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TG: HDL, AST: ALT, A:G Ratios in Alcoholic and Non-alcoholic Fatty Liver patients

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Abstract

***Background & Aims*:** Nonalcoholic fatty liver disease (NAFLD) is typically first suspected when the results of liver function tests, measured as part of routine testing, are abnormal. Most often observed biochemical pattern in hepatic steatosis due to NAFLD is of increased levels of transaminases, with alanine aminotransferase (ALT) levels exceeding those of aspartate aminotransferase (AST). This classical pattern is particularly useful in differentiating between hepatic steatosis from NAFLD.The pathophysiology of non-metabolic complication like atherosclerosis and cardiovascular disease (CVD) depends vastly on fatty acids (lipid) transportation and Deposition. AIM Estimation of the AST: ALT, Albumin: Globulin, and TG: HDL ratios, along with their comparison among the Alcoholic and Non-alcoholic fatty liver disease patient.

***Materials & Methods*:** A prospective observational cohort study was conducted in the department of Biochemistry at GBCM & KKBM Subharti hospital, Jhajra, Dehradun after obtaining the ethical clearance from the institutional ethical committee (IEC) with registration no GBCM/IEC/2023/07-03 dated 25/07/2023. Cases comprised of 120 Ultrasonographically confirmed fatty liver patients by Random sampling method. 5ml blood sample was collected in the serum separation test tube (SST) and results were analysed using SPSS v.20. and statistical p-value of <0.05 was considered to be significant.

***Results*:** Extremely significant difference in TG: HDL and A:G ratio was found between two groups with statistical p-value of <0.05 and <0.01 respectively.

***Conclusion*:** This study can significantly contribute in evaluating the lipid derangements in two groups and their management.

***Keywords*:** Alcoholic fatty liver, AST: ALT ratio, A: G ratio, Fatty Liver, TG: HDL ratio, Non-Alcoholic Fatty Liver

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Introduction

Excess fat deposition within the liver has been recognized for centuries. In a landmark paper published by Ludwig et al, the term “non-alcoholic steatohepatitis (NASH)” was first used to describe the liver histology associated with excess liver fat in the absence of significant alcohol consumption.(1) Prevalence of NAFLD has doubled over the past 20 years, while prevalence of other chronic diseases of the liver has remained constant and even diminished.(2) Prevalence

of NAFLD in the world is about 25%,(3) in non-obese Asian-Pacific individuals, it is 15–21%,(4) in American adults, it is 30%, and in Italy, it has been reported to be 25%.(5) The term "non-alcoholic" used by the researchers was derived from similarities in the histopathological findings of these patients compared to those with alcohol-related liver disease, due to the lack of knowledge about its pathophysiological basis at that time. Since the introduction of the term nonalcoholic fatty liver disease (NAFLD) into the medical compendium. The pathogenesis of nonalcoholic fatty liver diseaseremains poorly understood. It is a complex, multifactorialprocess that involves genetic and environmental ele-ments.(6,7) In early 2020, By an international panel, utilizing a 2-stage Delphi consensus, the term proposed was "metabolic dysfunction-associated fatty liver disease," or /MAFLD. (8) The pathophysiology of non-metabolic complication like atherosclerosis and cardiovascular disease (CVD) depends vastly onfatty acids (lipid) transportation and Deposition, along with inflammation. Inflammation plays a crucial role in the pathogenesis of cardiovascular disease (CVD), as it has been linked with both the initiation and progression of atherosclerosis(9,10).NAFLD is typically first suspected when the results of liver function tests, measured as part of routine testing, are abnormal. Most often observed biochemical pattern in hepatic steatosis due to NAFLD is of increased levels of transaminases, with alanine aminotransferase (ALT) levels exceeding those of aspartate aminotransferase (AST). This classical pattern is particularly useful in differentiating between hepatic steatosis from NAFLD and alcoholic liver injury, with the latter normally associated with a high AST:ALT ratio. With the progression of hepatic steatosis to NASH and associated hepatic fibrosis, however, AST levels increase with a resultant rise in the AST:ALT ratio. (11) Albumin synthesis is also a function of Liver and Globulin is synthesized outside of liver, A:G ratio and fatty liver relation is very less studied. In cases of fatty liver the role of A:G ratio could be important, so we conduct this study to compare the TG: HDL, AST: ALT, and A:G Ratios in Alcoholic and Non-alcoholic Fatty Liver patients.

Material & Methodology

Study design: A prospective observational cohort study was conducted in the department of Biochemistry at GBCM & KKBM Subharti hospital, Jhajra, Dehradun after obtaining the ethical clearance from the institutional ethical committee (IEC) with registration no GBCM/IEC/2023/07-03 dated 25/07/2023. Tutor from the Biochemistry department is posted in the Medicine and Surgery OPD for collection of history of the patient from a specified format, and consent of the patient to enrol in the study. A fasting serum sample was preferred.

Sample size and sampling: Aftertaking informed or written consent, 120 Ultrasonographically confirmed fatty liver patients were enrolled in the study. 5ml blood sample was collected in the serum separation test tube (SST) from the patients who visited the medicine as well as surgery outpatient department (OPD) of KKBM Subharti hospital during the period of June-December 2023.

Study procedure: The study group is divided into Alcoholic and Non-alcoholic fatty liver patients. AST:ALT ratio, A:G ratio, and TG:HDL ratio was calculated after obtaining the Liver and Lipid Profile results by using EM-200 fully automated clinical chemistry analyser for both alcoholic fatty liver and Non-alcoholic Fatty Liver Patients. The results were evaluated by using SPSS v.20. The results were expressed as Mean±SD. Statistical means was compared using 't'test and p-value of <0.05 was considered to be significant.

Inclusion criteria:

Ultrasonographically confirmed fatty liver patients among the age group of 20-80 yrs were enrolled in the study.

Exclusion criteria:

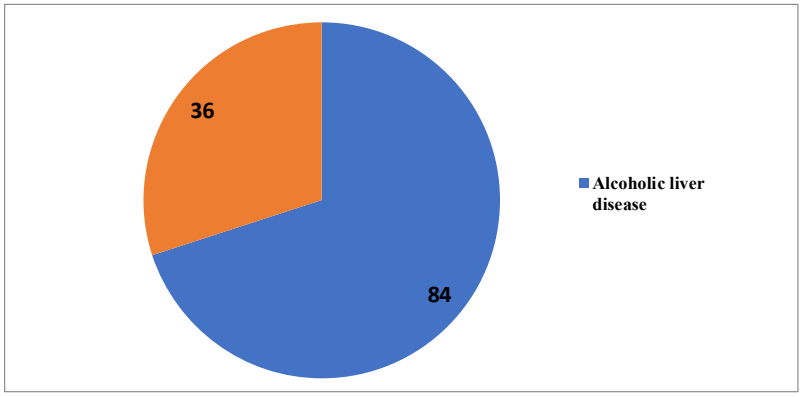
Patients with Diabetes mellitus, hypertension, age less than 20yrs and more than 80yrs, and confirmed endocrinopathies patients were excluded from the study.

Result

Out of 120 fatty liver patients 70% (n=84) were alcoholic liver disease, and 30% (n=36) were Non-alcoholic fatty liver disease. There was a significant difference found between theTG: HDL ratio, AST:ALT ratio, A:G ratios among the ALD and NALD patients with extremely significance p- value of <0.05. The result are as follows:

The mean±sd value for TG:HDL ratio in ALD and NALD was 5.07±3.58 and 3.39±1.96 respectively.The mean±sd value for AST: ALT ratio in ALD and NALD was0.99±0.70 and 1.18±0.53 respectively.The mean±sd value for A: G ratio in ALD and NALD was1.49±0.45 and 1.79±0.38 respectively.

These results are tabulated below in Table 1 and represented graphically in Graph 1and Graph 2.

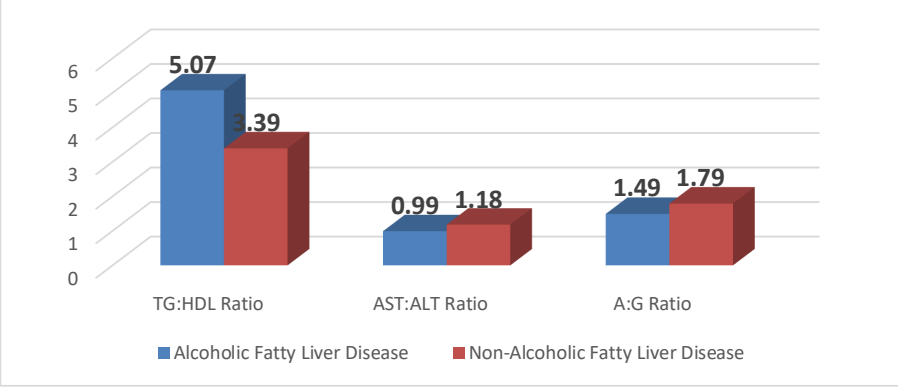


Graph 1. Frequency of fatty liver patients on the basis of alcohol consumption

Table 1. Comparison among the Alcoholic and Non-alcoholic Fatty Liver Disease

S.no	Parameters	Alcoholic liver disease (mean±sd) N=84	Non-alcoholic liver disease (mean±sd) N=36	*P-value	Significance
1.	TG: HDL Ratio	5.07±3.58	3.39±1.96	0.009	ES
2.	AST: ALT Ratio	0.99±0.70	1.18±0.53	0.01	ES
3.	A: G Ratio	1.49±0.45	1.79±0.38	<0.001	ES

*P<0.05 represents statistically significant values, AST: Aspartate aminotransferase; ALT: Alanine aminotransferase; TG: Triglyceride; HDL-C: High-density lipoprotein cholesterol; A:G Albumin: Globulin.



Graph 2. Comparison among the Alcoholic and Non-alcoholic Fatty Liver Disease

Discussion

There is limited historical evidence for the recognition of NAFLD and its contributory factors in the literature. Evidence that is available suggests that NAFLD recognition and diagnosis in primary care settings that manage the majority of patients are poorly understood and applied. The simple criteria for FLD (AFLD and NAFLD) have been purported to increase the recognition and understanding outside of gastroenterology and hepatology specialists, and it will also enable primary care practitioners and others to initiate early management. (12) The ratio of the serum activities of AST and ALT, also known as the De Ritis ratio, was first describedby Fernando De Ritis in 1957.(13) It is commonly used toassess liver function and reflects the severity of liverdisease. Previous studies reported that AST/ALT wasmore helpful for identifying heavy drinking in theNHANES study than when they were used alone (14).Our results provide a strong comparison result, which can aid in the diagnosis of fatty liver cause weather it is alcoholic or non-alcoholic, so it can help in the initial treatment planning. Satter Naved et al. (15) in his study represents most patients with NAFLD are asymptomatic and the disease is typically suspected based on raised alanine aminotransferase (ALT) levels together with other clinical and biochemical features, or an incidental finding during abdominal ultrasonography, these results are in accordance with our study. In a study by Arora et al. (16) showed highly significant increase in the levels of AST/ALT ratio in alcoholic liver disease patients as compared to control group. These results are found to be opposite of our results which could possibly due to the fact that the comparison they have conducted is with healthy controls but our study include the cohort of fatty liver patients and these patients although are non alcoholic but having fatty liver which is Ultrasonographically confirmed. Nyblom et al. (17) also demonstrated the similar results with alcoholic liver disease with AST/ALT ratio of 1.0 ± 0.6 (patients with withdrawal symptoms due to alcoholism) 1.7 ± 1.0* (patients with somatic diagnoses in addition to a diagnosis of alcohol abuse or dependence) our results are for alcoholic fatty liver disease (0.99±0.70) and for Non alcoholic liver disease is (1.18±0.53) these results are in accordance with our study. Bayard M. et al. (18) demonstrated in his study that laboratory abnormalities often are the only sign of NAFLD. Most commonly elevated liver enzymes are alanine transaminases (ALT) and aspartate transaminases (AST), usually one to four times the upper limits of normal. The ratio of AST/ALT usually is less than 1 (in alcoholic liver disease) but may increase as the severity of the liver damage increases. These findings are in accordance with our results and validate our study results.

Conclusion

There is an extremely significant difference found between the Alcoholic and Non-alcoholic Fatty Liver disease in the TG: HDL, A: G ratios were found to be most significant. In the literature the Albumin alone or combined with liver function tests panel is found to be significant in fatty liver but it would not be sufficient to comment on the status of alcohol involvement but A:G ratio in fatty liver could be a promising marker for differentiate among alcoholic and non alcoholic fatty liver. Study group is confined to the Uttarakhand region only, so geographical variation could be the limitation, which requires more external validity, also similar multicentric studies with large cohort groups would bring more light to it.

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Ethical approval

The study was conducted in accordance with the ethical standards set forth by the institutional ethical committee (IEC) of GBCM & KKBM Subharti hospital, Jhajra, Dehradun. Ethical clearance was obtained with

registration number GBCM/IEC/2023/07-03, dated 25/07/2023.

This research work is registered under CTRI (Clinical Trial Registry – India) /ICMR (Indian Council of Medical Research) with registration number CTRI/2023/11/059450.

Data Availability

The raw data supporting the conclusions of this article are available from the authors upon reasonable request.

Conflicts of interest

There are no conflicts of interest.

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References

1. Ludwig J, Viggiano TR, Mcgill DB, Oh B. Nonalcoholic steatohepatitis: Mayo Clinic experiences with a hitherto unnamed disease. Mayo Clin Proc 1980;55(7):434-8.
2. LaBrecque DR, Abbas Z, Anania F, Ferenci P, Khan AG, Goh K-L, et al. World Gastroenterology Organisation global guidelines: Nonalcoholic fatty liver disease and nonalcoholic steatohepatitis. J Clin Gastroenterol 2014;48:467-73. https://doi.org/10.1097/MCG.0000000000000116
3. Araújo AR, Rosso N, Bedogni G, Tiribelli C, Bellentani S. Global epidemiology of non-alcoholic fatty liver disease/non-alcoholic steatohepatitis: What we need in the future. Liver Int 2018;38:47-51. https://doi.org/10.1111/liv.13643
4. Chun Jen L. Prevalence and risk factors for non-alcoholic fatty liver disease in Asian people who are not obese. J Gastroenterol Hepatol 2012;27:1555-60. https://doi.org/10.1111/j.1440-1746.2012.07222.x
5. Bellentani S, Scaglioni F, Marino M, Bedogni G. Epidemiology of non-alcoholic fatty liver disease. Dig Dis 2010;28:155-61. https://doi.org/10.1159/000282080
6. Angulo P, Lindor KD. Non-alcoholic fatty liver disease. J Gastroenterol Hepatol 2002;17 Suppl:S186-90. https://doi.org/10.1046/j.1440-1746.17.s1.10.x
7. Harrison SA, Kadakia S, Lang KA, Schenker S. Nonalcoholic steatohepatitis: what we know in the new millennium. Am J Gastroenterol 2002;97(11):2714-24. https://doi.org/10.1111/j.1572-0241.2002.07069.x
8. Gofton C, Upendran Y, Zheng MH, George J. MAFLD: How is it different from NAFLD? Clin Mol Hepatol 2023 Feb;29(Suppl):S17-S31. https://doi.org/10.3350/cmh.2022.0367
9. Christodoulidis G, Vittorio TJ, Fudim M, Lerakis S, Kosmas CE. Inflammation in coronary artery disease. Cardiol Rev 2014;22:279-288. https://doi.org/10.1097/CRD.0000000000000006
10. Kosmas CE, Silverio D, Sourlas A, Montan PD, Guzman E, Garcia MJ. Anti-inflammatory therapy for cardiovascular disease. Ann Transl Med. 2019;7:147. https://doi.org/10.21037/atm.2019.02.34
11. Sorbi D, Boynton J, Lindor KD. The ratio of aspartate aminotransferase to alanine aminotransferase: Potential value in differentiating nonalcoholic steatohepatitis from alcoholic liver disease. Am J Gastroenterol 1999;94:1018-22. https://doi.org/10.1111/j.1572-0241.1999.01006.x
12. Shiha G, Korenjak M, Eskridge W, Casanovas T, Velez-Moller P, Högström S, et al. Redefining fatty liver disease: An international patient perspective. Lancet Gastroenterol Hepatol 2021;6:73-79. https://doi.org/10.1016/S2468-1253(20)30294-6
13. De Ritis F, Coltorti M, Giusti G. An enzymic test for the diagnosis of viral hepatitis; the transaminase serum activities. Clin Chim Acta 1957;2:70-4. https://doi.org/10.1016/0009-8981(57)90027-X
14. Kim SG, Kim HY, Seo JA, Lee KW, Oh JH, Kim NH, et al. Relationship between serum adiponectin concentration, pulse wave velocity, and nonalcoholic fatty liver disease. Eur J Endocrinol 2005;152:225-31. https://doi.org/10.1530/eje.1.01842
15. Sattar N, Forrest E, Preiss D. Non-alcoholic fatty liver disease. BMJ 2014 Jul 29;349:g4596. https://doi.org/10.1136/bmj.g4596

16. Arora M, Mahat R, Kumar S. Sharma A, Batra J. Evaluation of AST/ALT Ratio in patients of alcoholic Liver Disease. Bull Pharm Med Sci 2015;vol 3:3027-30.
17. Nyblom H, Berggren U, Balldin J, Olsson R. High AST/ALT ratio may indicate advanced alcoholic liver disease rather than heavy drinking. Alcohol Alcohol 2004;39(4):336-39. https://doi.org/10.1093/alcalc/agh074
18. Bayard M, Holt J, Boroughs E. Nonalcoholic fatty liver disease. Am Fam Physician 2006 Jun 1;73(11):1961-8.