

Seroprevalence of Hepatitis C Virus among type 2 diabetes mellitus patients in blue Nile state, Sudan

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Abstract

Background: A large number of clues have suggested the potential role of a common hepatotropic virus in developing diabetes. New observational studies in which prevalence of HCV infection in patients with DM have been carried out in endemic countries. This study was, therefore, carried out to determine the prevalence of HCV infection among diabetic patients and to elucidate the presence of any possible relationship between HCV and T2DM in this region.

Method: ELISA fourth generation for anti-HCV antibodies was done in 180 samples of patients with T2DM visiting Er-Roseires Hospital, and 180 volunteer blood donors visiting blood bank of the same hospital. Data about various variables was collected from diabetic patients using a structured questionnaire after taking informed consent.

Result: Prevalence rate of (1.7%) for HCV infection was recorded among T2DM patients with no seropositivity detected among the control group of volunteer blood donors without diabetes. The patients with T2DM were more likely to have HCV infection as compared to the control group (1.7%, 0.005% = $p = 0.00$).

Conclusion: There was statistically significant association between HCV infection and T2DM in the region as evident from significantly higher prevalence of HCV infection in diabetics as compared to the control group in the present study.

{**Citation:** Ahmed G Madny, Adam A Adam. Seroprevalence of hepatitis C virus among type 2 diabetes mellitus patients in blue Nile state, Sudan. American Journal of Research Communication, 2014, 2(12): 141-147} www.usa-journals.com, ISSN: 2325-4076.

Introduction

Hepatitis C virus (HCV) infection is an important public health problem which currently affects more than 170 million people (about 3% of world population) out of which 55-80% have chronic

infection ⁽¹⁾. Hepatitis C virus (HCV) is a small, enveloped RNA virus that belong to the genus *Hepacivirus* of the family *Flaviviridae*, and the molecular mechanisms underlying its viral replication are currently being unraveled ⁽²⁾. The HCV genome encodes a single polyprotein of about 3,000 amino acids, which is cleaved by host and viral proteases to generate at least 10 viral proteins, such as core, envelope 1 (E1), E2, p7, and non structural proteins NS2, NS3, NS4A, NS4B, NS5A, and NS5B, HCV can be classified into seven genotypes, with each genotype further classified into a number of subtypes, such as HCV-1a and HCV-1b ⁽³⁾⁽⁴⁾⁽⁵⁾. HCV especially attacks hepatocytes causing acute and chronic type of hepatitis, can be transmitted by blood, sexual contact contaminated needles or syringes, The likelihood of chronicity after acute HCV infection is as high as 85% with chronic infection being common even in those having normal amino- transferase levels after the acute episode ⁽⁶⁾ Infection with HCV has been shown to produce both hepatic and extra hepatic manifestations, the latter include insulin resistance, essential mixed cryoglobulinemia, glomerulonephritis, porphyria cutaneous tarda and benign monoclonal gammopathy ⁽⁷⁾⁽⁸⁾. A meta-analysis showed that HCV increases the risk of T2DM by 1.8 times in excess of that posed by relative degree of liver pathology ⁽⁹⁾.

The link between the HCV and diabetes was first reported by Allison et al. in 1994 and later explored by Simo and colleagues in 1996 ⁽¹⁰⁾⁽¹¹⁾. The initial idea that patients with T2DM have more parenteral exposures because of use of finger stick devices and thus are at an increased risk of contacting blood borne infections such as HCV was disproved by a study from France in 1998⁽¹²⁾. An Egyptian study showed that incidence of T2DM mellitus increased two fold in patients who had HCV infection compared with those who did not and reported that HCV-infected persons with mellitus were more likely to need insulin ⁽¹³⁾. A large retrospective survey of 1332 Italian patients with cirrhosis found that type 2 diabetes mellitus was present in 23.6% of those with HCV infection and in 9.4% of those with HBV infection ⁽¹⁴⁾. In addition, type 2 diabetes mellitus was closely correlated with age and severity of cirrhosis. The findings of a second prospective series of unselected patients who had glucose tolerance tests were similar to those in patients with cirrhosis. However, only 1 of 70 HCV infected patients without cirrhosis had diabetes mellitus ⁽¹⁴⁾ In a similar large U.S. study in 1117 patients with chronic viral hepatitis, the prevalence of type 2 diabetes mellitus was higher in those with HCV-related disease than in those with HBV-related disease (21% vs.12%, respectively) ⁽¹⁵⁾. Similar findings have been reported in smaller series^(16, 17). This study will be important in elucidating any relationship between HCV and T2DM in the Blue Nile state. In addition, it is necessary to determine the prevalence of HCV among diabetics to increase awareness among general population and health care workers to prevent morbidity and increased costs associated with this infection in diabetes due to failure of treatment. Since the prevalence of diabetes is on the rise and is complicated by co infection with HCV, the determination of relationship becomes even more important in this scenario so that it can be effectively managed ⁽¹⁸⁾.

Materials and method

Ethical approval from the Ministry of Health and informed consent regarding data and blood samples were obtained for collection and examination of the samples. The collected data

included age, gender, and duration of diabetes, marital status, family history and glycemic control. The obtained data were analysed using the statistical package (SPSS).

Study population

The study was carried out on a sample of 180 consecutive persons with confirmed T2DM visiting Diabetes clinic at Er-rsar Hospital, for follow up (79males,101females) with age ranged from (<28years - >66years with mean 44,8 years) Subjects were type 1 diabetes, transplant recipients, emergency cases and dialysis patients were excluded. A control group comprising of 180 healthy blood donors were taken from the same hospital who visited the blood bank during the study period (150males,30females) with age ranged from (<26years ->44years with mean 38,2 years) . Controls were excluded if proved to be diabetes patients.

Serum specimens collection

Three ml of blood samples was obtained via vein puncture in plain tubes. The blood samples after complete clotting were centrifuged at 3000 round/minute for 5 minutes, Sera were then collected in clean sterile containers properly labeled and kept at -20 °C till used.

Serology-Indirect ELISA for IgG

The enzyme-linked immunosorbent assay was used to detect the specific HCV IgG antibodies against core and nonstructural region, Commercial ELISA Kits (DIA.PRO,Milano,Italy) were used as described by the manufactures .The concentration of antibodies in the sample estimated by means of Cut-off value.The C.O value was calculated as follow:

(Calculation of the Cut-off value (C.O.) = $Nc + 0.350$) = 0.381

Statistical analysis

Data was analyzed using SPSS software package (version 16 for windows 7). Using Pearson chi-square test to determine the difference among various categories with respect to HCV seropositivity. A p value of <0.05 was considered statistically significant.

Results

Detection of the presence of anti-HCV antibody was positive in 3(0,84%) patients in the entire study group. The seroprevalance was 1,7% in patients with T2DM as compared to the control group in whom prevalence rate was less than sign 0.005%. Analysis revealed that diabetic patients had significantly higher prevalence of HCV infection as compared to the control group (P = 0.00). The distribution of HCV infection in diabetic patients was then studied with respect to age,gender, marital status, family history of diabetes, and glycemic control. The results of analysis are presented in table

Table 1 Description of the study group (n = 180) Diabetes group

Variable	NO	%	+ve ELIZA	P. value
Gender	❖	❖	❖	0.212
Male	79	43.9	1	
Female	101	65.1	2	
Marital status	❖	❖	❖	0.252
Married	147	81.7	1	
Un married	33	18.3	2	
History of DM	❖	❖	❖	0.199
Yes	96	53.4	2	
No	84	46.6	1	
Glycemic control	❖	❖	❖	0.236
Good	127	70.6	1	
Bad	53	29.4	2	
HCV	❖	❖	❖	0.00
Type2 DM PT	180		3	
Contrl group	180		0	

Discussion

In the present study, we found high prevalence of HCV infection in patients with T2DM as compared to the control group comprising of healthy volunteer blood donors (1.7% vs. less than 0.005%). The results of our study are in agreement with those of some studies conducted earlier in other countries ⁽⁹⁾⁽¹³⁾⁽¹⁵⁾. Analysis of HCV seropositivity rates with respect to gender revealed that females had higher HCV infection rate as compared to males. This disagrees with the work of Caronia et al. who observed that male diabetics are more likely to be contact HCV infected as compared to females ⁽¹⁹⁾. We did not observe any difference in the HCV distribution in study population with respect to marital status, glycemic control, age, and family history of diabetes. Our findings regarding family history of diabetes differ from those of an earlier study from Nigeria ⁽²⁰⁾. The strength of the present study is the use of a control group for comparison of findings with the diabetic group. The control group was recruited from the same area as the test group. The present study represents the first report on HCV association with T2DM in blue Nile state. The study has some important implications, the increased risk of HCV infection in patients with T2DM warrants screening diabetes person for HCV infection. Secondly, the study adds to the limited data on the subject available in this region and will help in increasing awareness regarding association of HCV and diabetes which will help in reducing morbidity and cost associated with this co morbidity in the long run. The result of the present study also calls for more Prospective, multicentre studies to be undertaken to establish temporal associations

elucidate the reasons of such association as well as the mechanisms and determination of other aspects of the relationships.

Conclusions

In conclusion, there is a significant association between Hepatitis C virus infection and type 2 diabetes in the region according to the findings of the present study. However, it remains to be seen whether diabetes is a risk factor for the HCV infection or vice versa. It is also evident that certain factors including middle age, longer duration of diabetes and good glycemic control increase the risk of having HCV infection which warrants special attention to patients with these risk factors. It is important that health care workers pay attention to prompt diagnosis and management of the condition in affected diabetic patients. Further investigation into the association of the two conditions is needed and may elucidate the temporal relationship and improved management strategies.

List of Abbreviations

CLD: Chronic Liver Disease; HCC: Hepatocellular Carcinoma; HCV: Hepatitis C Virus Infection; ELISA: Enzyme Linked Immunosorbent Assay; T2DM: Type 2 Diabetes Mellitus.

Acknowledgements

This study was supported by Department of Microbiology, Faculty of Medical Laboratory Sciences, Al-Neelain University, Sudan. We acknowledge Er-Roseires hospital and national health insurance fund, for permission to collect the samples.

References

- (1) NIH Consensus Statement on Management of Hepatitis C: 2002. NIH Consensus State Sci Statements 2002, 19(3):1-46.
- (2) Doi H., Apichartpiyakul C., Ohba K. I., Mizokami M., Hotta H. Hepatitis c Virus(HCV) subtype prevalence in Chiang mai, and Identification of Novel subtype of HCV major type 6.J of Clin Microbiol 1996; 34(3): 569-74.
- (3) Wienhues U, Ihlenfeldt HG, Seidel C, Schmitt U, Kraas W, Jung G. Characterization of a linear epitope in the nonstructural region 4 of hepatitis C virus with reactivity to seroconversion antibodies. Virology 1998; 245:281-288.
- (4) Neville JA, Prescott LE, Bhattacharjee V, Adams N, Pike I, Rodgers B, El-Zayadi A, et al. Antigenic variation of Core, NS3, and NS5 proteins HEPATOLOGY Vol. 29, No. 4, 1999

BELD ET AL. 1297 among genotypes of hepatitis C virus. *J Clin Microbiol* 1997;35:3062-3070.

(5) Khudyakov YU, Khudyakova NS, Jue DL, Lambert SB, Fang S, Fields HA. Linear B-cell epitopes of the NS3-NS4-NS5 proteins of the hepatitis C virus as modeled with synthetic peptides. *Virology* 1995;206:666-672.

(6) Fauci AS, Braunwald E, Kasper DL, Hauser SL, Longo DL, Jameson JL, Loscalzo J, eds: *Harrison's Principles of Internal Medicine*. 17 edition. New York: McGraw-Hill Professional; 2008.

(7) Andreone P, Gramenzi A, Cursaro C, Benardi M, Zignego AL: Monoclonal gammopathy in patients with chronic hepatitis C virus infection. *Blood* 1996, 88:1122.

(8) Zignego AL, Ferri C, Pileri SA, Caini P, Bianchi FB: Extrahepatic manifestations of Hepatitis C Virus infection: a general overview and guidelines for a clinical approach. *Dig Liver Dis* 2007, 39:2-17.

(9) White DL, Ratziu V, El-Serag HB: Hepatitis C infection and risk of diabetes: a systematic review and meta-analysis. *J Hepatol* 2008, 49:831-844.

(10) Allison ME, Wreghitt T, Palmer CR, Alexander GJ: Evidence for a link between hepatitis C virus infection and diabetes mellitus in a cirrhotic population. *J Hepatol* 1994, 21:1135-1139.

(11) Simo R, Hernandez C, Genesca J, Jardi R, Mesa J: High prevalence of hepatitis C virus infection in diabetic patients. *Diabetes Care* 1996, 19:998-1000.

(12) Rudoni S, Petit JM, Bour JB, Aho LS, Castaneda A, Vaillant G, Verges B, Brun JM: HCV infection and diabetes mellitus: influence of the use of finger stick devices on nosocomial transmission. *Diabetes Metab* 1999, 25:502-505.

(13) el-Zayadi AR., Selim OE., Hamdy H., Dabbous H., Ahdy H., Moniem SA. Association of chronic hepatitis C infection and diabetes mellitus. *Trop gastroenterol.* 1998 Oct-Sep;19(4):141-4.

(14) Caronia S, Taylor K, Pagliaro L, Carr C, Palazzo U, Petrik J, O'Rahilly S, et al. Further evidence for an association between non-insulin-dependent diabetes mellitus and chronic hepatitis C virus infection. *Hepatology* 1999;30:1059-63.

(15) Mason AL, Lau JY, Hoang N, Qian K, Alexander GJ, Xu L, Guo L, Jacob S, Regenstein FG, Zimmerman R, Everhart JE, Wasserfall C, Maclaren NK, Perrillo RP: Association of diabetes mellitus and chronic hepatitis C virus infection. *Hepatology* 1999, 29:328-333.

(16) Knobler H, Schihmanter R, Zifroni A, Fenakel G, Schattner A. Increased risk of type 2 diabetes in noncirrhotic patients with chronic hepatitis C virus infection. *Mayo Clin Proc* 2000;75:355-9.

(17) Zein NN, Abdulkarim AS, Wiesner RH, Egan KS, Persing DH. Prevalence of diabetes mellitus in patients with end-stage liver cirrhosis due to hepatitis C, alcohol, or cholestatic disease. *J Hepatol* 2000;32:209–17.

(18) Shaw JE, Sicree RA, Zimmet PZ: Global estimates of the prevalence of diabetes for 2010 and 2030. *Diabetes Res Clin Pract* 2010, 87(1):4-14.

(19) Caronia S, Taylor K, Pagliaro L, Carr C, Palazzo U, Petrik J, O’Rahilly S, Shore S, Tom BD, Alexander GJ: Further evidence for an association between non-insulin-dependent diabetes mellitus and chronic hepatitis C virus infection. *Hepatology* 1999, 30:1059-1063.

(20) Ndako JA, Echeonwu GO, Shidali NN, Bichi IA, Paul GA, Onovoh E, Okeke LA: Occurrence of hepatitis C virus infection in type 2 diabetic attending Plateau state specialist hospital Jos Nigeria. *Virol J* 2009, 6:98.