Original Research Paper

Volume - 13 | Issue - 05 | May - 2023 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

General Medicine

STUDY OF RADIOLOGICAL, ANTHROPOMETRIC AND BIOCHEMICAL ASSESSMENT OF NAFLD IN TYPE 2 DIABETES MELLITUS IN WESTERN UTTAR PRADESH

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ABSTRACT **Background:** Type 2 diabetes mellitus (DM) might increase risk of Nonalcoholic fatty liver disease (NAFLD) though its prevalence is not well studied. Undiagnosed patients of NAFLD may progress to Chronic Liver disease and cirrhosis of liver with resultant increased morbidity and mortality. We conducted a prospective study of the prevalence of NAFLD in patients with type 2 DM and its relation with radiological, biochemical, and anthropometric parameters. **Materials and Methods:** 100 patients of Type 2DM diagnosed on the basis of ADA criteria attending Tertiary care centre in Western Uttar Pradesh were evaluated. Abdominal ultrasonography was performed to determine the presence of fatty liver. HbA1c, Liver function profile and Lipid Profile was done. A probability value of $P < 0.05$ was considered statistically significant. **Results:** The study group (n = 100) was divided into a NAFLD group (n = 61) and a non-NAFLD group (n = 39). The prevalence of NAFLD was 61%. There was positive correlation between glycated haemoglobin and NAFLD with higher levels of HbA1C correlating with incremental prevalence in NAFLD. Similarly there was a highly significant association of BMI and NAFLD in our study population. **Conclusion:** The prevalence of NAFLD is high in patients of uncontrolled Type 2 DM. It correlates with higher HbA1c and BMI. So routine screening of Type 2 DM patients for NAFLD by ultrasonography of the liver may be helpful in monitoring the progression as well as treatment of the patients.

KEYWORDS : Diabetes, NAFLD, BMI, lipid profile

INTRODUCTION:

Diabetes mellitus is a common metabolic disorder that affects a large number of people worldwide and is expected to affect 69.9 million adults in India by 2025[1]. Diabetes mellitus affects almost all systems in the body and it causes considerable morbidity and mortality. The liver is the site of most of the metabolic activities and it plays a vital role in the metabolism of carbohydrates, proteins, and lipids. Involvement of liver in diabetes has been studied by many investigators with a particular interest on Non alcoholic fatty liver disease (NAFLD).

Non-alcoholic fatty liver disease refers to a broad spectrum of liver disease ranging from steatosis (bland fatty infiltration of hepatocytes) to non-alcoholic steatohepatitis (steatosis plus inflammation, necrosis, or fibrosis) to cirrhosis and, in some patients, to end-stage liver disease and hepatocellular carcinoma. These facts have been documented in studies done by Lee R. G et al [2] and Powell E .E et al[3]

Although a lot of studies have been done on Non-Alcoholic Fatty Liver Disease in many centers around the world and a few centres in India, no such study has been conducted till date in western Uttar pradesh. Our Tertiary medical center located in the western Uttar Pradesh caters to the medical needs of a large diabetic population. Many cases of diabetes mellitus present to our center also have chronic liver disease, and many of them do not have a history of significant alcohol consumption or evidence of infection with hepatotropic viruses or use of other known hepatotoxic drugs. NAFLD has a very close relationship with the presence of type 2 diabetes mellitus which is an important determinant of NAFLD presence and severity. Central role in the pathogenesis of NAFLD is Insulin resistance although the initial site and cause of insulin resistance is unknown. The two key pathophysiologic abnormalities associated with insulin resistance that play a role in the genesis of a fatty liver are hyperinsulinemia and increased free fatty acid delivery to the liver.[4]

So this study was conducted to evaluate the prevalence and general characteristics of Non-alcoholic Fatty Liver Disease as a Hepatic manifestation of type 2 diabetics in western Uttar Pradesh with the aim to generate some clinical data that might be useful for future reference and to evaluate the impact of this disease on persons belonging to this geographical region.

MATERIALS AND METHODS :-

The present study was carried out at the department of medicine, Rama Medical College & Hospital, Pilkhuwa Hapur UPfrom January 2021 to July 2022. An initial screening in the form of detailed history taking and clinical examination was carried out in Diabetic subjects who were diagnosed on the basis of ADA criteria of Diabetes Mellitus. A total 100 patients having diabetes of minimum 1 year duration in the age group of 30 to 70 years were included in the study. Exclusion criteria included: Patients with history of

1. Any chronic drug intake other than oral hypoglycemic agents like Steroids, chemotherapeutic drugs, immunomodulators, use of hormones & oral contraceptives in females etc.
2. Jaundice in the past
3. Alcohol intake i.e., daily intake as low as 20 g in females and 30 g in males
4. HBsAg positive on card test.
5. Hepatitis C virus positive on card test.
6. Pre-diagnosed Cirrhosis Patients
7. No H/O Metabolic Disorders like Wilson's Disease, Antitrypsin Deficiency.
8. Any history of previous abdominal surgeries such as Jejuno-Ileal Bypass, Gastrectomy was recorded.

The study was approved by the Institutional Ethical Committee. A detailed history regarding the disease was taken, and complete physical examination was performed. BMI was calculated as Weight in kg divided square of Height in meters a measure of obesity, whereas waist/hip ratio was measured as an index of non-visceral fat accumulation[5]. After an overnight fast, serum samples were obtained from all subjects for liver function tests (aspartate aminotransferase [AST], alanine aminotransferase [ALT], and alkaline phosphatase (ALP), serum lipid profile (total cholesterol, triglycerides, high density lipoprotein cholesterol [HDLC], and low-density lipoprotein cholesterol [LDL-C]), fasting blood glucose (FBS), HBA1C, and fasting insulin levels. All subjects underwent abdominal ultrasonography by the same radiologist as a routine investigation as other patients who attend hospital for evidence of fatty liver disease. Based on ultrasonography findings The echo texture of the liver parenchyma was graded as per table 1 [6] and patients were categorized as those with NALFD and those without NALFD.

A detailed comparison was made between the prevalence of fatty liver in type 2 diabetics by the above methods. Descriptive statistics were

performed on all study parameters (mean, standard deviation and range). Statistical analysis was carried out for study parameters between the two groups (NAFLD and Non-NAFLD) using chi square test. $P < 0.05$ was considered significant.

Table 1:- Ultrasonography Criteria

Score	Steatosis	Description of Fatty Infiltration in the liver	Visualization
0	Absent	Normal echotexture of the liver	Normal visualization of the portal vein wall
1	Mild	Slight/diffuse increase in liver echogenicity	Normal visualization of the portal vein wall
2	Moderate	Increase in liver echogenicity	Slightly impaired appearance of the portal vein wall
3	Severe	Increase in liver echogenicity	Poor/no visualization of the portal vein wall and posterior part of the liver lobe

RESULTS :- A total 100 patients with T2DM were enrolled during the study period. Both NAFLD and non-NAFLD groups were compared regarding demographic, anthropometric, and biomedical characteristics The mean age of the patient was 52.3 years. Out of 100 patients, 33 were males and 67 were females. None of the subjects had histories of alcohol consumption. Of 100 patients with T2DM, 61 (61%) were found to have changes of fatty liver disease on abdominal ultrasonography examination. Prevalence of fatty liver disease was found to be more in females, highest in the age group of 51–70. We found a positive correlation between HbA1C and NAFLD. With increased levels of HbA1C there was an increased prevalence in NAFLD cases. Elevated ALT (>34 IU/dl) was seen in 62 patients while 71 patients had AST >31 IU/dl. The Body Mass Index (BMI) in this study varied from 17.4 to 28.7 kg/m2. BMI of 25 kg/m2 was taken as a cut off. 64 subjects had a BMI below 25 kg/m2 and 36 subjects had a BMI of above 25 kg/m2. In overweight subjects with a BMI of more than 25 kg/m2, 83.3% subjects had fatty liver detected on ultrasonogram as against48.4% in those with BMI below 25 kg/m2 (p value 0. .02451) suggesting thereby a very strong correlation of increased BMI with prevalence of NAFLD. 80% of the diabetics with total cholesterol levels above 200 mg/dl had ultrasonographically detected NAFLD as compared with 54% in those with total cholesterol below 200 mg/dl. (p-value 0.002). 76% of the diabetics with triglyceride levels above 150 mg/dl had ultrasonographically detected NAFLD as compared with 24% in those with triglycerides below 150 mg/dl. (p-value 0.002). These results are tabulated in table 2.

Table-2:- Depicting Co-relation between HbA1C, BMI, Liver enzymes, Total Cholesterol and Hypertriglyceridemia with NAFLD.

TEST NAME	VALUE	NAFLD (On basis USG)	Normal Patient (On basis USG)	p-Value
HbA 1C	<6.5	4	10	0.0 165 63
	6.6-9.0	20	7	
	>9	37	22	
BMI(^{2}) Kg/m	<25	31	33	0.0 94 005
	>25	30	6	
AST	<31 IU/L	23	7	0.0 86 354
	>31 IU/L	38	32	
ALT	<34 IU/L	18	20	0.0 7 286
	>34 IU/L	43	19	
TOTAL CHOLESTEROL	<200 mg/dl	41	34	0.0 245 1
	>200mg/dl	20	5	
TRIGLYCERIDES	<150 mg/dl	23	27	0.0 03 021
	>150 mg/dl	38	12	

DISCUSSION

We conducted this study with the aim to find out the prevalence of NAFLD in patients of Type 2 diabetes mellitus with help of ultrasonography of the liver by applying the radiological criteria as mentioned in table 1. In addition anthropometric data and biochemical abnormalities with particular attention to liver function tests, fasting lipid profile, plasma glucose levels & glycosylated hemoglobin. The correlation of the biochemical abnormalities with prevalence of NAFLD was done using the statistical tools. We observed 61% prevalence of NAFLD in our 100 patients of type 2 Diabetes mellitus. After comparing Age-wise, study populations were divided into two groups i.e NAFLD group & Normal group by the means of sonography. In our study 61% prevalence detected with the p value of 0.007522 which is statistically significant. This prevalence is comparable with the study by Herath et al[7] which showed a prevalence of 62.6% in 233 Srilankan population with same diagnostic modality (ultrasonography) other studies on the subject have by and large shown similar results. These studies include Dai et al[8] show (59.67%) in its meta-analysis of 24 studies involving 35,599 T2DM patients, Kalra et al[9] (56.5%)in 934 type 2 DM patients, and (49%) Gupte et al[10]. In present study there is a statistically significant association between HbA1c values and NAFLD with the p value of .016563. A study by Ma H et.al[11] in 949 elderly Chinese subjects 257 were diagnosed as NAFLD and found that the prevalence of NAFLD was significantly higher in subjects with increased serum HbA1c levels of ≥6.5% than in those with normal range of serum HbA1c level. In another study by Xie Y et.al[12] cross sectional analysis showed an independent association of HbA1c with NAFLD. Diabetic subjects in our study who had normal BMI showed prevalence of NAFLD 48.4%, while overweight subjects showed a prevalence of 83.3%. There was a strongly positive correlation between BMI and NAFLD with highly significant p-value of .000594. Similar results have been previously demonstrated in the study done by Xing J et al[13] in 15,943 participants which had shown that BMI was an independent risk factor for incident NAFLD, with OR of 1.416 (95% CI 1.338–1.499) and 1.187 (95% CI 1.137–1.240) in the low-BMI and high-BMI groups respectively. Khadka B[14] also showed the similar association as in this study. So, the prevalence of NAFLD increases with BMI which is considered a risk factor for the development of NAFLD. In our study, the fasting plasma glucose was found to be non-significantly higher in diabetic subjects with NAFLD with a p value of .779718. This is not in accordance with several studies including a study by Mansour-Ghanaei R et al[15] (2019) which showed this association in PERSIAN Guilan Cohart Study. The above study had a large sample size as compared to our study.Moreover some difference may be present due to the presence of the geographical variation. Serum transaminases i.e. AST & ALT. In some studies like NHANES III study among US population conducted by Lazo M et al[16], 6% of patients with elevated ALT had 41% prevalence of NAFLD and 5.6 % of those with elevated AST levels demonstrated 33.8% prevalence of NAFLD thereby showing the association between elevated transaminases and NAFLD. However other studies like Piazzolla VA et al[17], and Fracanzani AL et al[18] did not find this association. d. In our study population, also there was no significant relationship between elevated transaminases and NAFLD.

Fasting lipid profile has been correlated with the NAFLD in earlier studies which show the positive relation between dyslipidaemia and NAFLD. Traditionally total cholesterol and triglyceride values have been found to be elevated in subjects with NAFLD. The total cholesterol, triglycerides values were significantly higher in subjects of NAFLD Group. Initially comparison was done regarding total cholesterol within the comparison groups which shows 25% population had more than normal levels. While 80% of study population have NAFLD with significant correlation with cholesterol. Study is compared with Sen A et al[22]have a prevalence of 62%.

Among NAFLD patients, elevated total cholesterol values were observed in 76% of 50% population with high TG levels have NAFLD. This is in accordance with the study done by Santhoshakumarietal[23]. Additionally, the prevalence of hypertriglyceridaemia was about 42.4% in a study by Rafique et al [24].

CONCLUSION

Our study finds the Coexistence of diabetes mellitus and non alcoholic fatty liver disease(NAFLD) by radiologically ,clinically along with anthropometric and biochemical studies .So routine screening of NAFLD by ultrasonography in diabetic patients yields a greater benefit to general population.Future follow up studies using larger cohorts of patients are necessary to validate these results and to extend these findings among type 2 diabetes.

CONFLICT OF INTEREST :- NONE

Acknowledgment

My sincere thanks to Dr. B.D. Sharma Sir, Dr. Ravish Kumar Verma, Dr. Gagan Saxena, Dr. Nitish Upadhya and Dr. Prakhar. For their constant support and guidance in conducting this study.

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