

Study of Correlation of Non Alcoholic Fatty Liver Disease and Nephropathy in Type 2 Diabetes Mellitus

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Conflict of interest: Nil

Abstract:

Introduction: According to the World Gastroenterology Organization's global guidelines, the overall prevalence of NAFLD is about 4% to 46% across the world. Considering the concept of bidirectional relationship between NAFLD and type 2 diabetes mellitus, assessing the hepatic status for fatty infiltration could be an ideal marker of insulin resistance in type 2 diabetes mellitus and its complications.

Objectives: To determine the correlation if any, between non-alcoholic fatty liver disease and microvascular complications in type 2 diabetes mellitus.

Material and Methodology: A Cross Sectional study conducted in Department of General Medicine at the teaching hospital of Mandya Institute of Medical Sciences between June 2020 to May 2021. Study population was All Non-alcoholic Diabetic patients diagnosed to have a Fatty liver on USG. A minimum sample size of 78 was required for the study. Purposive sampling was used. Appropriate statistical tools were used in analyzing the data. The level of significance [α] was 5% i.e., p-value <0.05 is considered statistically significant.

Results: In the study, all the participants were diagnosed with non-alcoholic fatty liver disease. Grade 1 NAFLD was observed in majority of the participants i.e., about 53.8% cases. Followed by Grade 2 around 34% and 10% cases had Grade 3 NAFLD. In assessing the association between diabetic complications in type 2 diabetic patients NAFLD, there exists statistically significant relation, all the three microvascular complications namely nephropathy.

Conclusion: The study concludes that increased severity of NAFLD with increase in the age, blood sugar level, and triglyceride level. Direct correlation between NAFLD and microvascular complications due to type 2 diabetes mellitus which include diabetic nephropathy.

Keywords: Diabetes Mellitus, Non-Alcoholic Fatty Liver Disease, Micro Vascular Complications, Type 2 DM.

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Introduction

According to the World Gastroenterology Organization's global guidelines, the overall prevalence of NAFLD is about 4% to 46% across the world [1]. Number of studies conducted in Indian population, concluded that the prevalence rate of NAFLD was about 9-32% and with a higher incidence of NAFLD among Type 2 Diabetes mellitus individuals found to be 12.5% to 87.5% [2].

Wide variety of fatty liver changes, from steatosis to steatohepatitis, cirrhosis and hepatocellular carcinoma is included under the term NAFLD, in the absence of alcohol intake [3]. Only recently, NAFLD has been increasingly recognized as the liver disease component of metabolic syndrome [4]. Number of studies has concluded that T2DM patients appear to have an increased risk of develop-

ing NAFLD than non-diabetic subjects and certainly the risk of developing fibrosis and cirrhosis is greater [3].

Current preclinical data suggest hyperinsulinemia and selective hepatic sensitivity to insulin leads to increased adipose tissue lipolysis and increased fatty acid delivery to liver, enhancing stimulation of hepatic lipid synthesis. Moreover, increased cellular oxidant stress leading to fibrosis by activation of hepatic stellate cells [5] has been implicated as the key for progression of NAFLD. The primary mechanism by which NAFLD contributes to type 2 diabetes mellitus is by increasing insulin resistance [6] and pancreatic beta cell lipo-toxicity caused by sustained elevation in FFAs formed from lipolysis of adipose tissue resulting in defective insulin se-

cretion [7]. Ultrasonography of abdomen seems to be a non-invasive, cost effective, simple procedure to detect the fatty changes in liver [8]. Therefore, considering the concept of bidirectional relationship between NAFLD and type 2 diabetes mellitus, assessing the hepatic status for fatty infiltration could be an ideal marker of insulin resistance in type 2 diabetes mellitus and its complications. [9]

Materials and Methods

Study design: Cross Sectional study

Study Setting: Department of General Medicine at the teaching hospital of Mandya Institute of Medical Sciences.

Study Population:

Population element: All Non-alcoholic Diabetic patients diagnosed to have a Fatty liver on USG Abdomen

Sampling element: All Non-alcoholic Diabetic patients diagnosed to have a Fatty liver on USG Abdomen at the study setting.

Study Period: 12 months (June 2020 to May 2021)

Inclusion Criteria:

1. Non-alcoholic individuals and Diagnosed cases of Diabetes Mellitus in the age group of 18-65 years with USG abdomen showing Hyperechoic liver suggestive of Fatty liver.
2. Patients who give informed consent.

Exclusion Criteria:

1. Patients who are positive for HBs Ag or Anti-HCV antibodies
2. Patients who have abnormal iron work up (High S. Iron, High S. Ferritin, Low TIBC)
3. Pregnant women.

Methods

All patients who are diagnosed with non-alcoholic fatty liver on USG abdomen in our hospital shall be explained about this study. Informed consent shall be obtained from those who agree to participate in the study.

Information will be collected through a pre-tested and structured proforma for each patient. In the first part, data regarding identifier details like name, age, phone number, inpatient number, date of admission, etc., will be obtained. In the second part, information about the chief complaints, history of presenting illness, past history, will be obtained. Details regarding the general condition of the patient will be obtained. In the third part, General physical examination including anthropometry and relevant systemic examination is undertaken. In the fourth part, patient is subjected to fundoscopy, urine for micro albuminuria study for estimating the micro vascular complications, which is then correlated with the presence of fatty liver.

Results

Table 1: Distribution of the Study Participants Based on the Grades of Non-Alcoholic Fatty Liver Disease

NAFLD	Frequency (N)	Percentage (%)
Grade 1	43	53.8
Grade 2	29	36.3
Grade 3	8	10.0
Total	80	100.0%

In the study, based on the findings from ultrasonography of whole abdomen, all the participants were diagnosed with non-alcoholic fatty liver disease. Further, on analyzing the severity of the condition, Grade 1 was observed in majority of the participants i.e., about 53.8% cases. The next common finding was Grade 2 which comprised about more than one third of the study population. Remaining 10% cases suffered with the most severe form i.e., Grade 3 NAFLD.

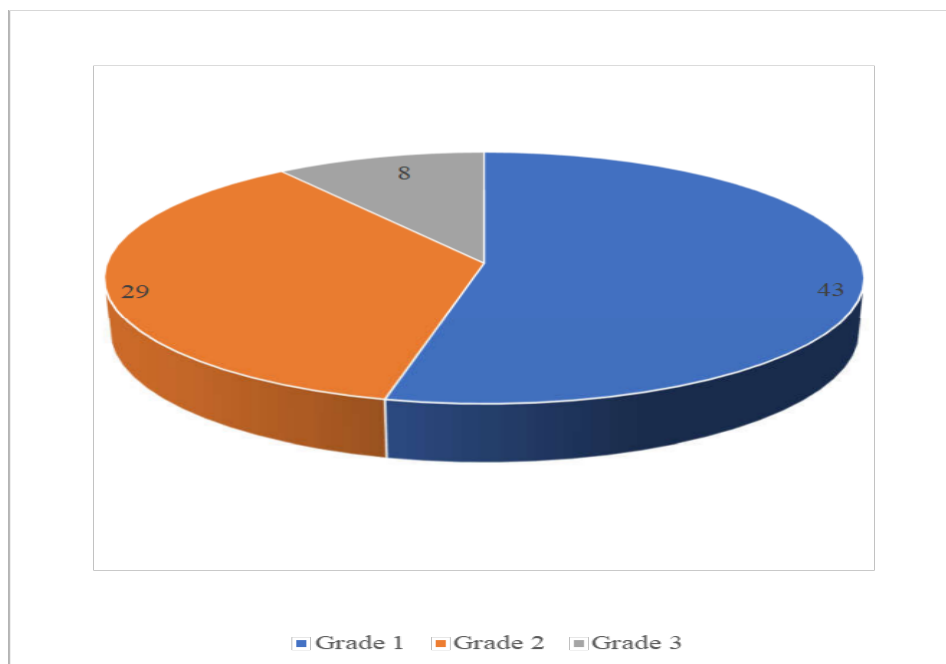


Figure 1: Distribution of the Study Participants Based on the Grades of Non-Alcoholic Fatty Liver Disease

Table 2: Association between Age of the Study Participants and Grades of NAFLD

NAFLD	Mean Age (in years)	Standard Deviation
Grade 1 (N=43)	42.95	7.30
Grade 2 (N=29)	52.10	8.34
Grade 3 (N=8)	55.75	6.90

The mean age of the participants in the study was 47.55 years with a standard deviation of around ± 9.11 years. The minimum age and maximum age of the study participants were 30 years and 65 years, respectively.

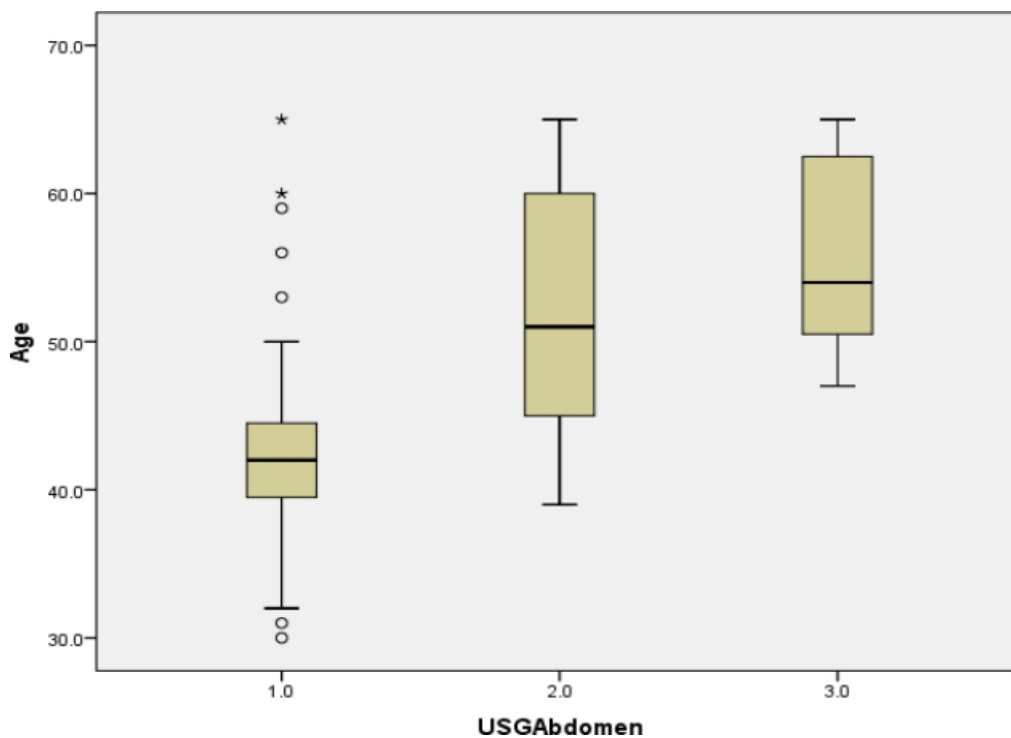


Figure 2: Association between Age of the Study Participants and Grades of NAFLD

Table 3: Association between Gender of the Study Participants and Grades of NAFLD

Gender	Non-Alcoholic Fatty Liver Disease		
	Grade 1	Grade 2	Grade 3
Male (N=49)	29 (67.4%)	18 (62.1%)	2 (25.0%)
Female (N=31)	14 (32.6%)	11 (37.9%)	6 (75.0%)

In the study, majority of the participants were males. Even on comparing with respect to the severity of non-alcoholic fatty liver disease, males were predominant in both Grade 1 and Grade 2. However, in case of Grade 3, females comprised about threequarters of the population.

Table 4: Prevalence of diabetic complications among the study participants

Diabetic complications	Frequency (N)	Percentage (%)
Diabetic Nephropathy	63	78.8

In the study, the risk of developing complications of diabetes mellitus was assessed among the participants.

Table 5: Association between nephropathy status and grades of NAFLD

NAFLD	Mean urine albumin (mg/L)	Standard Deviation	p-value
Grade 1 (N=43)	282.93	91.94	<0.001
Grade 2 (N=29)	520.14	64.49	
Grade 3 (N=8)	678.63	62.86	

Microalbuminuria often suggests the pathological condition of the kidneys, especially progression of nephropathy among the diabetics. Such that the urine sample of the study participants was collected to estimate the level of albumin in it. The mean value was found to be 408.49 mg/L with a standard deviation of around ±163.90 mg/L. The minimum and maximum values were 113 mg/L and 776 mg/L, respectively. On comparing the nephropathy status of the participants in the study with respect to the severity of non-alcoholic fatty liver disease, using one way ANOVA, it was found that there exists statistically significant relation. Thus, it is evident that more severe the nephropathy among the participants, more was the severity of NAFLD.

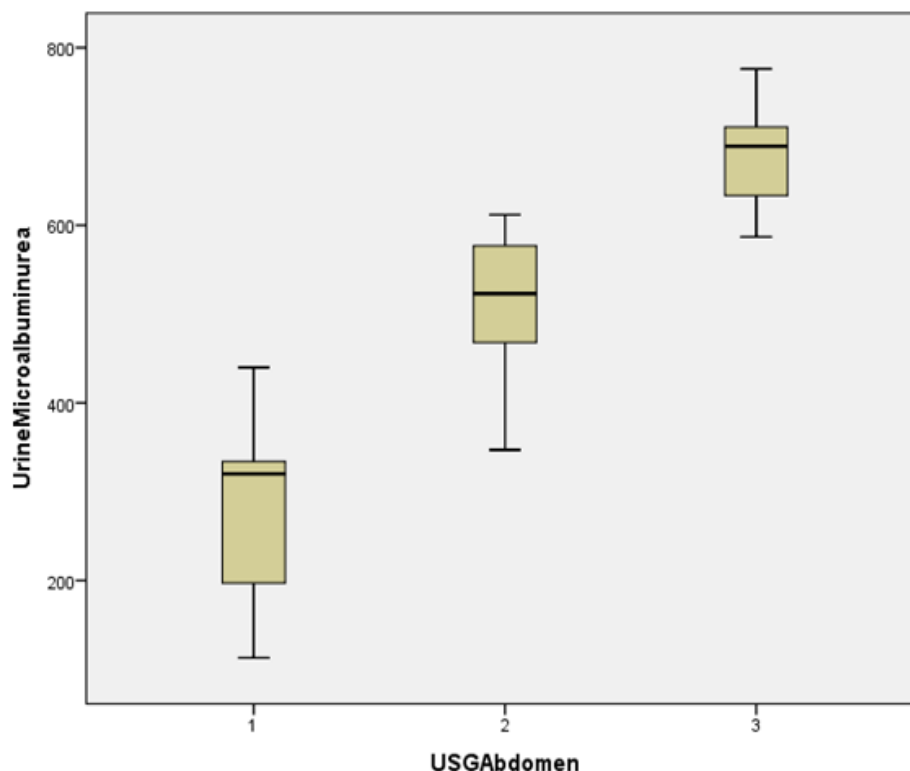


Figure 3: Association between nephropathy status and grades of NAFLD

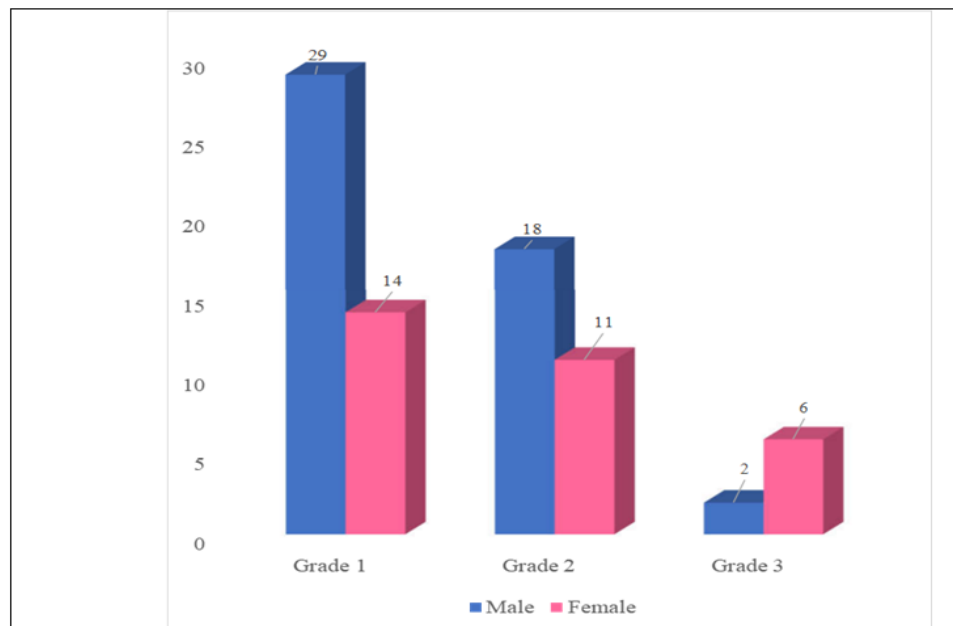


Figure 4: Association between Gender of the Study Participants and Grades of NAFLD

Discussion

The present cross-sectional study was conducted for a period of 12 months on around 80 type 2 diabetes mellitus patients who visited casualty or outpatient department of General Medicine at Mandya Institute of Medical Sciences, and later diagnosed with non-alcoholic fatty liver on USG abdomen, to determine any correlation between non-alcoholic fatty liver disease and microvascular complications due to type 2 diabetes mellitus. In the study, on analyzing the severity of non-alcoholic fatty liver disease among the participants, Grade 1 was observed in majority i.e., about 53.8% cases. The next common finding was Grade 2 which comprised about more than one third of the study population. Remaining 10% cases suffered with the most severe form i.e., Grade 3 NAFLD.

The mean age of the participants in the study was 47.55 years with a standard deviation of around ± 9.11 years. The minimum age and maximum age of the study participants were 30 years and 65 years, respectively. This resembles the study by Arase Y et al where the mean age was around 48.0 years with a standard deviation of around ± 8.4 years. Majority of the participants in the study were males. Even on comparing with respect to the severity of non-alcoholic fatty liver disease, males were predominant in both Grade 1 and Grade 2.

This is quite similar to the study by Targher G et al where males were predominant comparatively. However, in case of Grade 3, females comprised about three quarters of the present study population. In the study, the risk of developing complications of diabetes mellitus such as diabetic nephropathy was assessed by fundoscopy. Based on the findings from these tests, the prevalence of diabetic

nephropathy was found to be more than three fourth of the study population. Whereas in the study by Afarideh M et al the prevalence of diabetic nephropathy was around 28.48%, 70.10% and 20.80% respectively. In the study, few participants were suffering from more than one complication of diabetes mellitus. Thus, analysis for co-existence of diabetic complications was done. Accordingly, nearly two third of the participants were found to have all three diabetic complications, such as nephropathy. The study observed same proportion of the participants having nephropathy. Whereas more than three fourth of the participants had both nephropathy.

Conclusion

On observing type 2 diabetes mellitus patients who were diagnosed with non-alcoholic fatty liver based on the findings from USG abdomen, the study found;

- Increased severity of NAFLD with increase in the age, blood sugar level, and triglyceride level.
- Direct correlation between NAFLD and microvascular complications due to type 2 diabetes mellitus which include diabetic nephropathy.

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