividing weight in kilograms by height in meters squared .Participants who reported current use of anti-hypertension or anti-diabetes medications were regarded as having hypertension or diabetes, respectively. Those who had a history of alcohol consumption, hepatic mass, viral hepatitis and liver cirrhosis, were excluded. Unenhanced CT was conducted on each patient.

Unenhanced CT (80 kV, 100 mAs, collimation of 128 × 0.625, 10-mm section thickness) is performed. For each case, the hepatic attenuation is measured by means of a random selection of circular regions of interest (ROIs) on both lobes. For each ROI, the largest possible ROI is selected by avoiding areas of visible hepatic vascular and biliary structures. ROIs may range from 200 to 400 mm^2. The ROI values are averaged as a mean hepatic attenuation. To provide an internal control, the mean splenic attenuation is also calculated by random large ROI values of splenic attenuation measurement. The largest possible ROI is selected to represent splenic parenchymal attenuation. The liver spleen ratio (L/S) is derived from the difference between mean hepatic attenuation and mean splenic attenuation and can be used as a parameter for prediction of the degree of macrovesicular steatosis.

Statistical analyses were performed using the SPSS software, version 20.0. The prevalence of NAFLD was calculated as a proportion of diagnosed patients to included subjects. The chi-square test was used to compare the proportions between those with NAFLD and normal populations. The independent t - test was used for comparing the non parametric data between the two categories. The results are expressed as mean± SD and proportions as appropriate. A two-tailed p-value less than 0.05 were considered statistically significant.

RESULTS

Overall, we included 292 subjects in this study among which were 142 males (48.6%) and 150 females (51.4%) with the mean age of 48.08 ±15.56 (ranging from 18 to 88) years as show in table-1. The BMI was under weight in (6) 2.1%, Normal in (123) 42.1% of the subjects, overweight in 130(44.5%) and obesity was present in 33 (11.3%) of the subjects. Hypertension and diabetes were present in 49 (16.8 %) and 29 (9.9%) of the patients.

Table-1: Provides the general characteristics of the study population (n=292) based on baseline demographics, anthropometric and clinical factors

Variables	Mean or percent
Gender	
Male	(142) 48.6%
Female	(150) 51.4%
Age ,years	48.17±15.11
18-24	(20) 6.8 %
25-44	(96) 32.9%
45-64	(125) 42.8%
65<	(39)17.5%
Weight , kg	68.17±13.34
Height , m	1.63±.09
Waist circumference.cm	85.90±16.5
BMI kg/m2	25.66±4.59
Underweight	(6) 2.1%
Normal	(123) 42.1%
Overweight	(130) 44.5%
Obese	(33) 11.3%
Diabetes mellitus	(29)9.9%
Hypertension	(49)16.8%

Mean attenuation of right and left liver lobes were 56.69 ±7.0) and 57.04 ±7.6), respectively. The mean attenuation of the whole liver was (57.04 ± 6.79). while The mean spleen attenuation was (48.98±5.42).the mean of liver to spleen ratio was (1.18 ±.18) Table-2.

Table-2: Show the CT measurement for all participants represent as mean and standard deviation

Variables	Mean	Std. Deviation
Rt lobe	56.69	7.03
Lt lobe	57.40	7.62
LA	57.04	6.79
spleen	48.98	5.42
L/S	1.18	.18

LA= liver attenuation, L/S= Liver to spleen ratio

The overall prevalence of nonalcoholic fatty liver in this study was (43) 14.7% using L/S ratio 1.0 whereas 1.3% of the population had liver attenuation 40HU representing >30% liver fat content. There was no prevalent difference between males and females (15.5 vs 14 %). The prevalence of Non alcoholic fatty liver in our population was 24.2% in obese participants (BMI >30), 20.4% and 10.3% in hypertensive and diabetic participants, respectively. As demonstrate in table-3.

Table-3: Describe the percentage of NAFLD to a healthy subject **according to the gender**, **age** categories, **BMI categories**, **diabetes mellitus and hypertension**

	NAFLD(43)14.7%	Healthy (249)85.3%
Gender		
Male	(22) 15.5%	(120) 84.5%
Female	(21) 14%	(129)86.0%
Age ,years		
18-24	(0) 0.0 %	(20)100%
25-44	(11) 11.5%	(85)88.5%
45-64	(23) 18.4%	(102)81.6%
65<	(9)17.6%	(42)82.4%
BMI kg/m2		
Underweight	(0) 0.0%	(6)100%
Normal	(17) 13.8%	(106)86.2%
Overweight	(18) 13.8%	(112)86.2%
Obese	(8) 24.2%	(25)75.8%
Diabetes mellitus	(3)10.3%	(26)89.7%
Hypertension	(10)20.4%	(39)79.6%

Table-4 shows the comparison between subject with NAFLD and healthy one. Patients with NAFLD were significantly older (P <0.05) and had higher body weight (P <0.05) when compared to healthy subjects, While there is no significant different between the two groups in the height, BMI and waist circumference

Table-4: Comparison of the Socio-demographic, Anthropometric and liver attenuations between Those with NAFLD and Healthy Subjects

Variables	Healthy (n=249)	NAFL(n=43)	P-value
Age , year	47.32±15.94	52.37 ±12.42	.022*
weight , kg	67.41±13.05	72.57± 14.33	.031*
Height ,m	1.63±.09	1.65± .09	.073
BMI,kg/m^2	25.52±4.64	26.48±4.23	.181
WC, cm	85.41±16.74	88.61±15.29	.241
Rt lobe	58.23±5.78	47.74±6.99	.000*
Lt lobe	58.95±6.57	48.42±7.10	.000*
LA	58.59±5.59	48.08±6.20	.000*
spleen	48.39±5.07	52.39±6.15	.000*
L/S	1.22±.15	.92±.01	.000*

BMI= body mass index, WC= waist circumference, LA= liver attenuation, L/S= Liver to spleen ratio

DISCUSSION

Non-alcoholic fatty liver disease (NAFLD), a clinical syndrome that is predicted to affect millions of people worldwide, will become the next global epidemic [14] .The natural history of NAFLD ranges from asymptomatic indolent to the end stage liver disease. The prevalence of NAFLD in industrialized countries ranges from 20% to 60% [15], Israel 30% [16], Italy 23% [17] and Saudi Arabia16.6% [18]. The estimated prevalence of NAFLD in this study was found to be 14.7%, The discrepancy between the studies is probably due to the methods of sample selection, modalities used for diagnosis and diversity of lifestyles and dietary habits in different areas. Our figure is comparable with the prevalence of NAFLD in Sudan and appears to be within range to figures reported in Sudanese populations. A study conducted by Almobarak et al in 2014 looked at the radiological prevalence of NAFLD in Khartoum -Sudan. In their study, A total of 100 subjects was included in the study. Among them 20 out of the 100 subjects have NAFLD on ultrasound and the prevalence of NAFLD in males and females was found to be 45% and 55% respectively [6]. Another study done by Elkhader *et al*., among 500 Sudanese adults (200; 40% males and 300; 60% females) aged 15 to 80 years. Diagnosis of NAFLD was based on sonographic evidence, the overall prevalence of NAFLD was15%, 4.4% in males and 6.6% in females [7]. The difference in prevalence of NAFLD in our study compared to Al-mobarak and colleagues may be attributed to the sample size and the diagnostic tool. In our study, we used computed tomography to diagnose NAFLD while they used the ultrasound .in addition Al-moubarak used a small sample size which may not reflect the actual characteristic of the study population.

Our study population had more prevalence of NAFLD in men than women (15.5% vs. 14%, respectively) but with no significant correlation which similar to that found in the Al-moubarak study in which women had same prevalence rates as men 45% and 55%. Recent studies show that the prevalence of NAFLD is higher in male this depending on many studies across the world. Shanghi-China [19], Framingham [20] and, Spain [21].

NAFLD is a disease that can occur in all sexes, ages, and ethnic groups. The major risk factors of NAFLD are: obesity, hyperlipidemia, Diabetes Mellitus (DM) and metabolic syndrome (insulin resistance syndrome) which represent the strongest risk factor [22]. In the present study Patients with NAFLD were significantly older and NAFLD was found more in the age groups between 45-64 years (18.5% of patients). In many studies, NAFLD was mostly found in the middle age and old groups [23-25].

Nonalcoholic fatty liver disease is more prevalent in cohorts of patients with preexisting metabolic conditions than the general population. Specifically, type II diabetes mellitus and NAFLD have a particularly close relationship. A study of patients with type II diabetes mellitus reported a 69% prevalence of ultrasonographic NAFLD [26]. In our study the prevalence among diabetic patient is 10%, which is lower than the prevalence of NAFLD in the general population and that may be due to the small number of diabetic patients in our sample. Future studies should focus on the studying the relationship between NAFLD and diabetes to determine the characteristics of NAFLD in diabetic patients and non-diabetics.

The prevalence of non-alcoholic fatty liver disease may be higher than the result found in this study and this is due to the use of CT scan to diagnose the disease. CT scan can identify cases of moderate and severe fatty liver, but do not recognize the cases of mild liver fat. Therefore, there are cases not recognized which makes the prevalence more than what is mentioned in the study.

CONCLUSION

NAFLD is a common chronic hepatic disorder globally. The prevalence of NAFLD in Sudanese adult general population is 14.7%, which is Low in comparison with the figure across the world. NAFLD in Sudanese population is associated with age and body weight, while there is no relation between the sex, hypertension, diabetes mellitus and NAFLD in Sudanese population. Epidemiological survey must be conducted by the government to find out the characteristic and severity of NAFLD in Sudan.

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