A COMPARATIVE STUDY OF NON-ALCOHOLIC FATTY LIVER DISEASE IN RURAL AND URBAN POPULATION WITH TYPE 2 DIABETES MELLITUS

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ABSTRACT

BACKGROUND

Non-Alcoholic Fatty Liver Disease (NAFLD) is a common liver disease worldwide. The proportion of NAFLD is also higher in patients with type 2 diabetes than in the general population; 70-75% patients with type 2 diabetes may have some form of NAFLD. The objective of this research is 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.

METHODS

This cross-sectional study was performed for 18 months in our institution. Study population included consecutive 160 patients with type 2 diabetes attending the OPD and indoor patients of medicine department. The study group (n=160) was divided into a NAFLD rural population (group I, n=80) and NAFLD urban population (group II, n=80). A detailed history regarding 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. Ultrasonography was used for the detection and gradation of NAFLD according to the standard criteria accepted by the American Gastroenterology Association.

RESULTS

A total of 160 patients were enrolled during the study. The prevalence of NAFLD was higher in urban patients (58.75%) than the rural patients (31.25%). 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.

CONCLUSIONS

The 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 weight, 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, Type 2 Diabetes Mellitus.

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INTRODUCTION

Non-Alcoholic Fatty Liver Disease (NAFLD) is a common liver disease worldwide. Its reported prevalence varies depending on the population of the study. Changing lifestyle and dietary habits in addition to genetic predisposition has increased the prevalence of obesity and diabetes mellitus and their consequences including NAFLD, specifically in Asian populations. The proportion of NAFLD is also higher in patients with type 2 diabetes than in the general population.^[1] 70-75% patients with type 2 diabetes may have some form of

NAFLD.^{[2][3]} The dependence of NAFLD on obesity is much pronounced in type 2 diabetes mellitus patients, where many workers have found NAFLD to be a universal finding among obese diabetic patients.^{[4],[5]}

In India where nearly 70% of the population still live in villages and where even primary health care facilities are inadequate, the study of lifestyle disorders in rural population and their prevalence remains rather unexplored. The objective of this research is 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.

MATERIAL AND METHOD

This cross-sectional study was performed from February 2014 to July 2015 after approval from the Ethics Committee of our Institution. Study population included outdoor patients as well as hospitalized consecutive 160 patients (80 Urban and 80 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,

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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 history regarding 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 posterior segment of the right lobe of the liver.^[6] Metabolic syndrome in the study group was detected according to International Diabetes Federation (IDF) Criteria.^[7]

Statistical Analysis

The statistical analysis was done using SPSS (Statistical Package for Social Sciences) Version 15.0 statistical analysis software. The values were represented in Number (%) and Mean±SD. T-test was used to compare continuous variable. The Chi-square test was used to compare categorical variables. A result was deemed statistically significant when $p < 0.05$.

RESULTS

A total of 160 patients were enrolled during the study. The study group ($n=160$) was divided into a NAFLD rural population (group I, $n=80$) and NAFLD urban population (group II, $n=80$). NAFLD was detected in 25 (31.25%) patients in Group I and 47 (58.75%) patients in Group II. (Table 1) There were 17 (68%) male and 8 (32%) females in NAFLD group I and 25 (53.19%) males and 22 (46.81%) female patients in NAFLD group II. The mean age of subjects in NAFLD group I was 54.68 ± 11.65 years and that of NAFLD group II patients was 47.79 ± 8.92 years. Mean duration of diabetes mellitus in group I and group II was 76.60 ± 56.79 months and 50.83 ± 52.96 months respectively.

Anthropometric variables in patients with NAFLD in both groups are shown in Table 2. Urban population with NAFLD exhibited higher average weight (71.33 ± 7.40 kgs vs. 67.52 ± 8.08 kgs, $p=0.048$), waist circumference (90.96 ± 4.54 cm vs. 87.60 ± 6.92 cm, $p=0.016$), hip circumference (93.66 ± 4.66 cm vs. 90.56 ± 7.63 cm, $p=0.036$) and Body Mass Index (BMI) (26.04 ± 2.35 vs. 24.40 ± 2.95 , $p=0.012$) as compared to the rural population with NAFLD.

The serum triglyceride level in both the groups was above normal values. However, comparison of other biochemical parameters including fasting sugar, post-prandial blood sugar, glycosylated haemoglobin, fasting insulin and HOMA-IR and lipid profile between the two NAFLD groups was not significant (Table 3).

In both the study groups, most of the patients were non-vegetarians, group I (96%) and group II (80.85%) respectively. Metabolic syndrome was detected higher in group II 47 (95.7%) as compared to the group I patients 21 (84.0%).

	Total Subjects	Group I (n=80) Rural		Group II (n=80) Urban		Statistical Significance	
		No.	%	No.	%	χ^2	P
Non-NAFLD	88	55	68.75	33	41.25	12.222	<0.001
NAFLD	72	25	31.25	47	58.75		

Table 1: Group Wise Distribution of Study Population

Anthropometric Variables	Group I (Rural NAFLD)		Group II (Urban NAFLD)		Statistical Significance	
	Mean	SD	Mean	SD	't'	'p'
Weight (kg)	67.52	8.06	71.33	7.40	2.016	0.048
Height (cm)	166.60	7.66	165.64	6.16	0.579	0.564
Waist Circumference (cm)	87.60	6.92	90.96	4.54	2.476	0.016
Hip Circumference (cm)	90.56	7.63	93.66	4.66	2.140	0.036
Waist Hip Ratio	0.97	0.02	0.97	0.01	0.101	0.120
BMI	24.40	2.95	26.04	2.35	2.570	0.012

Table 2: Comparison of Anthropometric Variables in Study Population

Parameters	Group I		Group II		Statistical Significance	
	Mean	SD	Mean	SD	't'	'p'
Fasting blood sugar	193.28	47.25	185.21	43.63	0.726	0.470
PP	273.00	64.63	264.96	67.20	0.490	0.626
HbA1c	7.76	0.59	7.65	0.71	0.669	0.506
Serum Cholesterol (mg/dL)	174.28	71.10	165.70	39.86	0.658	0.513
Serum Triglycerides (mg/dL)	204.24	116.08	190.46	76.48	0.605	0.547
Serum HDL (mg/dL)	42.96	10.19	43.78	9.39	-0.341	0.734
Serum LDL (mg/dL)	90.47	46.24	84.24	28.44	0.708	0.481
Serum VLDL (mg/dL)	40.85	23.22	38.09	15.30	0.605	0.547
Fasting Insulin	8.28	3.39	9.43	4.01	-1.212	0.230
HOMA-IR	3.84	1.47	4.08	1.37	-0.680	0.499

Table 3: Comparison of Haematological/Biochemical Parameters in Study Population

DISCUSSION

The overall prevalence of NAFLD is 15 to 40% in western countries, while in India the prevalence of NAFLD in the general population varies from 10% to 30%, the lowest figures being from rural areas of West Bengal and the highest from urban population of Chennai.^{[8],[9]} During the last few decades, a spectrum of research work has shown that diabetics are at a higher risk of non-alcoholic fatty liver disease, which is complicated by the presence of other risk factors such as obesity and metabolic syndrome.^{[10],[11],[12],[13],[14],[15],[16],[17]} Kalra et al in a large multicentric study reported NAFLD in 56.5% type 2 DM patients, the prevalence of the disease was found to be higher in females (60%) as compared to males (54.3%) and it increased with increasing age. NAFLD varies from 44.1% in western India to 72.4% in northern states.^[18]

Our study revealed higher prevalence of NAFLD in the urban group (58.75%) than the rural population group (31.25%). 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. 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.^{[19],[20],[21]} 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.^{[16],[22],[23]} 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.^[24] However, a number of other studies were of the view that diet might have a role in the prevalence and treatment of NAFLD.^{[25],[26]} 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.

In conclusion, 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 weight), 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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