Prevalence of fatty liver in metabolic syndrome

Anita Goyal¹, Hobinder Arora², Sumit Arora³

Departments of ¹Family Medicine, ²Social and Preventive Medicine and ³Medicine, GGS Medical College and Hospital Faridkot, Affiliated to Baba Farid University of Health Sciences, Faridkot, Punjab, India

ABSTRACT

Background: In Western world, non-alcoholic fatty liver disease (NAFLD) is considered to be the commonest liver problem, and it is being recognised as a major cause of liver-related morbidity and mortality. As the prevalence of overweight/obesity and metabolic syndrome increases, NASH may become one of the more common causes of end stage liver disease and hepatocellular carcinoma. But much information is not available in this association. So an attempt has been made to correlate both. Aims: The aims of this study are: 1. to study the prevalence of non-alcoholic fatty liver in metabolic syndrome; and 2. to study the correlation between the non-alcoholic fatty liver and metabolic syndrome along with its individual components. Materials and Methods: The study was an observational and analytical study of patients attending OPD and indoor patients of the Department of Medicine, G.G.S. Medical College and Hospital Faridkot. In total, 100 patients diagnosed as metabolic syndrome according to the NCEP ATP III criteria were subjected to ultrasonography; age and sex matched 100 controls were also taken; and the relationship between metabolic syndrome and NAFLD was studied. Results: In total, 73% cases of metabolic syndrome according to NCEP ATPIII were having fatty liver, while in controls 38% persons were having fatty liver which is statistically significant. Conclusions: Fatty liver was found to be highly prevalent in metabolic syndrome, and the early detection of fatty liver can help in modifying the disease course and delaying more serious complications like cirrhosis of liver and hepatocellular carcinoma.

Keywords: Central obesity, dyslipidemia, metabolic syndrome, non-alcoholic fatty liver disease (NAFLD)

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Background: In Western world, non-alcoholic fatty liver disease (NAFLD) is considered to be the commonest liver problem, and it is being recognised as a major cause of liver-related morbidity and mortality. As the prevalence of overweight/obesity and metabolic syndrome increases, NASH may become one of the more common causes of end stage liver disease and hepatocellular carcinoma. But much information is not available in this association. So an attempt has been made to correlate both. Aims: The aims of this study are: 1. to study the prevalence of non-alcoholic fatty liver in metabolic syndrome; and 2. to study the correlation between the non-alcoholic fatty liver and metabolic syndrome along with its individual components. Materials and Methods: The study was an observational and analytical study of patients attending OPD and indoor patients of the Department of Medicine, G.G.S. Medical College and Hospital Faridkot. In total, 100 patients diagnosed as metabolic syndrome according to the NCEP ATP III criteria were subjected to ultrasonography; age and sex matched 100 controls were also taken; and the relationship between metabolic syndrome and NAFLD was studied. Results: In total, 73% cases of metabolic syndrome according to NCEP ATPIII were having fatty liver, while in controls 38% persons were having fatty liver which is statistically significant. Conclusions: Fatty liver was found to be highly prevalent in metabolic syndrome, and the early detection of fatty liver can help in modifying the disease course and delaying more serious complications like cirrhosis of liver and hepatocellular carcinoma.

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In India, NAFLD is quite common. Various studies show the prevalence of NAFLD ranging from 20% to 40%. A study by S.P. Singh et al. showed the prevalence of NAFLD as 24.5%. In Southern India, a study by Mohan et al. showed overall prevalence as 32% in men and 29.1% in women, and it is still higher in diabetics (54.5%).

This study is designed to diagnose patients with metabolic syndrome according to NCEP ATPIII criteria, and then subjecting these individuals to ultrasonography and patients are labelled to be having NAFLD according to standard criteria accepted by the American gastroenterology association, i.e. an increase in hepatic echogenicity as a reference, the presence of enhancement and lack of differentiation in the perportal intensity and the vascular wall due to great hyperechogenicity in the parenchyma. A cross-sectional relationship between NAFLD and metabolic syndrome with its individual components is evaluated.

Aims and objectives
The aims and objectives of the study are:
1. To study the prevalence of non-alcoholic fatty liver in metabolic syndrome; and
2. To study the correlation between the NAFLD and metabolic syndrome along with its individual components.

Materials and Methods
The study was conducted at Guru Gobind Singh Medical College and Hospital, Faridkot, Punjab, and 100 patients of metabolic syndrome were taken from OPD and indoor wards of the Medicine Department. Age and sex matched controls (100) were also be taken.

Inclusion criteria
• Patient fitting into criteria of metabolic syndrome
• Age more than 18 years.

Exclusion criteria
1. Patients less than 18 years and more than 65 years.
2. Patients with history of alcohol intake more than 30 grams/day in males and more than 20 grams/day in females.
3. Patients with history of jaundice or HBsAg positive and Hepatitis “C” positive.
4. Patients with history of following drug intake steroids, synthetic oestrogens, heparin, calcium channel blockers, amiodarone, valproic acid, arsenic, mercury, homeopathic drugs, ayurvedic drugs, antiviral agents.
5. Patients having autoimmune hepatitis.
6. History of drug abuse, opium, and nicotine.
7. Patients of Coronary artery disease.

Results
Total 100 cases were included in the study which met the criteria of metabolic syndrome and were subjected to USG abdomen. Detailed history, anthropometry, and clinical examination were done. All patients underwent various investigations including CBC, blood sugar, liver function test, HbsAg, anti HCV, and lipid profile. Fatty liver was defined as according to the standard criteria accepted by American Gastroenterology association, i.e. an increase in hepatic echogenicity as a reference, presence of enhancement and lack of differentiation in the perportal intensity and the vascular wall due to hyperechogenicity in the parenchyma. In total, 100 age and sex matched controls which did not have metabolic syndrome were taken, and various investigations and USG abdomen were done in controls also.

Out of 100 cases and 100 controls, 53 and 54 were females and 47 and 46 were males, respectively. Also, there is no statistically significant difference in the prevalence of fatty liver according to sex distribution.

Mean age in cases was 44.71 years and in controls was 46.15 years with SD of 10.27 and 14.17, respectively. No statistically
significant difference was seen in the prevalence of fatty liver in cases and controls. Mean waist circumference of cases was 106 cm with standard deviation 7.29 and of controls 84 cm with standard deviation of 8.11. This observation was statistically significant [Table 1]. In total, 58.7% cases had reported increased waist circumference in a study done by Bajaj et al.,[9] and 47.1% cases had increased waist circumference in another study done by Duseja et al.[10] So central obesity was found to be associated with NAFLD.

Clinical and biochemical parameters of all cases and controls are shown in Table 1.

Mean SGOT levels were 34.16 IU in cases with SD of 17.02 and 30.88 IU in controls with SD of 14.0, and there is no statistically significant difference between the two values. Similarly, mean SGPT levels were 37.40 IU with SD 18.97 in cases and 36.05 IU with SD 22.76 in controls.

Mean triglyceride levels of cases was 255.64 mg/dl with SD 93.64. In controls, mean TG level was 156 mg/dl with SD 67.9. This observation is found to be statistically significant with Mann-Whitney P value. 000.

Hypercholesterolemia was present with mean cholesterol levels in cases were 221 ± SD 66.31, while in control group mean cholesterol levels were 183 ± SD 35.76 [Table 1]. This again is statistically significant.

Low serum HDL levels were seen in cases with mean HDL 42 ± SD 8.16. In control group, mean HDL levels were 46 ± 5.16. Bajaj et al.[9] had reported low HDL levels in 63.34% cases of fatty liver grade I and 85.71% cases of grade II fatty liver disease.

In controls, 62% of the cases were from rural background [Table 2] and 38% were from urban background. The prevalence of fatty liver in rural and urban population was 38% and 36% and that almost equal to overall prevalence in controls 38%. Among cases [Table 3], 59% belonged to rural background and 41% to urban background with the prevalence of fatty liver 72% and 73%, respectively. There is no statistically significant difference according to place of residence.

Out of 100 cases, 52 were hypertensive and 48 were non-hypertensive [Table 3]. Out of 52 hypertensive patients, 37 (71%) were having fatty liver. Among non-hypertensive cases, 36 (75%) were having fatty liver most probably due to other components of metabolic syndrome. Among controls, 6 were having HT and only 1 (16%) person was having fatty liver.

Out of 100 cases [Table 3], 23 were diabetic and 5 persons among controls were also suffering from diabetes, and the prevalence of fatty liver in diabetic cases was 14 (43%) and in controls 3 (60%). Diabetes is also a risk factor for progressive fibrosis. In a study done by Kaushal et al., 9% patients of NAFLD were having diabetes and 63.8% were having impaired fasting glucose.[11]

**Discussion**

Metabolic syndrome includes central obesity, type 2 DM, dyslipidaemia, and hypertension which are established risk factors for cardio vascular abnormalities such as myocardial infarction and CAD but association between metabolic syndrome and fatty liver is not known much.

Mean age group of non-metabolic syndrome controls was 46.15 years with SD 14.17 and that of metabolic syndrome cases was 44.71 years with SD 10.27. So cases of controls were comparable. Mean age group is slightly higher in our study to that reported by Bajaj et al.[9] (40.11 ± 1.1).

Metabolic syndrome patients had hypertriglyceridaemia (>150 mg/dl) with a mean of 255.64 mg/dl with SD 93.65 as compared to non-metabolic syndrome patients who have Triglyceride mean as 156.64 mg/dl with SD of 67.9. Bajaj et al. had reported 23.1% of patients of NAFLD had hypertriglyceridaemia.

Deranged SGOT and SGPT was observed in metabolic syndrome cases. Mean SGOT was 34.16 with SD of in cases and in controls. Similarly, mean SGPT levels were in cases and in controls. But it is not statistically significant.

Type 2 DM is also a major component of metabolic syndrome. In our study, mean Fasting plasma glucose level in cases was 128.76 mg/dl ± 45.64 mg/dl and 95.76 mg/dl ± 34.54 mg/dl in controls. Out of 100 cases, 23% were diabetic and 5 persons among controls were also suffering from diabetes and the prevalence of fatty liver in diabetic cases was 14 (43%) and in controls 3 (60%). So diabetes as a single factor can be associated

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**Table 1: Clinical and biochemical parameters of all cases and controls**

|                          | Metabolic Syndrome (Cases) | Non Metabolic Syndrome (Controls) | Mann Whitney U Test |
|--------------------------|----------------------------|----------------------------------|---------------------|
| Age                      | 44.71±SD 10.271            | 46.15±SD 14.169                  | 0.750               |
| Waist circumference      | 106.51±7.291               | 84.86±8.114                      | 0.000               |
| SGOT                     | 34.16±17.026               | 30.88±14.00                      | 0.175               |
| SGPT                     | 37.40±18.97                | 36.05±22.76                      | 0.222               |
| S. Cholesterol           | 221.85±66.312              | 183.76±35.762                    | 0.000               |
| Triglycerides            | 255.64±93.649              | 156.64±67.845                    | 0.000               |
| HDL Cholesterol          | 42.877±8.165               | 46.050±5.166                     | 0.000               |

The significance level id 0.005
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In our study, odds ratio was found to be 4.4. This is in line with another study done by Bashu Dev Parde et al.\cite{8} in Nepal in 2018. They concluded that according to NCEP ATPIII criteria 13.6% of NAFLD were present with metabolic syndrome, where the risk estimate was significant (OR 2.15). Thus, a conclusion can be drawn that metabolic syndrome along with its individual components has greater association with fatty liver disease.

**Conclusion**

From the above observations, we can conclude that there is high prevalence of fatty liver in metabolic syndrome patients. Fatty liver is mostly asymptomatic in early stages or patients present with non-specific symptoms of abdominal fullness or dyspepsia. We can detect fatty liver if we have high suspicion of it in metabolic syndrome patients. Metabolic syndrome diagnosis can be established from clinical and biochemical parameters, and some of the components of metabolic syndrome like waist circumference are modifiable with lifestyle modifications. Reducing weight also helps in controlling diabetes, hypertension, hypercholesterolaemia, and hypertriglyceridaemia. Changes in the liver are reversible when there is only steatosis.

So in primary care setting, we easily diagnose metabolic syndrome based on clinical and biochemical parameters, thus establishing the risk for fatty liver. We can apply primary prevention by introducing lifestyle modifications, thus modifying the disease course and delaying more serious complications like Cirrhosis of Liver and Hepatocellular Carcinoma.

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**Conflicts of interest**

There are no conflicts of interest.

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