DOI: 10.21276/aimdr.2018.4.2.ME5

Original Article ISSN (O):2395-2822; ISSN (P):2395-2814

Prevalence Of Abnormal Liver Function Tests In Type 2 Diabetes Mellitus And Their Correlation With Glycemic Control And Duration Of Disease.

Lovleen Bhatia[1], Amritpal Singh[2], Ajay Pal[3], Tarvinderjit Khurana[4]

[1]Associate Professor, Department of Medicine, GMC, Patiala.
[2]Assistant Professor, Department of Medicine, GMC, Patiala.
[3]Junior Resident, Department of Medicine, GMC, Patiala.
[4]Senior Resident, Department of Medicine, GMC, Patiala.

Received: January 2018
Accepted: January 2018

ABSTRACT

Background: Diabetes mellitus (DM) is a syndrome of disordered metabolism with abnormally high blood glucose levels (hyperglycemia). The study was conducted to see the prevalence of abnormal liver function tests in patients with Type 2 diabetes mellitus and correlate them with glycemic control and duration of Type 2 DM so that we can detect them at early stage and prevent the long term morbidity and mortatlity. **Methods:** 100 patients of Type 2 diabetes mellitus attending Rajindra hospital outpatient and inpatient department were taken randomly to find out prevalence of abnormal liver abnormal liver tests. They were thoroughly investigated for liver function abnormalities. **Results:** The mean age of the patients was 55.15 ± 7.65 years with maximum patients in the age group of 56-60 years. Females outnumbered males in this study. The mean duration of diabetes in study group was 8.67 ± 4.07 years. Mean BMI in the study group was 28.37 ± 3.73 (kg/m2). Out of 100 patients, 50% had good glycemic control (HbA1c <7) and 50% had poor glycemic control (HbA1c ≥7). About 53% of the patients had minimum 1 abnormality of the liver function tests. **Conclusion:** Liver function test abnormalities showed a direct relationship with increasing duration of diabetes (p value 0.001) and increasing BMI (p value 0.031). USG abdomen showed fatty infiltration of liver in 19 patients out of which 11 had poor glycemic control as compared to rest of 8 with good glycemic control which was not statistically significant (p=0.444). These results show that poor the glycemic control, the frequency of abnormal liver function increases.

Keywords: Diabetes Mellitus, Glycemic control, Lft.

INTRODUCTION

Diabetes Mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia with disturbances of carbohydrates, fat and protein metabolism resulting from defects in insulin secretion, insulin action or both. Type 2 diabetes is the most common form, accounting for 90% of all cases. In countries like India diabetes is expected to increase from 40.6 million in 2006 to 79.4 million by 2030.[1] There exists an association between diabetes and liver injury. Several critical pathways have been identified as causing liver damage in diabetic patients. Insulin resistance, the main cause of hyperglycaemia and compensatory hyperinsulinaemia is the predominant causative factor.[2,3] As a collection of insulin-sensitive tissues, the liver is among the primary organs susceptible to the effects of hyperglycaemia-induced oxidative stress.[3] This is followed by derangement of protein, carbohydrate and lipid metabolism, thereby leading to increased oxidative stress and further triggering the inflammatory cascade.[2] In some cases, DM causes excessive accumulation of fat cells in the liver resulting in a fatty liver and consequently NAFLD. Subsequently, 2–3% of NAFLD patients experience hepatic inflammation, necrosis and fibrosis which are features of a condition known as non-alcoholic steatohepatitis (NASH).[4] Injured fibrotic livers will then become cirrhotic, form HCCs and eventually go into liver failure.[4] Liver function tests (LFTs) are commonly used in clinical practice to screen for liver disease, monitor the progression of known disease. The most common LFTs include the serum aminotransferases alkaline phosphatase, bilirubin, albumin and prothrombin time. Apart from kidney, eye, heart and blood vessels, liver is also indirectly affected with diabetes mellitus. Virtually the entire spectrum of liver disease is seen in patients with Type 2 diabetes. The study was conducted to see the prevalence of

Name & Address of Corresponding Author
Dr. Amritpal Singh
Assistant Professor,
Department of Medicine,
GMC,
Patiala.

abnormal liver function tests in patients with Type 2 diabetes mellitus and correlate them with glycemic control and duration of Type 2 DM so that we can detect them at early stage and prevent the long term morbidity and mortatlity.

Aims & Objectives

1. To find out types of biochemical liver abnormalities in Type 2 DM.
2. To find correlation between liver abnormalities and glycemic control and duration of Type 2 DM.
3. To find out radiological changes in liver in Type 2 DM.

MATERIALS AND METHODS

In the present study 100 patients admitted or visiting to Government Medical College, Patiala both male and female with Type 2 diabetes mellitus diagnosed by standard criteria adapted from the American Diabetes Association between ages 20 and 70 years over a period of 24 months were selected for the present study.[5]

Criteria for the diagnosis of Diabetes Mellitus.[5]

Symptoms of diabetes plus random blood glucose concentration ≥200 mg/dl

OR Fasting plasma glucose ≥126 mg/dl OR HeamoglobinA1c ≥6.5%

OR 2-h plasma glucose ≥200 mg/dl during an oral glucose tolerance test.

According to American diabetes association good glycemic control is defined as HbA1c <7.[6]

All the patients were investigated for:

1. Hematological tests include hemoglobin, white blood cell count, differential count, platelet count, prothrombin time and erythrocyte sedimentation rate (ESR). Biochemical tests include random blood sugar, blood urea, serum creatinine, electrolytes.
2. Liver function tests including serum bilirubin (total and fractionated), serum aspartate transaminase, alanine transaminase, alkaline phosphate, prothrombin time and serum albumin were done.
3. Ultrasonography was done for all patients to find evidence for liver steatosis and its radiological grading, any features suggesting of cirrhosis and portal hypertension and hepatocellular carcinoma.
4. All patients were tested for Hepatitis B and Hepatitis C.
5. Chest radiograph and electrocardiography was carried out in all cases.

Inclusion Criteria

Patients diagnosed to have Type 2 Diabetes Mellitus, belonging to both sexes between ages 20 and 70 years at Government Medical College Hospital, Patiala were included in the study.

Exclusion Criteria

1. Patients with history of any quantity of alcohol consumption for any duration of time are excluded.
2. Persons with symptomatic chronic active hepatitis.
3. Patients with history of intake of drugs known to cause steatosis including Methotrexate, Amiodarone, Glucocorticoids, tamoxifen, high dose Estrogen and Nucleoside Analogue (ddI, AZI) are excluded.

It's a cross sectional study in which hundred Type 2 diabetic patient newly diagnosed or on follow- up were included in the study.

RESULTS

The mean age of cases in our study was 55.15 ± 7.65 years. The range of age was 20-70 years. Maximum number of patients were found in the age group of 56-60 years. Out of 100, 57 cases were females constituting 57% of the study population and 43 were males constituting 43% of study population. The mean duration of diabetes in study group was 8.67 ± 4.07 years. Maximum no. of patients (31%) were found to have diabetes for a duration of 1-5 years and least number of patients (6%) were found in 16-20 years duration group. Mean BMI in the study group was 28.37 ± 3.73 (kg/m2). In our study 60 out of 100 patients were found to have BMI in range of 25- 30 kg/m2. Least number (n=7) of patients were found in BMI range of 35-40 kg/m2. Poor glycemic control defined as HbA1c ≥7 was found in 50 patients and good glycemic control defined as HbA1c <7 was found in the remaining 50 patients.

Table 1: Shows clinical profile of the patients.

PARAMETERS	MEAN±SD
AGE (YEARS)	55.15 ± 7.65
DURATION OF DIABETES(YEARS)	8.67 ± 4.07
BMI(kg/m2).	28.37 ± 3.73

Out of total 100 patients, 53 patients were found to have atleast a single parameter deranged of LFTs. No parameter was deranged in 43 and 4 patients with good and poor glycemic control respectively. 7 patients in good glycemic control group and 14 patients in poor glycemic control group were found to have single LFTs parameter deranged. More than one parameter of LFTs was deranged only in patients with poor glycemic control in whom two, three and four LFTs parameters were deranged in 17, 6 and 9 patients respectively. Liver function tests derangement pattern showed abnormal SGOT in 34 out of 50 patients with poor glycemic control as compared to 4 out of 50 patients with good glycemic control which was statistically highly significant ($p<0.001$). SGPT was found abnormal in 32 out of 50 patients with poor glycemic control as compared to 3 out of 50 patients with good glycemic control which was again found to be statistically highly significant ($p<0.001$). ALP was found abnormal in only patients with poor glycemic control (26 out of 50) unlike all patients with good glycemic control ($p<0.001$). Direct bilirubin was abnormal in 10 out of 50 patients with poor glycemic control in contrast

to normal levels in all patients with good glycemic control (p<0.001). However parameters like total bilirubin, prothrombin index, total serum protein, serum albumin were found within normal range in both the glycemic groups.

Table 2 Describes the liver function abnormalities in diabetes with good and poor glycemic control.

Liver Function Tests	Poor Glycemic Control(Hb A1c≥7)	Good Glycemic Control(Hb A1c<7)	P value	Significance
	Mean ± S.D	Mean ± S.D		
SGOT	49.62 ± 15.47	30.30 ± 7.29	<0.001	HS
SGPT	48.78 ± 14.67	40.16 ± 9.63	0.014	S
ALP	130.22 ± 20.22	118.66 ± 3.67	0.040	S
Direct bilirubin	0.178 ± 0.109	0.152 ± 0.050	0.818	NS
Total bilirubin	1.130 ± 0.166	1.120 ± 0.186	0.793	NS
Prothrombin index	1.050 ± 0.076	1.038 ± 0.069	0.339	NS
Total serum protein	7.314 ± 0.369	7.332 ± 0.370	0.808	NS
Serum albumin	4.504 ± 0.317	4.476 ± 0.310	0.657	NS

Mean values SGOT, SGPT and ALP were found significantly lower in patients with good glycemic control as compared to patients with poor glycemic control.

The present study showed statistically significant correlation between increasing BMI and LFT derangements (p value 0.031). In the study 33 out of 60 with BMI of 25-30 kg/m2, 11 out 19 with BMI of 30-35 kg/m2, 6 out of 7 with BMI of 35-40 kg/m2 showed deranged LFTs as compared to 3 out of 14 patients with BMI of 18-25 kg/m2 .The current study also showed statistically significant correlation between increasing duration of diabetes and deranged LFTs (p value 0.001). 5 out of 6 patients with duration of 16-20 years, 20 out of 25 with duration of 11-15 years and 19 out of 38 with duration of 6-10 years showed deranged LFTs in contrast to only 9 out of 31 patients with duration of 1-5 years.USG abdomen showed fatty infiltration of liver in 19 patients out of which 11 had poor glycemic control as compared to rest of 8 with good glycemic control which was not statistically significant (p=0.444).

DISCUSSION

The present study was undertaken for documentation of abnormal liver function tests in patients with Type 2 diabetes mellitus at Government Medical College, Patiala. Mean age in our study was 55.15 ± 7.65 years among which males were 43% and females were 57%. Mean duration of diabetes in our study was 8.67 ±4.07 years. In the present study mean BMI was found to be 28.37 ± 3.73 (kg/m2).

In the present study 53 percent of the patients were found to have atleast one liver function parameters deranged. Salmela PI et al found 57% prevalence,[7] Prabhudeva N et al found 54 prevalence and Sunitha S et al found 47 % prevalence.[8,9] Bora K et al found very high prevalence of 71.25%,[10] while Idris AS et al and Elmahi MH et al both found prevalence of only 22 percent.[11,12] Many studies indicate that some of the liver function derangement is found in diabetic population which need evalution as liver is main site of glucose metabolism.

If we see individual liver abnormalities, SGOT was found deranged in 38% of patients in the present study, Prabhudeva N et al,[8] Elmahi MH et al,[12] Mathur S et al and Bora et al found it deranged in 29%,[10,13] 20%, 56.1% and 32.5 % of patients respectively. SGPT was found deranged in 35% of patients in the present study, Prabhudeva N et al,[8] Elmahi MH et al,[12] Mathur S et al and Bora et al found it deranged in 30%,[10,13] 20%, 19.8% and 24.5% of patients respectively. ALP was found deranged in 26% of patients in the our study, Elmahi MH et al,[12] Mathur S et al and Bora et al found it deranged in 20%,[10,13] 33% and 41.2% of patients respectively. Direct bilirubin (D.BIL) was found deranged in 10% of patients in the present study, in a study conducted by Elmahi MH et al,[12] it was found deranged in 4% of patients. Total bilirubin (T.BIL) was not found deranged in any patients in the present study, while Prabhudeva N et al,[8] found it deranged in 17% of patients and Elmahi MH et al,[12] found it deranged in 6% of patients. Total serum protein (TSP) was not found deranged in present study, while Prabhudeva N et al and Elmahi MH et al both found it deranged in 10% of patients.[8,12] Serum albumin (S.ALB) was not found deranged in the present study, in study conducted by Prabhudeva N et al,[8] Elmahi MH et al,[12] Bora et al it was found deranged in 26%,[10] 4% and 7.5% respectively .The most common LFTs abnormality detected in our study was of SGOT.

In our study statistically significant correlation was found between deranged LFTs and glycemic control of the patients. Mean values of deranged LFTs were compared on the basis of glycemic control. In our study mean values of SGOT are 49.62 ± 15.47 in poor glycemic control patients and 30.30 ± 7.29 in good glycemic control patients. The difference is found to be is statistically highly significant (p value <0.001). This is in concordance with study conducted by Prabhudeva N et al in which mean values of SGOT were 40.8 ± 12.7 in poor glycemic control patients and 33.8 ± 8.6 in good glycemic control patients and difference was found to be is statistically significant (p value 0.002).[8] In our study mean values of SGPT are 48.78 ± 14.67 in poor glycemic control patients and 40.16 ± 9.63 in good glycemic control patients. The difference is found to be is statistically significant (p value 0.014). This is in concordance with study conducted by

Prabhudeva N et al [8] in which mean values of SGPT were 41.0 ± 13.6 in poor glycemic control patients and 33.5 ± 8.6 in good glycemic control patients and difference was found to be is statistically highly significant (p value 0.001). In our study mean values of ALP are 130.22 ± 20.22 in poor glycemic control patients and 118.66 ± 3.67 in good glycemic control patients. The difference is found to be is statistically significant (p value 0.040). This is inconcordance with study conducted by Prabhudeva N et al in which mean values of ALP were 96.3 ± 25.3 in poor glycemic control patients and 84.7 ± 24.0 in good glycemic control patients and difference was found to be is statistically highly significant (p value 0.021).[8] In our study mean values of Total,direct and indirect bilirubin, Serum albumin, Prothrombin index were not significantly different in patients with good or poor glycemic control. This finding was similar to study conducted by Prabudeva N et al.[8]

In our study we found statistically significant correlation between deranged LFTS and increasing BMI (p value 0.031 significant). This observation is supported by study conducted by Forlani G et al,[14] Ni H et al also find positive correlation between increasing BMI and deranged liver function derangement.[15]

In our study we found statistically significant correlation between deranged LFTS and increasing duration of diabetes (p value 0.001). This study found that as the duration of diabetes increases, there was increased frequency of abnormal liver function tests, indicating clearly that more the duration of diabetes more the effect of diabetes on functions of liver. Judi L et al also found significant positive correlation of deranged LFTs with duration of diabetes.[16] In a study conducted by Prabhudeva N et al also found positive correlation of deranged LFTs with duration of diabetes.[8]

In our study we found fatty infiltration in 19% patients. This is in concordance with study conducted by Ni H et al which found fatty infiltration in 16% patients and Prabhudeva N et al which found fatty infiltration in 18% patients.[8,15] This also suggest that ultrasonography must also be evaluated in larger number of diabetics to detect fatty changes so that preventive measures can be taken.

CONCLUSION

The present study unmasked some important and relevant information about the impact of Type 2 DM on the liver. The study is in concordance with the previous studies which reported high prevalence rates of abnormal liver function tests in patients with Type 2 diabetes mellitus. Although there are currently no consensus guidelines or recommendations regarding LFT screening in patients with Type 2 diabetes mellitus, these findings lend support to the practice of routine liver function monitoring in otherwise asymptomatic patients with Type 2 diabetes mellitus.

REFERENCES

1. LG Mehta SR, Col Kashyap AS, LC Das S. Diabetes Mellitus in India: The Modern Scourge : MJAFI 2009; 65:50-54.
2. Leclercq IA, Silva MAD , Schroyen B, Van H N, Geerts A. Insulin resistance in hepatocytes and sinusoidal liver cells, Mechanisms and consequences. J Hepatol 2007; 47:142–56.
3. Bugianesi E, McCullough AJ, Marchesini G. Insulin resistance: A metabolic pathway to chronic liver disease. Hepatology 2005; 42:987–1000.
4. Cohen JC, Horton JD, Hobbs HH. Human fatty liver disease: Old questions and new insights, Science 2011; 332:1519–23.
5. Kasper F, H Longo, Jameson, Loscalzo. Harrison's Principal of Internal Medicine.19 ed. Powers C.A,editor. New York: McGraw Hill Education 2015; 2399-407.
6. American Diabetes Association Standards of Medical Care in Diabetes. Glycemic targets. Diabetes Care 2017; 40 (Suppl. 1): S48-S56.
7. Salmela PI, Sotaniemi EA, Niemi M, Maentausta O. Liver function tests in diabetic patients. Diabetes Care 1984; 7: 248–54.
8. Prabhudeva N, Pasha G, Mounika K. Hepatic dysfunction in diabetes mellitus: biochemical and ultrasonological study. jacadind res. 2014;3:164–7.
9. Sunitha S, Gandham R, Wilma DSCR and Rao S, Evaluation of Significance of Liver Enzymes as Screening Tests for the Early Detection of Clinically Asymptomatic Non Alcoholic Fatty Liver Disease in Type 2 Diabetes Mellitus Patients, International Journal of Biomedical and Advance Research 2015; 6(12): 860-863.
10. Bora K, Borah M, Chutia H, Nath CK, Das D, Ruram AA. Presence of concurrent derangements of liver function tests in Type 2 diabetes and their relationship with glycemic status: A retrospective observational study from Meghalaya. J Lab Physicians 2016; 8:30-35.
11. Idris AS, Mekky KFH, Abdalla BEE, Ali KA. Liver function tests in type 2 Sudanese diabetic patients. Int. J. Nutr. Metab 2011; 3:17-21.
12. Elmahi MH, Abdrabo AEA. Determinants of Abnormal Liver Functions Tests in Diabetes Type 2 Patients in Sudan, Journal of Science 2014; Vol 4 (1):45-49.
13. Mathur S, Mehta DK, Kapoor S, Yadav S. Liver Function in Type-2 Diabetes Mellitus Patients. Int J Sci Stud 2016; 3(10):43-47.
14. Forlani G, Bonito DP, Mannucci E, Capaldo B, Genovese S, Orrasch M et al. Prevalence of elevated liver enzymes in Type 2 diabetes mellitus and its association with the metabolic syndrome J Endocrinol Invest 2008; 31:146.
15. Ni H, Soe HHK, Htet A. Determinants of Abnormal Liver Function Tests in Diabetes Patients in Myanmar. International Journal of Diabetes Research 2012; 1: 36-41.
16. Judi L, Toukan A, Khader Y, Ajlouni K, Khatib MA. Prevalence of elevated hepatic transaminases among Jordanian patients with Type 2 diabetes mellitus Ann Saudi Med. 2010 Jan-Feb; 30(1): 25–32.

How to cite this article: Bhatia L, Singh A, Pal A, Khurana T. Prevalence Of Abnormal Liver Function Tests In Type 2 Diabetes Mellitus And Their Correlation With Glycemic Control And Duration Of Disease. Ann. Int. Med. Den. Res. 2018; 4(2):ME16-ME19.

Source of Support: Nil, **Conflict of Interest:** None declared