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The Correlation Between Grade of Non-Alcoholic Fatty Liver Disease and Lipid Profile in Type 2 Diabetes Mellitus

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Abstract

Background. Non-alcoholic fatty liver disease (NAFLD) is a form of metabolic liver disease in which fat changes (steatosis) are associated with lobular inflammation, hepatocyte injury, polymorphs, or liver fibrosis. The study aimed to assess the relationship between NAFLD grades and lipid profiles in T2DM. **Method.** The design of the study was *cross-sectional* with the dependent variable being the grade of NAFLD and the independent variable being profile lipid. The sample of this study was NAFLD sufferers who met the inclusion criteria and were taken on a consecutive sampling basis. Diagnosis of NAFLD from anamnesis and physical, examination. Laboratory and abdominal ultrasound (Sonata SG 30 Ultrasound). Stages of NAFLD are divided into Degree I, Degree II, and Degree III. Lipid profile examination is carried out using a spectrophotometer tool colorimetric enzymatic method. **Result.** All patients are T2DM, consisting of Grade 1: 32 (40%), Grade II: 29 (36%), and Grade III: 19 (23%) patients. There was a significant difference between TC, TG, and LDL-C ($p < 0.01$) in the three grades of NAFLD. There is a significant correlation between NAFLD grade with TC and LDL-C ($p < 0.05$).

Conclusion. In T2DM, there is a significant correlation between NAFLD grades and TC and LDL-C, and there was a significant difference between TC, TG, and LDL-C in the three grades of NAFLD.

Keywords: NAFLD, T2DM, Lipid Profile

Abstrak

Latar Belakang: *Non-alcoholic fatty liver disease (NAFLD) adalah bentuk penyakit hati metabolik di mana perubahan lemak (steatosis) dikaitkan dengan peradangan lobular, cedera hepatosit, polimorf*

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atau fibrosis hati. Tujuan dari penelitian ini adalah untuk menilai hubungan antara nilai NAFLD dan profil lipid pada DMT2.

***Metode**. Desain penelitian ini potong lintang dengan variabel dependen adalah nilai NAFLD dan variabel independen adalah profil lipid. Sampel penelitian ini adalah penderita NAFLD yang memenuhi kriteria inklusi yang diambil berdasarkan sampling berturut-turut. Diagnosis NAFLD dari anamnesis, dan pemeriksaan fisik. Pemeriksaan laboratorium dan USG abdomen (Sogata SG 30 Ultrasound). NAFLD dibagi menjadi: Grade I, Grade II dan Grade III. Pemeriksaan profil lipid dilakukan dengan menggunakan alat spektrofotometer metode enzimatik colorimetric.*

***Hasil.** Semua pasien DMT2, terdiri dari pasien Grade 1: 32 (40%), Grade II: 29 (36%) dan Grade III: 19 (23%) pasien. Ada perbedaan yang signifikan pada TC, TG dan LDL-C antara tiga nilai NAFLD (p < 0,01). Ada korelasi yang signifikan antara Grade NAFLD dengan TC dan LDL-C (p < 0,05).*

***Kesimpulan**. Pada DMT2, ada korelasi yang signifikan antara Grade NAFLD dengan TC dan LDL-C, dan ada perbedaan yang signifikan antara TC, TG dan LDL-C dari tiga grade NAFLD.*

***Kata Kunci:** NAFLD, DMT2, Profil Lipid*

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1 Introduction

Non-alcoholic fatty liver disease (NAFLD) is a form of metabolic liver disease in which fat changes (steatosis) are associated with lobular inflammation, hepatocyte injury, polymorphs, or liver fibrosis.[1] NAFLD is usually the liver manifestation of insulin resistance syndrome but the factors that turn steatosis into NAFLD remain unclear. In 20-25% of cases, NAFLD can progress to the advanced stages of liver fibrosis and cirrhosis,[2] liver failure later becomes the most common cause of death. NAFLD is the primary diagnosis by the association of metabolism with obesity, insulin resistance, and type 2 diabetes, not just as an exclusionary disease.[3] Correction of insulin resistance with lifestyle modifications (dietary action and increased physical activity) is a logical approach to preventing or reversing NAFLD/NASH.[4] Obesity, diabetes, insulin resistance, sedentary lifestyle, and Western diet are the key factors underlying NAFLD, one of the most common liver diseases in developed countries. In many cases, NAFLD further progresses to non-alcoholic steatohepatitis (NASH), fibrosis, cirrhosis, and hepatocellular carcinoma. The hepatic lipotoxicity and non-liver factors, such as adipose tissue inflammation and gastrointestinal imbalances were linked to the evolution of NAFLD. Nowadays, the grade of adipose tissue inflammation was shown to directly correlate with the severity of NAFLD. Consumption of higher caloric intake is increasingly emerging as a fuel of metabolic inflammation not only in obesity-related disorders but also in NAFLD. However, multiple causes of NAFLD are the reason why the mechanisms of NAFLD progression to NASH

are still not well understood.[5] The study aimed to assess the relationship between NAFLD grades and lipid profiles in T2DM.

2 Method

The design of the study was *cross-sectional* with the dependent variable being the NAFLD *Fibrosis Score* and the independent variable being Fetuin-A levels. The target population of the study was NAFLD sufferers, while the affordable population was NAFLD sufferers who came to H. Adam Malik Medan hospital and network hospital from July-September 2021. The sample of this study was NAFLD sufferers who met the inclusion criteria and did not meet the exclusion criteria taken on a consecutive sampling basis. Diagnosis NAFLD from anamnesis, physical examination. Laboratory and abdominal ultrasound (Sogata SG 30 Ultrasound). Stages of NAFLD are divided into Degree I, Degree II, and Degree II.[6] Lipid profile examination is carried out using a spectrophotometer tool colorimetric enzymatic method or CHOD PAP parameters observed include total cholesterol, HDL-C, LDL-C, and TG.

Data Analysis

The data analysis was used in univariate analysis. The relationship between lipid profile levels and NAFLD grades uses the ANOVA test when the data is normally distributed and uses the Kruskal Wallis test if the data is not normally distributed. As for finding correlations between lipid profiles and NAFLD using Pearson tests when distributed data is normal, and spearman tests when data is not distributed normally. The results of the analysis are significant if the value of p-value < 0.05.

3 Result

In table 1, all patients are T2DM, consisting of Grade 1: 32 (40%), Grade II: 29 (36%), and Grade III: 19 (23%) patients. There was a significant difference between TC, TG, and LDL-C ($p < 0.01$) between the three grades of NAFLD.

Table 1 The differences of profiles lipid in Grading of NAFLD

Parameters		Grade I mean±SD, (n=32)	Grade II mean±SD, (n=29)	Grade III mean±SD, (n=19)	p
TC	mg/dl	107.2±27.8	126.5±33.7	102.1±20.9	0.004**
TG	mg/dl	107.2±27.8	126.5±33.7	102.1±20.9	0.008**
LDL-C	mg/dl	104.5±34.8	86.3±37.4	69.5±29.2	0.003**
HDL-C	mg/dl	69.5±29.2	27.9±15.3	24.8±12.2	0.345
FPG	mg/dl	216.8±103.8	225.9±120.0	176.2±86.0	0.266

PPG	mg/dl	286.2±98.8	295.1±128.0	245.0±87.3	0.270
HbA1c		10.5±1.8	9.6±1.9	10.0±2.4	0.210

TC: total cholesterol; TG: triglyceride; HDL-C: high-density lipoprotein cholesterol; LDL-C: low-density lipoprotein cholesterol; FPG: fasting plasma glucose; PPG: postprandial glucose *: $p < 0.05$; **: $p < 0.01$

Table 2 The relationship between lipid profile and NAFLD grade

Parameters		Mean±SD (n=80)	r	p
TC	mg/dl	122.1±38.1	-0.239	0.033*
TG	mg/dl	112.9±38.1	-0.012	0.917
LDL -C	mg/dl	89.6±36.8	-0.375	0.001**
HDL -C	mg/dl	28.3±14.3	-0.165	0.144
FPG	mg/dl	210.5±106.8	-0.129	0.254
PPG	mg/dl	279.7±108.5	-0.128	0.256
HbA1c		10.1± 2.0	-0.127	0.262

TC: total cholesterol; TG: triglyceride; HDL-C: high-density lipoprotein cholesterol; LDL-C: low-density lipoprotein cholesterol;FPG: fasting plasma glucose; PPG: postprandial glucose *: $p < 0.05$; **: $p < 0.01$

4 Discussion

Nonalcoholic fatty liver disease (NAFLD) encompasses a range of histopathological conditions, from mild steatosis to severe nonalcoholic steatohepatitis (NASH).[7] NAFLD has become the most common cause of the chronic liver disease (CLD) worldwide and can lead to serious sequelae, such as end-stage liver disease and hepatocellular carcinoma (HCC).[8] In the United States, the prevalence of NAFLD has been previously estimated to be 30% in the general population, affecting almost 100 million individuals.[9] NASH, characterized by the presence of lobular inflammation and hepatocyte ballooning degeneration with or without fibrosis, has an estimated prevalence of approximately 4% in the U.S. population.[10] NAFLD, which is associated with MetS, obesity, and diabetes, has increased in prevalence in parallel with epidemics of diabetes and obesity in the United States. Obesity may play a role in both initiations of liver steatosis and the progression of NAFLD.[11] The important finding of this study was that NAFLD, as diagnosed by liver ultrasound is the most widely used imaging test for detecting hepatic steatosis. Patients with fatty liver were further categorized into a group according to their lipid profile with dyslipidemia at 46.15% and without dyslipidemia at 53.84%. Similarly, patients without fatty liver (35%) were categorized in with dyslipidemia (37.14%) and without dyslipidemia (62.85%).[12]

In these studies, all patients are T2DM and there was a significant difference between TC, TG, and LDL-C ($p < 0.01$) between the three grades of NAFLD groups, and there is a significant correlation between NAFLD and TC and LDL-C ($p < 0.05$). The distribution of mean total cholesterol, triglyceride, LDL levels, total cholesterol to HDL ratio, and LDL to HDL ratio differed significantly in the study across three grades

of NAFLD. The distribution of abnormality of different components of lipid profile did not differ significantly across fatty liver grades.[13]

Ejaza et al, significant association with increasing grades of fatty liver was found with increasing levels of cholesterol (p = 0.028), and LDL-C (p = 0.017) in patients diagnosed with NAFLD. No significant association between increasing grades of fatty liver was found with increasing levels of TG (p = 0.32) and HDL-C (p = 0.25).[14] Most patients had grade I NAFLD (53%), 34% were grade II, and 13% were grade III. No association was noted with TC (P=0.569), HDL-C (P=0.220), and LDL-C (P=0.792).[15]

The differences in study results on the relationship between NAFLD grades and lipid profiles are due to differences in ultrasonography techniques for NAFLD imaging and differences in T2DM patients.

5 Conclusion

In T2DM, there is a significant correlation between NAFLD grades with TC and LDL-C, and there was a significant difference between TC, TG-C, and LDL-C in the three grades of NAFLD.

REFERENCES

[1]. Itoh S, Yougel T, Kawagoe K. Comparison between nonalcoholic steatohepatitis and alcoholic hepatitis. Am J Gastroenterol 1987; vol.82:p.650–4.
[2]. FiataroneJR,CoverdaleSA,BateyRG,FarrellGC.Non-alcoholic steatohepatitis: impaired antipyrine metabolism and hypertriglyceridemia may be clues to its pathogenesis. Gastroenterol Hepatol 1991; vol.6:p. 585–90.
[3]. Marchesini G, Forlani G. NASH: from liver diseases to metabolic disorders and back to clinical hepatology. Hepatology 2002; vol.35:p.497–9.
[4]. Angulo P. Non-alcoholic fatty liver disease. N Engl J Med 2002; vol.16:p.1221–31
[5]. Korinkova L., Prazienkova V., Cerna L., Karnosova A., Zelezna B., Kunes J., Maletinska L. Pathophysiology of NAFLD and NASH in experimental models: The role of food intake regulating peptides. Front. Endocrinol. 2020; vol.11:p.597583. doi: 10.3389/fendo.2020.597583
[6]. Hepatic Steatosis Ultrasound Procedures Manual. Hepatic Steatosis Ultrasound Images Assessment. National Health and Nutrition Examination Survey (NHANES) III. 2010.
[7]. Benedict M, Zhang X. Non-alcoholic fatty liver disease: an expanded review. World J Hepatol 2017; vol.9:p.715-32.
[8]. Sanyal AJ. Past, present, and future perspectives in nonalcoholic fatty liver disease. Nat Rev Gastroenterol Hepatol 2019; vol.16:p.377-86
[9]. Rinella ME. Nonalcoholic fatty liver disease: a systematic review. JAMA 2015; vol.313:p.2263-73.
[10]. Younossi ZM, Marchesini G, Pinto-Cortez H, Petta S. Epidemiology of nonalcoholic fatty liver disease and nonalcoholic steatohepatitis: implications for liver transplantation. Transplantation 2019; vol.103:p.22-7
[11]. Polyzos SA, Kountouras J, Mantzoros CS. Obesity and nonalcoholic fatty liver disease: from pathophysiology to therapeutics. Metabolism 2019; vol.92:p.82-97.

[12]. Krishan S. Correlation between non-alcoholic fatty liver disease (NAFLD) and dyslipidemia in type 2 diabetes. Diabetes & Metabolic Syndrome: Clinical Research & Reviews, 2016; vol. 10, no. 2:pp. S77–S81

[13]. Sudhir N, Vala D, Gupta M. Grading of Non-alcoholic fatty liver disease on ultrasound and its correlation with lipid profile. International Journal of Contemporary Medicine Surgery and Radiology. 2019; vol.4, no.3:p.C187-C92

[14]. Ejaza S, Mukhtar S, Uzairc M, Yousaf M. Sajjad S. Correlation Between Ultrasonographic Grading of Fatty Liver and Lipid Profile. American scientific research Journal for Engineering, Technology, and Sciences (ASRJETS) 2020, vol. 71, no. 1:pp 282-88

[15]. Cuenza LR , Razon TJ, Dayrit JC. Correlation between severity of ultrasonographic nonalcoholic fatty liver disease and cardiometabolic risk among Filipino wellness patients. J Cardiovasc Thorac Res, 2017, vol.9, no.2:p.85-9 DOI: 10.15171/jcvtr.2017.14