Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jptcp.v31i5.6284

PREVALENCE OF METABOLIC SYNDROME IN CHRONIC LIVER DISEASE

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Abstract

Background: Chronic liver disease (CLD) has a detrimental effect on the liver, an essential organ with several physiological functions, and has an influence on worldwide healthcare systems. The difficulties related to CLD are impaired by the increasing frequency of metabolic syndrome, especially in non-alcoholic fatty liver disease (NAFLD).

Objective: The objective of this research was to ascertain the metabolic syndrome prevalence in people with CLD, with a particular emphasis on NAFLD.

Methodology: A cross-sectional study of 540 NAFLD patients aged 18-55 in a medical ward of Hayatabad Medical Complex analyzed blood pressure, height, weight, waist circumference, and diagnosed metabolic syndrome and fatty liver using sonology and NCEP-ATP III criteria, respectively. The Mann-Whitney U test in SPSS (version 27) compared risk factor profiles between NAFLD and control cohorts; $p<0.05$ was significant.

Results: This study found a 20.18% prevalence of NAFLD (n=109) with distinct risk factor profiles compared to controls. NAFLD patients had higher frequencies of both very few (0 or 1, $p<0.012$) and significantly more (4 $p<0.038$) risk factors, highlighting the importance of individual profiles for identification and intervention strategies.

Conclusion: This study highlights a significant association between NAFLD and metabolic syndrome, with a prevalence of 20.18% and 33.94%, respectively, in NAFLD patients. Furthermore, NAFLD patients exhibit distinct risk factor profiles compared to controls, emphasizing the importance of individualized assessments for effective identification and management.

Keywords: Prevalence, Chronic Liver Disease, Non-alcoholic Fatty Liver Disease, Metabolic Syndrome

Introduction

The liver is a vital organ in the human body that carries out many physiological processes, such as protein synthesis, blood clotting factor production, protein, fat, and carbohydrate metabolism, blood volume maintenance, immune system stimulation, growth hormone receptor signaling pathway control, fat and cholesterol homeostasis, glycogen synthesis, bile production, and foreign material breakdown [1-3].

Chronic liver disease (CLD) affects millions of people and costs healthcare systems worldwide millions of dollars annually [4,5]. The prevalence of metabolic syndrome has drawn a lot of attention among the many problems linked to CLD, especially in relation to non-alcoholic fatty liver disease (NAFLD). NAFLD is described by the buildup of extra fat in the liver deprived of significant alcohol use [6]. Sedentary lifestyles and obesity are becoming more commonplace worldwide, and NAFLD is becoming a prevalent etiological factor for CLD that affects many different demographic groups [7]. It is crucial to comprehend the intricate relationship between metabolic syndrome and CLD, especially NAFLD, in order to create public health campaigns and successful treatment regimens [8,9].

Determining the frequency of metabolic syndrome in people with CLD was the aim of the study, with a particular emphasis on NAFLD. The multifaceted nature of metabolic syndrome allows for the complex interplay of factors that contribute to the severity and progression of liver disease. To manage the increasing burden of CLD, a review of the general population's metabolic syndrome incidence is necessary in order to identify high-risk individuals, create individualized treatment programs, and implement prevention measures.

This work aims to both clarify the intricate processes that connect metabolic syndrome to CLD and identify potential therapeutic targets. Anticipated results might influence clinical guidelines, therapies based on evidence, and public health initiatives meant to lessen the impact of metabolic syndrome on CLD. This work provides valuable information on how the complexity of interactions between different circumstances is evolving over time by aiming to fill in significant knowledge gaps.

Methodology

Study Design

A research using a cross-sectional design was carried out with 540 patients within the premises of Hayatabad Medical Complex in Peshawar, Pakistan. The patients who attended the medical ward were the focus of the research, and information was collected between January and December of 2018. The age range of those who made up the research population was between the ages of 18 and 55. At the time of recruiting, each participant provided written informed consent. Subsequently, each participant received printed questionnaires designed to gather comprehensive information on social, demographic, professional, dietary, and medical history aspects.

Inclusion and Exclusion Criteria

The study concentrated on those suffering from CLD receiving treatment in the medical ward of the Hayatabad Medical Complex in Peshawar, Pakistan, who had NAFLD. The median age of the participants was 18 to 55. Every subject willingly provided written informed consent. Those who did not meet the specified age range, those experiencing a history of strong alcohol use, and those with liver illnesses other than metabolic syndrome or CLD such as chronic disorders of the liver or viral hepatitis were excluded.

Measurement Procedures

A transportable stadiometer was used to determine the length, and an electronic weighing scale was employed for recording the weight. The lowest girth between the highest point of the ileum and the lower part of the ribcage was used to calculate the waist measurement. A mercury sphygmomanometer was used to measure the patient's resting blood pressure while they were sitting on their right upper limb following a 20-minutes rest. Employing certain enzymatic techniques, such as the PVS/PEGME technique to measure High-density lipoprotein (HDL) cholesterol, the GPO

technique for triglycerides, and the CHOD-PAP method for total cholesterol, the profile of lipids in the blood was ascertained. Auto analyzers were used to acquire lipid levels after fasting and hepatic function testing.

Fatty Liver Diagnosis

Fatty liver was identified sonologically by a wide improvement in parenchymal echogenicity, a steadily declining purity of the portal vein, as well as an increase in liver sound attenuation.

Metabolic Syndrome Diagnosis

The NCEP-ATP III specifications, with adjustments for waist circumference, served as the basis for determining the existence of metabolic syndrome in this study: The presence of at least three of the following signs suggested metabolic syndrome: Low HDL cholesterol (<40 mg/dl for men and <50 mg/dl for women), hypertriglyceridemia (triglycerides ≥150 mg/dl or specific medication), fasting plasma glucose ≥100 mg/dl or precise drug, increased blood pressure (bp) (systolic bp ≥130 mm Hg or diastolic bp ≥85 mm Hg or particular medicine), or a history of diabetes Type 2.

Statistical Analysis

The data were carefully entered into Microsoft Excel (version 2016) for arrangement and then imported to statistical analysis using SPSS software (version 27.0). Numbers and percentages were used to represent categorical data, whereas the mean and standard deviation were used to represent continuous data. Mann-Whitney U test used for comparing the disparity in risk factor profiles between NAFLD and control cohorts. For the length of the study, the quantitative variables remained ungrouped and in their original form. A p-value of less than 0.05 was chosen as the statistically significant criteria.

Results

A total of 540 patients participated in the research, conducted at Hayatabad Medical Complex in Peshawar, Pakistan. The sample included 298 males (55.18%) and 242 females (44.82%; figure 1).

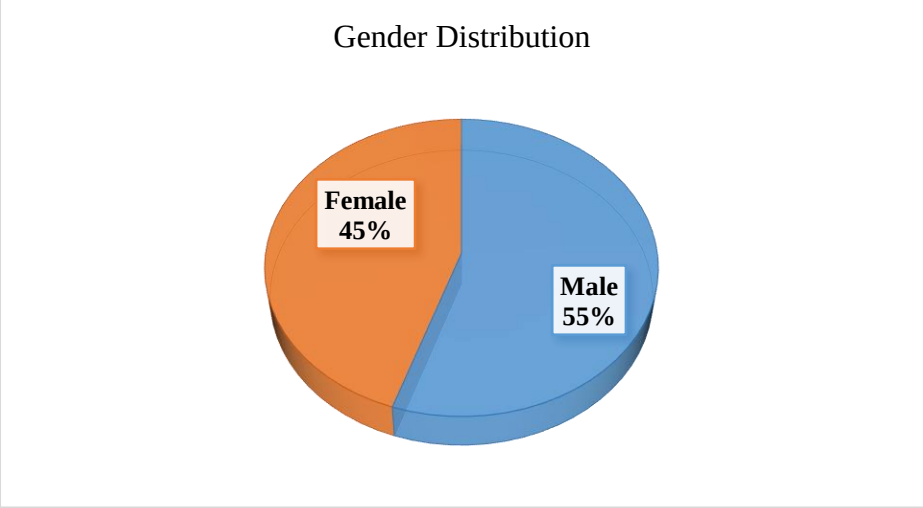

Figure 1: Distribution of genders in the research population

Table 1 of this research provides a detailed summary of the essential characteristics of the patients from the medical ward comprised in this research. The average age was 43.28 years, the body mass index (BMI) was 22.1 kg/m2, and the weight was 56.41 kg and the height was 154.8 cm. The average diastolic and systolic blood pressure values were 71.61 mm Hg and 124 mm Hg, respectively. In addition, the table shows biochemical markers such as HDL cholesterol, SGOT, SGPT, fasting blood sugar, and triglycerides, giving a thorough picture of the patient population's healthcare profile on the medical ward.

Table 1: Analysis of Demographic, Anthropometric, and Initial Bio-Chemical characteristics in the Study Population.

Variables	Mean ± Standard Deviation
Age in years	43.28 ± 13.42
Body Mass Index (kg/m²)	22.1 ± 4.53
Fasting blood sugar (mg/dl)	84.38 ± 24.61
Height (cm)	154.8 ± 8.2
Weight (kg)	56.41 ± 9.86
HDL cholesterol (mg/dl)	47.36 ± 16.47
Systolic blood pressure (mm Hg)	124 ± 13.75
Diastolic blood pressure (mm Hg)	71.61 ± 18.82
Triglycerides (mg/dl)	95.57 ± 27.98
SGPT	30.07 ± 11.62
SGOT	31.74 ± 12.13
High-density lipoprotein (HDL); SGPT, Serum Glutamate Pyruvate Transaminase; SGOT, serum glutamic-oxaloacetic transaminase	

There were 540 participants with NAFLD, 109 of them (20.18%) had fatty liver evidence on ultrasonography. There were 66 males (22.14%) and 43 girls (17.76%) with NAFLD. In the NAFLD group (n = 37) and the control group (n = 83), the prevalence of metabolic syndrome were 33.94% and 19.25%, respectively. In all, 22.22% (n=120) of the patients had metabolic syndrome. Furthermore, no patient had a biopsy of their liver since it is not feasible to do an invasive test on a group of healthy, unaffected people; as a result, our research was confined to an ultrasound-based assessment.

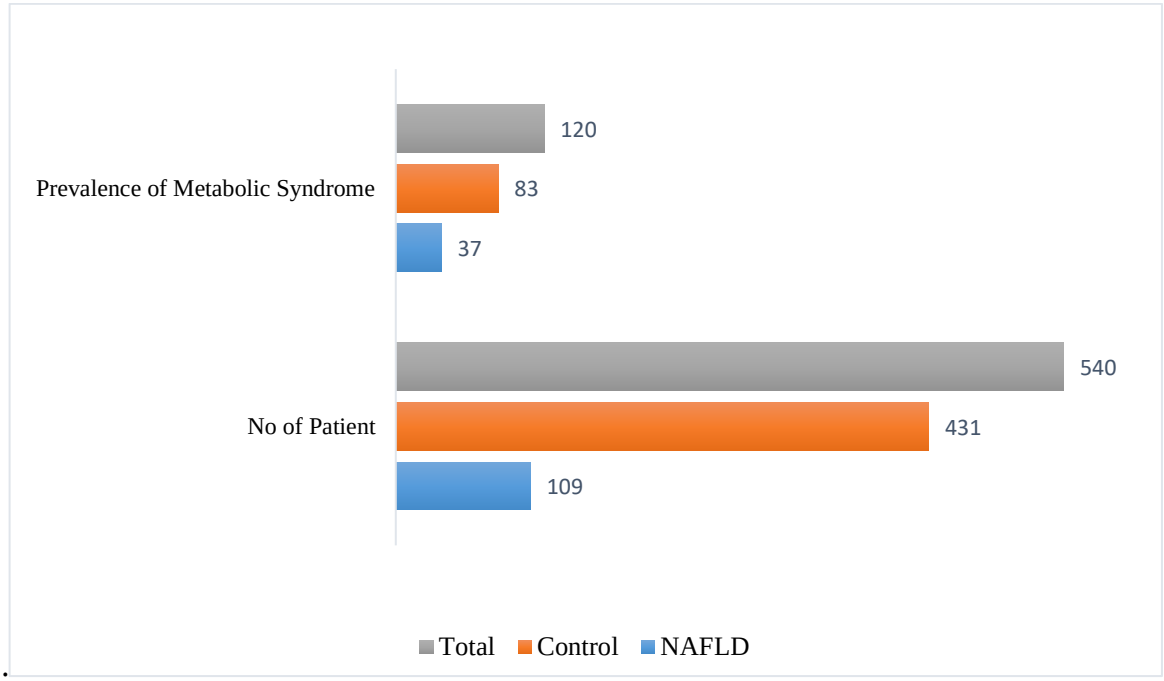

Figure 2: Exploring the Incidence of Metabolic Syndrome in the Study Cohort

This study identified a significant disparity in risk factor profiles between NAFLD and control groups, with NAFLD patients having a higher prevalence of both very few (0 or 1, p = 0.001 & 0.012 respectively) and significantly more (4, p = 0.038) risk factors compared to controls. Notably, the presence of 3 risk factors displayed the most striking difference, with a substantially higher prevalence observed in the NAFLD group (32.11%) compared to controls (9.74%, p < 0.001). These findings underscore the importance of considering individual risk factor profiles for identifying patients at risk for NAFLD and implementing appropriate preventive or therapeutic strategies (table 2).

Table 2: Comparing Disparity in Risk Factor Profiles between NAFLD and Control Cohorts

The quantity of risk variables	Control (n=431)	NAFLD (n=109)	p value
0	87 (20.19%)	6 (5.50%)	0.001**
1	159 (36.89%)	24 (22.02%)	0.012*
2	111 (25.76%)	29 (26.61%)	0.739
3	42 (9.74%)	35 (32.11%)	<0.001**
4	21 (4.87%)	13 (11.93%)	0.038*
5	11 (2.55%)	2 (1.83%)	0.774
***indicates a statistically significant difference ($p < 0.05$); *indicates a statistically significant difference ($p < 0.1$).*			

Discussion

The increasing worldwide burden of liver illnesses and its link to unfavorable health outcomes have made the frequency of metabolic syndrome in chronic liver disease—especially in the setting of non-alcoholic fatty liver disease (NAFLD) a serious concern [10]. Because of the liver's many functions in so many physiological processes, it is essential to comprehend the complex connections between metabolic syndrome and chronic liver disease [11]. Our study focused on the incidence of metabolic syndrome in a heterogeneous population, with a particular emphasis on NAFLD as a common etiological cause for CLD.

In the general population, NAFLD was shown to be 9–25% prevalent [12,13]. The current research revealed a prevalence of 20.18% (n=109), with men (n=66; 22.14%) having a greater prevalence than females (n=43; 17.76%). The current study's findings agreed with those of other studies [14–16]. The current research indicates that NAFLD is somewhat prevalent in the general population. The current study's NAFLD prevalence is lower than previous studies, although it is still higher than average. The exponential increase in obesity incidence among Pakistani people may help to explain this. Pakistanis now make up the sixth-largest diabetic population worldwide [17]. In Pakistan, adoption of the harmful Western food pattern and its concomitant sedentary lifestyle are also on the rise. Each of them has a part in the increasing trend of NAFLD prevalence.

In Pakistan, the prevalence of metabolic syndrome is on the rise for parallel reasons outlined earlier. The risk factors that are associated with metabolic syndrome and non-alcoholic fatty liver disease (NAFLD) are responsible for this increase. Furthermore, metabolic syndrome raises the chance of developing NAFLD on its own. NAFLD is regarded by many epidemiologists as the hepatic component of the metabolic syndrome [18, 19]. The prevalence of metabolic syndrome was higher in the NAFLD group (n = 37; 33.94%) than in the control group (n = 83; 19.25%), indicating a substantial correlation between the two conditions in the current investigation.

The quantity of risk variables is directly correlated with the liver histology [20]. In comparison to the controls, the current investigation demonstrated that individuals with ultrasound evidence of fatty liver had a higher prevalence of metabolic syndrome risk factors. Nonetheless, the hospital population—rather than the broader population—was the subject of the current investigation. As a result, both NAFLD and metabolic syndrome would be more common than they really are. Seldom are research that assess the metabolic syndrome risk variables between healthy, asymptomatic NAFLD patients and those who do not have fatty liver.

Conclusion

This study found a significant prevalence of NAFLD (20.18%, n=109) and metabolic syndrome (22.22%, n=120) in the studied population. The presence of metabolic syndrome was higher in the NAFLD group (33.94%, n=37) compared to controls (19.25%, n=83). Moreover, NAFLD patients exhibited a distinct risk factor profile with higher frequencies of both fewer and significantly more risk factors compared to controls, highlighting the importance of individual profiles for identifying patients at risk. These findings suggest a potential link between NAFLD, metabolic syndrome, and specific risk factor profiles, warranting further investigation and targeted interventions for effective management and prevention.

References

1. Ozougwu JC. Physiology of the liver. International Journal of Research in Pharmacy and Biosciences. 2017 Jan;4(8):13-24. DOI: https://doi.org/10.15835/nsb12310629.
2. Vilar R, Fish RJ, Casini A, Neerman-Arbez M. Fibrin (ogen) in human disease: both friend and foe. Haematologica. 2020 Feb;105(2):284. DOI: 10.3324/haematol.2019.236901
3. Casotti V, D'Antiga L. Basic principles of liver physiology. Pediatric Hepatology and Liver Transplantation. 2019:21-39. https://doi.org/10.1007/978-3-319-96400-3_2
4. Stepanova M, De Avila L, Afendy M, Younossi I, Pham H, Cable R, Younossi ZM. Direct and indirect economic burden of chronic liver disease in the United States. Clinical Gastroenterology and Hepatology. 2017 May 1;15(5):759-66. DOI: 10.1016/j.cgh.2016.07.020
5. Wang FS, Fan JG, Zhang Z, Gao B, Wang HY. The global burden of liver disease: the major impact of China. Hepatology. 2014 Dec 1;60(6):2099-108. DOI: 10.1002/hep.27406.
6. Kumar R, Priyadarshi RN, Anand U. Non-alcoholic fatty liver disease: growing burden, adverse outcomes and associations. Journal of clinical and translational hepatology. 2020 Mar 3;8(1):76. doi: 10.14218/JCTH.2019.00051.
7. Musso G, Gambino R, Cassader M. Non-alcoholic fatty liver disease from pathogenesis to management: an update. Obesity Reviews. 2010 Jun;11(6):430-45. DOI: 10.1111/j.1467-789X.2009.00657.x
8. Mitra S, De A, Chowdhury A. Epidemiology of non-alcoholic and alcoholic fatty liver diseases. Translational gastroenterology and hepatology. 2020;5. doi: 10.21037/tgh.2019.09.08.
9. Alemany-Pagès M, Moura-Ramos M, Araújo S, Macedo MP, Ribeiro RT, do Ó D, Ramalho-Santos J, Azul AM. Insights from qualitative research on NAFLD awareness with a cohort of T2DM patients: time to go public with insulin resistance?. BMC Public Health. 2020 Dec;20(1):1-4. DOI: 10.1186/s12889-020-09249-5
10. Souza MR, Diniz MD, Medeiros-Filho JE, Araújo MS. Metabolic syndrome and risk factors for non-alcoholic fatty liver disease. Arquivos de gastroenterologia. 2012;49:89-96. DOI: 10.1590/s0004-28032012000100015
11. Wang J, Kumar P, Engelmann C. Comprehensive insights into the multifaceted roles of the transient receptor potential vanilloid 1 channel in the digestive system. Life Sciences. 2023 Dec 1;334:122207. doi: 10.1016/j.lfs.2023.122207
12. Riazi K, Azhari H, Charette JH, Underwood FE, King JA, Afshar EE, Swain MG, Congly SE, Kaplan GG, Shaheen AA. The prevalence and incidence of NAFLD worldwide: a systematic review and meta-analysis. The lancet gastroenterology & hepatology. 2022 Sep 1. DOI: 10.1016/S2468-1253(22)00165-0
13. Williams CD, Stengel J, Asike MI, Torres DM, Shaw J, Contreras M, Landt CL, Harrison SA. Prevalence of nonalcoholic fatty liver disease and nonalcoholic steatohepatitis among a largely middle-aged population utilizing ultrasound and liver biopsy: a prospective study. Gastroenterology. 2011 Jan 1;140(1):124-31. DOI: 10.1053/j.gastro.2010.09.038
14. Elhence A, Bansal B, Gupta H, Anand A, Singh TP, Goel A. Prevalence of non-alcoholic fatty liver disease in India: a systematic review and meta-analysis. Journal of Clinical and Experimental Hepatology. 2022 May 1;12(3):818-29. doi: 10.1016/j.jceh.2021.11.010.
15. Singh SP, Nayak S, Swarn M. Prevalence of NAFLD in eastern coastal India-A Preliminary USG study. Trop Gastroenterol. 2004;25:76-9. https://pubmed.ncbi.nlm.nih.gov/15471321/.
16. Das K, Das K, Mukherjee PS, Ghosh A, Ghosh S, Mridha AR, Dhibar T, Bhattacharya B, Bhattacharya D, Manna B, Dhali GK. Nonobese population in a developing country has a high prevalence of nonalcoholic fatty liver and significant liver disease. Hepatology. 2010 May;51(5):1593-602. DOI: 10.1002/hep.23567
17. Gillani AH, Amirul Islam FM, Hayat K, Atif N, Yang C, Chang J, Qu Z, Fang Y. Knowledge, attitudes and practices regarding diabetes in the general population: A cross-sectional study from Pakistan. International journal of environmental research and public health. 2018 Sep;15(9):1906. DOI: 10.3390/ijerph15091906

18. McCULLOUGH AJ. Epidemiology of the metabolic syndrome in the USA. Journal of digestive diseases. 2011 Oct;12(5):333-40. doi: 10.1111/j.1751-2980.2010.00469.x.
19. Yki-Järvinen H. Non-alcoholic fatty liver disease as a cause and a consequence of metabolic syndrome. The lancet Diabetes & endocrinology. 2014 Nov 1;2(11):901-10. DOI: 10.1016/S2213-8587(14)70032-4
20. Leung JC, Loong TC, Wei JL, Wong GL, Chan AW, Choi PC, Shu SS, Chim AM, Chan HL, Wong VW. Histological severity and clinical outcomes of nonalcoholic fatty liver disease in nonobese patients. Hepatology. 2017 Jan;65(1):54-64. doi: 10.1002/hep.28697.