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Original Research Article

Prevalence of non-alcoholic fatty liver disease in patients of metabolic syndrome in a rural population attending tertiary care centre

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ABSTRACT

Background: Non-alcoholic fatty liver disease and steatohepatitis now constitute the major etiology of chronic liver disease. Prevalence of non-alcoholic fatty liver disease is rising due to the change in lifestyle habits, diet and obesity. Metabolic syndrome is closely related with the pathogenesis of non-alcoholic fatty liver disease. Studies showed that prevalence of metabolic syndrome is rising in Indian population. This study was conducted to look into the current status of the metabolic syndrome in rural population.
Methods: The study was conducted among patients attending General Medicine OPD. Each participant was subjected to clinical examination, anthropometric measurements, laboratory investigations and abdominal ultrasound. NAFLD was diagnosed by ultrasound and metabolic syndrome was diagnosed based on modified NCEP:ATP III criteria.
Results: The prevalence of NAFLD was found to be 18.78% and was higher among male population (20.05%) as compared to females (17.32%). The prevalence of metabolic syndrome among NAFLD and control groups were 42.74% and 17.91% respectively.
Conclusions: Present study has shown moderate prevalence of NAFLD and metabolic syndrome among the rural population of western Uttar Pradesh with a more male predisposition.

Keywords: Metabolic syndrome, Non-alcoholic fatty liver disease, Rural population

INTRODUCTION

The term NAFLD is used to describe a spectrum of liver diseases ranging from simple steatosis to steatohepatitis in the absence of significant alcohol intake which can result in cirrhosis and hepatocellular carcinoma.[1,2] It is now considered as one of the most common causes of chronic liver disease globally. Abnormal deposition of triglycerides in hepatocytes is the basic pathology in NAFLD.[3] NAFLD is emerging as an important cause of chronic liver disease in India also. Central obesity, type 2 diabetes mellitus, hypertension and dyslipidemia are the main risk factors of NAFLD.[4,5]

The diagnosis of NAFLD requires a combination of invasive and non-invasive tests. Transaminases (ALT, AST) may be normal or elevated in NAFLD. Hence diagnosis based solely on enzyme levels may underestimate it. Ultrasound has a sensitivity of 89% and a specificity of 93% in detecting steatosis.[6] NAFLD can be more accurately diagnosed by computed tomography and magnetic resonance imaging.[7-9] But liver biopsy is considered as the gold standard for the definitive diagnosis of NAFLD.[10] The metabolic syndrome is a constellation of metabolic abnormalities resulting in increased risk of cardiovascular diseases and type 2 diabetes mellitus.

The major features of this syndrome are insulin resistance, central obesity, hypertension and dyslipidemia. Other risk factors include physical inactivity, high calorie diet, habitual alcohol drinking, smoking, psychosocial stress and increase in pro-inflammatory cytokines.[11] The precise mechanism by which these factors cause metabolic syndrome is yet to be determined. Newer studies suggest oxidative stress also play a significant role in metabolic syndrome and associated cardiovascular diseases.[12]

Metabolic syndrome and associated co morbidities like type 2 diabetes, obesity and dyslipidemia are predisposing factors of NAFLD and prevalence of NAFLD has increased parallel to these risk factors. NAFLD and metabolic syndrome are strongly associated with T2DM and cardiovascular disease. It is characterized by insulin resistance and mitochondrial dysfunction.[13]

The third report of the national cholesterol education programme expert panel on detection, evaluation and treatment of high blood cholesterol in adults (adult treatment panel III [ATP III]) recommended the use of five variables for diagnosing the metabolic syndrome, namely waist circumference, serum triglyceride level, serum high-density lipoprotein (HDL) cholesterol level, blood pressure and fasting plasma glucose level. This study was conducted to look into the clinical profile of patients of NAFLD and evaluate the relationship between the non-alcoholic fatty liver disease and the metabolic syndrome as defined by the modified NCEP ATP III criteria.[14]

METHODS

We conducted a hospital based cross sectional study among 660 subjects. The study population was selected from people attending the general medicine OPD of Uttar Pradesh University of Medical Sciences. The duration of study was from January 2016 to July 2017. The age group of the population was 18 to 55 years.

Written informed consent was taken from all the participants at the time of recruitment. Printed questionnaires were distributed to collect information on social, demographical, occupational, dietary and medical history.

Height was measured by a portable stadiometer. Weight was measured by an electronic weighing balance. Waist circumference was measured as the minimum circumference between the inferior margin of ribcage and the crest of the ileum.

Resting blood pressure was measured in sitting position in right upper limb after 20 minutes of rest using a mercury sphygmomanometer.

The serum lipid profile was estimated by the enzymatic CHOD-PAP method for total cholesterol, GPO method for triglycerides and PVS/PEGME method for HDL cholesterol. These estimations were carried out by using ERBA-XL 300 (Transasia) fully automated analyzer.

LDL cholesterol was calculated by using Frieden Wald equation:

LDL cholesterol = Total cholesterol - HDL cholesterol - triglycerides / 2.2.

Liver function test and fasting lipid profile were done using auto analyzers. NAFLD was defined as fatty liver not resulting from excessive alcohol consumption (>20 grams/day), drugs, toxins, infectious diseases or any other identifiable exogenous causes.

This was an ultrasound-based study. Sonologically fatty liver was diagnosed as diffuse increase in parenchymal echogenicity with progressive loss of clarity of portal veins and increased attenuation of sound by the liver. Metabolic Syndrome was diagnosed by NCEP-ATP III criteria modified for waist circumference as follows:

Three or more of the following:

- Central obesity: waist circumference ≥90cm (male), ≥80cm (female)
- Hypertriglyceridemia: triglyceride ≥150 mg/dl or specific medication
- Low HDL cholesterol: <40mg/dl (male) and <50mg/dl (female) or specific medication.
- Blood Pressure: systolic blood pressure ≥130 mm Hg or diastolic blood pressure ≥85 mm Hg or specific medication
- Fasting plasma glucose ≥100 mg/dl or specific medication or previously diagnosed type 2 diabetes.

RESULTS

A total of 660 patients who attended the General Medicine OPD of Uttar Pradesh University of Medical Sciences were selected for the study.

The study group comprised of 354 males and 306 females. The baseline demographic, anthropometric and biochemical characteristics of the study population is given in table 1.

Out of the 660 participants 124 had USG evidence of fatty liver. Thus, the prevalence of NAFLD was 18.78%. NAFLD was present among 53 (17.32%) females and 71 (20.05%) males.

Prevalence of metabolic syndrome among NAFLD group and control group was found to be 42.74% and 17.91% respectively. The overall prevalence of metabolic syndrome was 22.57%.

Liver biopsy was not done in any of the patient as it is not practical to do an invasive test in a healthy asymptomatic population limiting our study to be an ultrasound based study (Table 2).

Not even a single risk factor of metabolic syndrome was present in 8 (6.45%) cases and 113 (21.08%) controls, while one risk factor was present in 29 (23.38%) cases and 188 (35.07%) controls.

The presence of two risk factors were almost similar in both groups at 34 (27.41%) among cases and 139 (25.93%) among controls.

Three risk factors were present in 36 (29.03%) of NAFLD group and 53 (9.88%) of controls. Four risk factors were noted in 14 (11.29%) and 26 (4.85%) of cases and controls respectively. All the components of metabolic syndrome were present in 3 (2.41%) of cases and 17 (3.17%) of controls (Table 3).

Table 1: Demographic, anthropometric and baseline biochemical characteristics of the study population.

Characteristics	Mean standard deviation
Age (years)	45.62±14.25
Weight (kg)	57.14±9.68
Height (cm)	157.9±8.6
Body Mass Index (kg/m^2)	22.8±4.35
Systolic blood pressure (mm Hg)	124±14.85
Diastolic blood pressure (mm Hg)	72.16±18.82
Fasting blood sugar (mg/dl)	86.58±25.68
Triglycerides (mg/dl)	96.68±28.89
HDL cholesterol(mg/dl)	48.37±16.74
SGOT	32.75±13.14
SGPT	31.08±12.64

Table 2: Prevalence of metabolic syndrome among study population.

	NAFLD	Control	Total	P value
No of participants	124	536	660	
Prevalence of metabolic syndrome	53 (42.74%)	96 (17.91%)	149 (22.57%)	< 0.05

Table 3: Comparison between NAFLD group and control group based on no of risk factors.

No. of risk factors	NAFLD group (N=124)	Control group (N=536)	p value
0	8 (6.45%)	113 (21.08%)	< 0.05
1	29 (23.38%)	188 (35.07%)	< 0.05
2	34 (27.41%)	139 (25.93%)	< 0.05
3	36 (29.03%)	53 (9.88%)	< 0.05
4	14 (11.29%)	26 (4.85%)	< 0.05
5	3 (2.41%)	17 (3.17%)	< 0.05

DISCUSSION

The prevalence of NAFLD in the general population was found to be 10 to 24%.[15] An ultrasound based study from India showed a prevalence of 24.5%.[16] The present study showed a prevalence of 18.78% with a higher prevalence among males (20.05%) than among females (17.32%). The results of the present study were consistent with the study conducted by Singh et al.[16] Present study points towards a moderate prevalence of NAFLD among general population. Compared to western studies the prevalence of NAFLD in the present study is less but still on a higher range. This could be explained by the exponential rise in the prevalence of obesity in Indian population. Now India constitute the second largest diabetic population globally. Adaptation of unhealthy western dietary pattern is also increasing in India with an associated sedentary lifestyle habits. All these contribute to the rising trend in the prevalence of NAFLD.

The prevalence of metabolic syndrome is also increasing in India for the same reasons mentioned above as the risk factors for both NAFLD and metabolic syndrome are the same and metabolic syndrome itself is a risk factor for NAFLD. Many epidemiologists consider NAFLD as the hepatic component of metabolic syndrome.[17] The present study showed a strong association between NAFLD and metabolic syndrome with its prevalence being more than double in the NAFLD group (42.74%) as compared to the controls (17.91%). The liver histology is closely associated with the number of risk factors.[18] The present study showed the increased presence of the number of risk factors of metabolic syndrome in those with ultrasonic evidence of fatty liver as compared to the controls. However, the present study was done on hospital population and not on general population. Hence, the prevalence of both NAFLD and metabolic syndrome would be higher than the actual values. There are hardly any studies to compare the risk factors of metabolic syndrome in the healthy asymptomatic patients with NAFLD and in those without fatty liver.

To conclude USG evidence of fatty liver should be taken seriously as a predictor of metabolic syndrome and also actively look for NAFLD in patients with metabolic syndrome. A diagnosis of NAFLD in an asymptomatic

patient should alert the clinician on the preventable aspects of both conditions. Patients should be advised on dietary modification, regular exercise, weight reduction and treatment of co morbidities with specific medications.

CONCLUSION

Present study has shown moderate prevalence of NAFLD and metabolic syndrome among the rural population of Western Uttar Pradesh with a more male predisposition. Early diagnosis and specific management is the desirable aspect which can decrease further progression and complications. Limitations of this study are small data and demographic variation among different regions of India and World.

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