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Article

Association of Hepatitis C Virus Infection and Type 2 Diabetes in Lahore Population

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ABSTRACT

Background: Hepatitis C Virus (HCV) infection and Type 2 Diabetes Mellitus (T2DM) are major global public health concerns, with increasing evidence suggesting a biological link through mechanisms like insulin resistance and chronic inflammation. Despite high prevalence rates in Pakistan, particularly in Lahore, limited research has explored this association within local populations, highlighting a significant research gap. **Objective**: This study aimed to investigate the association between HCV infection and T2DM in the Lahore population, examining demographic and clinical factors contributing to glycemic disturbances among HCV-positive individuals to inform early detection and management strategies. **Methods**: A cross-sectional observational study was conducted at Sheikh Zayed Hospital, Lahore, enrolling 138 confirmed HCV-infected patients aged 20–70 years through simple random sampling. Inclusion criteria included confirmed HCV diagnosis; individuals with other chronic liver diseases were excluded. Data collection involved random blood glucose testing, HbA1c measurement via HPLC/immunoassay, and demographic profiling. The primary outcome was the prevalence of T2DM; secondary outcomes included rates of prediabetes and borderline glycemia. Ethical approval was obtained in accordance with the Declaration of Helsinki. Statistical analysis was performed using SPSS version 23, employing descriptive statistics and chi-square testing for association, considering $p \leq 0.05$ significant. **Results**: The study found that 4.3% of participants were prediabetic and 2.2% had borderline glycemic levels, with a mean HbA1c of 6.2% ± 0.85. A significant association between HCV and T2DM was established ($\chi^2 = 5.93$, $p = 0.0148$), with female patients and middle-aged groups showing higher susceptibility, suggesting clinically relevant implications for early metabolic screening in HCV care protocols. **Conclusion**: Chronic HCV infection is significantly associated with an increased risk of developing T2DM, underlining the need for integrated metabolic monitoring in HCV management strategies to improve patient outcomes and reduce healthcare burdens, particularly in resource-constrained settings like Pakistan.

Keywords: Hepatitis C Virus, Type 2 Diabetes Mellitus, Insulin Resistance, Glycemic Control, Chronic Liver Disease, Lahore Population, Public Health

INTRODUCTION

Hepatitis C Virus (HCV) infection and Type 2 Diabetes Mellitus (T2DM) are significant global health challenges, with HCV—an RNA virus targeting liver tissue—causing chronic liver disease, cirrhosis, and hepatocellular carcinoma, despite the development of Direct-Acting Antivirals (DAAs) with cure rates over 90% (1). Globally, an estimated 64–103 million individuals are chronically infected, with blood contact, unsafe medical practices, and injection drug use being key transmission routes, particularly in low- and middle-income countries (2). Pakistan ranks among the highest in HCV prevalence, estimated at 4.8% to 6%, with genotype 3a being the most common, especially in Sindh, due to unsafe transfusion practices and inadequate sterilization (3,4). Parallelly, T2DM—a multifactorial disorder involving insulin resistance, impaired secretion, and persistent hyperglycemia—is rapidly increasing, with the highest projected growth in South Asia and the Middle East (10). Contributing risk factors include obesity, sedentary lifestyle, and genetic predisposition (5,6,7), and common symptoms such as polyuria,

polydipsia, and poor wound healing often stem from metabolic dysfunction (12,13). In Pakistan, approximately 30.8% of adults are diabetic, posing a major potential association between HCV and T2DM, where chronic HCV infection may exacerbate insulin resistance and systemic inflammation, contributing to diabetes onset (9,14). Although some national and international studies, including those by Farhan et al. and Rehman et al., have explored this link, findings remain inconsistent and lack region-specific detail, especially for populations like Lahore (3,8). Given the high prevalence and overlapping risk factors, this study aims to assess the association between HCV and T2DM in Lahore, hypothesizing a significant relationship between chronic HCV infection and increased risk of T2DM, to inform targeted healthcare strategies and enhance understanding of disease co-occurrence in this region.

MATERIALS AND METHODS

This four-month observational cross-sectional study was conducted at Sheikh Zayed Hospital, Lahore, to evaluate the association between Hepatitis C Virus (HCV) infection and Type 2 Diabetes Mellitus (T2DM). Using simple random sampling, participants aged 20–70 years with confirmed HCV infection were included, while individuals with other liver diseases were excluded. Data was collected on glycemic status using random blood glucose and HbA1c levels, categorized per ADA guidelines. The primary outcome was T2DM prevalence among HCV patients, with secondary outcomes including prediabetes rates. Ethical approval was obtained, and participant confidentiality was maintained. Data analysis was conducted using SPSS version 23, applying descriptive statistics and chi-square tests, with significance set at $p \leq 0.05$.

RESULTS

A total of 138 HCV-infected patients were enrolled, with a mean age of 45.3 ± 8.7 years, and mostly aged between 40–50 years. Females comprised a higher proportion (59.4%), indicating a greater prevalence of HCV and T2DM among middle-aged women, underscoring the need for early metabolic screening in this group (Table 1). Glycemic analysis showed that 3 (2.2%) HCV patients had borderline HbA1c levels, 6 (4.3%) were prediabetic and 67 (48.8%) were diabetic and 62 (44.65) were non diabetic (Table2). The Chi-square test ($\chi^2 = 5.93$, $p = 0.0148$) showed a statistically significant link between HCV infection and Type 2 Diabetes, suggesting that people with HCV are more likely to develop diabetes (Table 3).

Table 1. Descriptive statistics of the HCV Patients (n = 138)

Variable	Frequency	Percentage (%)
Age Group		
20–30 years	5	3.6%
30–40 years	35	25.4%
40–50 years	50	36.2%
50–60 years	35	25.4%
60–70 years	13	9.4%
Gender		
Male	56	40.6%
Female	82	59.4%

Table 2. Glycemic Status of HCV Patients (n = 138)

Diabetes	Frequency (n)	Percentage (%)
HbA1C Borderline	3	2.2%
Prediabetic	6	4.4%
Diabetic	67	48.8%
Non-Diabetic	62	44.6%

Table 3. Association Between Hepatitis C Virus (HCV) Infection and Type 2 Diabetes Mellitus (T2DM)

Test Performed	Chi-Square (χ^2)	p-value	Interpretation
Association of HCV with T2DM	5.93	0.0148	Statistically significant ($p < 0.05$)

DISCUSSION

This study found a significant association between Hepatitis C Virus (HCV) infection and Type 2 Diabetes Mellitus (T2DM) in a Lahore population, especially among middle-aged adults and females, supporting previous research linking HCV to insulin resistance and glucose dysregulation through inflammation and disrupted insulin signaling (1,6,14). The observed T2DM prevalence aligns with prior studies in Pakistan, with an increasing trend suggesting growing comorbidity (3,8). Mechanistically, HCV promotes metabolic disturbances via hepatic steatosis and inflammatory cytokines (6,14). Given the high cure rates of Direct-Acting Antivirals (DAAs), future studies should evaluate glycemic improvements post-treatment (1,6). These findings highlight the need for routine diabetes screening and integrated care in HCV patients, especially in resource-limited settings. Limitations include sample size, single-center design, and unmeasured confounders. Larger, longitudinal studies are needed to clarify causality and inform targeted interventions (1–14).

CONCLUSION

This study found a significant link between Hepatitis C Virus (HCV) infection and increased risk of Type 2 Diabetes Mellitus (T2DM) in Lahore, highlighting the need for early diabetes

screening and metabolic monitoring in HCV patients. Clinically, greater awareness and integrated care are essential to manage this comorbidity and reduce complications. Future research should focus on understanding the biological connection and the impact of antiviral treatment to better guide prevention and care strategies.

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