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ORIGINAL ARTICLE

Distribution of type 2 diabetes mellitus in chronic hepatitis-C patient; A cross-sectional study conducted in Khyber Teaching Hospital and Khushal Medical Center Peshawar

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ABSTRACT

Background: Prevalence of Hepatitis C virus infections (HCV) and Diabetes Mellitus (DM) is escalating and is associated with increased morbidity and mortality. Patient with HCV are more prone to develop DM and this study aims to determine the distribution of DM in HCV patients. **Methods:** This descriptive cross sectional enrolled 160 HCV patients from 27th October 2020 till 26th April 2021 at Medicine Unit, Khyber Teaching Hospital (KTH) Peshawar and Khushal Medical Center (KMC) Peshawar. After ethical approval from KMC, the enrolled HCV patients were screened for DM. After detailed interview, blood samples were collected and subsequently processed for glycated hemoglobin A1C (HbA1C). The data were analyzed using SPSS version 22.0. **Results:** The mean age of the patients was 61.1±12.1 years. Similarly, the mean height, weight and body mass index (BMI) was 71.6±11.4 kg, 166.2±9.7 cm and 26.1±4.7 kg/m2 respectively. Family history of DM was positive in 30.6% patients while family history of obesity was positive in 23.8% individuals. The DM was prevalent in 31.3% HCV patients in which 58% were newly diagnosed. Statistical significant association was observed in HCV obese patient than non-obese patients with DM (p-value 0.03). Furthermore, obese patients were 12.4 times more likely to develop DM as compared to non-obese patients (OR, 95%CI 12.4 (5.52-28.5). **Conclusion:** DM is more common in HCV patients particularly if the patient is obese. It is necessary to screen and control earlier for the presence of type 2 diabetes mellitus and also to rule out HCV infection among diabetic populations which is rarely done on population-based studies.

Keywords: Hepatitis C virus, Diabetes mellitus, Body mass index, World health Organization

Introduction

Hepatitis C virus (HCV) causes inflammation of the Liver and is a single-stranded RNA virus of the family flaviviridae; it is one of the major cause of life-threatening chronic liver disease, with global prevalence estimated 177.5 million HCV infected adults (101). Some studies reveals the risk for diabetes to be 10.9% for anti-HCV sero-negative and 16.7% for anti-HCV seropositive respectively and the treatment of HCV infection have been reported to decrease the episodes of hyperglycemia (102, 103). In East and South Asia the prevalence of hepatitis C is highest, with the key factors being the family history of diabetes and sedentary life style that contribute to development of diabetes mellitus which lead to the development of micro-vascular complications of neuropathy, nephropathy and retinopathy (104).

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Diabetes is a metabolic disorder of functional insulin deficiency. The top countries of highest diabetes prevalence are United States (U.S), China and India (105). In Pakistan diabetes mellitus prevalence is up to 26.3% with 14.4% as pre-diabetes (106). Studies have shown that diabetes prevalence (36%) is more in patients with Hepatitis C virus (HCV) infections (107). The acceleration of the course of chronic hepatitis C and the decreased response to antiviral therapy may be attributed to insulin resistance. The developing countries have reported higher prevalence of chronic liver disease due to hepatitis C reporting (22%), (4.8%), (3.2%) for Egypt, Pakistan and China respectively (108). The processes through which HCV is associated with Type 2 DM include direct viral effects, insulin resistance, chemokine, cytokine signal suppression and other immune mediated mechanisms (109). HCV patients have higher reports of T2DM occurrence, portraying a relationship between T2DM and HCV infection. The subpar therapeutic response, aggravated liver fibrosis, insulin resistance and deteriorating liver condition are attributed to the comorbidity of T2DM with HCV infection (110).

Pakistan is enduring an HCV epidemic of historical proportions, with approximately one in every 20 Pakistanis being infected, having high prevalence in all-risk populations, HCV has major role in liver disease burden in this country (111). According to the projections by WHO, diabetes will be the 7th leading cause of death by 2030 and this have become a problem in Pakistan with 7.1 million diabetics in 2010 and expected 13.8 million diabetics till 2030 (108). Our rationale was to find the distribution of diabetes in HCV patients and correlate it with age, gender, body mass index (BMI) and history of duration of diabetes.

Methods

This descriptive cross sectional study was conducted from 27th October 2020 till 26th April 2021 at Medicine Unit, Khyber Teaching Hospital (KTH) Peshawar and KMC Peshawar. A total of 160-sample size was calculated using WHO calculator based on prevalence of 28.3% with the margin of error 5% and confidence interval of 95%. After Ethical approval from KMC via letter no. KMC/EB02/010, HCV patients of either gender, willing to participate were enrolled in the study. The demographic data was recorded on pre-designed proforma after detailed interview and then 5cc blood was taken from each patient for RBS and HbA1C determination. Patients not willing to participate in the study, patients with hepatitis B infection as per ELIZA results and patients with history of type 1 DM were excluded from the study.

SPSS version 22 was used for analysis. Frequency, percentages and Mean ± SD of quantitative variables were calculated. Stratification of effect modifiers factors like age, gender, BMI, family history of diabetes, family history of obesity was presented against the status of type II diabetes and Chi-square test was applied with the p-value of ≤0.05 being as statistically significant. Odds ratio with 95% confidence interval was calculated to determine the future risk. All the selected statistical values were two tailed.

Results

The mean age of the patients was 61.1±12.1 years. Similarly, the mean height, weight and body mass index (BMI) was 166.2±9.7cm, 71.6±11.4 kg and 26.1±4.7 kg/m2 respectively. The mean random blood sugar (RBS) among diabetic patients was 265±23.8 mg/dl. The details are shown in table 1.

Similarly, male participants were 53.8% while female were 46.3%. Family history of DM was positive in 30.6% patients while family history of obesity was positive in 23.8% individuals. The DM was prevalent in 31.3% HCV patients in which 58% were newly diagnosed as shown in Figure 1. The results are summarized in Table 2.

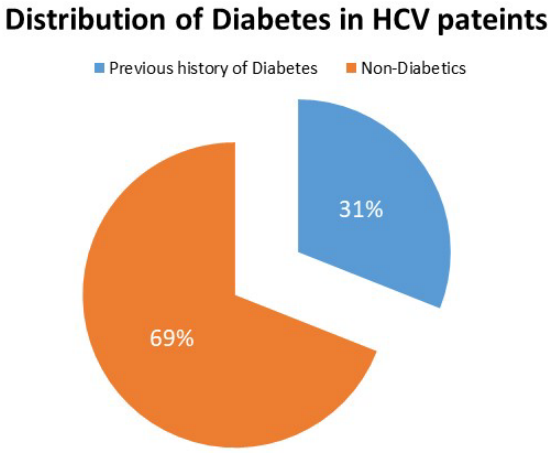

Figure 1: Distribution of diabetes in HCV patients.

Table 1: Demographics of study participants

Variable	Mean	Standard deviation
Age (years)	61	12.1
Weight (Kg)	71.6	11.4
Height (cm)	166.2	9.7
BMI (kg/m²)	26.1	4.7
Random Blood sugar (RBS) (mg/dl)	295	23.8

Table 2: Characteristics of study population

Parameter	Sub-Types	Frequency (%)
Gender	Male	86 (53.8)
	Female	74 (46.3)
Diabetes	-	50 (31.3)
Type of diabetes	Old	21 (42)
	New onset	29 (58)
Family history of diabetes	-	49 (30.6)
Family history of obesity	-	38 (23.8)

To find the possible association between different study parameters with DM, chi-square test was applied. The results reveal that no statistical significant association between different age groups and gender with DM. However, Females are 1.75 times more likely to develop diabetes as compare to males with OR, 95%CI 1.73, 0.89-3.43. Obesity was significantly associated with DM with p value 0.03. Furthermore, obese patients were 12.4 times more prone to develop diabetes as compared to normal BMI patients with OR, 95%CI 12.4, 5.52-28.5. All the results are given in table 3 while the significant association of BMI and DM is shown in Figure 2.

Table 3: Association of different study parameters with diabetes mellitus

Parameters		Status of diabetes		P-Value	OR (95%CI)
		Yes	No		
Age groups	40-60 years	24	50	0.86	0.9 (0.47-1.73)
	61-80 years	26	60		
Gender	Male	22	64	0.12	1.75 (0.89-3.43)
	Female	28	46		
BMI	Normal	29	83	0.03	12.4 (5.52-28.5)
	Obese	39	09		

BMI-Body mass index

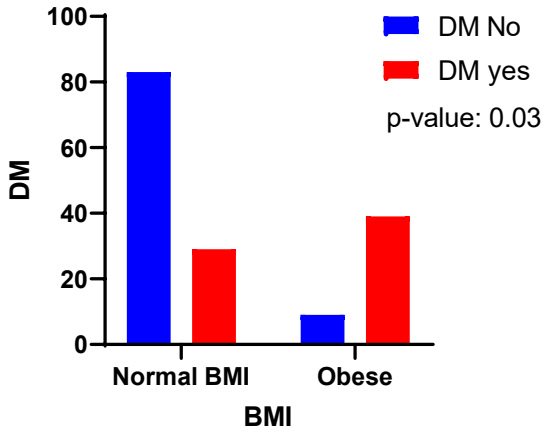

Figure 2: Association of BMI with DM

Discussion

Extra hepatic manifestations have been identified in HCV infection, yet it remains to be understood whether HCV infection leads to diabetes or vice versa, but it is still discussed that diabetics have higher risk of exposure to HCV infections. It has been established that HCV infected patients increased frequency of glucose intolerance and some studies indicate that HCV infections may be an additional risk factor for development of diabetes (112). In our study, there were 86 (53.8%) were males while 74 (46.3%) were females which is also reported in a 2024 study with higher frequency of males.(113) According to a recent study published in 2020 by Kadla et al shows a bit higher percentage of females are compared to males (114).

Our study revealed a total of 31.3% patients having type II diabetes with chronic hepatitis C infection. In consistent with our findings a southeast Asian study conducted in 2013 also reported 31.5% of prevalence of diabetes in HCV infected patients and observed that cirrhotic patients appeared significantly more likely (p-value 0.01) to be diabetic as compared with non-cirrhotic patients (115). Among these 31.3% DM patients, 42% were old diabetes while 58% were new onset of diabetics. A similar prevalence of new and old DM cases were also reported by the Studies in the past where the prevalence of new and old onset of DM in HCV is 36% and 28.3% patients respectively (107, 116). Another study also found that patients with HCV infections are 2 folds more prone to develop diabetes as compared non-HCV patients (114). The HCV plays important role in the development and pathogenesis of DM. The viral proteins causes insulin resistance (IR) and oxidative stress at cellular level by producing reactive oxygen species (117, 118) . Furthermore, these proteins also causes phosphorylation of insulin receptor leading to IR thus leading to the development of DM in such patients (114, 119). Obesity is one of the most significant factors for the development of DM (120, 121). In our study, obesity was positive in 39 (23.3%) DM patients. The level of significance was high (p-value 0.03) when compare patient with normal BMI and obese in relation to DM. Furthermore, obese individuals were 12.4 times more likely to develop DM as compared to non-obese individuals. According to the nationwide diabetes report of national program for prevention and control of DM (NPPCD-2021), obesity was found as an independent risk for development of DM. Furthermore, obese individuals develops diabetic complications more early as compared to non-obese individuals (122, 123). Thus treating HCV in patients with DM and obesity will further complicates the treatment regimen and will results in bad prognosis of the patients.

Conclusion

Our study concludes that type 2 diabetes is very common in patients with hepatitis C infection. Detection of HCV infections among diabetic patients is rarely ruled out in

population-based studies, hence screening and early control is necessary for HCV infected diabetic patients.

Conflict of Interest: Authors declare no conflict of interest.

Funding: No funding was received for this project

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HISTORY	
Date received:	05-08-2024
Date sent for review:	06-08-2024
Date received reviewers comments:	13-08-2024
Date received revised manuscript:	23-08-2022
Date accepted:	26-08-2024

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