

Association of Type 2 Diabetes Mellitus with Fatty Liver

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ABSTRACT

Objective: To assess the association of fatty liver with type 2 diabetes and other socio-demographic factors among the patients at Pak Emirates military hospital Rawalpindi.

Study Design: Cross-sectional analytical Study.

Place and Duration of Study: Pak Emirates Military Hospital, Rawalpindi Pakistan from Aug 2019 to Jan 2020.

Methodology: This study was conducted on 300 patients of type 2 diabetes mellitus reporting for a routine checkup at the medical Outpatient department. Fatty liver was diagnosed on ultrasound by a consultant radiologist.

Results: Out of three hundred patients with diabetes mellitus included in the final analysis, 225(75.0%) were males, and 75(25.0%) were females. 176(58.6%) had fatty liver on ultrasound, while 124(41.4%) had no fatty liver on ultrasound examination at the time of the study. we found that increasing age, long duration of diabetes and poor control of illness had a statistically significant relationship with the presence of fatty liver among the target population ($p < 0.05$).

Conclusion: Patients with type 2 diabetes had a high frequency of fatty liver on routine ultrasound examinations. In addition, patients with more age, long duration of diabetes mellitus and poor control of illness were at a high risk of developing fatty liver among the study participants.

Keywords: Fatty liver, relationship, Type 2 diabetes.

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INTRODUCTION

The liver has been a common organ for many diseases, especially multisystem diseases.¹ There could be multiple etiological factors that could alter the functioning of this vital body organ.^{2,3} Fatty liver has been an important metabolic case which may be linked to sub-optimal functioning of the liver.⁴ Mostly, it is not the pathology which is especially looked for, rather it has been an incidental finding on the radiological examination or laboratory investigations leading to suspicion of fatty liver.⁵

Diabetes is the most frequently diagnosed metabolic illness all over the world.^{6,7} All types of populations, may they be from developed or developing countries, have a high prevalence of this multisystem disease.^{8,9} Diabetes may lead to other illnesses, including HTN, sexual problems, stroke, psychiatric problems and various cancers.¹⁰

Local data has been limited in this regard. Few studies have been performed that could link the risk factors to metabolic phenomena. If we could not target all the patients with diabetes to screen for or prevent fatty liver, we could target the high-risk cases. This

study aimed to record the presence of fatty liver in patients suffering from diabetes mellitus type 2 and look for the factors associated with the presence of fatty liver among the study participants.

METHODOLOGY

This cross-sectional analytical study was conducted at the Department of Medicine, Pak Emirates military Hospital, Rawalpindi Pakistan, from August 2019 to January 2020. The sample size was calculated by the WHO formula using the study of Browning *et al.* by using the population prevalence percentage of fatty liver in DM as 75%.¹¹ Ethical approval (IREB Letter No: A/124 EC-129) was taken from the Ethical Review Board Committee of PEMH before the start of this study. The sample was gathered by using the non-probability consecutive sampling technique.

Inclusion Criteria: Patients of either gender, aged 18 to 60 years diagnosed with type 2 diabetes mellitus by a consultant medical specialist or endocrinologist were included in the study.

Exclusion Criteria: Patients with morbid obesity, or other endocrine problems, already diagnosed with hyperlipidemias or taking statins, viral diseases of the liver, hepatocellular carcinoma or other benign or malignant liver diseases, alcoholics or patients on antipsychotic medications were not included in study.

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Most patients were recruited from the OPD who came for routine medication. Fatty liver was diagnosed on routine ultrasonography by a consultant radiologist. Ultrasound is a cost-effective and easy-to-perform technique, especially in public sector hospitals where a biopsy of every patient has not been possible. It has a more than 90 percent sensitivity of hepatic steatosis is more than 30 percent.^{12,13} One consultant performed all the ultrasounds of cases included in this study to remove the operator dependence bias.

After written informed consent from the potential participants, patients with Type 2 DM fulfilling were included in the study. Before the inclusion, proper clinical and laboratory investigations like ECG, chest X-ray, cardiorespiratory status and serology were carried out. Once comorbidities were established and exclusion criteria were applied, the patients underwent an ultrasound abdomen by the consultant radiologist.

All statistical analysis was performed using the Statistics Package for Social Sciences version 24.0 (SPSS-24.0). First, the mean and standard deviation for the age and duration of diabetes of study participants was calculated. Next, frequency and percentages for gender, presence of fatty liver and mode of treatment were calculated. Finally, Chi-square was used to establish the extent of the relationship between the dependent variables and the presence of fatty liver among the patients with type 2 DM. The *p*-value of ≤ 0.05 was set as the cut-off value for significance.

RESULTS

Of the 300 patients included in the final analysis, 225(75.0%) were males, and 75(25.0%) were females. Table-I showed that the mean age of the study participants was 47.21±3.45 years. 176(58.6%) had the presence of fatty liver on ultrasound, while 124(41.4%) had no fatty liver at the time of the study. The establishment of the association of variables with the chi-square test has been summarized in Table-II. we found that increasing age, long duration of diabetes and poor control of illness had a statistically significant relationship with the presence of fatty liver among the target population (*p*<0.05).

DISCUSSION

Diabetes mellitus is a common metabolic disorder in all parts of the world. It disrupts the homeostatic mechanisms of the body and, if uncontrolled, leads to severe morbidity of various body systems. The liver has also been the victim of this problem, and metabolic syndrome often has fatty liver as a comorbidity.^{11,14,15} Fatty liver itself can also accelerate the process of

obesity and activate multiple pathways, which could lead to various metabolic derangements in the body and lead to the onset of diabetes. Dai *et al.* evaluated this association in detail in their meta-analysis on 35,599 T2DM patients concluding that 20264 had a non-alcoholic fatty liver disease which is a huge burden of this disease.¹² The most important fact is that fatty liver has been present silently among these individuals, and neither they nor their physicians have an idea that such a vital organ of the body has been involved in a disease process.

Atan *et al.* conducted an extensive analysis in this regard and concluded that around 54% of people with type II diabetes have fatty liver, and control of diabetes alone can be a huge factor in the prevention of non-alcohol fatty liver disease among the diabetic population.¹³

Table-I: Characteristics of Patients with Type 2 Diabetes Mellitus (n=300)

Characteristics	n(%)
Age (years)	
Mean±SD	47.21±3.45 years
Range (min-max)	19 -57 years
Gender	
Male	225(75.0%)
Female	75(25.0%)
Fatty Liver	
No	124(41.4%)
Yes	176(58.6%)
Treatment	
Insulin	256(85.3%)
Oral Hypoglycemics	44(14.7%)
Control of Illness	
Poor	100(33.3%)
Good	200(66.6%)

Table-II: Outcome of Factors studied in the Analysis (n=300)

Factors Studied	No fatty liver (n=124)	Fatty liver (n=176)	<i>p</i> -value
Age			
<45 years	78(62.9%)	61(34.6%)	<0.001
>45 years	46(37.1%)	115(65.4%)	
Gender			
Male	98(79.1%)	127(72.1%)	0.173
female	26(20.9%)	49(27.9%)	
Insulin Dependent Diabetes Mellitus			
No	110(88.7%)	146(82.9%)	0.160
Yes	14(11.3%)	30(17.1%)	
Control of Diabetes			
Good	99(79.8%)	101(57.4%)	<0.001
Poor	25(20.2%)	75(42.6%)	
Duration of Diabetes			
<5 years	75(60.4%)	76(43.2%)	0.003
>5 years	49(39.6%)	100(56.8%)	

Around 58.6% of patients with DM included in our study showed the presence of fatty liver. In their recent analysis, Dai *et al.* established that more than half of the diabetic population has non-alcoholic fatty liver disease.¹² Taseer *et al.* had similar results in a survey conducted on the local population.¹⁴ Our results strengthened the findings of these studies, and type 2 DM emerged as a strong predictor of fatty liver disease in the population studied.

Long duration of type II DM also emerged as a predictor for the presence of fatty liver target population. Li-Zhen *et al.* generated similar results regarding the duration of DM and the presence of fatty liver disease.¹⁶ It might be that long-standing metabolic illness had affected the overall metabolic status of the body resulting in the deposition of excessive fat upon this vital organ of the body.¹⁷

Lee *et al.* concluded that diabetes poses a significant risk for developing fatty liver disease.¹⁸ Our study design was not a cohort study design, so temporal association is difficult to establish that what is the real pathway of causation. Though most work has been done showing that diabetes leads to fatty liver disease, Adams *et al.* and Sung *et al.* have concluded the relation another way round that the presence of fatty liver increases the chances of a person having diabetes.^{15,19}

LIMITATIONS OF STUDY

The temporal association could not be ascertained with this design. Still, with limited resources, we highlighted that type 2 DM had a strong association with fatty liver, and clinicians should take advantage of this fact in routine clinics. They should be able to screen in time to avoid further complications.

CONCLUSION

Patients with type 2 diabetes had a high frequency of fatty liver on routine ultrasound examinations. In addition, patients with advancing age, long duration of diabetes and poor control of illness were at a high risk of developing fatty liver among the target population.

Conflict of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

SUS & MH: Study design, data acquisition, critical review, approval of the final version to be published.

MN & AH: Conception, drafting the manuscript, approval of the final version to be published.

MSK & SS: Data analysis, data interpretation, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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