

Original Research

An ultrasonographic assessment of fatty liver and cardiovascular disorders in individuals with type 2 diabetes

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ABSTRACT:

Aim: An ultrasonographic assessment of fatty liver and cardiovascular disorders in individuals with type 2 diabetes. **Material and Methods:** 100 Patients having been diagnosed as type 2 diabetic and Liver USG scan showing fatty changes (USG was done in patients of diabetes as a routine investigation) were included in this study. **Results:** We have found most of the cases of fatty liver (30%) were in the age group of 50-60 years. There were 4% cases with fatty liver above 80 years age. Among the fatty liver cases 50% were males and 50% were females. 6% of patients did not show any left ventricular diastolic dysfunction. 47% showed type 1, 44% showed type 2, 9% showed type 3 diastolic dysfunction. Type 3 LVDD was found mostly (10%) in cases with duration of diagnosis >10 years group. 29% subjects showed ischemic changes in their ECG. In the >10 years duration group 8% cases presented with ischemic changes in ECG. Statistical significance not found. **Conclusion:** Left ventricular diastolic dysfunction found to be the prime echocardiographic abnormality in type 2 diabetes mellitus patients.

Keywords: Cardio-vascular risk, Non-alcoholic fatty liver disease, Type 2 diabetes

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INTRODUCTION

The term Non-alcoholic fatty liver disease (NAFLD) is categorized by accumulation of fat in liver which changes from simple steatosis to steatohepatitis, cirrhosis and hepatocellular carcinoma (HCC) in lack of excessive alcohol intake.[1] NAFLD is distinct by macrovascular steatosis of more than 5% hepatocytes in the absence of inflammation. Type 2 Diabetes Mellitus (T2DM) patients seem to have an increased risk of developing NAFLD than non-diabetic subjects and certainly have higher risk of increasing fibrosis and cirrhosis. Existence of NAFLD in T2DM may also contribute to increased cardiovascular disease risk.[2] T2DM surges the risk of liver associated death by up to 22-fold in patients with NAFLD.[3]

Non-alcoholic fatty liver disease (NAFLD) is the upcoming leading cause of chronic liver disease in the United States and its prevalence is increasing worldwide. It is a spectrum of liver diseases that ranges from simple steatosis to a progressive form of liver disease called non-alcoholic steatohepatitis (NASH). The prevalence of NAFLD is remarkably high in populations of both industrialized and developing

countries, although there is variation depending on the criteria used and the population studied.[4] In one study of adults based on histological findings, mild to severe steatosis was shown in 70% of obese patients compared to 35% of lean patients. Steatohepatitis was found in 18.5% of obese patients, compared to 2.7% of lean patients.[5] In the primary care setting, NAFLD accounts for at least one third of cases of suspected chronic liver disease. Among patients with abnormal liver enzymes, NAFLD accounts for 40-80% of cases, with its prevalence strongly influenced by the presence of coexisting obesity, diabetes and dyslipidaemia.[6] In severely obese patients (usually defined as BMI >35kg/m²), the prevalence of steatosis is over 90% from patients undergoing bariatric surgery.[7] From another perspective, three-quarters of type 2 diabetic patients have steatosis. The coexistence of diabetes in NAFLD patients more than doubles the prevalence of cirrhosis from 10-25%.[8] Among patients with hyperlipidaemia, at least two-thirds with hypertriglyceridemia and one-third with hypercholesterolemia have fatty liver by

ultrasonography.[9] Liver imaging may be a more reliable method for diagnosing NAFLD. In three large population studies, ultrasound imaging suggestive of NAFLD was independently associated with cardiovascular events.[10] Overall survival was reduced in subjects with NASH compared to the general population due to increased mortality by cardiovascular disease. Importantly in this study, only subjects with NASH had significantly reduced survival.[11] Several mechanisms have been postulated for development of accelerated atherosclerosis in patients with NAFLD, including genetic predisposition, insulin resistance, atherogenic dyslipidemia, oxidative stress, chronic inflammation, reduced levels of the adiponectin and altered production of pro and anticoagulant factors.[12] All these mechanisms are present at the same time. NAFLD, regardless of its stage, is strongly associated with hepatic and adipose tissue insulin resistance (IR). In fact, liver fat content can be used as an independent predictor of insulin resistance. These mechanisms work synergistically.[13] NAFLD, especially in its necro inflammatory form (NASH), may cause atherogenic dyslipidemia.[14] The aim of this study was to ultrasonographically evaluate fatty liver disease and cardiovascular diseases in type 2 diabetic patients

MATERIAL AND METHODS

100Patients having been diagnosed as type 2 diabetic and Liver USG scan showing fatty changes (USG was done in patients of diabetes as a routine investigation) were included in this study.Long term history for chronic alcoholism, known hepatic disease, HBS Ag or anti HCV positivity, history of ingestion of hepatotoxic drugs, blood for ANA positivity were excluded from the study.

Table 1: Age distribution

Age	Fatty liver	%	Non-Fatty liver	%	Total	%	P value
Below 40	4	8	7	14	11	11	0.17
40-50	10	20	10	20	20	20	
50-60	15	30	19	38	34	34	
60-70	12	24	8	16	20	20	
70-80	7	14	4	8	11	11	
Above 80	2	4	2	4	4	4	
Total	50	100	50	100	100	100	

Table 2: Prevalence of LVDD with duration of diabetes

Duration of diabetes	LVDD				Total	P-value
	0	1	2	3		
0-5 years	1	8	4	3	16	0.26
5-10 year	3	10	7	2	22	
>10	1	3	3	5	12	
Total	5	21	14	10	50	

METHODOLOGY

Total of 100 patients diagnosed as type 2 diabetic and with liver USG scan showing fatty changes were included in this study. Study population was divided in 2 groups one group for fatty liver and group 2nd for non fatty liver. Each group had at least 50 patients. Study method was Interview schedule questionnaire, OPD records, bedside tickets, physical examinations and laboratory measurements.

STATISTICAL ANALYSIS

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2010) and then exported to data editor page of SPSS version

20.0 (SPSS Inc., Chicago, Illinois, USA). Descriptive statistics included computation of percentages and means. Test applied for the analysis was chi-square test. The confidence interval and p-value were set at 95% and 5%.

RESULTS

We have found most of the cases of fatty liver (30%) were in the age group of 50-60 years. There were 4% cases with fatty liver above 80 years age. Among the fatty liver cases 50% were males and 50% were females. 6% of patients did not show any left ventricular diastolic dysfunction. 47% showed type 1, 44% showed type 2, 9% showed type 3 diastolic dysfunction. Type 3 LVDD was found mostly (10%) in cases with duration of diagnosis >10 years group. 29% subjects showed ischemic changes in their ECG. In the >10 years duration group 8% cases presented with ischemic changes in ECG. Statistical significance not found.

Table 3: Prevalence of ischemic changes in ECG with duration of diabetes

Duration of diabetes	Ischemic changes in ECG				P-value
	Absent	Present	Total		
	Number	Number	Number	Percentage	
0-5 years	32	11	43	43	0.29
5-10 years	28	10	38	38	
>10	11	8	19	19	
Total	71	29	100	100	

Table 4: Prevalence of hypertension with hepatic status

Status of liver	HTN			Total	Percentage	P value
	0	1	2			
Fatty liver	16	11	23	50	50	0.23
Non-fatty liver	15	26	9	50	50	
Total	31	37	32	100	100	

Table 5: Prevalence of LVDD with A1C in fatty liver

A1C	LVDD				Total	Percentage	P-value
	0	1	2	3			
6.4-7	2	4	2	1	9	18	0.22
7.1-8	0	5	6	1	12	24	
8.1-10	0	7	5	1	13	26	
>10	1	5	8	2	16	32	
Total	3	21	21	5	50	100	

Table 6: PPBS by LVDD in fatty liver

PPBS	LVDD				Total	P-value
	0	1	2	3		
≤200	8	5	7	0	20	20
>200	4	45	25	6	80	80
Total	12	50	32	6	100	100

DISCUSSION

Liver ultrasonography results, although not sufficiently sensitive to detect liver inflammation and fibrosis, correlate well with the histological finding of fatty infiltration. In addition, international guidelines have been proposed for the diagnosis of different degrees of steatosis. NAFLD is associated with various metabolic abnormalities, including central obesity, type 2 diabetes, dyslipidaemia, high blood pressure, and metabolic syndrome (MetS). Fatty liver can develop as the result of various metabolic conditions that promote fat accumulation and inflammation in the liver. Otherwise, NAFLD may contribute to the development of MetS.

There is increasing evidence for an association between NAFLD and an increased risk of cardiovascular morbidity and mortality. The association between NAFLD and cardiovascular risk factors can largely explain the higher risk of cardiovascular disease among people with NAFLD. The aim of this study was to assess the prevalence of fatty liver disease in known Type 2 diabetic cases and whether, these cases do have increased association of cardiovascular risk factors with them compared to the population with type 2 diabetes without fatty liver disease. Banerjee S et al in their study showed fatty change in 43%, non-alcoholic steatohepatitis (NASH)

could be identified in 40% with more advanced disease in 23% of the study population.[15]

High levels of CRP is a potent cardiovascular risk factor. Chia-Hung Chiang et al established in their study that NAFLD patients have increased risk of CVD and elderly subjects have raised CRP value with a p value 0.004.[16] We have found significant association of hypertension with fatty liver disease in present study population as 37% cases showed grade 1 and 32% grade 2 hypertension (p-value was significant). Present findings are supported by a study from Targher et al as they showed, 27.54% cases with grade 2 hypertension in study population with a odd ratio 1.42 with a significant p value.[17] Hypertensive patients were mostly associated with left ventricular hypertrophy as detected in present study, p value was significant (p<0.001). According to Bleumke DA et al, abnormal left ventricular mass and geometry stands out to be potential marker of myocardial remodelling and cardiovascular disease.[18]

CONCLUSION

Left ventricular diastolic dysfunction found to be the prime echocardiographic abnormality in type 2 diabetes mellitus patients.

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