PREVALENCE OF FATTY PANCREAS AMONG PATIENTS WITH NON-ALCOHOLIC FATTY LIVER DISEASE IN SULAIMANI

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ABSTRACT

Background

Fatty pancreas results from excessive ectopic fat accumulation represents a global health problem recently.

Objectives

To determine the prevalence of fatty pancreas among non alcoholic fatty liver patients and to find out the main risk factors for fatty pancreas.

Patients and Methods

Adescriptive prospective observational study conducted at Kurdistan Center for Gastroenterology and Hepatology (KCGH) in Sulaimani governorate through the period from 1st April, 2014 to 31st of April, 2015 on convenient sample of 75 non-alcoholic fatty liver patients. The data was collected by researcher through direct interview and filling of questionnaire included demographic data, weight, height, smoking, drug history, laboratory results of Gamma-Glutamyl transferase(GGT) and lipid profile and ultrasound results of pancreas.

Results

The prevalence of fatty pancreas among patients with non alcoholic fatty liver diseases was 49.3%. Fatty pancreas was significantly predominant among elderly patients (p=0.006), male (p=0.04) and obese patients (p=0.03). Significant higher levels of triglycerides (p=0.03) and GGT (p=0.02) were found among fatty pancreas patients. High density lipoproteins level was significantly lower among fatty pancreas patients (p=0.04).

Conclusion

About half of patients with non alcoholic fatty liver diseases had non alcoholic fatty pancreas;The main risk factors for fatty pancreas were elderly age, male gender, obesity and abnormal lipid profile.

Keywords: *Fatty pancreas, Fatty liver, Obesity.*

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INTRODUCTION

Globally, high obesity prevalence was recorded along with negative impact on health and economy [1]. Excessive energy intake by some liable patients is stored outside the visceral adiposity limits to be accumulated in unusual body sites as an ectopic fat in liver, heart, skeletal muscles and pancreas. Fat accumulation had a remarkable effect on metabolic diseases development like diabetes,hypertension, cardiovascular disease, and cancer [2].

Fatty pancreas is defined as an excessive ectopic fat accumulationin the pancreas attributed to obesity with exclusion of alcohol intake [3]. Over than 90% of world population would have less than 5% of fatty pancreas infiltration [4]. Nonalcoholic fatty liver is a risk factor and predictor for insulin resistance, diabetes type 2, metabolic syndrome, atherosclerosis and cardiac diseases [5, 6]. Nonalcoholic fatty pancreas disease differs from fatty liver in lack of knowledge with local consequences of excessive fat accumulation in the pancreas. Fatty infiltration in the pancreas is common risk factors of metabolic syndrome [7-9]. Nonalcoholic fatty pancreas disease had an adverse effect on development of chronic pancreatitis [10, 11], pancreatic cancer [3] and potentiates acute pancreatitis severity [2] .

Fatty pancreas is a significant ultrasound finding associated with increased echogenicity as compared to the normal pancreas [12]. Accurate imaging diagnostic techniques are needed for organ location like abdominal MRI and/or Endoscopic Ultrasound (EUS). Three dimensional two point Dixon techniques are used to estimate the fatty content in pancreas, but not used for normal population screening might be due to its cost [9, 13, 14].

This study aimed to determine the prevalence of fatty pancreas among non alcoholicfatty liver patients and to find out the main risk factors for fatty pancreas.

PATIENTS AND METHODS

This is an observational study conducted at Kurdistan Center for Gastroenterology and Hepatology (KCGH) in Sulaimani governorate through the period from 1st April, 2014 to 31st April, 2015. All patients with non-alcoholicfatty liver attending KCGH center were the target population of the study. The inclusion criteria were participants with non alcoholicfatty liver by ultrasound (diffuse/focal; with or without spared areas) with negative virology andage more than 18 years. The exclusion criteria were frequent alcohol intake, history of pancreatitis, diabetes, pregnancy, renal failure, renal parenchymal diseases, malignancy and patients refused to participate or not completing the study.

Seventy five fatty liver patients were included for this study. All patients were asked to attend the hospital after an overnight fasting. The fatty pancreas was diagnosed by the researcher; the data were collected through direct interview and filling of prepared questionnaire including demographic data (age and gender), weight, height, smoking, drug history, laboratory results of Gamma-Glutamyltransferase (GGT) and lipid profile and ultrasound results of pancreas.

Weight measured by electronic scale standardized every 10 readings by standard weight and the height measured by Seca scale tape and the patients with light clothes and without shoes in both measurements. BMI was categorized as overweight if it was 25–29.9 9 Kg/m^2, and obese if it was ≥30 Kg/m^2 [15]. Blood pressure was recorded by mercuric sphygmomanometer. Hypertension was diagnosed as a systolic blood pressure ≥ 140 mmHg or a diastolic blood pressure ≥ 90 mmHg. Ultrasound was performed using (SIEMENS, Korea, and ACUSON X 300, CH5-2 MHz probe); the examination was performed by single experienced radiologist; cine recording with an extended field of view to demonstrate the retroperitoneun; liver; pancreas and RT kidney-for the pancreatic head-body assessment and the LT kidney for retroperitoneun – pancreatic tail assessment was used.

On abdominal ultrasound, we assessed the pancreas for the presence of fatty infiltration by comparing the pancreatic echogenicity with renal echogenicity; increased echogenicity of pancreas compared with the kidney was used as an indicator of fatty change. subjects were classified into two groups (non-fatty pancreas), where the pancreas echogenicity was similar to the kidney parenchymal echogenicity; fatty pancreas, where the pancreas echogenicity was higher (focal/diffuse" than the kidney echogenicity; as seen in figures 2, 3 and 4.

From each patient, 10 ml of blood was taken for laboratory investigations; these parameters (GGT, Total cholesterol, TG, LDL and HDL) by using spectrophotometry method.

The study started after approval by Ethical Committee of the Faculty of Medicine in Sulaimani and Sulaimani Directorate of Health. Oral consent was taken from each patient participated in the study with informing

the physicians responsible of selected patients with results of the examinations.

The data were analyzed by SPSS software program version 20. The result presented as tables and/or graphs. Chi-square was used for categorical variables and Fishers exact test when necessary. In all statistical analysis, level of significance (p value) set at ≤ 0.05.

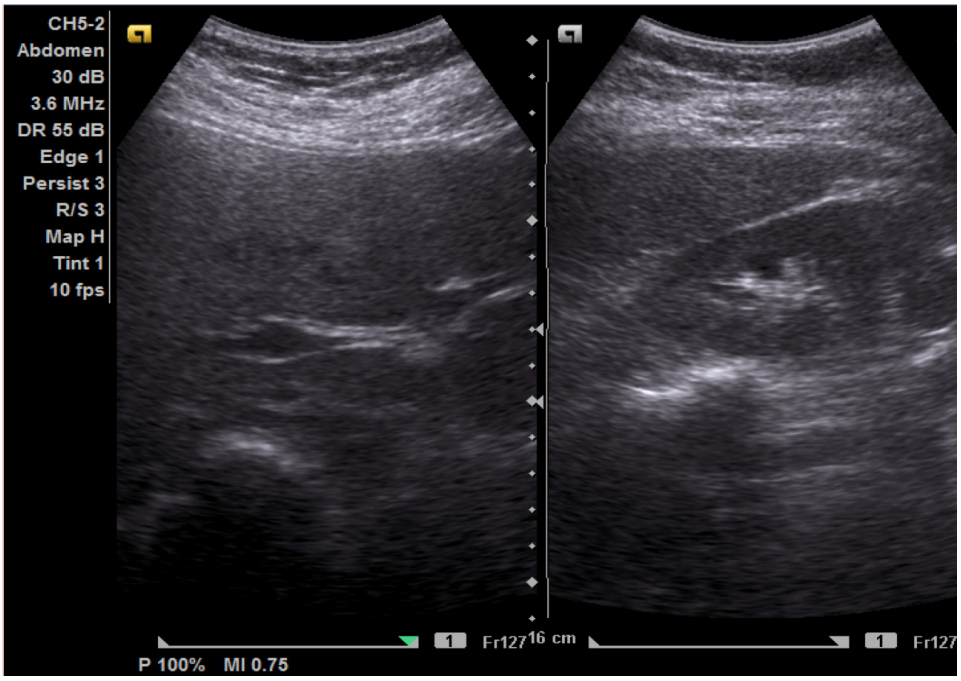

Figure 1. Fatty liver-increased echogenicity & blurring of vascular definition.

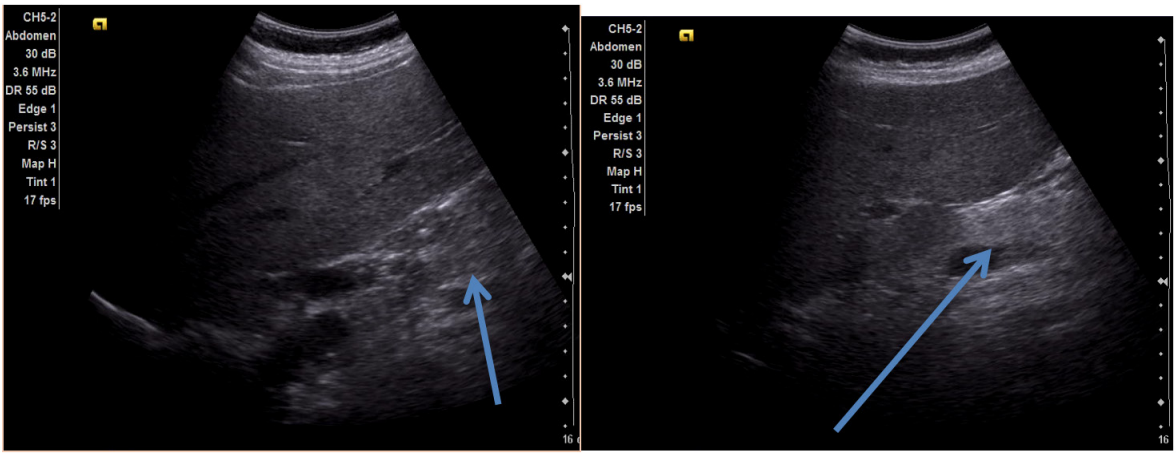

Figure 2. Fatty liver-& head of pancreas.

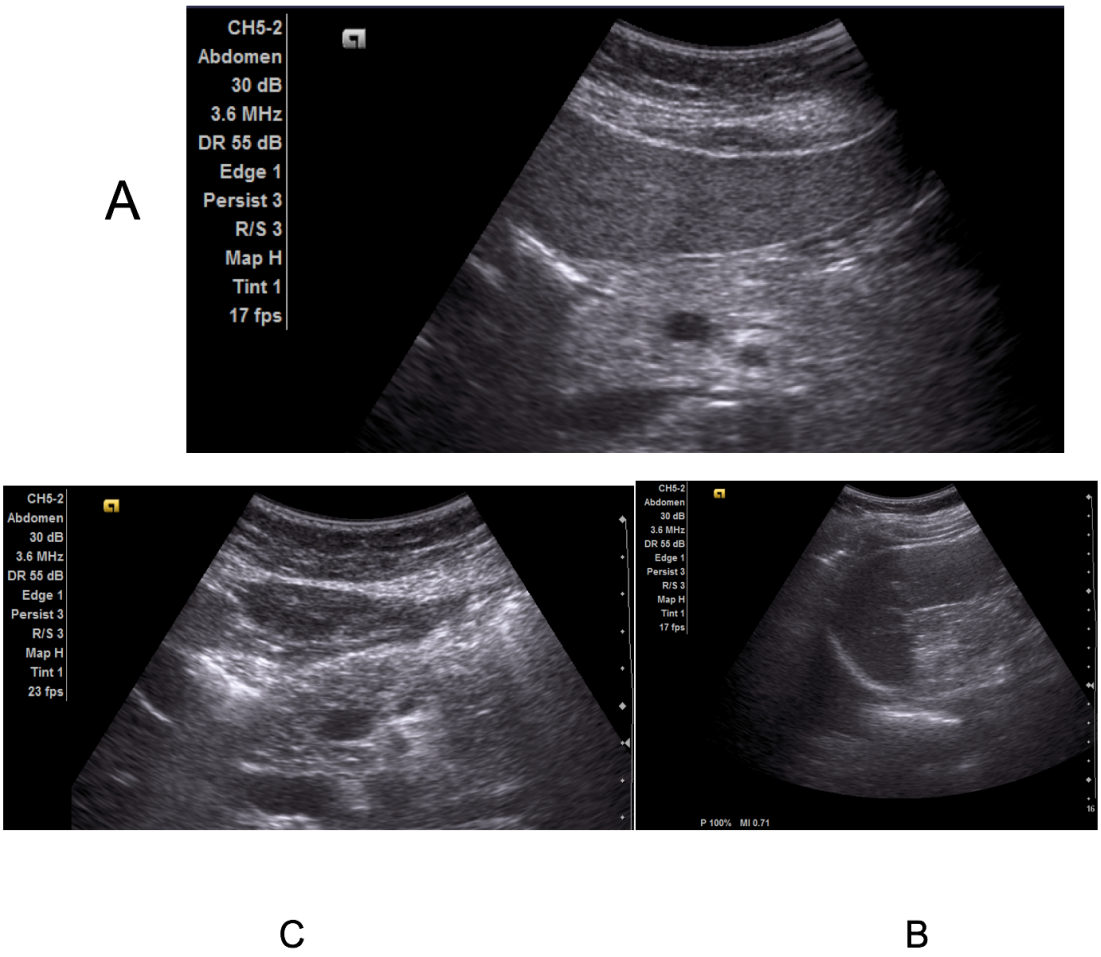

Figure 3. A & B- hepatic LT lobe & fatty body of pancreas; C-spleen-fatty tail of pancreas.

RESULTS

A total of 75 participants were included in this study with mean age as 42±11 years, 32% of them were aging 40-49 years and 30.7% of them were aging 30-39 years. Males were more than females and mean BMI of participants was 33.6±4.1 Kg/m2, more than two thirds of them were obese. Smoking was present among 9 patients and drug history was found among 19 patients, table 1.

Mean blood pressure of study participants was 131.6/89.9±15.3/11.3 mmHg, 76% of them were hypertensives. Cholesterol level was high among 60% of participants, TG was increased among 76%, LDL was high for 46.7% of participants and HDL was low among 86.7% of participants. GGT level was high for 48% of study participants. Fatty pancreas prevalence among patients with fatty liver diseases was 49.3%, table 2 and figure 4.

There was a significant association between elderly age patients and fatty pancreas (p=0.006). A significant association was observed between male gender patients and fatty pancreas (p=0.04). Obesity was significantly higher among patients with fatty pancreas (p=0.03). No significant differences were observed between study participants with fatty and normal pancreas regarding smoking and drug history (p>0.05), table 3.

As shown in table 4, there were no significant differences between study participants with different pancreas status regarding blood pressure, cholesterol level and LDL level (p>0.05). There was a significant association between high TG level and fatty pancreas (p=0.03). A significant association was observed between fatty pancreas patientsand low HDL level (p=0.04). GGT level was significantly higher among patients with normal pancreas (p=0.02).

Table 1. General characteristics of study participants.

Variable	No. (%)
Age mean±SD (42±11 years)	
<30 years	10 (13.3)
30-39 years	23 (30.7)
40-49 years	24 (32.0)
≥50 years	18 (24.0)
Gender	
Male	42 (56.0)
Female	33 (44.0)
BMI mean±SD (33.6±4.1 Kg/m2)	
Overweight	11 (14.7)
Obese	64 (85.3)
Smoking	
Yes	9 (12.0)
No	66 (88.0)
Drug history	
Yes	19 (25.3)
No	56 (74.7)
Total	75 (100.0)

Table 2. Examination and investigation findings of study participants.

Variable	No. (%)
Blood pressure mean±SD (131.6/89.9±15.3/11.3 mmHg)	
Hypertensive	57 (76.0)
Normotensive	18 (24.0)
Cholesterol mean±SD (217.3±51.3 mg/dl)	
Normal	30 (40.0)
High	45 (60.0)
Triglycerides mean±SD (220.2±83.8 mg/dl)	
Normal	18 (24.0)
High	57 (76.0)
LDL mean±SD (132.3±40.5 mg/dl)	
Normal	40 (53.3)
High	35 (46.7)
HDL mean±SD (31±7.7 mg/dl)	
Normal	10 (13.3)
Low	65 (86.7)
GGT mean±SD (43.7±27.3 mg/dl)	
Normal	39 (52.0)
High	36 (48.0)
Total	75 (100.0)

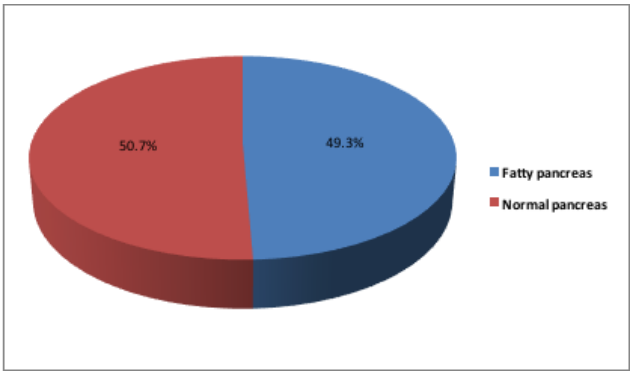

Figure 4. Fatty pancreas distribution

Table 3. Distribution of general characteristics of study participants according to pancreas status (no=75).

Variable	Fatty pancreas No. (%)	Normal pancreas No. (%)	P value
Age			
<30 years	1 (2.7)	9 (23.7)	
30-39 years	10 (27.0)	13 (34.2)	0.006
40-49 years	12 (32.4)	12 (31.6)	
≥50 years	14 (37.8)	4 (10.5)	
Gender			
Male	25 (67.6)	17 (44.7)	0.04
Female	12 (32.4)	21 (55.3)	
BMI			
Overweight	1 (2.7)	10 (26.3)	0.003
Obesity	36 (97.3)	28 (73.7)	
Smoking			
Yes	7 (18.9)	2 (5.3)	0.06
No	30 (81.1)	36 (94.7)	
Drug history			
Yes	11 (29.7)	8 (21.1)	0.3
No	26 (70.3)	30 (78.9)	

Table 4. Distribution of study participants examination and investigations findings according to pancreas status (no=75).

Variable	Fatty pancreas No. (%)	Normal pancreas No. (%)	P value
Blood pressure			
Hypertensive	29 (78.4)	28 (73.7)	0.6
Normotensive	8 (21.6)	10 (26.3)	
Cholesterol			
Normal	15 (40.5)	15 (39.5)	0.9
High	22 (59.5)	23 (60.5)	
TG			
Normal	5 (13.5)	13 (34.2)	0.03
High	32 (86.5)	25 (65.8)	
LDL			
Normal	20 (54.1)	20 (52.6)	0.9
High	17 (45.9)	18 (47.4)	
HDL			
Normal	2 (5.4)	8 (21.1)	0.04
Low	35 (94.6)	30 (78.9)	
GGT			
Normal	24 (64.9)	15 (39.5)	0.02
High	13 (35.1)	23 (60.5)	

DISCUSSION

Although biopsy is the gold standard for pancreatic steatosis; its practically an invasive procedure, so imaging is used for assessment; the cutoff value of pancreatic fat to be regarded as steatosis isn't established yet. Nonalcoholic fatty pancreas is a newly described disease reported mainly with obesity and metabolic disturbances [16]. Present study revealed that fatty pancreas prevalence among patients with non alcoholicfatty liver diseases was 49.3%. This is close to results of Uygun et al [17] study in USA whichshowed that 51.2% of patients with non alcoholic steatohepatitis had fatty pancreas. Corte et al 16 study in Italy revealed that 47.9% of children with fatty liver had at the same time hyperechogenicity of pancreas. Fatty pancreas prevalence in normal population was found to be 16% [18]. Lesmana et al study in Indonesia reported prevalence of fatty pancreas among adult medical check-up patients as 35% and revealed that fatty pancreas was present among 53.1% of patients with fatty liver diseases [12]. Previous studies reported that hepatic steatosis is a predictor for fatty pancreas [19, 20]. Although, high consumption of food rich with fat increased triglyceride contents in pancreas but not liver, assuming that pancreas is more liable for ectopic fat accumulation than liver [21].

Fatty pancreas prevalence in present study was significantly higher among elderly patients (p=0.006). This finding is similar to Chinese population study [18]. Male gender in the current studywas significantly associated with fatty pancreas as compared to females (p=0.04). This is consistent with Patel et al [21] study

in USA.Obesity among patients in our study was significantly associated with fatty pancreas (p=0.03). This coincided with findings of many literatures as Lee et al [7] study in South Korea and Carter et al study in UK [16] which reported that obesity is an independent risk factor of fatty pancreas. Patients with fatty pancreas in present study had significantly high triglycerides level (p=0.03) and low HDL (p=0.04). These findings agreed with Prachayakul and Aswakul study in Thailand [4] which reported that obesity and dyslipidemia are the main etiological factors for fatty pancreas.

GGT was significantly lower among fatty pancreas than non alcoholic fatty liver patients (p=0.02); so GGT can be used as a marker against pancreaticsteatosis with its likely coming consequences of steato-pancreatitis and increased risk of malignancy. This is consistent with results of Hori et al [23] study in Japan which showed that GGT had increased with liver and biliary diseases more than pancreatic diseases.

Despite that ultrasonography is a relatively insensitive tool for fat detection;many studies identified a relationship between fatty pancreas detected by ultrasonography and elderly age, abnormal lipid profile, obesity, and insulin resistance [2, 20]. Another study revealed that fatty pancreas diagnosed by ultrasonography was associated with multiple components of metabolic syndrome [8]. Al-Haddad et al. [19] and Choi et al. [24] showed a strong relationship between pancreatic fat and hepatic steatosis in cohorts of patients undergoing endoscopic ultrasound.

The limitation of present study were the absence of pathological confirmation for nonalcoholic fatty liver and nonalcoholic fatty pancreas and inability to assess the temporal relationship as the study design was cross sectional. CT or MRI provide more confident assessment of steatosis but MRI isn't easily feasible and CT radiation dose makes justification and patient consent difficult

This study also suffers the limitation of sample size; other studies done also claimed this limitation unless retrospective; since a population or larger sample study mandates a lot of resources; can be done in research centers

This study concluded that about half of patients with nonalcoholic fatty liver diseases had nonalcoholic fatty pancreas. The main risk factors for fatty pancreas were elderly age, male gender, obesity and abnormal lipid profile.Normal HDL & elevated Triglyceride & GGT level can be used as an indicator of only non alcoholic fatty liver versus additional pancreatic steatosis

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