The Research of Medical Science Review
ISSN: 3007-1208 & 3007-1216 Volume 3, Issue 6, 2025

FREQUENCY OF TYPE I DIABETES MELLITUS IN CHRONIC HEPATITIS-C VIRUS INFECTION

Urva Mazhar[*1], Zafar Iqbal Chaudhary[2], Rawaha Abad Rao[3], Tanavish Amin[4]

*[*1]PG Trainee General Medicine, MBBS, General Medicine/Akhtar Saeed Medical and Dental College Lahore*
[2]Professor General Medicine, MBBS, FCPS, General Medicine/Akhtar Saeed Medical and Dental College Lahore
[3]Medical Officer, MBBS, Medical Officer/Farooq Hospital Westwood Branch Lahore
[4]PG House Officer, MBBS/Akhtar Saeed Medical and Dental College Lahore

[*1]urvamazher09@gmail.com

DOI: https://doi.org/10.5281/zenodo.17294090

Keywords
Blood Sugar Level, C-Peptide Level, Chronic Hepatitis C Virus Infection, Glycated Hemoglobin, Type I Diabetes Mellitus

Article History
Received: 15 April 2025
Accepted: 15 May 2025
Published: 30 June 2025

Copyright @Author

Corresponding Author: *
Urva Mazhar

Abstract

Objective: "To determine the frequency of type-1 Diabetes mellitus in chronic Hepatitis-C virus infection". Study design: Cross Sectional Study. Study place and duration: Department of internal Medicine, Akhtar Saeed Trust Teaching Hospital for about 6 months from October 2024 till March 2025. Methodology: Total 119 patients were enrolled and were diagnosed for diabetes mellitus on the basis of random blood sugar > 200 mg/dL, fasting blood sugar > 1 26 mg/dL on two occasions or HBA1C > 6.5%. All this information will be documented in proforma and analysed in SPSS version 25, Results: In this study, total 119 patients of chronic HCV were enrolled who had mean age of 29.87 ± 5.75 years. There were 75 (63%) male patients and 44 (27%) female patients. Blood sugar level were assessed and observed that mean blood sugar level in fasting condition was 110.74 ± 36.48 mg/dl, while after 2-hours of glucose intake, the mean blood glucose level random was 199.30 ± 85.54 mg/dl. The mean HBA1c level of individuals was 6.92 ± 2.26 %. Out of 119 patients with chronic HCV, 37 (31.09%) patients were found to be positive of type I diabetes mellitus. Conclusion: The chances of developing type I diabetes mellitus are high among patients with chronic HCV.

INTRODUCTION

With an estimated 11.55% of adults in Pakistan infected with HCV, hepatitis is a serious public health concern. About one out of every 20 Pakistanis is already infected with the hepatitis C virus (HCV), making the nation the second most afflicted in the world.[1] Numerous studies have found that HCV infection raises insulin resistance, which in turn raises the risk of diabetes.[2]

According to epidemiological research, individuals with type 2 diabetes may also be more susceptible to negative consequences from their hepatitis C infection, such as a decreased rate of sustained virological response, the development of cirrhosis and fibrosis, and an increased risk of hepatocellular cancer.[3, 4] The majority of studies acknowledge the short-term effects of glycometabolic alterations and the beneficial effect of SVR obtained by DAA therapy on DM prevention. Cohort studies indicate that effective treatment of chronic HCV infection with currently available direct acting antiviral agents

(DAAs) improves glycemic control in these diabetics.[2, 5, 6]

It is still up for dispute whether this effect is sustained over time and has a major clinical impact on liver and diabetes.[7] The link between type 1 diabetes mellitus and an increased risk of complications from HCV is not well established. This possible link has been explained by a number of biological processes. In particular, an immunological response to β-ce11s appears to be favored by HCV infection.[2, 8] Additional plausible explanations point to the role of a molecular mimicry process as a catalyst for HCV-associated autoimmunity or an activity facilitated by IL-18 and other pro-inflammatory cytokines. [9, 10]

Determining the prevalence of type-1 diabetes mellitus in patients with chronic Hepatitis-C virus infection was the rationale for this investigation. Unlike type 2 diabetes, for which there is a substantial body of evidence connecting HCV to type 2 diabetes, there is currently little information on the relationship between HCV and type 1 diabetes. Although the prevalence of type-2 diabetes mellitus in hepatitis C virus patients has been documented in local literature, there are little statistics on type-1 diabetes. So with this study we will be able to know the frequency of type-l diabetes frequency in our local population. As HCV patients' treatment protocol is shifted toward direct acting antivirals so this is important to see how much this effect the development of type-l diabetes in this population. Early identification of type-l diabetes has a significant impact for prognosis of the patients as well as it helps in better treatment planning for minimizing the morbidity and mortality.

METHODOLOGY

This Cross Sectional Study was conducted at the Department of internal Medicine, Akhtar Saeed Trust Teaching Hospital for about 6 months from October 2024 till March 2025. Sample size of 119 patients was estimated with 95% confidence level, 8% margin of error and using percentages of type-1 diabetes in hepatitis C virus patients as 27.1%.[11] Patients who fulfilled the following criteria were enrolled by applying Non-probability consecutive sampling technique.

Inclusion of patients: Diagnosed patients of Hepatitis-C virus patients, aged (20-40 years) either gender were included in the study. Hepatitis-C Virus Infection was diagnosed with the help of HCV antibodies by ELISA, and confirmed by detecting HCV RNA by polymerase chain reaction (Viral Load>800,000 IU/ml).

Exclusion of patients: Diagnosed patients of Type-l diabetes, Pregnant women, Pre-existing liver disease, patients presenting with any malignancy, history or evidence of pancreatitis, pancreatic tumor, hepatic tumor cirrhosis, or with other coexisting viral infections were excluded for the study sample.

Ethical approval was taken from the Institutional ethical review board committee. Total 119 patients were enrolled through outpatients/in-door Department. Patients' demographics and clinical data was noted. Diabetes mellitus was diagnosed on the basis of random blood sugar above 200 mg/dL, fasting blood sugar above 126 mg/dL on two occasions 4 or HBAIC above 6.5 % (diagnostic criteria designed by ADA). Confirmation of type-l diabetes was done with the help of c-peptide test. C-peptide level of less than 0.2 nmol/l is associated with a diagnosis of type 1 diabetes mellitus.[12] Whereas, the HCV test was done by real time qPCR. All this information was documented on a pre designed proforma by the researcher.

Data entry and analysis was done with SPSS version 25. HbAlc was presented as mean±SD and Type I diabetes was presented as frequency and percentage. Effect modifiers, were controlled through stratification. Post stratification, Chi-Square test was applied to see the impact of these effect on occurrence of type I diabetes mellitus. p-value≤0.05 was kept as significant.

RESULTS

In this study, total 119 patients of chronic HCV were enrolled who had mean age of 29.87 ± 5.75 years. There were 75 (63%) male patients and 44 (27%) female patients. The mean height, weight and body mass index of patients were 1.70 ± 0.10 meter, 88.33 ± 13.47 kg and 30.81 ± 5.96 kg/m^2, respectively. Out of 119 patients, 58 (48.7%) had residence in rural areas while 61 (51.3%) patients were living in urban areas. There were 75 (63.0%) married patients, 38 (31.9%) were unmarried while 6 (5.0%) were widow or divorced. Out of 119 patients, 41 (34.5%) were belong to low class status, 44 (37.0%) were middle class and 34 (28.6%) had high class socioeconomic

status. About 46 (38.7%) patients had positive family history for diabetes mellitus. Table-I

Blood sugar level were assessed and observed that mean blood sugar level in fasting condition was 110.74 ± 36.48 mg/dl, while after 2-hours of glucose intake, the mean blood glucose level random was 199.30 ± 85.54 mg/dl. The mean HBA1c level of individuals was 6.92 ± 2.26 %. Table-II

Out of 119 patients with chronic HCV, 37 (31.09%) patients were found to be positive of type I diabetes mellitus. Fig-I

We stratified data for effect modifiers that could affect the occurrence of type I diabetes. It was observed that age has no impact on type I diabetes and noticed that frequency of type I diabetes was 21 (31.3%) in patients fall in age range 20-30 years while 16 (30.8%) patients of age 30-40 years were found to have type I diabetes (p-value >0.05). But risk of type I diabetes was significantly high in females (47.7%) as compared to males (21.3%, p-value = 0.003). Area of residence did not affect occurrence of type I diabetes and almost equal number of cases had type I diabetes 31.0% vs. 31.1%, p-value>0.05, in rural and urban areas, respectively. The risk is somewhat higher in married or widow or divorced patients (33.3%) as compared to unmarried patients (26.7%). Family history of diabetes showed significant relationship with type I diabetes and it was observed that the frequency of type I diabetes was 32 (69.6%) in patients with positive family history of diabetes as compared to 5 (6.8%) patients who had negative family history of diabetes (p-value <0.0001). Body mass index was also found to be significantly associated with type I diabetes mellitus. Patients with normal BMI, type I diabetes was nil (0%), among overweight patients, 2 (5.3%) patients had type I diabetes, 14 (48.3%) among obese and 21 (63.6%) among morbidly obese patients developed type I diabetes (p-value<0.0001). Socioeconomic status has also no effect on occurrence of type I diabetes (p-value>0.05). Table-III

Table-I: Presentation of demographic details of enrolled individuals (n = 119)

	F (%), mean ±SD
n	119
Age (years)	29.87 ± 5.75
Gender	
Male	75 (63%)
Female	44 (27%)
Height (m)	1.70 ± 0.10
Weight (kg)	88.33 ± 13.47
Body mass index (kg/m^2)	30.81 ± 5.96
Residence	
Rural	58 (48.7%)
Urban	61 (51.3%)
Marital status	
Married	75 (63.0%)
Unmarried	38 (31.9%)
Widow	6 (5.0%)
Socioeconomic status	
Low class	41 (34.5%)
Middle class	44 (37.0%)
High class	34 (28.6%)
Family history of diabetes	46 (38.7%)

Table-II: Descriptive statistics presenting laboratory findings for blood sugar level (n = 119)

	F (%), mean ±SD
Fasting blood sugar level (mg/dl)	110.74 ± 36.48
Random blood sugar level (mg/dl)	199.30 ± 85.54
HBA1c (%)	6.92 ± 2.26

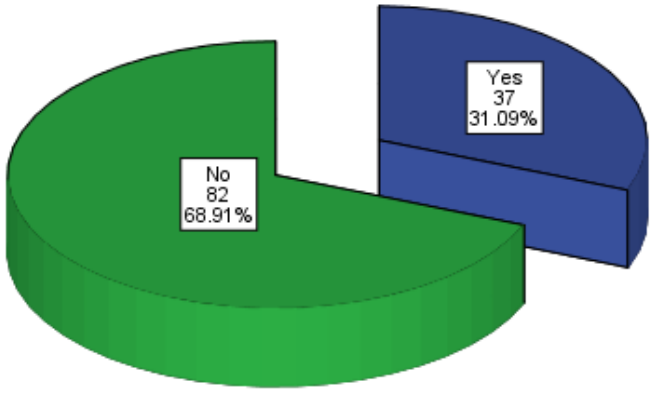

Fig-I: Graphic showing presence of type I diabetes mellitus

Table-III: Distribution of type I diabetes mellitus in patients with different characteristics (n = 119)

		Type 1 diabetes mellitus		p-value
		Yes n = 37)	No (n = 82)	
Age (years)	20-30	21 (31.3%)	46 (68.7%)	0.946
	31-40	16 (30.8%)	36 (69.2%)	
Gender	Male	16 (21.3%)	59 (78.7%)	0.003
	Female	21 (47.7%)	23 (52.3%)	
Residence	Rural	18 (31.0%)	40 (69.0%)	0.989
	Urban	19 (31.1%)	42 (68.9%)	
Marital status	Married	25 (33.3%)	50 (66.7%)	0.743
	Unmarried	10 (26.7%)	28 (73.7%)	
	Widow/divorced	2 (33.3%)	4 (66.7%)	
Family history of diabetes	Present	32 (69.6%)	14 (30.4%)	0.000
	Absent	5 (6.8%)	68 (93.2%)	
Body mass index	Normal	0 (0.0%)	19 (100%)	0.000
	Overweight	2 (5.3%)	36 (94.7%)	
	Obese	14 (48.3%)	15 (51.7%)	
	Morbidly obese	21 (63.6%)	12 (36.4%)	
Socioeconomic status	Low class	14 (34.1)	27 (65.9%)	0.873
	Middle class	13 (29.5%)	31 (70.5%)	
	High class	10 (29.4%)	24 (70.6%)	

DISCUSSION

In our study, we observed that out of 119 patients with chronic HCV, type I diabetes mellitus was positive in 37 (31.09%) patients. This value is higher than reported in previous studies. This may be owing to the fact that incidence of diabetes mellitus is increasing in Asian population, especially in our population. The basic reason behind this increase in incidence is lifestyle and routine diet.

Nizamuddin and colleagues conducted a cross-sectional descriptive study on 104 HCV patients and found that about 21% patients were diagnosed with diabetes.[13] Later on, Masnoor et al., conducted another cross sectional study on 102 HCV patients at Jinnah Sindh Medical University, Karachi, and diabetes was diagnosed in 32.4% patients.[14]

Grattagliano et al., carried out a cohort study on 8299 HCV positive patients and observed that about 11.89% individuals had type I diabetes.[15] Zornitzki et al., carried out another study on 107 individuals with HCV sero-positivity and reported the frequency of type I diabetes among HCV patients as 27.10%.[11] Schreuder et al., carried out another study on 189 HCV patients and observed the development of type I diabetes in only 2.6% treated for HCV. [16]

In contrast to our cross-sectional investigation, which had a sample of 9,783 patients, a comparable study carried out in New Orleans, USA, used a retrospective analysis. In our study, diabetes mellitus was independently linked to HCV, chronic hepatitis, and cirrhosis, with a prevalence of 21% and 31%, respectively.[17]

Patients with type 2 diabetes had a greater frequency of HCV infection than those with type 1 diabetes (84% vs. 16%), according to earlier research. Additionally, a different study found that individuals with HCV had a higher prevalence of type-2 diabetes than those with an HBV infection.[18, 19] The effects of interferon-α treatment on diabetes are not entirely explained by the association with type I diabetes. In fact, from an entirely different angle, individuals with HCV should also be evaluated for antiviral therapy using interferon due to its ability to slow the advancement of this metabolic disorder.[20]

CONCLUSION

The chances of developing type I diabetes mellitus are high among patients with chronic HCV. Through this study, we have attained magnitudes for local population and found risk of type I diabetes also high as type II diabetes in HCVV patients, especially on interferon therapy. Now in future, we will implement to screen HCV patients regularly, in order to diagnose type I diabetes on earlier basis and can plan the prognosis of HCV patients as well as in planning better treatment strategies to minimize the morbidity and mortality of HCV patients and improve quality of life of these patients.

CONFLICT OF INTEREST

None.

ACKNOWLEDGMENT

REFERENCES

1. 1. Farhan M, Fazal F, Dave T, Butt A, Basit J, Maqbool S. National hepatitis registry in Pakistan: a dire need for hepatitis surveillance and control. Tropical Medicine and Health 2023;51(1):41.
2. 2. Chaudhari R, Fouda S, Sainu A, Pappachan JM. Metabolic complications of hepatitis C virus infection. World journal of gastroenterology 2021;27(13):1267.
3. 3. Chávez-Reyes J, Escárcega-González CE, Chavira-Suárez E, León-Buitimea A, Vázquez-León P, Morones-Ramírez JR, et al. Susceptibility for some infectious diseases in patients with diabetes: the key role of glycemia. Frontiers in public health 2021;9:559595.
4. 4. Wang CC, Cheng PN, Kao JH. Systematic review: chronic viral hepatitis and metabolic derangement. Alimentary pharmacology & therapeutics 2020;51(2):216-30.
5. 5. Roguljic H, Nincevic V, Bojanic K, Kuna L, Smolic R, Vcev A, et al. Impact of DAA treatment on cardiovascular disease risk in chronic HCV infection: an update. Frontiers in pharmacology 2021;12:678546.

6. 6. Vancsa S, Nemeth D, Hegyi P, Szakacs Z, Farkas A, Kiss S, et al. Diabetes mellitus increases the risk of hepatocellular carcinoma after direct-acting antiviral therapy: systematic review and meta-analysis. Frontiers in Medicine 2021;8:744512.
7. 7. Ribaldone DG, Sacco M, Saracco GM. The effect of viral clearance achieved by direct-acting antiviral agents on hepatitis C virus positive patients with type 2 diabetes mellitus: a word of caution after the initial enthusiasm. Journal of clinical medicine 2020;9(2):563.
8. 8. Tomic D, Shaw JE, Magliano DJ. The burden and risks of emerging complications of diabetes mellitus. Nature Reviews Endocrinology 2022;18(9):525-39.
9. 9. Costa GL, Sautto GA. Exploring T-Cell Immunity to Hepatitis C Virus: Insights from Different Vaccine and Antigen Presentation Strategies. Vaccines 2024;12(8):890.
10. 10. Méndez-Sánchez N, Coronel-Castillo CE, Ramírez-Mejía MM. Chronic Hepatitis C Virus infection, Extrahepatic disease and the impact of new Direct-Acting antivirals. Pathogens 2024;13(4):339.
11. 11. Zornitzki T, Malnick S, Lysyy L, Knobler H. Interferon therapy in hepatitis C leading to chronic type 1 diabetes. World Journal of Gastroenterology: WJG 2015;21(1):233.
12. 12. Leighton E, Sainsbury CA, Jones GC. A practical review of C-peptide testing in diabetes. Diabetes therapy 2017;8:475-87.
13. 13. Ghaffar T, Kanwal S, Jan B, Aamir MS, ul Haq T, Rahman A, et al. Frequency of diabetes mellitus in patients with chronic Hepatitis C Infection: Frequency of Diabetes with Hepatitis C. Pak J Health Sci 2023;4(5):69-72. https://doi.org/10.54393/pjhs.v4i05.723.
14. 14. Mansoor U, Fatima K, Ahuja KK, Khan A, Khan A. Frequency of diabetes mellitus in patients with chronic hepatitis C infection. J Pop Therap Clin Pharmacol 2024;31(3):515-9. https://doi.org/10.53555/jptcp.v31i3.4952.
15. 15. Grattagliano I, Rossi A, Marconi E, Lapi F, Cricelli C. Determinants of HCV-related complications in Italian primary care patients. Liver International 2021;41(12):2857-65.
16. 16. Schreuder TC, Gelderblom HC, Weegink CJ, Hamann D, Reesink HW, DeVries JH, et al. High incidence of type 1 diabetes mellitus during or shortly after treatment with pegylated interferon α for chronic hepatitis C virus infection. Liver International 2008;28(1):39-46.
17. 17. Gordon SC, Lamerato LE, Rupp LB, Holmberg SD, Moorman AC, Spradling PR, et al. Prevalence of cirrhosis in hepatitis C patients in the Chronic Hepatitis Cohort Study (CHeCS): a retrospective and prospective observational study. Am J Gastroenterol 2015;110(8):1169-77. http://doi.org/10.038/ajg.2015.203.
18. 18. Kanwal N, Nasir B, Abrar MA, Kaukab I, Nawaz A, Nisar N, et al. Prevalence of hepatitis Cin diabetic patients: a prospective study. Acta Pol Pharma 2016;73(3):771-5.
19. 19. Aldubaie MH, Suryavamshi PM, Irfan UM, Al-Hamed HA, Almogbel TA, Almatroudi A, et al. Prevalence of Hepatitis C Viral Infection among Diabetes Mellitus Patients in Qassim Region, Saudi Arabia. J Pure Appl Microbiol 2023;17(3):1722-36. https://doi.org/10.22207/JPAM.17.3.37.
20. 20. Antonelli A, Ferrari SM, Giuggioli D, Di Domenicantonio A, Ruffilli I, Corrado A, et al. Hepatitis C virus infection and type 1 and type 2 diabetes mellitus. World journal of diabetes 2014;5(5):586-600. http://doi.org/10.4239/wjd.v5.i5.586.

IEER Institute for Excellence in Education & Research