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ORIGINAL ARTICLE

Prevalence of Nonalcoholic Fatty Liver Diseases Among Obese Adults in Mosul City.

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ABSTRACT

Objective: The present study's objective is to determine the prevalence of nonalcoholic fatty liver among obese adults in Mosul City, Iraq.

Methodology: A prospective study design was applied to achieve the present study's objectives for November 1, 2019, to March 1, 2020. The total sample size was 225. All subjects were selected purposively from outpatient clinics at Al-Salam Teaching Hospital, Ibn Sina Teaching Hospital, and Mosul General Hospital.

Results: Among obese adults, the prevalence of NAFLD is 68%; among the 225 patients examined herein,153 had NAFLD. Parameter comparisons between NAFLD and without NAFLD subjects and indicated the mean BMI was (38.8±4) Kg/m2 and (34.1±2.4) Kg/m2, respectively. WC was (106.6±3.9) cm in the NAFLD group and (102.7±3.3) cm in the subject without the NAFLD group. The mean triceps skinfold thickness was (3.8±1.4) cm in the NAFLD group and (2.9±0.9) cm in the subject without the NAFLD group. All parameters had high significance.

Recommendations: Further studies on large populations are needed to facilitate the generalization of the current findings.

Keywords: Fatty Liver, Nonalcoholic, Mosul

INTRODUCTION

Non-alcoholic fatty liver disease is a term describing a group of conditions in which a build-up of fats occurs in the liver and usually appears in people who are overweight or obese, according to the UK National Health Service.(1). The pathologic spectrum of NAFLD includes initial fat accumulation in hepatocyte-termed hepatic steatosis, progressing to nonalcoholic steatohepatitis (NASH), and possibly leading to liver fibrosis and cirrhosis, which may develop into hepatocellular carcinoma (HHC)(2). In recent years, NAFLD has come to be considered the most common chronic liver disease. It affects a quarter of the global population. According to the third Nutrition Examination Survey (NES) that was applied in the USA between 1988 and 2008, the prevalence of NAFLD has been gradually growing in addition to the majority of metabolic conditions such as obesity and insulin resistance(3). The pathophysiology of fatty liver disease is not accurately defined, being multifactorial, and remains unclear. Many hypotheses about the pathophysiology of NAFLD have been approved, including mechanisms such as nutritional factors, insulin resistance, oxidative stress theory, lip toxicity, proinflammatory cytokines, adipokines, genetic polymorphisms, mitochondrial dysfunction, and altered gut microbiota. All these factors play a vital role in the development and progression of NAFLD(4). NAFLD diagnosis is still a dilemma in many countries because of the high costs and limited availability of necessary diagnostic techniques like ultrasound, MRI, CT, and advanced histopathological investigations(5). Although some experts have recommended screening aggregated populations and major risk groups like obese children and adolescents, hospital-based studies are still urgently needed in many countries.(6) The morbidity and mortality of NAFLD and NASH will constitute a significant challenge shortly if the disease and the treatment of it are neglected(7)

Obesity represents a causative factor for many diseases and disorders. NAFLD is one of the main diseases correlated with obesity and nutritional health problems in both developed and developing nations(8). The present study aimed to determine NAFLD prevalence among obese individuals attending outpatient clinics in Mosul Teaching Hospital.

MATERIAL AND METHODS

A prospective study design was applied to achieve the present study's objectives from November 1, 2019, until March 1, 2020. The sample size was 225 subjects, 153 obese patients with NAFLD and 72 patients with obesity as the normal liver. All subjects were selected purposively from the outpatient clinics at Al-Salam Teaching Hospital, Ibn Sina Teaching Hospital, and Mosul General Hospital. The study group's inclusion criteria comprised being nonalcoholic, aged between 16 and 70 years, no use of medications known to cause hepatic steatosis, BMI ≥ 30 Kg/m2, fatty infiltration of the liver noted on abdominal ultrasound, free from viral hepatitis, and consenting to participate. We excluded women who are pregnant, and those with abnormal liver ultrasound, and who are suffering from various chronic conditions (heart or kidney disease) and liver steatosis (including estrogens, valproic acid, amiodarone, or renal failure). The instruments of the study were composed of two parts. In Part One, general information, anthropometry and Body composition, demographic information (age, gender, residence, educational level, job, and socio-economic status), dietary intake, physical activity level, and family history of obesity, diabetes, or liver disease were recorded. Blood pressure (BP) was measured using an automated BP instrument (Omron HEM-7203, Kyoto, Japan). Weight and height were measured to the nearest 0.1 kg and 0.5 cm, respectively, and BMI was calculated. Weight was measure by SECA; this scale (SN: 3101615) was manufactured for UNICEF

using technology developed in Australia. Waist circumference (WC) was measured using a non-stretchable tape according to WHO guidelines. Skinfold thickness was measured at the triceps region using Holtain's skinfold calipers (Holtain Ltd, Crymych, UK). In Part Two, NAFLD was diagnosed based on ultrasonography (USG) using PHILIPS ULTRASOUND, model HD11XESN, USD 1078734. Fatty liver was diagnosed and graded as mild, moderate, or severe based on echogenicity, visualization of vasculature, parenchyma, and diaphragm. A routine abdominal ultrasound examination was performed in adults with fatty liver based on clinical indications; all patients underwent a standardized ultrasound examination using high ultrasound equipment. All visible liver parenchyma was examined. The liver has been assessed as usual if the texture is homogenous, delicate echoes are present, minimally hyperechoic, or isoechoic compared to normal kidney cortex, and the ultrasound beam has not been attenuated later. Statistical Package analyzed data for Social Sciences (SPSS) version 25. A descriptive approach was applied. Mean ± SD, median(range) or Frequency (percentage) was computed. A Chi-square test was used to compare the Parameters of the adults with and without NAFLD. Fisher's exact test for categorical variables, one independent t-test for continuous variables following normal distribution odds ratio was calculated to estimate the relative risk factors.

Table 1. NAFLD prevalence among obese subjects

Number of subjects	Positive NAFLD	%
225	153	68

Table 2. Anthropometry findings of patients with NAFLD

Age	NAFLD		No- NAFLD	
	No	%	No	%
(29-36) years	18	12	19	26
(37-44) years	22	14	18	25
(45-52) years	32	21	13	18
(53-60) years	64	42	15	21
(61-68) years	17	11	7	10
	Chi-Sq = 15.910, DF = 4, P-Value = 0.003			
Gender	No	%	No	%
Male	91	58.6	30	41.6
Female	62	41.3	42	58.3
Total	153	100	72	100
	Chi-Sq = 6.248, DF = 1, P-Value = 0.012			
Residency	No	%	No	%
Rural	130	85.5	44	61.2
Urban	23	14.5	28	38.8
Total	153	100	72	100
	Chi-Sq = 15.896, DF = 1, P-Value = 0.000			
Educational level	No	%	No	%
Unable to read and write	31	20	14	19.4
Primary	32	21	20	27.8
Secondary	38	25.3	12	16.7
University	50	32	24	33.4
Postgraduate	2	2.3	2	2.7
	Chi-Sq. = 3.087, DF = 4, P-Value = 0.543			
Obesity	No	%	No	%
Obesity I	42	27.5	58	80
Obesity II	78	50.9	13	18.6
Obesity III	33	21.6	1	1.4
	Chi-Sq. = 57.383, DF = 2, P-Value = 0.000			
	No	%	No	%
D.M	88	57.5	7	9.7
H. T	50	32.6	10	13.8
	Chi-Sq. = 54.685, DF = 3, P-Value = 0.000			

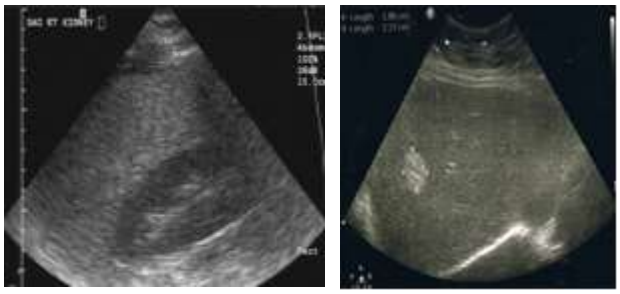

Figure 1 Sonographic features in fatty liver.

Table 3. Summarize Data and Statistics Number of Study Parameters.

	NAFLD		Without NAFLD			
Factors	Mean	SD	Mean	SD	t	p-value
BMI kg /m2	38.8	4	34.1	2.4	12.3	0.000000
WC (c.m)	106.6	3.9	102.7	3.3	6	0.000000
Weight (Kg)	108.7	13	100	8.6	4.7	0.000003
Height (c.m)	167.5	8.7	171	8.6	-2.9	0.003751
Triceps skin folds (c.m)	3.8	1.4	2.9	0.9	4.6	0.000007

DISCUSSION

The study's initial objective was to identify the prevalence of NAFLD among obese adults in teaching hospitals located in Mosul City, Iraq. The most striking result to emerge from the data was the high prevalence rate of NAFLD among the obese in Mosul (68%), which correlated with the obesity rate. Hepatic steatosis was found in 90% of patients with grade III obesity (BMI = 40-59 kg/m2). To the best of our knowledge, this is the first screening attempted to determine the prevalence of NAFLD in Mosul, Iraq. NAFLD is a growing epidemic due to obesity and insulin resistance, which lead to the accumulation of triglycerides and free fatty acids in the liver(9). The disease NAFLD is most common in Western countries. As yet, no nation in Africa and the Middle East has addressed this. A comparison of the findings with those of other studies confirmed that NAFLD's prevalence rate in Mosul City is lower than that reported for the US. NAFLD prevalence rates vary widely in different populations ranging from 4% to 47%. NAFLD is the most common hepatic disease in the United States and other developed countries today. It affects 18% of the general adult population and 90% of those who are severely obese. (10). In this study, the mean BMI of patients with fatty liver was (38.8±4) kg/m2, while inpatients without NAFLD, the mean BMI was (34.1±2.4), t = 12.3, p-value = 0.00. This finding is consistent with studies showing that high mean BMI and mean waist circumference increase a patient's chances of developing fatty liver disease(11, 12). As Clemente and others mentioned, waist circumference and BMI can grossly predict the development of fatty liver(13). This study supports evidence from observations in a previous study in Japan that found BMI to be an appropriate predictor of NAFLD onset in both genders(14). The measure of central obesity has recently been suggested as a new risk factor for metabolic syndrome, referred to as central obesity, for diagnosis and treatment(15). The current study results showed that the mean WC was (106.6 ± 3.9) cm in NAFLD individuals, while (102.7± 3.3) cm without NAFLD

individuals. This finding agrees with those of Clemente et al., who assessed NAFLD in obese patients and found WC to be a significant screening method for liver steatosis. for women in the 3rd and 4th quantile of WC, a greater incidence of NAFLD was seen. Patients receiving NASH patients had significantly higher body weight and body mass index readings(16). The current study suggests that such a marker may be useful in clinical practice on a need to test other populations. Moreover, anthropometrical measurements are inexpensive and straightforward. The current results demonstrated that this factor plays an important role in the occurrence of fatty liver. Another anthropometric measured was done in the present study was triceps skinfold with statistical significance when compared in mean among fatty liver subject (3.8 ± 1.4), while (2.9 ± 0.9) cm

t = 4.6 p-values = 0.000. A skinfold caliper is used to assess the skinfold thickness to predict the total amount of body fat that can be made. This method is based on the hypothesis that the body fat is equally distributed over the Body and that the thickness of the skinfold is a measure for subcutaneous fat(17). Padsalgi and others confirmed this funding. The correlation between fatty liver occurrence and increases in BMI and triceps skinfold(18) was confirmed. The mean age of NAFLD was (49.7±10) while in people without NAFLD was (46.7±10). Advanced age is also more associated with the occurrence of NAFLD. The patients' age group (53-60) years reported the highest rate among other age groups to have NAFLD. A statistically significant chi- sq = 15.910, DF = 4, p-value = 0.003. The results can be explained by the degenerative factor related to age as well as the wide changes that occur with age in physiological functions. The most defining of these is reduced total volume, which translates to reduced cell mass with compensatory cell hypertrophy and decreased blood flow in liver function. The capacity to synthesis macromolecules or clear toxins is impaired, and stress response is also less robust. It leads to a reduction in the liver's ability to regenerate and an increase in the alteration of hepatic structure and functions. The liver's fat and cholesterol volumes gradually increase as one gets older, and blood cholesterol, high-density lipoprotein cholesterol, and fat levels also expand over time(19). These are paralleled by an increase in circulating free fatty acids and decreased energy expenditure in old age(20). When comparing the current results to those of older studies, it must be pointed out that overall, the current findings are following older findings. Fan et al. conducted their cross-sectional study with randomized multistage stratified cluster sampling that included 3175 subjects (1218 men) with a mean age of 52 yr. Fatty liver was found in 661 (20.82%) subjects, and its prevalence increased with age in both sexes, peaking in women at 60-69 years of age and in men at 40-49 years of age. Interestingly, the prevalence was higher in males than in females in people under 50 years but lower in males than in females among people older than 50 years(21). Generally, the prevalence rate of NAFLD among adults is estimated to be 15–30%. It tends to become more prevalent as a population gets older. NAFLD's overall prevalence rate among people aged more than 65 years was 35.1%(22). Another study showed that elderly participants had a higher prevalence of NASH than their younger counterparts (56% vs. 72%, p-value = 0.02) when patients aged more than 65 years were compared with patients in the 18-64 years age group(23). The present study done by Soresi and others was found that a higher prevalence of NAFLD with steatosis was seen in younger patients than in patients without steatosis(24) . The present study confirmed the finding that gender variation plays a role in different fatty liver incidence among men & women. The men are at a greater risk than women for the fatty liver; among the subjects in this study, (91/153) (58.6%) men and (62/153) (41.4%) women, while the women were (42/72) (58.3%) and men. were (30/72) (41.6%) in peoples without NAFLD these results are significant chi- Sq= 6.248, DF= 1, p-value =0.012. Women have a lower risk for fatty liver than men until menopause; this finding can be explained on a hormonal basis. The mechanisms by which estrogen signaling, estrogen being been protective against fatty accumulation in the liver(25). In comparing studies, males are more likely to develop NAFLD (37). Another study showed that the prevalence of NAFLD in boys was 24.51% and in girls was 11.96% (OR=2.39; 95% CI=1.10–5.19; p-value = 0.025)(26). The prevalence and severity of NAFLD are higher in men than in women. Inverse results were seen in another study that reported NAFLD prevalence in women to be 22.9% (95% CI: 22.5 to 23.5), whereas it was only 18.3% (95% CI: 17.4 to 19.2) in men. However, another study shows that NAFLD is independently and positively correlated with increasing age in both sexes or women only(27). Some studies have failed to investigate the role of gender, given that a separate multivariate analysis according to sex was not performed(28). The present study confirmed that a higher prevalence of NAFLD is seen among urban populations; in this study130/153 participants (85.5%) were from urban areas, and only (28/153) (14.5%) were from rural areas. The normal liver (44/72) (61.2%) participants resided in urban areas and (28/72) (38.8%) in rural areas chi – sq = 15.89, DF= 1, p-value = 0.000. This finding has high significance. This result may be explained by variations in lifestyle, nutritional habits, and environment. Urbanization, economic, and cultural conditions positively influence wellness activities, such as regular exercise and person-food habits. This finding was supported by an Iranian study, which discovered that NAFL (nonalcoholic fatty liver disease) is markedly less prevalent in those who reside in rural than in urban areas. Additionally, this outcome was observed in univariate and multivariate studies. According to one study in China, the prevalence of NAFD was significantly lower in those who lived in rural (1 in every 12.9 people) as opposed to those who lived in urban areas (one in every one person) (23 percent). Some research has proven that rural living tends to help fend off the effects of cognitive decline in both men and women. NAFD was significantly lower in those who lived in rural areas than urban residences; findings confirmed in multiple analyses showed that NAND was significantly less prevalent in those living in rural environments(29). It is not surprising that a strong association was found between NAFLD and diabetes mellitus (DM). In the current study, DM was positive in 88/153 (57.5%) of the NAFLD participant. These highly significant chi-sq = 54.685, DF= 3, P-value = 0.000, can be explained by the liver's main role in glucose, fatty acids, and amino acids metabolism. There is an interaction between

fatty liver and the development of a diabetic metabolic state; a fatty liver will lead to insulin resistance and DM type II development. This finding generally supports the work of other studies in this area correlating NAFLD with DM. Accumulating evidence suggests that NALFD and DM may be related to each other. The presence of NAFLD predicts the development of DM; conversely, the presence of DM induces the progression of NAFLD(30). In cross-sectional research, an increased prevalence of NAFLD (previously known as type 2 diabetes) was found to be related. (31). A close relationship between elevated liver enzymes in NAFLD and diabetes has also been reported in cohort studies(32). However, the prevalence of NAFLD in Metabolic Syndrome is difficult to evaluate because of the heterogeneity of published studies and the different diagnostic methods used(33). Furthermore, the previous study does not verify a causal relationship directly related to NAFLD. While the cause of NAFLD and diabetes is unknown, it is possible that NAFLD plays a significant role as a confounding factor. This study supports evidence from previous observations. Shibata et al. first reported an observational cohort study (conducted from 1997 to 2005) in male workers over the age of 40 years as a health-check study of the direct correlation between NAFLD and the incidence of diabetes(34). The most important clinically relevant finding was the significant relationship between HT and NAFLD. The current results demonstrated that hypertension was positive in (50/153) (32.6%) subjects in the NAFLD individual and but only in (10/72) (13.8%) subjects in the individuals without NAFLD. This difference was statistically significant. Although, the reasons for these associations are poorly understood, these relationships may partly be explained by the causal link in many individuals between liver disease and hypertension seems to be the metabolic syndrome. These results go with previous reports to show that a strong association with hypertension was found in patients with simple steatosis(35).

CONCLUSIONS

Based on the discussion of results and their interpretations, the present study concluded that NAFLD prevalence is high among Mosul people. It affects around 2/3 of obese adults. The male gender carries a higher incidence of fatty liver diseases. NAFLD is more prevalent in urban than in rural areas. Increased BMI and Waist Circumference are associated with NAFLD occurrence. Liver enzymes are not uniformly elevated in all NAFLD individuals. There is a significant relationship between NAFLD and metabolic syndrome, and this relationship is more prominent in diabetes patients.

RECOMMENDATIONS

This study recommends health promotion programs about elements that play an essential role in avoiding fatty liver diseases. Encouraging people to adopt a healthy lifestyle and increased physical activity to maintain healthy body weight by different media.

A national screening program is needed to estimate the disease's prevalence across multi-setting and among other risk groups. Further large sample studies are needed among obese, non-obese, alcoholic, and nonalcoholic individuals to assess fatty liver disease more accurately in Iraq.

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