Journal of Population Therapeutics & Clinical Pharmacology

ORIGINAL ARTICLE
DOI: 10.53555/jptcp.v31i6.6521

EXAMINING THE PREVALENCE OF MAJOR RISK FACTORS FOR TYPE-II DIABETES MELLITUS IN PATIENTS WITH LONGSTANDING HEPATITIS-C INFECTION

Dr Rashid Ali Khan[1], Dr Wasim Ajaz[2*], Dr Khushal Nadir Hadi[3], Dr Waqar Khan[4], Dr Hoor Umar Afridi[5], Dr Faraz Waheed[6], Dr Rabail Irfan[7], Dr Muhammad Haider Ali[8]

[1]Senior Registrar, Department of Medicine, Saidu Medical College Saidu Sharif Swat, Pakistan
[2*]Junior Registrar, Department of Medicine Saidu Group of Teaching Hospital Saidu Sharif Swat, Pakistan
[3]Resident Medical Officer, Department of Medicine HMC Peshawar, Pakistan
[4,6,7]Medical Doctor, Department of Medicine HMC Peshawar, Pakistan
[5]Final Year MBBS, KGMC Peshawar, Pakistan
[8]Resident Doctor, HMC Peshawar, Pakistan

***Corresponding author:** Dr Wasim Ajaz,
Email: dr.wasim.ajaz@gmail.com

Abstract

Objective: To examine the major risk factors among individuals with longstanding Hepatitis-C infection that are associated with Type-II Diabetes emergence.

Methodology: In this cross-sectional descriptive study, 130 patients with longstanding hepatitis-C virus (Hep-C) infection were assessed for Type II Diabetes Mellitus (T2DM) prevalence and risk factors at the Department of Medicine, Saidu Medical College Saidu Sharif Swat, Pakistan. Inclusion criteria included patients aged 18 years and above with chronic HCV confirmed by ELISA and PCR, while exclusion criteria ruled out those with other types of hepatitis, non-HCV-related liver diseases, or pre-existing diabetes. Data were collected over one year using a structured questionnaire for demographic and clinical information, along with clinical assessments and blood tests for ALT, AST, HbA1c, and blood sugar levels. Diabetes was diagnosed based on ADA criteria. SPSS version 20.0 was utilized for data analysis. The study, accepted by the hospital's ethics committee, ensured confidentiality and obtained informed consent from participants.

Results: An overall 130 participants were enrolled in this research. The mean age was 45.6 years, with diabetic patients being older (52.4 years) than non-diabetic patients (42.9 years). Males constituted 53.8% of participants, with a higher percentage in the non-diabetic group. 27.4 kg/m² was the mean BMI, with higher values in diabetics (30.1 kg/m²) compared to non-diabetics (26.3 kg/m²). Smoking history was reported by 35.4% of participants, with no significant difference between groups. A history of diabetes in family was more common in diabetics (50.0%) than non-diabetics (18.2%). Older age, high BMI, and family history were significant risk factors for T2DM. Diabetic patients showed higher levels of HbA1c, fasting blood sugar, random blood sugar, ALT, and AST.

Conclusion: We conclude that our research sheds light on the complex link between longstanding hep-C infection and the diabetes mellitus, highlighting the associations with age, BMI, smoking, family history, hypertension, and liver function tests. These perspectives highlight the imperative for holistic treatment approaches that address the multifaceted nature of these conditions, thereby informing personalized therapeutic interventions.

Keywords: Diabetes, Hepatitis, Chronic Hep C, Risk factors, Liver function tests, HbA1c.

Introduction

Type-II Diabetes Mellitus (T2DM) and chronic Hepatitis-C virus (Hep-C) infection are two significant public health concerns worldwide, each presenting substantial challenges to healthcare systems.[1] T2DM is recognized as one of the swiftly growing diseases globally, with the number of affected individuals projected to increase dramatically in the coming decades. In 2002, there were approximately 177 million T2DM patients, a figure projected to rise to 300 million by 2025. It is predictable that the prevalence of type 2 diabetes (T2DM) will rise by 69% in the developing world and 20% in industrialized nations by 2030, with 24 million diabetic individuals likely to reside in Africa.[2-3]

Chronic HCV infection, on the other hand, affected around 170 million people worldwide in 2013, though recent advances in screening, diagnostics, and treatment have reduced this number to approximately 70 million.[4] East and South-Central Asia are home to the highest rates of HCV infection. Hepatocellular carcinoma, cirrhosis, and fibrosis are among the serious liver diseases that can result from HCV infection and are the main causes of mortality linked to the virus.[5]

The liver is essential for the metabolism of carbohydrates, and liver illness has a substantial effect on glucose tolerance.[6] Thirty to forty percent of cirrhosis patients go on to develop diabetes mellitus, and about seventy percent of them show signs of glucose intolerance.[7] Chronic Hep-C infection is strongly linked to the emergence of type 2 diabetes (T2DM); multiple studies have demonstrated a considerable increase in T2DM risk associated with liver damage attributable to HCV infection. Because it frequently appears in the lack of other prevalent diabetes risk factors like obesity, a family history of the disease, inadequate dietary control, and inactivity, this link is especially significant.[8]

Several elements contribute to the amplified risk of T2DM in chronic HCV patients.[9] Family history of diabetes and a sedentary lifestyle are well-established risk factors for T2DM in the general public.[10] In chronic HCV patients, additional factors such as increased iron overload and the direct role of HCV in inducing insulin resistance further elevate the risk. It is hypothesized that Hep-C virus itself may play a momentous role in the pathogenesis of diabetes, independent of other predisposing factors.[11]

T2DM causes a number of serious side effects, affecting 59.6%, 24.4%, and 15.9% of individuals with diabetes, respectively, including neuropathy, nephropathy, and retinopathy.[12] Healthcare professionals are urged to screen diabetic patients for HCV due to an elevated incidence of T2DM amongst chronic HCV patients. This is crucial as T2DM in the context of HCV infection presents peculiarly, often facilitated by chronic degenerative changes in the liver.[13]

Globally, both emerging and industrialized nations are seeing an increase in HCV infection trends, further complicating the epidemic of diabetes and vice versa. This growing burden accentuates the need for detailed epidemiological studies to understand the prevalence and risk factors of T2DM in chronic HCV patients, especially in regions with high HCV prevalence like the Pakistan where liver disease is common. However, data on the factors influencing the occurrence of T2DM in Hep-C patients across the world remain limited.[14-15]

By examining the common risk variables for Type 2 diabetes. in patients with persistent HCV infection, our study seeks to close this gap. Healthcare professionals can improve patient outcomes and lessen the burden of these related public health issues by better managing and preventing the formation of Type 2 diabetes among those with longstanding Hep-C by being aware of these risk factors.

Objective

To examine the common risk factors among individuals with longstanding hepatitis-C infection that are associated with Type-II Diabetes emergence.

Study Methodology

This descriptive cross-sectional study included a sample size of 130 patients diagnosed with chronic HCV infection. According to predetermined inclusion and exclusion criteria, patients were chosen. Patients of both sexes who have been identified with chronic HCV based on confirmed HCV antibody detection by ELISA and confirmation by HCV RNA detection with polymerase chain reaction (PCR) met the inclusion criteria. They had to be 18 years of age or older. Exclusion criteria were the patients with other types of hepatitis (e.g., hepatitis B), other chronic liver diseases not related to HCV, and patients already diagnosed with long standing diabetes or with diabetic complications before the start of study.

Data was collected over a one-year period from March, 2023 to February, 2024 at the Department of Medicine, Saidu Medical College Saidu Sharif Swat, Pakistan. A methodical survey was employed to collect clinical and demographic data, such as the participant's name, age, gender, height, weight, BMI, history of smoking, family history of hepatitis and diabetes, other associated illnesses, and prior hepatitis C treatments. Taking blood samples for biochemical and serological testing as well as measuring blood pressure were clinical examinations. These tests included serum transaminase (ALT, AST), hemoglobin A1c (HbA1c), random and fasting blood sugar levels.

The American Diabetes Association (ADA)[16] criteria—random blood sugar exceeding 200 mg/dL, two fasting blood sugar readings above 126 mg/dL, or a HbA1c measurement above 6.5%—were used to diagnose diabetes mellitus. For statistical analysis, the gathered data were imported into SPSS version.20.0. The data were presented as mean and/or standard deviation, frequency, and percentage. The relationship between the presence of HCV and the overall incidence of T2DM and associated risk variables was examined using the chi-square test. The hospital's institutional reviewing board and ethical committee gave their approval for this study. After being made aware of the study's purpose, each participant gave their written informed consent to take part. Data confidentiality and participant anonymity were ensured throughout the study.

Results

A total of 130 patients, whose mean age was 45.6 ±12.3 years, were included in the study. In contrast to people without diabetes, who had a mean age of 42.9 ±11.8 years, patients with diabetes had a greater mean age of 52.4 ±10.1 years. 53.8% of the population was male, with a greater percentage of males in the non-diabetic group (71.4%) than in the diabetes group (28.6%) according to gender distribution. The overall population's mean Body Mass Index (BMI) was 27.4 ±4.1 kg/m²; diabetes patients had a higher mean BMI of 30.1 ±3.5 kg/m² than non-diabetic patients, who had a BMI of 26.3 ±3.6 kg/m². Regarding smoking history, 35.4% of the total population reported a history of smoking, with a similar distribution between both the sub-groups. Family history of diabetes was present in 30.8% of the total population, with a significantly higher proportion in the diabetic group (50.0%) compared to the non-diabetic group (18.2%). These characteristics provide insights into the composition of the study population and highlight potential risk factors associated with diabetes in patients with longstanding Hepatitis C-virus infection. Table 1 presents the clinical characteristics of the study population, categorized into diabetic and non-diabetic groups.

Table 1: Clinical characteristics of the Study Sample

Variables/Parameters		Total (n=130)	Diabetic (n=35)	Non-Diabetic (n=95)
Age (years)		45.6 ± 12.3	52.4 ± 10.1	42.9 ± 11.8
Gender	Male	70 (53.8%)	20 (28.6%)	50 (71.4%)
	Female	60 (46.2%)	15 (25.0%)	45 (75.0%)
BMI (kg/m²)		27.4 ± 4.1	30.1 ± 3.5	26.3 ± 3.6
Smoking History	Yes	46 (35.4%)	16 (34.8%)	30 (31.6%)
	No	84 (64.6%)	19 (22.6%)	65 (77.4%)
Family History of DM	Yes	40 (30.8%)	20 (50.0%)	20 (18.2%)
	No	90 (69.2%)	15 (16.7%)	75 (83.3%)

Table 2 illustrates that among the diabetic cohort (n=35), a notable proportion (51.4%) were aged over 50 years, compared to only 17.9% of non-diabetic individuals (n=95), indicating an important association between older age and diabetes (p<0.001). Similarly, a BMI of 30 kg/m² or higher was prevalent in 40.0% of diabetic patients, contrasting with 20.0% among non-diabetic individuals, demonstrating a significant association between elevated BMI and diabetes (p=0.01). Family history of diabetes emerged as another significant factor, with half of diabetic patients (50.0%) reporting a familial predisposition compared to 21.1% of non-diabetic individuals (p<0.001). But there was no statistically significant link found between diabetes and smoking history (p=0.08). Conversely, hypertension displayed a marginally significant association, with 40% of diabetics presenting hypertension compared to 25% of non-diabetic individuals (p=0.05). These findings underline the critical role of age, high BMI, and history of diabetes in family as key risk factors for the evolution of T2DM in individuals with long-standing Hep-C infection.

Table 2: Risk factors analysis

Risk Factors for T2DM	Diabetic (n=35)	Non-Diabetic (n=95)	p-value
Age more than 50 years	18 (51.4%)	17 (17.9%)	<0.001
BMI ≥30 kg/m²	14 (40.0%)	19 (20.0%)	0.01
Family History of Diabetes	20 (50.0%)	20 (21.1%)	<0.001
Smoking History	16 (34.8%)	30 (31.6%)	0.08
Hypertension	14 (40%)	24 (25%)	0.05

The HbA1c levels were substantially elevated in diabetic patients (7.8 ± 1.2%) compared to non-diabetic patients (5.6 ± 0.7%) (p<0.001). Similarly, fasting and random blood sugar levels were markedly elevated in diabetic patients compared to their non-diabetic counterparts (p<0.001 for both). Additionally, liver function tests indicated significantly higher levels of ALT and AST in diabetic patients compared to non-diabetic patients (p<0.001 for both). Shown in table 3.

Table 3: Diabetic profile and liver function investigations in study population

Test	Diabetic (n=35)	Non-Diabetic (n=95)	p-value
Diabetic Profile Tests			
HbA1c (%)	7.8 ± 1.2	5.6 ± 0.7	<0.001
Fasting Blood Sugar (mg/dL)	154 ± 30	95 ± 12	<0.001
Random Blood Sugar (mg/dL)	228 ± 45	122 ± 25	<0.001
Liver Function Tests			
ALT (U/L)	68 ± 15	42 ± 12	<0.001
AST (U/L)	62 ± 14	39 ± 10	<0.001

Discussion

Our study observed a mean age of 45.6 years among the study participants, with diabetic patients having a higher mean age of 52.4 years compared to non-diabetic patients (42.9 years). This finding is consistent with previous research, such as the study by Memon et al.,[17] which found a higher occurrence rate of diabetes in older individuals with long-lasting hepatitis C. Advanced age has been reliably identified as a significant risk factor for diabetes onset among patients with long-lasting hep-C infection.

There was a higher proportion of male participants (53.8%) compared to females (46.2%) according to our findings. However, among diabetic patients, the proportion of males was lower (28.6%) compared to females (25.0%). Previous studies have shown a higher frequency of type-2 diabetes within men diagnosed with long-term hep-C infection, despite the fact that gender disparities in prevalence of diabetes were not of statistical significance in our investigation.[17] The disparity in

gender distribution may reflect variations in risk factors and disease progression among different populations.

The mean BMI among all participants in our study was 27.4 kg/m², with diabetic patients having a higher mean BMI of 30.1 kg/m² compared to non-diabetic patients (26.3 kg/m²). This aligns with existing literature, including studies by Nguyen et al. and Zhang et al., which have shown a positive association between elevated BMI and the occurrence of diabetes amongst individuals with persistent hepatitis-C infection.[18-19] Elevated BMI is a known risk factor for insulin-resistance and metabolic complications, contributory to the development of diabetes in this population.

In terms of tobacco smoking, 35.4% of participants had a history of smoking, with similar proportions observed among both the groups of patients. Despite the lack of statistical significance regarding the smoking history difference between these groups, our results are consistent with the work of Negro and Alaei, who investigated the potential link between type-2 diabetes and hepatitis-C virus (HCV) infection.[14] They highlighted smoking as a potential risk factor for diabetes evolution in individuals with chronic hep-C infection. By contrast, Negro and Alaei's review provided a broader perspective on the relationship between HCV infection and T2DM, emphasizing the multifactorial nature of diabetes development in this population and accentuating the need for comprehensive risk assessment and intervention strategies.

Among all participants, 30.8% had a history of diabetes in family, with a higher pervasiveness pragmatic among diabetic patients (50.0%) compared to non-diabetic patients (21.1%). This finding highlights the importance of genetic predisposition in diabetes development, particularly among individuals with chronic hepatitis C infection. Constant with our findings, the study by Xiong et al. has demonstrated a constructive link between history of diabetes in family and the rate of diabetes in this particular population.[20]

In our study, compared to 25% of non-diabetic individuals, 40% of diabetics who had a persistent hepatitis C infection had hypertension. Despite the marginally significant ($p=0.05$) variation in blood pressure between the two study groups, hypertension was shown to be a prevalent comorbidity among people with persistent hepatitis-C infection and type-2 diabetes. The overall incidence of hepatitis-B and hep-C in people with type-2 diabetes mellitus was examined in a related study by Villar et al., offering information on the epidemiological nature of viral hepatitis in diabetic individuals.[21]

Furthermore, consistent with previous research like that conducted by Mason et al.,[22] our research demonstrated significant differences in biochemical and serological parameters across both the sub-groups in study population. Diabetic patients exhibited higher levels of HbA1c, fasting blood sugar, and random blood sugar, indicating compromised glycemic control and heightened insulin-resistance. These findings emphasize the elaborate interaction between viral-induced insulin-resistance and dysregulated glycemic-control in patients with chronic hepatitis-C infection. Mason et al.'s research provided broader insights into the prevalence and clinical implications of the association between diabetes mellitus and HCV infection.

With respect to elevated liver function tests in diabetic patients with chronic hepatitis C infection are in line with the results reported by Simó et al.[23] Both studies observed marked elevations in ALT and AST levels among diabetic individuals, suggesting liver inflammation and possible fibrosis. While our study focused on characterizing the biochemical alterations associated with diabetes in this population, Simó et al.'s research provided insights into the high frequency of hepatitis-C virus infection among diabetics.

Thus, this study elucidates the multifactorial nature of type-II diabetes in patients with long-standing hepatitis-C infection, highlighting the influence of demographic, clinical, and biochemical factors on disease pathogenesis. By comprehensively evaluating these variables, we provide valuable intuitions into the epidemiology and pathophysiology of diabetes mellitus in the context of long-lasting hepatitis-C infection, informing tailored management approaches and therapeutic interventions for affected individuals.

Conclusion

We conclude that our research sheds light on the complex link between chronic hepatitis C infection and diabetes mellitus, highlighting the associations with age, BMI, smoking, family history, hypertension, and liver function tests. These perspectives highlight the imperative for holistic treatment approaches that address the multifaceted nature of these conditions, thereby informing personalized therapeutic interventions.

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