

# FATTY LIVER IN OVERWEIGHT AND OBESE PATIENTS IN WESTERN PART OF SAUDI ARABIA: A study of sonological prevalence

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## ABSTRACT

**Objective:** The aim of the study was to determine the association between fatty liver and obesity in patients presenting to King Abdulaziz University Hospital.

**Methods:** This is a retrospective study reviewing medical records of all obese patients having a fatty liver over a one-year period between April 2003 and April 2004. The data collected included age, gender, nationality, BMI, serum level of alanine (ALT) and aspartate (AST) transaminases, bilirubin, albumin, HbA1C, cholesterol, triglyceride, LDL, and TSH. The fatty liver was diagnosed by routine ultrasound when patients presented with abdominal pain or hepatomegaly.

**Results:** 235 case files were enrolled in the study. The mean age of the study group was  $46 \pm 14.4$  years with 82 males (35%) and 153 females (65%). The mean aspartate aminotransferase level was  $43.9 \pm 6.18$  units/L (NR 7-53 IU/L); alanine aminotransferase was  $36.2 \pm 5.1$  units/L (NR 11-47 IU/L). A transaminase value above the normal range was present in 15 (6.4%) patients only, whereas values of cholesterol and triglyceride above normal range were seen in 17 patients (7.2%). Overweight and obesity were the main risk factors in our study group. The mean BMI was  $33.6 \pm 7.5$  Kg/m<sup>2</sup>. Obesity with diabetes is the most important risk for a fatty liver. 78 (33%) of our patients were diabetic. Another risk factor associated with a fatty liver is the metabolic syndrome, which is reported in 14.9% and hypothyroidism in 3.8% of the subjects.

**Conclusion and recommendations:** Overweight and obesity are the most important risk factors for fatty liver in Saudi Arabia. They are more prevalent in females. Ultrasound appears to be a useful non-invasive tool to determine liver involvement with fatty liver in obese adults even in the absence of hypertransaminasemia.

We should encourage obese subjects to gradually reduce their weight in order to improve the liver abnormalities.

**KEY WORDS:** - Fatty liver, NASH, obesity, overweight and abdominal ultrasound, NAFLD

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## INTRODUCTION

The term Non-Alcoholic Steato Hepatosis (NASH) was first used by Dr. Ludwig and colleagues in 1980 to describe a previously recognized clinopathologic syndrome.<sup>1</sup> The original syndrome was described predominantly in obese, diabetic women, who denied alcohol use, but in whom the hepatic histology was consistent with alcoholic hepatitis.<sup>2</sup>

Non-Alcoholic Fatty Liver Disease (NAFLD) is now recognized as the most common liver disease in the United States, with a prevalence

of approximately 5% in the general population<sup>3</sup> and reaching 25% to 75% in patients with obesity and Type 2 diabetes mellitus.<sup>4</sup> A prevalence of 7-10% has been reported in the general population of Saudi Arabia.<sup>5,6</sup> Nonalcoholic fatty liver disease covers a spectrum of diseases ranging from simple fatty deposition in the liver to inflammation and finally to fibrosis and cirrhosis.<sup>7,8</sup> Although the exact etiology is not clear, it could possibly be a part of a metabolic syndrome associated with insulin resistance, diabetes, obesity and hypertension. Patients typically present with asymptomatic serum aminotransferase elevation of 2-3 times the normal.<sup>9</sup> Symptoms may include fatigue and abdominal pain. Physical examination may show hepatomegaly.<sup>10</sup> Liver Biopsy is useful and effective as a prognostic indicator, but it is an invasive and costly tool to diagnose fatty liver.<sup>11</sup> The imaging modalities most often used to identify hepatic steatosis include computerized tomography and ultrasonography. Hyperechogenic (bright) liver indicates steatosis by ultrasonography.<sup>12</sup> No medical treatment has been found to be totally effective.<sup>13</sup> Patients who are overweight or obese are encouraged to gradually reduce their weight since weight reduction has been associated with improvement in liver abnormalities.<sup>14</sup> The prevalence of overweight and obesity is increasing in Saudi Arabia amongst Saudis and expatriates especially in females due to a change in dietary habits and a sedentary life style. We studied the association between fatty liver diagnosed by ultrasonography and obesity in patients presenting to King Abdulaziz University Hospital.

## METHODS

This is a retrospective chart review of all patients undergoing evaluation for fatty liver with obesity over a one year period between April 2003 and April 2004 at King Abdulaziz University Hospital. Fatty liver was diagnosed by ultrasonography using an ATL HDI 5000 abdominal probe at 205-3 MHz. Longitudinal, subcostal, ascending, and oblique scans were performed. The ultrasonographic criteria

which were used to diagnose a fatty liver included liver and kidney echo discrepancy, presence of an increased liver echogenicity (bright), echo penetration into the deep portion of the liver, and clarity of the liver's blood vessel structures. The inclusion criteria of this study include all patients who had a fatty liver on ultrasound with the presence of abdominal pain or hepatomegaly.

In most patients' medical charts serum level of alanine (ALT) aspartate (AST) transaminases, bilirubin, albumin, cholesterol, triglyceride, LDL, and TSH were documented. The normal Body Mass Index (BMI) is less than 20, where as the BMI is more than 30 Kg/m<sup>2</sup> in obese patients and it is 25-29.9 Kg/m<sup>2</sup> in overweight patients. Data from study participants obtained at the initial clinic visit included age, gender, nationality, weight, height, BMI, and clinical presentation of abdominal pain or presence of hepatomegaly.

Exclusion criteria for the study included primary liver disorders other than fatty liver that could account for steatosis including hepatitis C, alpha 1- antitrypsin deficiency, Wilson's disease and hemochromatosis. All the study patients denied alcohol consumption or use of steatogenic medications.

The results were expressed as mean  $\pm$  standard deviation using Student's t test and Chi-square test for statistical analysis. The test was considered to be significant if the p-value was less than 0.05.

## RESULTS

A total of 235 overweight and obese adult patients were enrolled in the study. The mean age of the study group was 46 $\pm$ 14.4 years with 82 males (35%) and 153 females (65%) with a male to female ratio of 1:1.9. One hundred and fifteen (49%) of them were Saudi and 120 (51%) were non-Saudis. Their laboratory data is given in Table-I.

### *Biochemical Abnormalities :-*

The mean serum aspartate aminotransferase level was 43.9 $\pm$ 6.18.1 units/L, alanine

aminotransferase was  $36.2 \pm 5.1$  units /L and bilirubin was  $12.4 \pm 18$  mmol/L. A value of transaminase above the normal range was present in 15 patients (6.4%) only. Hyperbilirubinemia was seen in the same patients with hypertransaminasemia. The incidence of hypertransaminasemia was statistically not significant in relation to the BMI or the age of the patients.

Values of cholesterol and triglyceride above normal range were present in 17 (7.2%) patients, 13 of them were diabetics. The mean cholesterol level was  $5.3 \pm 1.4$  mmol/L and the mean triglyceride level was  $5.3 \pm 1.4$  mmol/L. The incidence of hypercholesterolemia and

Table-I: Laboratory data in obese patients with fatty liver

Laboratory Tests	Mean $\pm$ SD	Median	Range
ALT	$43.9 \pm 6.18$	31	17-519
AST	$36.2 \pm 5.1$	25	19-536
HbA1C	$8.4 \pm 1.6$	8	6-12%
Albumin	$38 \pm 4.6$	39	16-47
Bilirubin	$12.4 \pm 18$	8	2-144
Cholesterol	$5.3 \pm 1.4$	5.2	2-14.3
Triglyceride	$5.3 \pm 1.4$	1.6	0.1-12.1
TSH	$6.64 \pm 13.5$	3.31	0.2-95

ALT = alanine aminotransferase NR (7-53 IU/L)

AST= aspartate aminotransferase NR (11-47 IU/L)

HbA1C=glycated hemoglobin

Albumin = 36-50 gm/L

Bilirubin=1-18 mmol/L

Cholesterol=1.3-5.2 mmol/L

Triglyceride=0.6-2.3 mol/L

TSH = 0.27-4.2 IU /L

Table-II: Comparison of BMI in Kg/m<sup>2</sup> between sex and nationality in patients with fatty liver

Character	Mean $\pm$ SD	P-value
Male BMI	$33.5 \pm 7.7$	<0.005
Females BMI	$33.5 \pm 7.4$	
Saudi BMI	$33 \pm 7.2$	<0.005
Non Saudi BMI	$33.9 \pm 7.76$	

hypertriglyceridemia did not correlate with the hypertransaminasemia in patients with fatty liver reported by ultrasound.

TSH was done in 68 patients (29%) to rule out hypothyroidism as a cause of obesity. Overt hypothyroidism was noted in nine (3.8%) cases who were obese and who had fatty liver by ultrasound.

### Risk Factors:-

Over weight and obesity were the main risk factors in our study group. Mean BMI was  $33.6 \pm 7.5$  Kg/m<sup>2</sup>. The mean BMI in females was  $33.5 \pm 7.2$  Kg/m<sup>2</sup>, and in males it was  $33.5 \pm 7.7$ . ( $p < 0.005$  between males and females). Significant differences ( $p < 0.005$ ) in BMI were noted between Saudi and non Saudi individuals as illustrated in Table-II.

A significant relationship was found between the presence of a fatty liver and the female sex ( $p = 0.05$ ). No significant relationship was found between the presence of a fatty liver and age.

Diabetes was an important risk factor associated with obesity and fatty liver. 78 (33%) of our study group patients were diabetics. The mean duration of diabetes was  $13.6 \pm 3.3$  years and the mean HbA1C was  $8.4 \pm 1.6$ , which was done in 13 patients only.

Hypothyroidism was another risk factor associated with obesity and fatty liver, which was detected in 10 cases (4.2%). Almost all the patients had abdominal pain as a clinical indication to have an abdominal ultrasound. Hepatomegaly with fatty infiltration, as assessed by ultrasound, was reported in 78 cases (33%) with a mean liver size of  $18.3 \pm 4.3$  cm.

## DISCUSSION

Obesity, defined by a Body Mass Index (BMI) of  $\geq 30$  Kg/m<sup>2</sup> is clearly associated with NASH. Furthermore, it was associated with those who are moderately overweight, i.e. 10 - 40 percent more than their ideal body weight.<sup>14</sup> Non-Alcoholic Steato Hepatosis (NASH) is a common medical problem among over weight and obese adults in the western part of Saudi Arabia (Jeddah) as has been documented in

this study. This problem is commonly observed in females of childbearing age. Previous epidemiological surveys have shown a high prevalence of overweight and obesity among Saudi subjects.<sup>15,16</sup> The prevalence of obesity in Saudi female subjects was the highest reported all over the world and a report of increasing obesity in females from different Arab communities.<sup>17-19</sup> The incidence of hypertransaminasemia in patients with fatty liver diagnosed by ultrasound is similar to other reports in the literature.<sup>20</sup>

Obesity and Type 2 diabetes often cluster together, hence 33 % of our subjects were diabetics. However, our study did not show any relationship between the duration of diabetes or glycemic control with the severity of fatty liver. This could be a biased result and explained by a rather small sample size and the fact that Hb A1C was measured in 13 subjects only which was rarely available in the hospital.

Another risk factor associated with fatty liver is the metabolic syndrome, which is characterized by obesity, hyperinsulinemia, peripheral resistance, diabetes, hypertriglyceridemia and hypertension. It was reported in 14.9% of our study group, which is similar to other reports in the literature.<sup>21</sup>

Hypothyroidism was one of the risk factors associated with obesity and fatty liver which has been observed in 3.8% of our study group.<sup>22</sup> Hypertransaminasemia was observed in patients with severe fatty liver; two patients had hemolytic anemia due to a deficiency of red cell Mg<sup>2+</sup> - adenosine triphosphatase, and one young adult patient had a glycogen storage disease.<sup>23</sup>

The fatty liver could be discovered incidentally during routine abdominal ultrasound as a part of a workup for abdominal pain which is typically vague, non-descript aching in character.<sup>24</sup> Hepatomegaly was a common clinical finding in those with a fatty liver, however no other stigmata of chronic liver disease like spider navi, palmer erthyema were noted in our study. A fourteen year old boy who had sickle cell anemia developed symptoms of hepatic en-

cephalopathy which indicated decompensated liver disease due to fatty liver after exclusion of other causes of liver cirrhosis.

A liver biopsy to assess the stages of the disease and histological changes of steatosis was not carried out in any patient enrolled in the study because of the risks associated with biopsy. In addition, the histological findings do not contribute to the future management.

## CONCLUSION

Overweight and obesity are risk factors for a fatty liver in Saudi Arabia, which is more prevalent in females. Ultrasound appears to be a useful non-invasive tool to determine liver involvement with fatty liver in obese adults even in absence of hypertransaminasemia.

No medical treatment has been found to be totally effective. Patients who are overweight or obese should be encouraged to gradually reduce their weight because it has been associated with improvement in the liver abnormalities.

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