Original Article

Association of Ultrasonographic Grades of Non-Alcoholic Fatty Liver Disease Severity with Metabolic Syndrome

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Abstract:
Background: *In addition to obesity, the severity of Non-Alcoholic Fatty Liver Disease (NAFLD) and insulin resistance both play important roles in metabolic syndrome. Whether NAFLD is a precursor or a component of metabolic syndrome is a question.* ***Objective:*** *To determine the association between the prevalence of metabolic syndrome and NAFLD severity using semi-quantitative ultrasonography.* ***Methods:*** *The study design was cross-sectional and was conducted in the Department of Medicine, Comilla medical college and hospital from January 2014 to December 2014. Two hundred adult non-alcoholic patients with ultrasonographic evidence of fatty liver were included. Clinical examination, anthropometric measurement and laboratory tests were done to find out metabolic syndrome as defined in Asian criteria. Association between metabolic syndrome and USG grades of NAFLD severity was searched by Chi-square test.* ***Results****: Among NAFLD patients prevalence of metabolic syndrome was 31% with a M:F ratio 1:1.02. Mean age was 45.53±10.04. 30% of NAFLD patients of low socio-economic status had metabolic syndrome. Among obese NAFLD patients 49% had metabolic syndrome. In lipid parameter TG (mean 258.46±117.66) & HDL (mean 38.51±5.58) were found statistically significant. With increasing grades (USG) of NAFLD there was a rise in the prevalence of metabolic syndrome though not statistically significant.* ***Conclusion:*** *Though the association between NAFLD severity and metabolic syndrome was not found statistically significant study results reflect the influence of NAFLD severity on metabolic syndrome.*

Key words: NAFLD, Metabolic syndrome, Ultrasonography

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Introduction:

Metabolic syndrome and non-alcoholic fatty liver disease (NAFLD) appear to have a common pathogenesis, arising from insulin resistance, central adiposity and chronic low-grade inflammation. Metabolic syndrome (MetS) is a cluster of metabolic abnormalities that is a precursor to cardiovascular disease and patients with NAFLD have a higher rate of MetS than those without NAFLD[1,2]. Moreover, NAFLD has also been reported to be independent of the traditional risk factors for subclinical atherosclerosis, cardiovascular disease (CVD) and MetS[3,4].

Both MetS and NAFLD involve interactions of adipokines, cytokines, inflammatory factors and insulin resistance, and some researchers have proposed that NAFLD can be regarded as a hepatic manifestation of Mets[5]. In contrast, some evidences have demonstrated that NAFLD dissociates from the features of the MetS in familial hypobeta-lipoproteinemia (FHBL) and in subjects with a diacylglycerol acyltransferase 2 (DGAT2) gene polymorphism[6,7]. Taken together, it is suggested that the association of NAFLD with MetS need more research. In fact, MetS is now considered as a global epidemic, where about 20-30% of the adult population is affected worldwide[1,8].

Reports have suggested that the prevalence of NAFLD among Asian Indians is comparable to that of the West and NAFLD may be present in approximately 20% of these patients, with a 2- to 3-fold increased prevalence in patients with type-2 diabetes [9-11]. In Bangladesh, prevalence of NAFLD is 34.34% more among rural women[12]. The age-adjusted prevalence of MetS was 30.7% (males 30.5%; females 30.5%) using the NCEP definition, whereas prevalence in rural women aged >15 years

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is 31.25%. Both these conditions are going high in accordance with our socioeconomic and demographic change and increase our noncommunicable disease burden associated with CVD[12]. So, a better understanding of these two interlinked conditions will help us to develop our future health prevention strategies.

Materials and Methods:

This cross-sectional study was conducted on 200 patients attending medical out-patient department of Medicine and indoor patients during the study period of one year since 1st January 2014 to 30th December 2014. In this study any patient >18 years of either sex attending at medical out-patient department as well as indoor during the study period were included. Patient who taking alcohol or had H/O alcohol consumption and H/O taking drugs known to cause steatosis including Amiodarone, Corticosteroids, Tamoxifen, Methotrexate and high dose Estrogen etc. were excluded from the study. Even patient with chronic viral hepatitis and/or drug induced hepatitis were also excluded from the study.

Females who were pregnant at the time of study were also excluded. Out of these subjects, patients showing hepatic steatosis or fatty liver on Ultrasonography (USG) were included in study group. Detailed history was taken and scrutiny of previous medical record was done with thorough clinical examination of every patient included in the study. Subjects were enrolled after satisfying the inclusion/exclusion criteria.

Complete Laboratory work up data were collected from patient like Fasting plasma glucose (FBS), Total Lipid Profile: Serum total cholesterol, HDL, LDL and triglycerides after overnight fasting, Liver function Tests: Serum Bilirubin, AST, ALT, ALP, HbsAg and Anti HCV antibody. Data regarding Abdominal Ultrasonography, Anthropometric measurement Height (m), Weight (Kg), Waist circumference (cm) were also collected along with laboratory work up to identify cases with metabolic syndrome.

All subjects underwent trans-abdominal ultrasonography performed by radiologists for evidence of fatty liver disease. The diagnosis of hepatic steatosis was made based on characteristic ultrasonographic findings (diffuse increase in echogenicity as compared to that of the spleen or renal cortex). The severity of fatty liver was recorded as mild, moderate or severe fatty liver according to the findings of bright liver, hepato-renal echo contrast, the blurring of vessels and deep attenuation of ultrasound signal[11].

Metabolic syndrome was diagnosed by the NCEP ATP III (Adult Treatment Panel III). In accordance with this definition, a subject is classified as having the features of Metabolic Syndrome if one had at least three of the following five components: waist circumference >102 cm in men or >88 cm in women, Serum Fasting Triglycerides >150 mg/dl, Serum Fasting HDL <40 mg/dl in men and <50 mg/dl in women, Blood pressure >130/85 mm Hg or receiving treatment, Fasting plasma glucose ≥100 mg/dl[13,14]. Statistical methods used were unpaired student's t-test for continuous variables and chi-square test for categorical variables using bivariate analysis by SPSS Version 21. P value <0.05 was considered as significant.

Results:

Among the NAFLD patients 31% had metabolic syndrome and 69% had no metabolic syndrome (Figure-1).

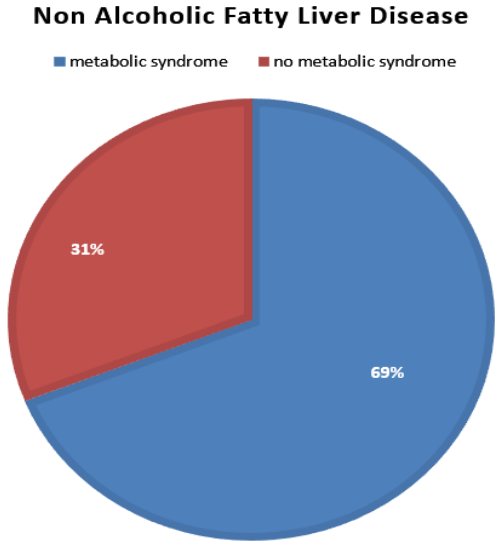

Figure-1: Prevalence of metabolic syndrome in NAFLD patients

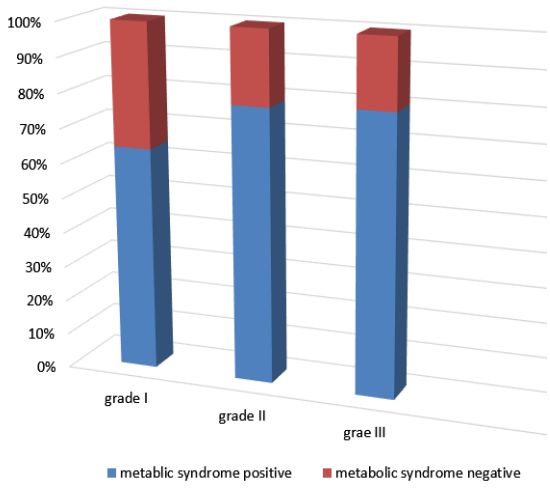

Figure-2: Prevalence of metabolic syndrome in NAFLD patients

The mean age of the study group was 45.53 and Male-Female ratio was 1:1.02. 30%, 72% and 36% patients of the study groups were from low, middle and good socioeconomic status. Mean BMI of our study group was 30.65 (Table-I). Clinical variables of NAFLD among patients with and without metabolic syndrome were shown in Table-II. There were significant differences among clinical symptoms between metabolic and no metabolic syndrome NAFLD patients. Liver function test and lipid profile values of NAFLD patient having metabolic and no metabolic syndrome are shown in Table-III. There were no significant differences among the variables except HDL and Triglyceride.

Table-I: Demographic variables of NAFLD among patients with and without metabolic syndrome

Variables	Nonalcoholic fatty liver disease		P value
	Metabolic syndrome	No Metabolic syndrome	
Age (Mean ± SD)	45.53 ±10.04	45.93 ± 11.22	0.802
M:F	1:1.02	1:0.2	0.001
Socioeconomic status (%)			
Low	30	6	
Middle	72	49	0.002
Good	36	7	
Life style			
Sedentary	82	32	0.19
Moderate exercise	56	30	
Family history of Liver disease	8	4	0541
Family history of DM	40	14	0.22
Family history of HTN	48	12	0.019

Table-II: Clinical variables of NAFLD among patients with and without metabolic syndrome

Variables	Nonalcoholic fatty liver disease		P value
	Metabolic syndrome	No Metabolic syndrome	
Asymptomatic	70	29	
Abdominal pain	4	6	
Anorexia	0	2	0.002
Pedal edema	14	2	
Tingling and numbness	2	0	
BMI SD	30.65±4.6	28.38±4.6	0.002
Obese	49	28	0.186
Non obese	87	36	0.129
Waist circumference	103.03±10.6	94.48 ± 14.67	0.000
Waist hip circumference ratio	0.99 ± 0.04	0.99 ± 0.04	0.789
Anaemia	4	0	0.224
Jaundice	8	2	0.351
Features of CLD	8	6	0.243

Table-III: Laboratory variables of NAFLD among patients with and without metabolic syndrome

Variables	Nonalcoholic fatty liver disease		P value
	Metabolic syndrome	No Metabolic syndrome	
Liver function test			
ALT	52.83±33.09	51.10±33.64	0.731
AST	47.99±31.09	44.93±30.01	0.522
Serum albumin	3.79±0.37	3.77±0.32	0.801
Prothrombin time	9.38±1.36	9.35±1.5	0.881
Lipid profile			
Cholesterol	208.95±51.75	198.36±46.29	0.169
LDL	122.62±38.74	124±34.54	0.811
HDL	38.51±5.58	43.46±18.60	0.005
Triglyceride	258.46±117.66	189.93±73.92	0.000

Discussion:

This cross-sectional study demonstrated that the prevalence of metabolic syndrome in study population was 31% which was higher than that in South Asia (5-20%), India (26%) and Europe (30%)[12-14]. This may be due to selection bias of our

study population of NAFLD. South Asian ethnicity may also be a factor for increasing prevalence of NAFLD. 44% US population above age 50 years had metabolic syndrome[13,14]. Mean age of our study group was less (45.53). Increasing age might be the factor that play role in the rise of prevalence of metabolic syndrome in US people[13,14] Male female ratios was similar in both Asian and Western population as also in our study[12-14].

Though both NAFLD and metabolic syndrome is a disease of affluence, 30% patients of low socioeconomic status were affected with metabolic syndrome as was the fact for non-obese people. South Asian ethnicity and genetic factor may be the underlying influence. Mean BMI of our study group was 30.65, a little below than that for NAFLD in western population[15,16]. A study in Western people showed that an increase in waist circumference by 1 cm increase the risk for metabolic syndrome by 7.4%[17,18]. Waist circumference in our study people was also high (mean 103.03).

The results of our cross-sectional analysis from this cohort demonstrate that the presence of increasing number of metabolic syndrome in severe grades of NAFLD has shown the relationship between this two condition though not found statistically significant. This may not tell the fact that metabolic syndrome is the hepatic manifestation of NAFLD. Significant relationship was found in different studies in India and also in Western population[19,20].

Small size of sample and biasness of sampling may be the faults. However, study reports are also available that showed no association between this two condition[17].

Conclusion:

This study showed that most of the patients developing NAFLD presents one or many of the metabolic syndrome traits reflecting common pathophysiological mechanism linking NAFLD and metabolic syndrome. So, this study findings may give a perspective regarding the common pathophysiology and forecast common management of these two metabolic diseases.

Conflict of Interest:

The authors declare to have no conflicts of interest.

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