International Journal of Medical and Health Research
ISSN: 2454-9142; Impact Factor: RJIF 5.54
Received: 29-12-2019; Accepted: 30-01-2020; Published: 16-02-2020
www.medicalsciencejournal.com
Volume 6; Issue 2; 2020; Page No. 130-134

Non: Alcoholic fatty liver disease in rural and urban population with type 2 diabetes mellitus: A cross sectional descriptive study

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Abstract
Introduction: Non-alcoholic fatty liver disease (NAFLD) is a chronic liver disease that might affect up to one-third of the adult population in industrialised countries. NAFLD incorporates histologically and clinically different non-alcoholic entities; fatty liver (NAFL, steatosis hepatis) and steatohepatitis (NASH-characterised by hepatocyte ballooning and lobular inflammation ± fibrosis) might progress to cirrhosis and rarely to hepatocellular cancer.
Objective: To find out the Non-Alcoholic Fatty Liver Disease in Rural and Urban Population with Type 2 Diabetes Mellitus.
Materials and Methods: This was a cross sectional descriptive study conducted in medicine department, Rajshahi medical college, Rajshahi among ninety one T2DM patients. Abdominal ultrasonography for NAFLD detection and grading as well as measurement of blood pressue, BMI, waist circumference, HbA1c, lipid profile, liver function tests were done. All data were analysed by SPSS 16 and p value <0.05 was assumed as statistically significant in this study. Study population included outdoor patients as well as hospitalized consecutive 91 patients (50 Urban and 41 Rural) in the medicine department with type 2 diabetes diagnosed according to the American Diabetes Association (ADA) 2011 criteria.
Results: A total of 91 patients were enrolled during the study. The prevalence of NAFLD was higher in urban patients (54.54%) than the rural patients (45.45%). Males were affected more than the female patients in both the groups. Urban population, patients exhibited higher weight, waist circumference, hip circumference, BMI and had earlier age of presentation of NAFLD than the rural population. Both the groups showed high prevalence of metabolic syndrome.
Conclusion: In our study revealed higher prevalence of NAFLD in urban population as compared to the rural population with males affected more than the female patients. Although the risk factors for NAFLD were similar in both the study groups, better anthropometric parameters (lower weigh), waist circumference, hip circumference and BMI had a role in reduced prevalence of NAFLD in rural as compared to Urban population patients.

Keywords: non-alcoholic fatty liver disease, urban, rural, BMI

1. Introduction

Diabetes mellitus (DM) is one of the major public health and economic burdens among chronic non-communicable diseases worldwide [1]. The cost incurred by developed nations like US in the management of DM is passing 100 billion dollars annually [2]. It is further complicated when it is associated with Non-Alcoholic Fatty Liver Disease (NAFLD). NAFLD is "insulin resistance and hepatic fat accumulation in the absence of other identifiable causes of fat accumulation" [3, 4]. The exact identification of NAFLD co-existing with DM is not yet successful making the control programs complex [5]. Althouh it has remained unnoticed for many years, NAFLD is the first leading cause of liver diseases like cirrhosis [6, 7]. Patients developing cirrhosis from NAFLD are at approximately 75% risk of acquiring liver cancer [8]. The great challenge is that most of the patients do not manifest any overt signs and symptoms [8, 9], and severe NAFLD can progress to liver failure [10]. The worldwide prevalence of NAFLD is 20% in the general population and 70% amongst people with type 2 diabetes [11]. NAFLD is supposed to be hepatic manifestation of metabolic syndrome [28, 29, 30]. Patients with NAFLD usually have insulin resistance (IR) which increases lipolysis from the adipose tissue [4], and there is an increased delivery of Free Fatty Acid (FFA) to the liver. These FFA either undergo lipid peroxidation or are esterified with glycerol to form triglycerides, leading to hepatic fat accumulation [31, 32]. Though the mechanism is unclear by some intricated ways hypertension, central obesity and dyslipidaemia play their role as individual risk factor in the development of NAFLD. Non-alcoholic fatty liver disease (NAFLD) has become a public health problem worldwide due to rising incidence of obesity and Type 2 diabetes [41]. It has emerged as the commonest cause of chronic liver disease and abnormal liver function tests among adults in Western countries [28, 29, 30]. The prevalence of Non-alcoholic fatty liver disease (NAFLD) varies in different population of study with a prevalence of 15%–30% in Western populations [33, 34] and 9-40% in Asian countries [42]. The prevalence increases to 58% in overweight individuals and can be as high as 90% in obese individuals [35, 36]. NAFLD is found in 60% of patients with mixed hyperlipidemia and in 83% of those with both mixed hyperlipidemia and an elevated serum alanine aminotransferase (ALT) [37, 28]. Increasing incidence of NAFLD is reported in Asian countries like Japan

and China [14]. There is increased incidence of diabetes, obesity in India in last two decades, it is logical to expect increase in incidence of NAFLD in India [39, 40]. Bangladesh is the next door neighbour of India and hence supposed to run the same risk. The prevalence of NAFLD in Type 2 DM patients is about 75% [29], and Diabetes mellitus is observed in 18%–45% NAFLD patients [35, 36]. Compared with non-diabetic subjects, people with type 2 diabetes appear to have an increased risk of developing NAFLD and have a higher risk of developing fibrosis and cirrhosis [28, 29, 30]. More than a quarter of adults in developed nations are losing either their lives or jobs due to this disease (12). Even though there are International Diabetes Federation (IDF) reports regarding the projected prevalence of type 2 DM to reach 1 million in Ethiopia, the number of patients developing fatty liver disease already acquiring DM is given less attention by health professionals [13]. Type 2 DM and obesity were associated with NAFLD to affect the liver throughout the world [8]. The findings of some researches also try to speculate the cardiovascular disease (CVD) risk of having NAFLD among type 2 diabetic patients with NAFLD as compared to type 2 diabetic patients without NAFLD. These associations could help clinicians to identify people with NAFLD who need more intensive therapy to decrease their risk of future CVD events [14-16]. Many scientific data are available across the industrialized nations identifying the cause and risk factors for NAFLD among type 2 diabetic patients [6, 17-19]. However, the effect of NAFLD on the African population is completely ignored. Thus, it is widely feared that it may cause harsh public health and economic consequences in this part of the world [11]. Therefore, The objective of this research to know the prevalence of NAFLD in urban and rural population in our district and to compare demographic profile, anthropometric measurements and lipid profile in the study group.

2. Objective

To find out the Non-Alcoholic Fatty Liver Disease in Rural and Urban Population with Type 2 Diabetes Mellitus.

3. Materials and Methods

This was a Cross sectional descriptive study carried out at medicine inpatient and outpatient department, Rajshahi Medical College Hospital, Rajshahi, Bangladesh done from *July-2015 to June-2017*. The study population were adults with type 2 DM attending in Medicine inpatient and outpatient department, Rajshahi Medical College Hospital, Rajshahi, Bangladesh. Sample Size: Ninety one cases of Type 2 DM patients and Purposive sampling method. Dependant and Independent variables: NAFLD, Metabolic syndrome, Age, Sex, Hypertension, BMI, Waist circumference, Duration of DM, Control of DM, Serum TG, Serum HDL cholesterol, Serum LDL cholesterol, Serum Total cholesterol, HbA1c, Serum AST, Serum ALT, AST: ALT and BAAT score. Study population included outdoor patients as well as hospitalized consecutive 91 patients (50 Urban and 41 Rural) in the medicine department with type 2 diabetes diagnosed according to the American Diabetes Association (ADA) 2011 criteria. Patients with history of chronic liver disease of any aetiology, space occupying lesion of liver, alcohol consumption >20 g/day and drugs intake like Tamoxifen, Corticosteroids, Amiodarone, Oestrogen were excluded from the study. The study group was divided into rural population (Group I) and urban population (Group II). A detailed historyre garding the demographic details, physical activity, diet and personal habits were obtained from the patients. After assessment of anthropometric parameters, these patients were subjected to laboratory investigations and ultrasonography (Ultrasound machine LOGIQ 5 Pro of GE with 3.5 MHz convex and 11 MHz linear probe). Subjects were considered as cases if they have fatty liver according to the standard criteria accepted by the American Gastroenterology Association. NAFLD Grade I-Minimal diffuse increase in the fine echoes. Liver appears bright compared to the cortex of the kidney and normal visualization of diaphragm and intrahepatic vessel borders, NAFLD Grade II-Moderate diffuse increase in the fine echoes. Slightly impaired visualization of the intrahepatic vessels and diaphragm, NAFLD Grade III-Marked increase in the fine echoes. Poor or no visualization of intrahepatic vessels and diaphragm and poor penetration of the poster iorsegment of the right lobe of the liver [6]. Metabolic syndrome in the study group was detected according to International Diabetes Federation (IDF) Criteria.

Sample collection

Ninety one cases of type 2 DM were included in this study. The diagnosis of type 2 DM was based on performing FBS, PPBS and HbA1c and checking previous treatment records. After meeting the inclusion and exclusion criteria patients with type 2 DM admitted in inpatient department and attending outpatient department of medicine, Rajshahi medical college hospital were included in the study. Age of the patient ranged from 42 to 71 years. Among them 61 were male and 30 were female.

3.1. Variables used in this study

Procedure of Data Analysis: The numerical data obtained from the study was analyzed and the significance of differences was estimated by using statistical methods. After processing of all available information, statistical analysis was performed by using computer based SPSS-16 (Statistical Package for Social Science). Data was expressed in percentage, frequencies, mean and standard deviation. Continuous data was expressed as mean ± standard deviation (SD) and dichotomous data was represented as percentage. Continuous variables were compared through the Student's t-test and for the categorical variables the chi-square test was applied.

4. Results

A total of 91 patients were enrolled during the study. The prevalence of NAFLD was higher in urban patients (54.54%) than the rural patients (45.45%). Males were affected more than the female patients in both the groups [Table-1].

Table 1: Group Wise Distribution of Study Population (N=91)

Total number of subjects subjects		Group A (n=50) Rural Area		Group B (n=41) Urban Area	
		Number	Percentage	Number	Percentage
Non-NAFLD	58	35	70	23	56
NAFLD	33	15	30	18	44

Table 2: Comparison of anthropometric variables in study population (N=91)

Variables	Group A(Rural NAFLD)		Group B(Urban NAFLD)	
	Mean	SD	Mean	SD
Weight (kg)	63.56	7.84	70.66	6.64
Height (cm)	167.89	6.88	164.54	5.45
Waist Circumference (cm)	86.23	6.54	85.23	3.79
Hip Circumference (cm)	88.67	7.43	90.45	3.88
Waist Hip Ratio	0.96	0.04	0.87	0.03
BMI	23.54	2.96	24.8	2.45

Table 3: Comparison of Haematological/Biochemical Parameters in Study Population (N=91)

Parameters	Group A		Group B	
	Mean	SD	Mean	SD
Fasting blood Sugar	190.13	40.23	182.12	40.24
PP	270.01	60.34	265.12	65.20
HbA1c	7.56	0.79	7.50	0.76
Serum cholesterol (mg/dl)	170.12	50.12	164.21	35.24
Serum triglycerides (mg/dl)	202.56	112.34	180.12	75.32
Serum HDL (mg/dl)	40.14	8.18	42.6	9.12
Serum LDL (mg/dl)	87.32	36.54	82.13	26.44
Serum VLDL (mg/dl)	40.76	20.22	35.12	12.65
Fasting Insulin	8.12	2.12	9.13	4.02
HOMA-IR	3.54	1.2	4.01	1.37

In this study Comparison of Haematological/Biochemical Parameters in Study Population were significantly associated with presence of fatty liver in T2DM patients. HbA1c was significantly associated with presence of NAFLD Group A mean 7.56 and group-B 7.50 and Serum triglycerides (mg/dl) level group-A 202.56 and group-B 180.12 so that with SD (0.79-0.76) and (112.34-75.32 respectively) [Table-3].

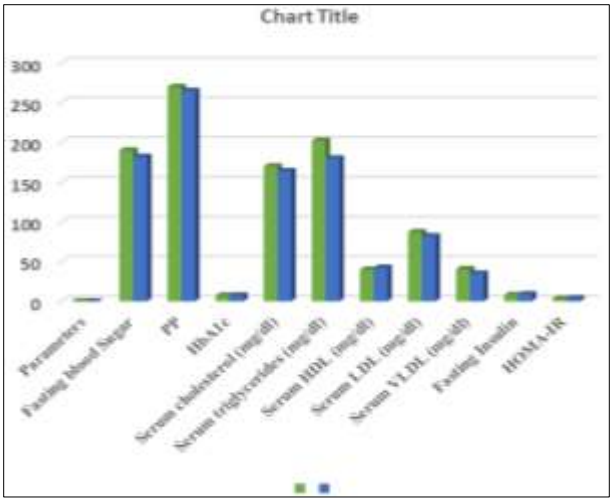

Fig 1: Comparison of Haematological/Biochemical Parameters in Study Population.

Urban population, patients exhibited higher weight, waist circumference, hip circumference, BMI and had earlier age of presentation of NAFLD than the rural population. Both the groups showed high prevalence of metabolic syndrome [Table 2-3]. The findings of the present study also supported the viewpoint that impact of diet on the prevalence of NAFLD might vary from one environment to another environment. The finding also highlighted that the risk factors for NAFLD are also dependent on the overall demographic profile and environmental settings.

5. Discussion

Our study revealed higher prevalence of NAFLD in the urban group (54.54%) than the rural population group (45.45%). Mean age of the rural NAFLD group was significantly higher than urban NAFLD group, thus indicating a probable delaying of NAFLD onset in rural as compared to urban diabetic patients. Although, NAFLD was detected more in males in comparison to females in both groups, no significant association between gender and NAFLD prevalence could be seen. One of the reasons for higher prevalence of males in rural group could be the gender-biased difference in health seeking behaviour in a male dominated society like ours. We observed that NAFLD patients in the urban population exhibited higher weight, waist circumference, hip circumference and BMI than the rural population. NAFLD and T2DM together have poorer prognosis in terms of higher frequency of cirrhosis and mortality [21]. NAFLD is more commonly seen in T2DM patients and it is now an important public health issue. NAFLD is associated with a variety of features of metabolic syndrome like obesity, hypertension and hypertriglyceridemia and low HDL. NAFLD is the integral part of the metabolic syndrome which comprises a cluster of abnormalities such as hyperglycemia, hypertriglyceridemia and low HDL, hypertension, obesity with insulin resistance as a central pathogenic factor [28]. This cross sectional descriptive study was conducted in medicine department, Rajshahi medical college. This study was designed to determine the ultrasonographic proportion of NAFLD in subjects with T2DM. UIltra sonography has a sensitivity and specificity of 83% and 100% respectively as compared with histological finding as the gold standard method in detecting fatty liver [23, 24]. Ultrasonography is a validated tool for screening of NAFLD in the absence of liver biopsy [25, 26, 27]. Ninety one patients with T2DM were included in this study who met the inclusion criteria and who were admitted in inpatient or attended outpatient department of medicine in Rajshahi medical college hospital. Out of the five components of metabolic syndrome, diabetes is the risk factor most frequently associated with NAFLD. This study further documented the proportion of the other components of metabolic syndrome namely obesity, elevated blood

pressure, elevated triglyceride and low HDL cholesterol and we tried to determine if there was significant association of these factors to NAFLD in study subjects. Liver function tests were also done to asses any derangement. The study population was mostly urban, middle class, living and working in Rajshahi and from diverse occupational background. The relationship between anthropometric parameters and NAFLD is well established; however, variable impact of different anthropometric parameters has been shown in different studies. Anthropometric parameters such as BMI and waist/hip ratio have been seen to be associated with causation of NAFLD and its outcome. The dependence of NAFLD on anthropometric measurements is much pronounced in type 2 diabetes mellitus patients where many workers have found NAFLD to be a universal finding among obese patients [5]. The present study also revealed that the prevalence of metabolic syndrome was significantly higher in urban as compared to rural group and in both the groups, metabolic syndrome was significantly associated with NAFLD. This fact re-emphasized and confirmed that instead of a single risk factor a combination of several variables have a synergistic effect on the occurrence of NAFLD. This finding is in agreement with the observations of previous studies to the extent that NAFLD is often considered to be the hepatic component of metabolic syndrome. This single parameter in itself is capable of explaining the difference in prevalence of NAFLD between rural and urban areas and could explain the multifactorial relationship of NAFLD and also lack of empiricity for univariate relationship. Although, the majority of NAFLD patients in our study was non-vegetarian, there is varied opinion regarding the effect of diet on the prevalence of NAFLD. Choi *et al.* were of the view that a vegetarian diet does not protect against NAFLD [20]. However, a number of other studies were of the view that diet might have a role in the prevalence and treatment of NAFLD. All these studies indicate that the relationship between diet and NAFLD is not empirical. The findings of the present study also supported the viewpoint that impact of diet on the prevalence of NAFLD might vary from one environment to another environment. The finding also highlighted that the risk factors for NAFLD are also dependent on the overall demographic profile and environmental settings.

6. Conclusion

In our study revealed higher prevalence of NAFLD in urban population as compared to the rural population with males affected more than the female patients. Although the risk factors for NAFLD were similar in both the study groups, better anthropometric parameters (lower weigh), waist circumference, hip circumference and BMI had a role in reduced prevalence of NAFLD in rural as compared to Urban population patients.

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