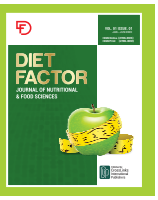
DOI: https://doi.org/10.54393/df.v3i1.45

DIET FACTOR
Journal of Nutritional & Food Sciences
https://www.dietfactor.com.pk/index.php/df
Volume 3, Issue 1 (Jan-Jun 2022)



Original Article

Evaluation of Liver Changes in Type-2 Diabetes Mellitus Patients using Computed Tomography

Nayyar Ashfaq[1], Akash John[1], Abid Ali[1],Amina Sharif Bhatti[1],Hateem Qaiser[1]

[1]Department of Allied Health Sciences ,University Institute of Radiological and Medical Imaging Sciences, The University of Chenab, Gujrat,Pakistan

ARTICLE INFO

Key Words:

Fatty liver disease, Diabetes mellitus , Hypertension, Computed tomography

How to Cite:

Ashfaq, N. ., John, A. ., Ali, A. ., Sharif Bhatti, A. ., & Qaiser, H. . (2022). Evaluation of Liver Changes in Type-2 Diabetes Mellitus Patients using Computed Tomography: Liver Changes in Type-2 Diabetes Mellitus Patients using Computed Tomography. DIET FACTOR (Journal of Nutritional &Amp; Food Sciences), 3(1). https://doi.org/10.54393/df.v3i1.45

***Corresponding Author:**

Nayyar Ashfaq
Department of Allied Health Sciences
,University Institute of Radiological and Medical Imaging Sciences, The University of Chenab, Gujrat,Pakistan

Received Date: 10th April, 2022
Acceptance Date: 16th May, 2022
Published Date: 30th June, 2022

ABSTRACT

There is an association between hypertension, non-alcoholic fatty liver, and diabetes mellitus. Diabetic patients commonly have fatty liver and heart problems. **Objective:** To evaluate the adverse effects of diabetes on the liver, and to determine the association between diabetes and metabolic associated fatty liver disease using Computed Tomography. **Methods:** It was a cross-sectional study conducted on 50 diabetic patients using convenient sampling method. The research was carried out in CT Department of Radiology of Tertiary care hospital in Gujranwala, Pakistan. Males and females between the ages of 30-80 who had undergone abdominal CT scans were included in this study. A written consent form was also signed by patients. This study was conducted over 4 months from December 2021 to March 2022. Data were entered and analyzed using SPSS version 20.0. **Results:** The current study revealed that male diabetic patients have more chances to have non-alcoholic fatty liver disease 33(66%) than females 17(34%). The diabetic patients of in senior age group (50-60) years were most commonly affected by 27(54%) with metabolic-associated fatty liver disease. According to findings diabetic patients frequently had fatty liver disease 22(44%) and fatty liver disease along with cardiovascular disease was 11(22%). Some other findings with less occurrence of non-alcoholic fatty liver disease were hypertension and hyperlipidemia 7(14%). **Conclusion:** In conclusion, diabetic patients are more common to be related with fatty liver disease. There was strong connection between diabetes mellitus and fatty liver disease. Elderly patients are more commonly affected.

INTRODUCTION

Diabetes mellitus is defined as disturbances in carbohydrates, lipids, and protein metabolism because of abnormalities in production of insulin or action of insulin in addition to chronic hyperglycemia. Almost 90% to 95% are affected by Type-2 diabetes mellitus [1]. Previous research has linked diabetes to an increased threat of chronic liver disease and metabolic associated liver disease [2]. In 2015, there were an estimated 400 million confirmed cases of diabetes worldwide. The number of confirmed Type-2 diabetes mellitus cases is hope for to reach 640 million by 2040 [3]. In individuals with metabolic associated fatty liver disease, diabetes mellitus type-2 raises the danger of liver-related mortility rate by 22 times. On the other hand, fatty liver disease can increase the chances of death in diabetes patients. A community-based study of Type-2 diabetic patients found that those with metabolic associated liver disease had higher risk of mortality than those without any metabolic diseases [4]. However, 30%–60% of Type-2 diabetes patients have metabolic liver disease [5]. Endangerment for liver diseases in patients of diabetes are age, gender, dyslipidemia, metabolic disorders and increased weight [6]. A strong correlation between diabetes and non-alcoholic metabolic liver disease indicates that 80 to 90% of diabetes patients will

DOI: https://doi.org/10.54393/df.v3i1.45

acquire metabolic fatty liver disease [7]. Diabetes is a persistant metabolic disease distinguished by high sugar in blood, insulin resistance and insufficiency [5]. Main symptoms include excessive thirst, excessive urination, and loss of weight. Further indicators to look out for are unbalanced diet, fatigue, and unhealed sores [8]. Now a days, the risk of diabetes mellitus has increased 30–40% due to sedantry lifestyle [9]. Diabetes appears to be associated with liver damage. Homeostasis of carbohydrates relies heavily on the liver [10]. Hepatocellular glycogen accumulation causes hepatomegaly and abnormal liver enzymes in patients with poorly managed diabetes [11].High cholesterol, seizures, nephrotic syndrome, and insufficient blood flow in the limbs, which can lead to amputations, are all deep rooted effects of impaired glucose tolerance [12].Type-2 hypoglycemia can be avoided by feeding well, staying active, and sustaining healthy weight [13]. When blood glucose levels aren't under control, metformin is frequently prescribed. Insulin shots may be required for a large number of patients [14]. Men are more probabliy to develop nonalcoholic fatty liver disease among diabetes patients [15]. Imaging tests have been used to help in diagnosis, risk stratification, disease progression, and therapy response [16]. Although the US is arguably the most extensively used as an imaging tool for diagnosing hepatic changes, it has a poor sensitivity for diagnosing severe hepatic encephalopathy and does not offer accurate quantitative data as well as technician dependence [17]. US may not be an acceptable method for detecting the pathology in patients with metabolic liver disease [18]. There may also computed tomography which provides more accurate examination along with Hounsfield unit measurements of liver [19]. For detecting steatosis, non-contrast CT scanning appear more successful than contrast enhanced computed tomography [20]. Evaluation of hepatic attenuation independently, normalization of liver attenuation by splenic attenuation, expressing discrepancy in spleen and liver attenuation, and giving proportion of findings are only a few of the methods for determining the correct CT readings [21]. The spleen attenuates roughly 8-10 HUs in normal persons, which is less than the [22].A liver attenuation of < 40 HUS on CT. Hepatosteatosis is found to be significantly predicted by CT [23]. Spleen attenuation ratios in CT are beneficial for identifying >30 percent steatosis. This approach has a sensitivity of 73%–100% and a specificity of 100% [24]. As a result, assessment of liver fat on CT is a relevant modality for individuals suffering from metabolic syndrome, such as those with diabetes mellitus [25]. This study showed that diabetes mellitus is strongly linked to metabolic associated liver diseases. This study will evaluate the impact of diabetes on liver on computed tomography. Obesity and a sedentary lifestyle are two variables that extend the chance of diabetes. To avoid diabetes-related disorders such as non-alcoholic hepatic disease maintain a healthy lifestyle consisting of nutritious food, activity, and body weight.

METHODS

It was a cross-sectional study conducted on 50 diabetic patients using convenient sampling method. The research was carried out in CT department of radiology of tertiary care hospital in Gujranwala, Pakistan. Males and females between the ages of 30-80 who had undergone abdominal CT scans were included in this study. A written consent form was also signed by patients. This study was conducted over 4 months from December 2021 to March 2022. Data were entered and analyzed using SPSS version 20.0. Abdominal CT scan were performed using TOSHBA CT scan Machine.

RESULTS

Table 1 is showing 50 diabetic patients that includes 33(66%) males and female 7(34%). Males are more prone to develop liver diseases.

Gender	Frequency	Percent
Female	17	34.0
Male	33	66.0
Total	50	100.0

Table 1: Frequency distribution of gender of diabetic patients

Table 2 shows that diabetic patients of senior age group (50-60) years are most commonly affected 27(54%) with non-alcoholic fatty liver. Minimum frequency of patients is 7(14%) in the age group of (70-80).

Age Groups	Frequency	Percent
30-40 years	16	32.0
50-60 years	27	54.0
70-80 years	7	14.0
Total	50	100.0

Table 2: Frequency distribution of age group in diabetic patients

Table 3 shows the findings that the diabeteic patients frequently had fatty liver 22(44%), fatty liver disease along with cardiovascular disease was 11(22%). Some other findings with low occuranace of metabolic fatty liver disease were hypertension and hyperlipidemia 7(14%). Only 2(2%) of patients are affected with renal failure, fatty liver, stroke, only 2(2%) affected with malignant abdominal mass. The patients affected with malignant liver disease, cirrhosis are 2(2%), 2(2%) affected with hypertension and dyslipidemia and only 2(2%) affected with obesity, hypertension and fatty liver. Diabetic patients most commonly have fatty liver disease and hypertension as compared to non-diabetic patients.

DOI: https://doi.org/10.54393/df.v3i1.45

Clinical findings of diabetic patients	Frequency	Percent
Only fatty liver disease	22	44.0
Heart disease, Fatty liver disease	11	22.0
Hypertension, Fatty liver, Hyperlipidemia	7	14.0
Renal failure, Fatty liver, Stroke	2	4.0
Malignant abdominal mass	2	4.0
Malignant liver disease, Cirrhosis	2	4.0
Hypertension, Dyslipidemia	2	4.0
Obesity, Hypertension, Fatty liver.	2	4.0
Total	50	100.0

Table 3: Frequency distribution of clinical findings in diabetic in patients

DISCUSSION

Total 50 patients were included in this investigation. Effects of diabetes mellitus type-2 on the liver using a CT scan. The participants in the study ranged in age from 30 to 80 years old. The patient's age and gender have an impact on diabetes. Diabetes increases the risk of long-term problems, which usually manifest themselves after a few years. Blood vessel damage is the most serious long-term impact.This study reveals that male diabetic patients are more commonly to have non-alcoholic fatty liver disease 33(66%) than females 17(34%). Elderly diabetic patients of age group of 50-60 years are most commonly affected by 27(54%). The current study found that diabetic patients most commonly have fatty liver disease and hypertension than non-diabetic patients. Osama et al, published 2020 was also mentioned that elderly people with type -2 diabetes mostly affected by fatty liver and hypertension than non-diabetic. Hyperglycemia levels damage major body organs over time. They was also mentioned that male diabetic patients more commonly affected with metabolic liver disease [26]. In current research 22(44%) diabetic patients were affected with only fatty liver disease and 11(22%) patients affected with heart disease and fatty liver and 7(14%) affected with hypertension, fatty liver, and hyperlipidemia. This study proved that diabetic patients are more commonly to have metabolic hepatic disease. There was a strong correlation between diabetes mellitus type-2 and metabolic fatty liver disease. A previous study was done by Hegazy et al 2019 also prove that there was a strong relationship between diabetes and fatty liver disease by comparing Hounsfield units of the liver in non-diabetes mellitus patients and diabetic patients [27]. Abayazed, 2019 also concluded no association between substantial Hyperlipidemia and enlargement of liver in diabetes patients [28]. In current study also said that Hyperlipidemia was 7(14%) linked with diabetes mellitus and fatty liver. In the current study, it was proved that diabetic patients were mostly affected with only fatty liver 22(44%) and heart disease, fatty liver. 11(22%) Prevalence of these disorders increases in diabetic patients more than in other diseases. Osama et al, 2020 also mentioned that there is a strong association between type-2 diabetes and metabolic fatty liver disease and heart disease [26].

CONCLUSION

In conclusion, diabetic people in their later years, particularly those between the ages of 50 and 60, are more probably than non-diabetic patients to have metabolic associated fatty liver disease and hypertension. In this study, men more likely to have fatty liver diabetes mellitus Type-2 than women. Metabolic fatty liver disease is commonly found in people with diabetes mellitus, and it's linked to a major organ damage and metabolic disorders. Fatty liver largely influences diabetes co-morbidities and outcomes when type 2 diabetes is present (hepatic and cardiovascular). This study proved that there is ethentic correlation in between the fatty liver disorders and heart disorders in a sample of type-2 diabetic individuals in our investigation.

REFERENCES

[1] Haligur M, Topsakal S, Ozmen O. Early degenerative effects of diabetes mellitus on pancreas, liver, and kidney in rats: an immunohistochemical study. Experimental diabetes research. 2012; 2012:120645. doi: 10.1155/2012/120645.

[2] Lai R-M, Chen T-B, Hu Y-H, Wu G, Zheng Q. Effect of type 2 diabetic Mellitus in the prognosis of acute-on-chronic liver failure patients in China. World Journal of Gastroenterology. 2021 Jun; 27(23):3372-3385. doi: 10.3748/wjg.v27.i23.3372.

[3] Song T, Jia Y, Li Z, Wang F, Ren L, Chen S. Effects of liraglutide on nonalcoholic fatty liver disease in patients with type 2 diabetes mellitus: a systematic review and meta-analysis. Diabetes Therapy. 2021 Jun; 12(6):1735-1749. doi: 10.1007/s13300-021-01072-4.

[4] Besutti G, Bonilauri L, Manicardi E, Venturelli F, Bonelli E, Monelli F, et al. Feasibility and efficiency of European guidelines for NAFLD assessment in patients with type 2 diabetes: A prospective study. Diabetes Research and Clinical Practice. 2021 Jul; 177:108882. doi: 10.1016/j.diabres.2021.108882.

[5] Unsal İO, Calapkulu M, Sencar ME, Cakal B, Ozbek M. Evaluation of NAFLD fibrosis, FIB-4 and APRI score in diabetic patients receiving exenatide treatment for non-alcoholic fatty liver disease. Scientific Reports. 2022 Jan; 12(1):283. doi: 10.1038/s41598-021-04361-x.

[6] Tariq R, Axley P, Singal AK. Extra-hepatic manifestations of nonalcoholic fatty liver disease: a review. Journal of clinical and experimental hepatology. 2020 Jan-Feb;1 0(1):81-87. doi:

DOI: https://doi.org/10.54393/df.v3i1.45

10.1016/j.jceh.2019.07.008.

[7] Silaghi CA, Silaghi H, Craciun AE, Farcas A, Colosi HA, Cosma DT, et al. Age, abdominal obesity, and glycated hemoglobin are associated with carotid atherosclerosis in type 2 diabetes patients with nonalcoholic fatty liver disease. Medical ultrasonography. 2015 Sep; 17(3):300-7. doi: 10.11152/mu.2013.2066.173.cas.

[8] Tan L, Chen L, Jia Y, Li L, Wang J, Huang X, et al. Impact of diabetes mellitus on short-term prognosis, length of stay, and costs in patients with acute kidney injury: A nationwide survey in China. Plos one. 2021 May; 16(5):e0250934. doi: 10.1371/journal.pone.0250934.

[9] Sakharkar P, Deb S. Examining Liver Function in Adults with Diabetes in the United States. Journal of Pharmacy & Pharmaceutical Sciences. 2021; 24:317-328. doi: 10.18433/jpps31851.

[10] Fortes PC, de Moraes TP, Mendes JG, Stinghen AE, Ribeiro SC, Pecoits-Filho R. Insulin resistance and glucose homeostasis in peritoneal dialysis. Peritoneal Dialysis International. 2009 Feb; 29 Suppl 2:S145-8. doi.org/10.1177/089686080902902S28

[11] Koutnikova H, Genser B, Monteiro-Sepulveda M, Faurie J-M, Rizkalla S, Schrezenmeir J, et al. Impact of bacterial probiotics on obesity, diabetes and non-alcoholic fatty liver disease-related variables: a systematic review and meta-analysis of randomized controlled trials. British Medical Journal Open. 2019 Mar; 9(3):e017995. doi: 10.1136/bmjopen-2017-017995.

[12] Singh SP, Singh A, Pati GK, Misra B, Misra D, Kar SK, et al. A study of the prevalence of diabetes and prediabetes in patients of non-alcoholic fatty liver disease and the impact of diabetes on liver histology in coastal Eastern India. Journal of diabetes mellitus. 2014; 4(04):290. doi.org/10.4236/jdm.2014.44040

[13] Khodami B, Hatami B, Yari Z, Alavian SM, Sadeghi A, Varkaneh HK, et al. Effects of a low free sugar diet on the management of nonalcoholic fatty liver disease: a randomized clinical trial. European Journal of Clinical Nutrition. 2022 Jul; 76(7):987-994. doi: 10.1038/s41430-022-01081-x.

[14] Bril F, Cusi K. Management of nonalcoholic fatty liver disease in patients with type 2 diabetes: a call to action. Diabetes Care. 2017 Mar; 40(3):419-430. doi: 10.2337/dc16-1787.

[15] Masuoka HC, Chalasani N. Nonalcoholic fatty liver disease: an emerging threat to obese and diabetic individuals. Annals of the New York Academy of Sciences. 2013 Apr;1281(1):106-22. doi: 10.1111/nyas.12016.

[16] Lee DH. Noninvasive evaluation of nonalcoholic fatty liver disease. Endocrinology and Metabolism. 2020 Jun; 35(2):243-259. doi: 10.3803/EnM.2020.35.2.243.

[17] Mohammed Z. Characterization of Non-alcoholic Fatty Liver Diseases using computed Tomography: Sudan University of Science and Technology; 2020.

[18] Tamaki N, Ajmera V, Loomba R. Non-invasive methods for imaging hepatic steatosis and their clinical importance in NAFLD. Nature Reviews Endocrinology. 2022 Jan; 18(1):55-66. doi: 10.1038/s41574-021-00584-0.

[19] Lamos EM, Kristan M, Siamashvili M, Davis SN. Effects of anti-diabetic treatments in type 2 diabetes and fatty liver disease. Expert review of clinical pharmacology. 2021 Jul; 14(7):837-52. doi: 10.1080/17512433.2021.1917374.

[20] Heo S, Kim DW, Choi SH, Kim SW, Jang JK. Diagnostic performance of liver fibrosis assessment by quantification of liver surface nodularity on computed tomography and magnetic resonance imaging: systematic review and meta-analysis. European radiology. 2022 May; 32(5):3377-87. doi: 10.1007/s00330-021-08436-1.

[21] Chandan S, Mohan BP, Khan SR, Facciorusso A, Ramai D, Kassab LL, et al. Efficacy and safety of intragastric balloon (IGB) in non-alcoholic fatty liver disease (NAFLD): a comprehensive review and meta-analysis. Obesity Surgery. 2021 Mar; 31(3):1271-9. doi: 10.1007/s11695-020-05084-0.

[22] Pastori D, Pani A, Di Rocco A, Menichelli D, Gazzaniga G, Farcomeni A, et al. Statin liver safety in non-alcoholic fatty liver disease: A systematic review and metanalysis. British Journal of Clinical Pharmacology. 2022 Feb; 88(2):441-51. doi: 10.1111/bcp.14943.

[23] Cao Q, Yan C, Han X, Wang Y, Zhao L. Quantitative Evaluation of Nonalcoholic Fatty Liver in Rat by Material Decomposition Techniques using Rapid-switching Dual Energy CT. Academic Radiology. 2022 Jun; 29(6):e91-e97. doi: 10.1016/j.acra.2021.07.027.

[24] Tatikonda VK, Gorrela VP, Racherla A. Role of Triple Phase Computed Tomography in the Evaluation of Liver Lesions. 2021. doi.org/10.7860/IJARS/2021/48188.2644

[25] Abd El-Kader SM, El-Den Ashmawy EMS. Non-alcoholic fatty liver disease: The diagnosis and management. World journal of hepatology. 2015 Apr; 7(6):846-58. doi: 10.4254/wjh.v7.i6.846.

[26] Osama H, Siddig A, Gareeballah A, Gameraddin M,

DOI: https://doi.org/10.54393/df.v3i1.45

Osman HE. Evaluation of Liver in Type 2 Diabetes Mellitus Using Unenhanced Computed Tomography. International Journal of Biomedicine. 2020;10(4): 402-6. DOI: 10.21103/Article10(4)_OA14

[27] Hegazy M, Elsayed NM, Ali HM, Hassan HG, Rashed L. Diabetes mellitus, nonalcoholic fatty liver disease, and conjugated linoleic acid (omega 6): what is the link?. Journal of Diabetes Research. 2019 Apr; 2019. doi.org/10.1155/2019/5267025

[28] Bayazed AR. Study of Liver Changes in Diabetic Patients using Computed Tomography (Doctoral dissertation, Sudan University of Science and Technology). 2019.