Original Articles

Prevalence of Non-alcoholic Fatty liver Disease in patients of Diabetes Mellitus in Referred Clinic in Kosti Teaching Hospital, Kosti city, White Nile State, Sudan

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Abstract

Introduction:
Non-alcoholic fatty liver disease (NAFLD) is very common pathological conditions worldwide that is closely associated with the clinical features of metabolic syndrome and is characterized by substantial inter patient variability in severity and rate of liver disease progression.
Methods:
This is a prospective hospital based study which was performed in Kosti city-White Nile State (Sudan). The study population comprised diabetic patients whom are randomly selected from Kosti Teaching Hospital. It was conducted in the period between 1/2/2019 to 1/4/2019.The sample size was on an average of 150 cases, categorized further into 80 cases and 70 controls. All cases were subjected to full history, proper examination, lab investigations and abdominal ultrasound. Information were collected, classified into three forms of data and analyzed accordingly.
Results:
The overall prevalence of non alcoholic liver disease in diabetes mellitus is 68%. This prevalence increases with age as there is remarkable increase in developing nonalcoholic liver disease mainly in patients of old ages. The prevalence has gender variation as it reveals predominance of female in diabetes and diabetes with hypertension and no gender variation in diabetes with coronary artery disease. Prevalence of non alcoholic liver disease increased in urban areas in diabetes with coronary artery disease and increased in rural areas in diabetes and diabetes with hypertensive patients. Prevalence of nonalcoholic liver disease increased with duration of diabetes mellitus.
Conclusion:
Based on the findings of the presents study, the prevalence of nonalcoholic fatty liver disease in diabetes mellitus is related to age, sex, residence, duration of disease.

Key words: nonalcoholic fatty liver disease (NAFLD), diabetes mellitus (DM), hypertension (HTN), coronary artery disease (CAD).

Introduction:

Nonalcoholic fatty liver disease (NAFLD) represents a spectrum of progressive liver disease occurring in the absence of excessive alcohol consumption that ranges from isolated intra hepatic triglyceride accumulation (simple steatosis), through intra hepatic triglyceride accumulation plus inflammation and hepatocyte injury (non-alcoholic steatohepatitis, NASH), and ultimately progresses to fibrosis /cirrhosis and potentially hepatocellular carcinoma. Although a significant proportion of the population has NAFLD, only a minority progresses to advanced liver disease or liver-related death.[1] Epidemiological studies indicate that type 2 diabetes mellitus and concomitant hypertension are associated with high risks of macrovascular and microvascular complications as well as clinical adverse cardiovascular accident.[2]
Although the factors such as excessive caloric intake and insulin resistance are involved in pathogenesis of hypertension in type 2 diabetes mellitus and these have been targeted for therapeutic intervention, however, up to now, the mechanisms facilitating hypertension in type2 diabetes mellitus individuals are still not very clear. More research studies are needed to determine the causes of hypertension in type2 diabetes mellitus.[2]
Nonalcoholic fatty liver disease (NAFLD) has been increasing worldwide in the last

decades and is occurring in up to 75% among patients with type 2 Diabetes mellitus(DM). [3] It has been suggested that NAFLD could increase the risk of insulin resistance (IR) and may be involved in the pathogenesis of cardiovascular disease in type2 diabetes mellitus (DM) .[4] However, currently, there has been scarce literature on the study of high metabolic risk of hypertension in type 2 diabetes mellitus with or without NAFLD.

Little is known about the relationship between NAFLD and hypertension in this patient population, which limits the understanding of the relative crosstalk between NAFLD and the other metabolic risks contributing to prevalent hypertension in type2 diabetes mellitus. Taking into account that NAFLD is the most common chronic liver disease among patients with type2 diabetes mellitus, studying the effects of NAFLD on the pathogenesis of hypertension should be considered in type2 diabetes mellitus with and without NAFLD separately.[5 -7] In prashnath et al study, 87% had NAFLD on histology with 62.6% steatohepatitis and 37.3% fibrosis.[6] Age, duration of diabetes mellitus, degree of glycemic control, body mass index, waist circumference, family history of diabetes mellitus, did not predict the presence or severity of NAFLD or fibrosis[6]. Serum alanine aminostranferase (ALT) and alkaline phosphatase levels, though within normal limits, were significantly higher in patients with steatohepatitis. Prevalence of nonalcoholic steatohepatitis (NASH) increased with increase in the components of the metabolic syndrome. Serum AST / ALT ratio were also significantly higher in patients with severe fibrosis.[6,8]

Justification:

This study was undertaken for a variety of reasons:

- The high incidence of diabetic patients in target area.
- Despite of its importance, the prevalence of NAFLD among diabetic patients is not well reviewed, not only in White Nile State, but also in whole Sudan.
- The relevance and national importance of the target area (Kosti city).
- Establish a database and a reference through which further study can be undertaken.

***Aim of the study*:**

To know the prevalence of nonalcoholic fatty liver disease in diabetic patients and its relation to age, sex, residence and duration of the disease.

Materials and Methods:

This is a prospective hospital based study. The study was performed in Kosti city-White Nile State. The study population comprises diabetics (32 patients), diabetes associated with hypertension (32 patients) and diabetes with coronary artery disease(16 patients). Patients were randomly selected from medical referred clinic of Kosti Teaching Hospital. The study was conducted in the period between, 1/2/2019 and 1/4/2019.

Study population:

The study included 150 patients diagnosed with diabetes, diabetes with hypertension and diabetes with coronary heart disease as a group from which the cases were selected. The patients were randomly selected from medical referred clinic of Kosti Teaching Hospital**.** The inclusion criteria for the study population were patients with type 2 diabetes, diabetes associated with hypertension and diabetes with coronary artery disease patients on treatments. All patients above 50 years of age with disease duration of 10 years and above.

Data collection:

A brief description for the aim of the study was explained to the patients, and verbal consent was obtained. The data was collected through data forms of 3 types - Data form 1→ contains the following: Personal information of the patients, name, age, sex, marital status, tribe, residence, housing condition , brief history of his

illness, duration, disease control, other co morbidities, treatment; brief examinations and recent finding if there; Data form 2→ include the following investigations random blood (RBG), aspartate aminotransferase (AST) and alanin aminotransferase(ALT), urine analysis and glycosylated hemoglobin (HbA1c). Data form 3→ contains the findings in abdominal ultrasonography. Abdomenal ultrasonography was used for the detection and gradation of NAFLD according to the standard criteria accepted by the American Gastroenterology Association.[9]

Statistical method:

All relevant statistics were performed using the Statistical package for social sciences (SPSS Ver-20.0, SPSS) software. The mean and standard deviation (SD) of all parameters were expressed. Analysis of variance(ANOVA) was used for comparison of mean between the groups. The relationship between the parameters were obtained by Pearson's correlation matrix (r) and a value of P< 0.05 was considered (at 95% CI) to be statistically significant

Ethical certificate:

The ethical approval for this research was obtained from the ethical committee of Ministry of Health- White Nile State before conduction of this research.

Results:

The overall prevalence of NAFLD in diabetes mellitus is 68 %(54 patients out of 80 patients).The overall prevalence of NAFLD in diabetes is 43 % (14 patients out of 32patients), in diabetes with hypertension is 75%(24 patients out of 32 patients) and diabetes with coronary artery disease is 100%(16 patients out of 16 patients) . (**figure1**)

The prevalence of NAFLD is 26% in Diabetes (14 patients out of 54 patients), 44% in diabetes with hypertension (24 patients out of 54patients) and 30% of diabetes with coronary artery disease (16 patients out of 54 patients).

The prevalence of NAFLD in diabetes increases with age, as there is remarkable increase in developing NAFLD mainly in patients of old ages. (**Table1**)

The prevalence of NAFLD in diabetes mellitus has gender variation as it reveals high predominance of female in diabetes, mild predominance of female in diabetes with hypertension and no gender variation in diabetes with coronary artery disease (**Table 2**).

Prevalence of NAFLD increased in urban areas in diabetes with coronary artery disease and increased in rural areas in diabetes and diabetes with hypertension (**Table 3**).

Prevalence of NAFLD increased with duration of diabetes as higher prevalence noticed with longer duration of diabetes (**Table 4**).

Table 1 : Prevalence of NAFLD in DM related to age categories.

	Diabetes		**DM+ HTN**		**DM+ CAD**	
Age group	No(14)	prevalence %	No(24)	prevalence %	No(16)	prevalence%
50-59 years	3	21.5%	5	20.9%	0	0%
60-69 years	5	35.7%	7	29.1%	3	18.7%
70-80 years	6	42.8%	12	50%	13	81.3%
Total	14	100%	24	100%	16	100%

Table 2 : Prevalence of NAFLD in DM according to gender variation

Gender	**Diabetes** No(14) prevalence %	**DM+HTN** No(24) prevalence%	**DM+CAD** No(16) prevalence%
Male	3 21.4%	11 45.8%	8 50%
Female	11 78.6%	13 54.2%	8 50%
total	14 100%	24 100%	16 100%

Table 3: Prevalence of NAFLD in DM according to Residency

Residence	**Diabetes** No(14) prevalence %	**DM+HTN** No(24) prevalence %	**DM+CAD** No(16) prevalence%
Urban	5 35.7%	9 37.5%	12 75%
Rural	9 64.3%	15 62.5%	4 25%
total	14 100%	24 100%	16 100%

Table4: Prevalence of NAFLD in DM according to duration of disease

Duration of disease	**DM** No(14) prevalence %	**DM+HTN** No(24) prevalence%	**DM+CA** No (16) prevalence%
10-15 yrs	6 42.1%	3 12.5%	0 0%
16-20 yrs	8 57.9%	6 25%	1 6.3%
>20 yrs	0 0%	15 62.5%	15 93.7%
Total	14 100%	24 100%	16 100%

Table 5: Means and standard deviations of main parameters in the prevalence of NAFLD in DM

Cases categories:	**Parameters**			
	RBG	AST	ALT	P value
DM	201.+/-100.7	29.3+/-9.2	31.2+/-8.7	0.02*
DM with HTN	211.2+/-94.2	31.9+/-11.6	32.4+/-10.6	0.01*
DM with CAD	302.4+/-74.2	41.9+/-10.9	39.0+/-9.6	0.013*

* P value < 0.05 indicates significant differences

**P value > 0.05 indicates no significant differences

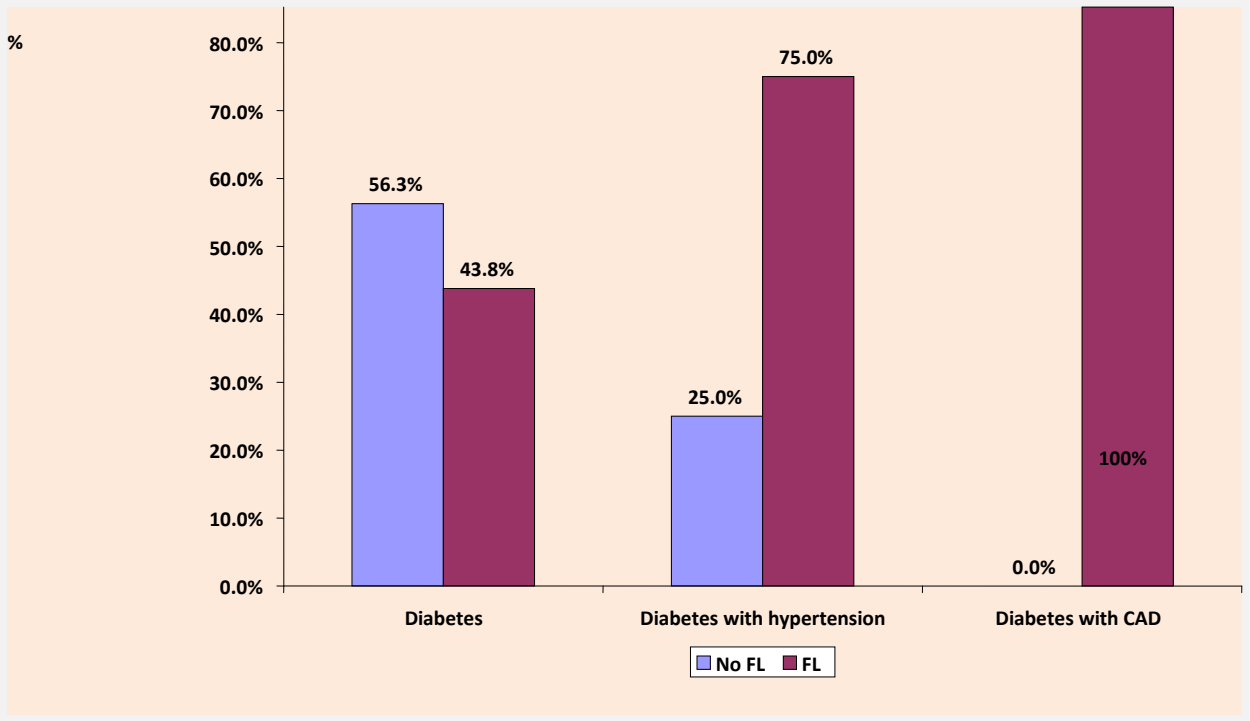

Figure 1: The overall prevalence of NAFLD in diabetes, diabetes with hypertension and diabetes with coronary artery disease using ultrasound.

Discussion:

Our study evaluated 150 patients diagnosed with diabetes, diabetes with hypertension and diabetes with coronary heart disease. The prevalence of NAFLD in the three categories is related to the age of the patients. The age categories were 50-59 years,60-69 years and 70-80 years with prevalence21.5%,35.7%,42.8% respectively in diabetes, 20.9%, 29.1% ,50% respectively in diabetes with hypertension, 0%, 18.7%, 81.3%respectively,in diabetes with coronary artery disease (**Table1**).

There is remarkable increase in developing NAFLD mainly in patients of old ages Comparable to Prashanth et al[6] determined the prevalence and risk factors of NAFLD among Indian patients with diabetes mellitus.

The prevalence of NAFLD in males reveals 21.4% in diabetes, 45.8% in diabetes with hypertension, 50% in diabetes with coronary artery disease and in females 78.6%, 54.2% and 50% respectively(**Table2**). This in line with the findings of Summart U et al[10], in a total of 34,709 participants (27,073 females and 7,636 males). They found that the prevalence of NAFLD in women was 22.9% whereas it was only 18.3%.

The prevalence of NAFLD in diabetes among urban areas reveals 35.7% in diabetes,37.5% in diabetes with hypertension ,75% in diabetes with coronary artery disease, possibly due to sedentary life style, smoking and westernized food while in rural areas reveals 64.3% in diabetes, 62.5% in diabetes with hypertension, 25% in diabetes with coronary artery disease possibly due to lack of health awareness, noncompliance and the bad storage of treatment (**Table3**).

On the contrary to the recent findings of Davendra K. et al (2019)[7] who found that prevalence of NAFLD was higher in urban patients (58.75%) than the rural patients (31.25%).

The prevalence of NAFLD also related to duration of disease as it reveals in diabetes 42.9%, 57.1%, 0% in the duration of 10-15 years,16-20years and>20 years respectively. In diabetes with hypertension it reveals

12.5%, 25%, 62.5% in the duration of 10-15years, 16-20 years and >20 years respectively. In diabetes with coronary artery disease it reveals 0%, 6.3%, 93.7% in the duration of 10-15 years, 16-20 years and >20 years respectively (**Table4**). The overall prevalence of NAFLD in diabetes, diabetes with hypertension and diabetes with coronary artery disease through using ultrasound machine constitutes 43.**8%**, 75%and 100% respectively (Figure1).This is in agreement with the study carried by Baharvand-A. et al (2016) which studied the prevalence of NAFLD in patients with coronary artery disease among Iranian subjects.[11] They found significant difference between patients with NAFLD associated with coronary artery disease and those with NAFLD without coronary artery disease.

***Conclusion*:**

Based on the finding of this study, the overall prevalence of NAFLD in diabetes mellitus is 68%. This prevalence increases with age as there is remarkable increase in developing NAFLD mainly in patients of old ages. The NAFLD is predominant in female with diabetes and diabetes with hypertension but has no gender variation in diabetic patients with coronary artery disease. Prevalence of NAFLD increased with the duration of diabetes mellitus. Prevalence of NAFLD increased in urban areas in diabetes with coronary artery disease and increased in rural areas in diabetes and diabetes with hypertension.

Recommendations:

- Establish a center of liver disease in Kosti Teaching Hospital not only for NAFLD but also for other liver diseases.
- Introduction of abdominal ultrasonography as a routine tool in follow up of diabetic patient to detect early stages of NAFLD.
- Establishment of a dietitian center in Kosti Teaching Hospital to orient patients for using healthy food and maintaining optimum weight.
- Patients of DM with HTN and DM with CAD should be followed up using all liver profile in every visit.
- Further study of NAFLD including large number of samples is needed.

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