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RESEARCH ARTICLE

SERO PREVALENCE OF HEPATITIS C VIRUS IN TYPE II DIABETIC PATIENTS IN ADIGRAT, ETHIOPIA

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ABSTRACT

Introduction: Hepatitis C virus is an RNA virus in the flavivirus family. Due to high hospitalization and frequent contact with needle diabetic patients are at greatest risk for HCV.
Objective: To assess the seroprevalence of HCV and to identify associated factors among Type II Diabetic patients in Adigrat, Ethiopia.
Method: A hospital based cross sectional study was conducted. Blood sample (5 ml) was collected and centrifuged. Using rapid antibody screening test Anti-HCV was determined from serum sample. Data was entered in to SPSS version 21 for final analysis. A bivariate and multivariate analysis was performed to identify factors related with HCV.
Result: Out of the total study participants 22 (5.5%) of them were positive to HCV. HCV transmission is 12.5 times more likely by blood transfusion (95% CI of 1.61-96.22 P=0.016). Similarly, having surgical procedures increased HCV risk by 35 times (95% CI 5.94-157.24, P=0.00).
Conclusion: The study confirmed a lower rate of HCV in Type II DM patients in Adigrat than previous study in Ethiopia. The present study recommends screening for HCV among Type II DM patients with operation or those having blood transfusion. HCV awareness and prevention campaign for all chronic DM patients are encouraged.

INTRODUCTION

Diabetes mellitus (or diabetes) is a chronic, lifelong condition that affects body's ability to use the energy found in food. There are three major types of diabetes: type 1 diabetes, type 2 diabetes, and gestational diabetes. All types of diabetes mellitus have something in common. Normally, body breaks down the sugars and carbohydrates we eat into a special sugar called glucose. Glucose fuels the cells in our body. But the cells need insulin, a hormone, in our bloodstream in order to take in the glucose and use it for energy. With diabetes mellitus, either our body doesn't make enough insulin, it can't use the insulin it does produce, or a combination of both (Michael, 2014). Hepatitis C virus is an RNA virus in the flavivirus (eg, yellow fever, dengue) family. It has a very simple genome, consisting of just three structural and five nonstructural genes. There are at least six major genotypes, with multiple subtypes. The transmission of hepatitis C by blood is well documented: indeed, until screening blood for transfusions was introduced, it caused the great majority of cases of post transfusion hepatitis. Hepatitis C may be sexually transmitted but to a much lesser degree than hepatitis B. Needle sharing accounts for up to 40% of cases (Kenneth and George, 2004).

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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% has chronic infection (Jadoon *et al.,* 2010). Hepatitis C virus (HCV) has been identified as one of the leading causes of chronic liver disease with serious sequel as the end stage of cirrhosis, liver cancer, liver fibrosis, cirrhosis, hepatocellular carcinoma (HCC), and is the primary cause for liver transplantation in the western world (Memon *et al.,* 2013, Bose and Ray, 2014). Moreover, chronic HCV infection has been associated with several extra hepatic complications. Series of studies found that prevalence of HCV infection is higher in patients with diabetes than in those without diabetes (Lecued *et al.,* 2006, Weiss, 1983, SAS, 2012, Ali, *et al.,* 2007). Elevations of aminotransferases greater than eight times the upper limit of normal which reflect either acute viral hepatitis or liver injury and chronic mild elevations of transaminases are frequently found in type 2 diabetic patients (Kaabia *et al.,* 2009). Liver enzymes conventionally associated with liver dysfunction (aspartate aminotransferases (AST) and alanine aminotransferases (ALT)) may predict diabetes (Masresh *et al.,* 2013). It might be then thought that HCV could trigger an immune reaction against the cell that leads to diabetes. In recent years researchers have begun studying the connections between hepatitis C and diabetes. It turns out that people with hepatitis C infections have a much higher

prevalence of type 2 diabetes, and people with diabetes are more likely than most to have hepatitis C (Rana, 2015, Hua-Fen *et al.,* 2006, Muhammad *et al.,* 2013). Hepatitis C virus infection, particularly of genotypes 1 and 4, may cause insulin resistance or may exacerbate preexisting insulin resistance (Dawn and Stephen, 2008). Due to high hospitalization and frequent contact with needle diabetic patients are at greatest risk for HCV. Diabetes is the most common health problem in Ethiopia. According to the latest WHO data published in April 2011 diabetes mellitus deaths in Ethiopia reached 21,550 or 2.62% of total deaths. The age adjusted death rate is 61.96 per 100, 000 of population ranks Ethiopia number 28 in the world (WHO, 2011). A review in Ethiopia indicates DM occurrences and complications have been increasing throughout the country and HCV is one of the major complications observed and it shows 9.9% association of HCV and diabetes mellitus (Mistire, 2013). Similar to this one study in Jmma shows 9.9 % association (Solomon *et al.,* 2012). Despite high prevalence of Diabetes there is limited information on prevalence and associated factors of HCV with diabetic in Adigrat hospital. Therefore, this study was designed to determine the prevalence of hepatitis C and associated factors among Type II diabetic patients at Adigrat hospital where there is dearth of information.

MATERIALS AND METHODS

Study design and period*:* Across-sectional hospital based study was conducted from February 2016 up to June 2016.

Source population: All Type II diabetic patients that take follow up in Adigrat Hospital including new case.

Study population: Type II Diabetic patients that visit the hospital during the study period

Sample size determination and sampling technique

Sample size determination

The sample size was calculated by using the following formula according to the following assumptions, prevalence of HCV among TYPE II DIABETIC patients IN JIMMA = 9.9% taken from Solomon Ali *et al.,* 2012, with 95% confidence interval and marginal error 3 %, P=0.099; q=1-p = 0.901.

$$n=\frac{\left(\frac{z\alpha}{2}\right)p(1-p)}{d2}$$

$$\frac{(1.96*1.96)0.099(0.901)}{0.03*0.03} = 380.6\sim381$$

Where Zα/2= 1.96 (Z value at (∞ = 0.05) = 1.96)

p= 0.099
d= 0.03 (Margin of error (Precision))
n = sample size

The calculation resulted in a sample size of 381 diabetic patients. Five percent (5% = 19) of the total sample size was added as an attrition rate for any non-response of the study subjects during the study period. Therefore, the actual sample size of the study was 400 diabetic patients.

Sampling technique and processing

Convenient Sampling technique was used in this study. We recruit all DM patients who was consecutively attended the outpatient diabetic clinic for follow up from February 2016 up to June 2016. After explaining the procedure and aim of the work, informed consent was obtained from each study participant prior to data collection. Demographic data was collected by using predesigned, pretested and structured questionnaire. And using aseptic technique by applying 70% alcohol at the site of cephalic and median cephalic vein blood samples (5 ml) was collected by Medical Laboratory Technologist by using disposable syringe into gel tubes and stand at room temperature until the coagulant was formed. Then, the samples were centrifuged at 3000 rpm for 5 min. All samples were marked by the name, day and numbering and stored at (-20Ċ) until carried out. For detection of anti HCV; One Step Hepatitis C Virus Test Which is a immunochromatographic rapid test for the qualitative detection of antibodies specific to HCV in human serum, plasma or whole blood was used according to leaflet of kit. The membrane of chromographic immunoassay strips is pre-coated with recombinant HCV antigen on the test line region of the strips. During testing, the serum or plasma specimen reacts with the particle coated recombinant HCV antigen on the membrane, the mixture was formed and creates red band at the control and test region.

Study variables

Dependent
Hepatitis C virus
Independent

- Duration of Diabetic mellitus
- Education
- Body mass index
- Employment status
- Age
- Sex
- Jaundice
- Work
- Intravenous drug use
- Hospital admission
- Surgical operation
- Blood transfusion

Data collection tools and procedures

A questionnaire was prepared to collect data during the data collection period. An English version is prepared. However, during training the questionnaire was translated into the local language (Tigrigna). Translated questionnaires were translated back to the original language (English) and compared to the original questionnaire.

Data management and quality control

A one -day training session for all data collectors and supervisors was given. The data collectors (Lab workers) completed a total of 400 questionnaires. The Lab technologist performed the lab analysis. The supervisors also perform continuous follow up and early correction of errors if happen.

Data analysis

The result was noted on laboratory data collection format sheet. From these pre-coded checked data was entered to SPSS version 21 for final analysis. The analysis was made with binary logistic regression to see the significant relation of selected independent variables with dependent variable. Independent variables found significant and with P-value<0.05 will be entered to multiple logistic regressions to control the effect of confounding. Frequency distributions, percentages and odds ratios (OR) with 95% confidence level (C.I) was calculated for statistical significance tests between variables and the analyzed data was presented via tables, graphs and texts.

Ethical consideration

An ethical approval was requested from the ethical committee of Adigrat University. Support letters was inquired from Tigray regional health bureau, Adigrat hospital medical director. Information on the study was given to the Type II diabetic patient including the study purposes, procedures, potential risks, and benefits. Training of data collectors was given more attention to the issue of informed consent, privacy and confidentiality.

All participants were informed about the purpose and significances of the study to get the consent of the Type II diabetic patient and their full right to refuse, withdraw or completely reject to be included in the study. Written informed consent was obtained from Type II diabetic patients selected for the study. Participants name was not documented or recorded to assure confidentially. The right of participants to anonymity and confidentiality was ensured by making the questionnaire anonymous. The raw data was handled with key and locked system and the information was not handover to third party. In addition, scientific honesty was made as much as possible by citing properly all Authors of books and journals that are used, and acknowledging Scholars, individuals and organizations contributed for the successful completion of this research paper.

RESULTS

Socio-demographic characteristics of study participants

A total of 400 Type II diabetic patients were included in the study. Out of this 199 (49.8%) were females and 201(50.2%) were males. Two hundred nineteen (54.8%) of the study participants were married. The mean age of the Type II diabetic patients was 44.37± 20.3 (ranging from 2 to 102 median of 45.5 with mode of 50). The mean of FBS/RBS was 206.28 ± 101.05 (ranging from 52 to 600 median of 189 with mode 120). A socio-demographic characteristic of study participants is summarized in Table 1.

Disease profile

Most of the Type II DM patients (55.1%) their DM duration is 2-5 years (2.04± 0.7 years). Patients were treated with insulin (62.5 %), oral hypoglycemic drugs (31.0 %), combination of drugs (2.8 %), or just with diet control (3.8 %). Most patients have normal or healthy body weight (18.5 to 25.5 BMI).

Sero prevalence of HCV

Using the Rapid screening test, Out of the total study participants 22 (5.5%) of them were positive to HCV. Ten of them were females and 12 of them were males

Table 1. A socio-demographic characteristic of Type II Diabetic patients in Adigrat General Hospital, Ethiopia February 2016-June 2016

Variable	Number of study participants	% of study participants
Age		
Less than 20	72	18
21-30	52	13
31-40	56	14
41-50	66	16.5
51-60	52	13
61-70	68	17
Greater than 71	34	8.5
Sex		
Female	199	49.8
Male	201	50.2
Marital status		
Married	219	54.8
Unmarried	98	24.4
Divorced	49	12.3
Widowed	34	8.5
History of hospital admission		
Yes	310	77.3
No	90	22.7
History of operation		
Yes	70	17.5
No	330	82.5
History of blood transfusion		
Yes	13	3.3
No	387	96.7
FBS		
<200mg/dl	216	54
200-400mg/dl	167(41.8)	41.8
>400 mg/dl	17(4.2)	
BMI		
<18.5	32	8.00
18.5-25.5	322	80.5
25.5-30	37	9.2
>30	9	2.3
Total		

Associated factors of HCV with Diabetes

Exposure to dental procedure was given by 52.3 % of the patients. The majority of patients (77.3 %) were previously hospitalized at least once in their lifetime with a mean of 1.2 ± 0.4. 17.5% of patients reported surgical procedures (1.83±0.38). Recipients of blood transfusion were 3.3 %. Seventy of them (17.5%) had chronic disease other than DM most of them with hypertension. A minority (1.3 %) were on dialysis. Tattooing was reported by 28.8 %. HCV transmission is 12.5 times more likely by blood transfusion (95% CI of 1.61-96.22, P=0.016). Similarly, having surgical procedures increased HCV risk by 35 times (95% CI 5.94-157.24 P=0.00). The univariet and multivariet analysis was summarized in table 2 and table 3 respectively.

DISCUSSION

There is evidence that DM patients are at higher risk of acquiring HCV infection and may be related to either the disease itself or frequent parenteral exposure. The prevalence rate of HCV (5.5 %) in the present study is lower than the 36 % reported from Pakistan (Ali *et al.,* 2007) and 12% reported

Table 2. Univariate Analysis of risk factor associated with HCV seropositivity in Type II diabetic patients in Adigrat General Hospital, Ethiopia from February 2016-June 2016

Variable	N (%)	OR (95%CI)	P-value
Age			0.67
Less than 20	72 (18)	1.00	
21-30	52 (13)	0.94(0.16-5.41)	0.95
31-40	56 (14)	1.33 (0.23-7.71)	0.75
41-50	66 (16.5)	0.30 (0.03-3.34)	0.32
51-60	52 (13)	0.50 (0.67-3.71)	0.49
61-70	68 (17)	1.70(0.31-9.32)	0.54
Greater than 71	34 (8.5)	1.00(0.17-5.75)	1.00
Sex			
Female	199 (49.8)	0.83(0.35-1.97)	0.68
Male	201(50.2)	1.00	
Marital status			0.67
Married	219(54.8)	0.55(0.14-2.07)	0.37
Unmarried	98(24.4)	0.92(0.23-3.68)	0.90
Divorced	49(12.3)	0.00(0.00)	0.99
Widowed	34(8.5)	1.00	
Duration of DM			0.50
<1 Year	82(20.5)	1.00	
1-5 year	221(55.3)	2.03(0.47-8.78)	0.34
>5 year	97(24.2)	2.12(0.59-7.55)	0.247
History of hospital admission			
Yes	310 (77.3)	3.03(0.69-13.24)	0.14
No	90 (22.7)	1.00	
Duration of hospital admission			0.28
1 times	144(46.5)	1.00	
2 times	79(25.5)	0.38(0.99-1.50)	0.17
3 times	40(12.8)	1.19(0.29-3.78)	0.95
>4 times	47(15.2)	1.20(0.28-5.12)	0.81
History of operation			
Yes	70(17.5)	10.06(4.03-25.09)	0.00*
No	330(82.5)	1.00	
History of blood transfusion			
Yes	13(3.3)	28.33(8.66-96.81)	0.00*
No	387(96.7)	1.00	
FBS			0.44
<200mg/dl	216(54)	0.69(0.08-5.84)	0.74
200-400mg/dl	167(41.8)	1.24(0.15-10.15)	0.84
>400 mg/dl	17(4.2)	1.00	
BMI			0.23
<18.5	32(8.00)	0.36(0.05-2.59)	0.31
18.5-25.5	322(80.50)	0.19(0.38-1.01)	0.05
25.5-30	37(9.20)	0.00(0.00)	0.99
>30	9(2.30)	1.00	
Total			

Table 3. Multivariate analysis of risk factors associated with HCV Sero positivity in Type II Diabetic patients in Adigrat General Hospital, Ethiopia from February 2016-June 2016

Variable	N (%)	COR (95%CI)	AOR (95%CI)	P-value
Sex				
Female	199 (49.8)	0.83(0.35-1.97)	0.67(0.21-2.15)	0.50
Male	201(50.2)	1.00	1.00	
History of hospital admission				
Yes	310 (77.3)	3.03(0.69-13.24)	0.37(0.061-2.25)	0.28
No	90 (22.7)	1.00		
History of operation				
Yes	70(17.5)	10.06(4.03-25.09)	30.55(5.94-157.24)	0.00*
No	330(82.5)	1.00	1.00	
History of blood transfusion				
Yes	13(3.3)	28.33(8.66-96.81)	12.46(1.61-96.22)	0.016*
No	387(96.7)	1.00	1.00	
FBS				0.47
<200mg/dl	216(54)	0.69(0.08-5.84)	0.45(0.037-5.47)	0.53
200-400mg/dl	167(41.8)	1.24(0.15-10.15)	0.95(0.08-10.73)	0.97
>400 mg/dl	17(4.2)	1.00		
BMI				0.79
<18.5	32(8.00)	0.36(0.05-2.59)	1.82(0.09-38.23)	0.70
18.5-25.5	322(80.50)	0.19(0.38-1.01)	0.77(0.49-11.98)	0.85
25.5-30	37(9.20)	0.00(0.00)	0.00(0.00)	0.99
>30	9(2.30)	1.00		
Total				

from Turkey (Ozyilkan *et al.,* 1994). It is also lower than the rates reported in Ethiopia and Nigeria which is 9.9 % and 11 % respectively (Solomon *et al.,* 2012, Ndako *et al.,* 2009). In contrast to this the prevalence in the current study is higher than reports with 1.9 % from Saudi (Ba-Essa *et al.,* 2016). This difference could be attributed due to socio demographic characteristic of the participants and in the difference of the study method. However, the rate revealed by the present study is comparable to the 4 % reported from France (Rudoni *et al.,* 1999) and 5.7% reported from India Demitrost L *et al.,* 2015). HCV can be transmitted by the use of needles, sharp materials and blood transfusion rather than sexual intercourse (Greg *et al.,* 2006). Ba- Essa *et al.,* 2016 have reported surgical procedures were significantly associated with HCV risk. Similarly In the present study association was identified. These suggest a nosocomial source of HCV infection in operated DM patients. Rudoni *et al.,* 1999 reported no differences were observed between anti-HCV-positive and anti-HCV-negative diabetic patients in terms of mode of treatment, previous hospital admissions in diabetic patients; this finding is similar to our study. In opposite to this association was identified in Saudi Arabia (Ba- Essa *et al.,* 2016). Study from Iraq (Rana SA, 2015 indicates no association between age and gender this is also similar to the current study but it is in contrast to study reported from Saudi Arabia (Ba-Essa *et al.,* 2016). This could be due to difference in methods used.

Conclusion

The study confirmed a lower rate of HCV in Type II DM patients in Adigrat General Hospital than previous study in Ethiopia. The present study recommends screening for HCV among DM patients with operation or those having blood transfusion. HCV awareness and prevention campaign for all chronic DM patients are encouraged.

Abbreviation

DM: Diabetic Mellitus
HCV: Hepatitis C Virus
FBS: Fasting Blood Sugar
RBS: Rabid Blood Sugar
BMI: Body Mass Index

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