Original Article

Socio-demographic association with confirmed hepatitis C virus infection: A cross-sectional analysis from a teaching institute

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Abstract

Introduction: Hepatitis C virus (HCV) infection is the most common chronic blood-borne disease and is more commonly associated with chronic active hepatitis leading to cirrhosis, hepato-cellular carcinoma and end-stage liver disease. **Methodology:** 160 consecutive screening positive (Enzyme linked immuno sorbent assay positive) Hepatitis C samples were tested by HCV RNA Real Time-PCR for confirmation. **Result:** Prevalence of confirmed hepatitis C among screening positive patient in the present study was found to be 24.4%. Vaccinated individual with Hepatitis A and Hepatitis B had significant association with PCR positivity in screening positive Hepatitis C patient ($p< 0.05$). IV drug users and patient having multiple sex partners have significant association with PCR positivity among screening positive Hepatitis C patients ($p< 0.05$). **Conclusion:** Due to the lack of an effective vaccine and the increased risk of serious complications, it is important to focus on prevention and early detection of HCV.

Keywords: Hepatitis C, RT-PCR, vaccination

Introduction

Hepatitis C virus (HCV) infection is the most common chronic blood-borne disease. After infecting nearly 170 million people (3% of the world's population), it was recognized as a major global public health problem in 1989.[1]

Hepatitis C is a parenterally transmitted hepatotropic virus and it is more commonly associated with chronic active hepatitis whereas due to the paucity of symptoms, the acute phase of the disease remains mostly unnoticed. It impacts the global health system to a large extent and it is responsible for significant morbidity and mortality as HCV can lead to chronic liver disease among 5%–20% of infected persons causing cirrhosis, hepatocellular carcinoma, and end-stage liver disease.[2]

Since the reports estimate that 50%–80% of individuals are unaware of their HCV infection status, it is considered a major public health issue with important behavioral implications.[3-5]

To global estimates, out of more than 170 million people, the majority of chronic HCV infections are from the Western Pacific and Southeast Asia regions.[6-8] Approximately, a fifth of

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Received: 08-11-2023 **Revised:** 03-01-2024
Accepted: 05-01-2024 **Published:** 24-05-2024

Access this article online

Quick Response Code:

Website: http://journals.lww.com/JFMPC

DOI: 10.4103/jfmpc.jfmpc_1794_23

How to cite this article: Medhi M, Sonowal A, Sonowal P, Neog BJ, Phukan C. Socio-demographic association with confirmed hepatitis C virus infection: A cross-sectional analysis from a teaching institute. J Family Med Prim Care 2024;13:2060-5.

the patients with chronic hepatitis C infection can progress to cirrhosis over a decade.[9]

Vaccines for the prevention of Hepatitis C are yet not available unlike those of Hepatitis B. Research is going on for the same.[10] The estimated global prevalence of hepatitis C is around 1% in the year 2020.[11]

There is still a paucity of data related to the socio-demographic aspects of HCV infection and previous studies mostly concentrated on professional blood donors. The present study was undertaken to focus on the current prevalence of PCR positivity among hepatitis C virus screening-positive patients attending a teaching institution in Dibrugarh, Assam. Our objective was to assess the prevalence of polymerase chain reaction (PCR) positivity among Hepatitis C screening-positive individuals and the association of socio-demographic factors with confirmed Hepatitis C (PCR-positive) infection.

Materials and Methods

A cross-sectional study was conducted among 160 screening-positive hepatitis C individuals of different age groups who attended for confirmation by HCV RNA Real Time-PCR (RT-PCR) at the Department of Microbiology, Assam Medical College, Dibrugarh. Using the Hepatitis C prevalence rate among patients with jaundice as 38.5% from previous studies[12] the sample size was determined using a standard formula: Z2 pq/d2 with a precision of 8% (d). The minimum sample size applying the above formula was found to be 147. However, to accommodate the refusals or nonresponse, a sample size of 160 was selected.

Inclusion criteria

Individuals of all age groups and both sexes, from wards and outpatient departments, and who were positive after Hepatitis C screening were included in the study.

Exclusion criteria

Individuals who were positive after hepatitis C screening but refused to give consent were excluded from the study.

Statistical analysis

Data were entered in the SPSS 25 (trial version) package and analyzed. Chi-square test was applied to assess the association between the socio-demographic profile and PCR-positive hepatitis C individuals.

Ethical approval

Ethical approval was obtained from the Institutional Ethics Committee of Assam Medical College and Hospital (No. 2023/AMC/EC/10796, Dibrugarh dated 19th October 2023).

Laboratory diagnosis

The screening of HCV infection is made by the detection of anti-HCV antibodies using immunoassays followed by the detection of HCV ribo nucleic acid (RNA) in serum or plasma. A reactive HCV antibody result should be followed by testing for HCV RNA using nucleic acid amplification test (NAAT) (RT-PCR) for confirmation of hepatitis C infection.[13]

Data collection

The study was conducted in July–December 2022 using a predesigned, pretested questionnaire, which included demographic information like the type of family, education, occupation, hepatitis A and hepatitis B vaccination status, etc., A detailed clinical history was taken and patients were explained about the test procedure. Patients were asked for (1) complaints of Jaundice, loss of appetite, fever, and weight loss; (2) history of co-morbidities (Human immuno deficiency virus status); (3) patients were assessed for the presence of risk factors (blood transfusion, sharp injury, previous surgery, tattooing, alcohol abuse, IV drug use, renal dialysis) and the findings were noted down.

The selection of patients was done by random sampling method till the required number was attained. All patients satisfying the inclusion criteria were included in the study. Written consent from the patient was taken. Five milliliters of blood samples from each patient were collected aseptically in a clot activator vial. The serum was separated into sterile vials and then tested by ELISA as per the manufacturer's protocol. The ELISA kit used was Erba Lisa HCV ELISA kit (Transasia). All ELISA-positive samples were confirmed by HCV RNA Real Time-PCR. For the extraction of viral RNA, a QIAGEN VIRAL RNA extraction mini kit was used and all the procedures were carried out according to the manufacturer's protocol. Hepatitis C virus RNA detection and quantification (viral load) was done using Geno-Sen's HCV Real Time PCR RG kit with the TaqMan principle according to the manufacturer's protocol. Results were statistically evaluated by applying a univariate analysis.

Limitation

Co-infection with other hepatitis was not evaluated in the present study.

Result

In the present study, out of 160 screening-positive hepatitis C patients, 39 were found to be PCR-positive. Thus, the prevalence of confirmed hepatitis C among screening-positive patients in the present study was found to be 24.4%.

Out of 160 screening-positive Hepatitis C patients, maximum PCR positivity was observed (25%) amongst the age groups 21–40 years and >60 years, 27.27% amongst patients residing in urban settings, 25.35% amongst male patients, 25.35% amongst married and 29.33% amongst patients residing in joint families [Table 1].

In the present study, 20.27% of the patients with clinical signs in the form of fever, pain in the abdomen, and jaundice were

PCR-positive with hepatitis C, of which 23.08% amongst fever positive, 23.08% patients with abdominal pain, and 25.64% amongst jaundice positive cases are positive for PCR of Hepatitis C. PCR for Hepatitis C were positive (9.68%) for patients amongst complete course of Hepatitis A vaccine taken and 13.33% amongst Hepatitis B vaccine was taken by the patient. PCR was positive amongst 32.18% of IV drug users, 66.67% amongst persons having multiple sex partners, 31.58% amongst HIV positive, 42.86% amongst patients with H/O contact with a person having jaundice, and 24% amongst patients with H/O blood transfusion [Table 2].

Out of the total 39 positive cases, 35 were male and 4 were female. No statistical significance was found between gender and Hepatitis C PCR positivity. There was no statistical significance observed between the marital status of the patient, literacy status, occupation, and family type with Hepatitis C PCR positivity among screening-positive patients. There was no significant association observed between PCR positivity among screening-positive Hepatitis C patients with presence of any of the clinical signs such as fever, pain in the abdomen, and jaundice ($P > 0.05$). Vaccinated individuals against Hepatitis A and Hepatitis B had a significant association with PCR positivity in screening-positive Hepatitis C patients ($P < 0.05$). Previous H/O blood transfusion, dental procedure, or any other surgical procedure and dialysis have no association with PCR positivity of screening positive Hepatitis C patients ($P > 0.05$). IV drug users and patients having multiple sex partners have a significant association with PCR positivity among screening-positive Hepatitis C patients ($P < 0.05$). No association was observed between PCR positivity among screening-positive Hepatitis C patients with consumption of alcohol and smoking [Table 3].

Table 1: Socio-demographic profile of screening positive Hepatitis C patients (*n*=160)

Variable	Variable status	Frequency and percentage		Total
		PCR positive	PCR negative	
Age group	0 to 20 yrs	9 (28.13%)	23 (71.87%)	32 (100%)
	21 to 40 yrs	23 (25%)	69 (75%)	92 (100%)
	41 to 60 yrs	6 (18.75%)	26 (81.25%)	32 (100%)
	>60 yrs	1 (25%)	3 (75%)	4 (100%)
Habitant	Urban	15 (27.27)	40 (72.73)	55 (100%)
	Rural	24 (22.86%)	81 (77.14%)	105 (100%)
Sex	Male	35 (25.55%)	102 (74.45%)	137 (100%)
	Female	4 (17.39%)	19 (82.61%)	23 (100%)
Marital status	Married	18 (25.35%)	53 (74.65%)	71 (100%)
	Unmarried	21 (23.60%)	68 (76.4%)	89 (100%)
Family type	Nuclear	17 (20%)	68 (80%)	85 (100%)
	Joint	22 (29.33%)	53 (70.67%)	75 (100%)

Discussion

In the present study, the seroprevalence of hepatitis C was observed to be 24.4%. However, the prevalence of Hepatitis C in Eastern Mediterranean and European regions was found to be 2.3% and 1.5%, respectively, as per the Hepatitis C fact sheet by World Health Organization (WHO). Worldwide the prevalence of HCV infection varies from 0.5% to 1.0%.[11] In India National seroprevalence of Hepatitis C was 0.32%.[14]

Table 2: Socio-clinical profile of screening positive Hepatitis C patients (*n*=160)

Variable	Variable status	Frequency and percentage		Total
		PCR positive	PCR negative	
Clinical sign	Present	15 (20.27%)	59 (79.73%)	74 (100%)
	Absent	24 (27.91%)	62 (72.09%)	86 (100%)
Fever	Present	3 (23.08%)	10 (76.92%)	13 (100%)
	Absent	36 (24.49%)	111 (75,51%)	147 (100%)
Pain in abdomen	Present	6 (23.08%)	20 (76.92%)	26 (100%)
	Absent	33 (24.63%)	101 (75.37%)	134 (100%)
Jaundice	Present	10 (25.64%)	29 (74.36%)	39 (100%)
	Absent	29 (23.97%)	92 (76.03%)	121 (100%)
Hepatitis A vaccine	Administered	3 (9.68%)	28 (90.32%)	31 (100%)
	Not administered	36 (27.91%)	93 (72.09%)	129 (100%)
Hepatitis B vaccine	Administered	6 (13.33%)	39 (86.67%)	45 (100%)
	Not administered	33 (28.7%)	82 (71.3%)	115 (100%)
IV drug user	Yes	28 (32.18%)	59 (67.82%)	87 (100%)
	No	11 (15.07%)	62 (84.93%)	73 (100%)
Multiple sex partner	Yes	4 (66.67%)	2 (33.33%)	6 (100%)
	No	35 (22.73%)	119 (77.27%)	154 (100%)
HIV status	Positive	6 (31.58%)	13 (68.42%)	19 (100%)
	Negative	33 (23.4%)	108 (76.6%)	141 (100%)
H/O contact with a person having jaundice	Yes	3 (42.86%)	4 (57.14%)	7 (100%)
	No	36 (23.53%)	117 (76.47%)	153 (100%)
H/O blood transfusion	Yes	6 (24%)	19 (76%)	25 (100%)
	No	33 (24.44%)	102 (75.56%)	135 (100%)

Table 3: Risk factors associated with PCR positive Hepatitis C

Factors	Status	PCR status		Total	*P*
		Positive	Negative		
Hepatitis A vaccine	Yes	3	28	31	*P*<0.05
	No	36	93	129	
Hepatitis B vaccine	Yes	6	39	45	*P*<0.05
	No	33	82	115	
Alcohol consumption	Yes	20	69	89	*P*>0.05
	No	19	52	71	
Smoking	Yes	27	68	95	*P*>0.05
	No	12	53	65	
HIV status	Positive	6	13	19	*P*>0.05
	Negative	33	108	141	
IV drug user	Yes	28	59	87	*P*<0.05
	No	11	62	73	
Multiple sex partner	Yes	4	2	6	*P*<0.05
	No	35	119	154	
H/O blood transfusion	Yes	6	19	25	*P*>0.05
	No	33	202	135	
H/O dialysis	Yes	4	9	13	*P*>0.05
	No	35	112	147	
HIV status	Positive	6	13	19	*P*>0.05
	Negative	33	108	151	

Choudhury A *et al.* in their study in nine villages in the Birbhum district of West Bengal reported a 0.87% prevalence of HCV among randomly selected 3579 individuals.[15] Another study by Sood A *et al.*, reported an anti-HCV prevalence of 5.2%, with the highest rate in the 40–60 year age group and significant clustering within families among 5258 subjects with a mixed urban and rural population from Mullanpur, Punjab.[16] Another study by Sachdeva S *et al.* in Fatehabad district of Haryana observed 1% anti-HCV prevalence among 1,50,000 screened residents whereas in another study 21% HCV seroprevalence was reported in a select group of 7114 persons who were at a high risk of HCV had a history of prior jaundice or voluntarily came for screening.[17]

Another study conducted by Chadha MS *et al.* from rural Maharashtra (n = 1054), reported a prevalence of HCV as 0.09%.[18] However, in another study conducted at Hyderabad, the prevalence of HCV in similar gastroenterology camps (n = 704) was found to be 1.4%.[19] However, the prevalence of anti-HCV antibodies was reported as 7.89% in the Lisu community in Changlang District of Arunachal Pradesh,[20] 2.02% among the Lambada tribe in Andhra Pradesh,[21] and 14.4% in Bharia tribe in Madhya Pradesh.[22] The varied prevalence of HCV in different parts of India may be probably due to the different cultural practices, socio-economic status, and human behavior.

In the present study, males were observed to be affected more than females but no statistical significance was observed. Prasad A (2017),[23] Supriya L (2014),[24] and Chakraborty A (2015)[25] found similar male preponderance. Hence no significance of gender concerning hepatitis C infection was observed in the above studies.

In the present study, patients of all age groups were included, but the 21–40 year age group was found to be predominantly affected. Chakraborty A (2015)[25] found the age group of less than 15 years to be the most affected. Another study by Agrawal S[26] found maximum positive cases of hepatitis C among the 12–18 year age group followed by the 9–12 year age group and these were predominantly found among thalassemia patients who had multiple blood transfusions. Contrarily, Supriya L,[24] in their study, conducted at Manipur observed maximum hepatitis C cases among the 41–50 year age group in males and 31–40 year age group in females. The increased rate/clustering of patients of substance abuse in Manipur could be the reason for higher age preponderance in the above study.

Jain M *et al.*, 2009[27] and Tseng FC *et al.*, 2008[28] in their study found that HCV infection is transmitted predominantly by the parenteral route. Sexual and vertical transmission is infrequent except when HIV co-infection is present. Blood transfusion allows a large quantum of infective virions into the susceptible patient; hence, it is an effective mode of transmission of hepatitis C infection. Perez CM *et al.*, 2005[29] and Amarapurkar D *et al.*, 2001[30] in their study observed that in India, blood or blood products transfusion is considered as the most common route for HCV transmission. Another Indian study by Mehta CH *et al.*, 2010[31] observed that 50% of chronic hepatitis C patients had received blood transfusions. In another study from Vellore by Seeff LB *et al.*, 1992,[32] it was found that among 61% out of the 90 chronic HCV patients, blood transfusion was responsible. In the present study, it was observed that screening positive patients with multiple sex partners and IV drug users were significantly associated with Hepatitis C PCR positivity ($P < 0.05$). However, in our study, we didn't find any association between Hepatitis C PCR positivity and patients having a history of blood transfusion. Contrarily Supriya L[24] in their study, conducted at Manipur observed intravenous drug use to be a major risk factor for transmission of hepatitis C.

Conclusion

Due to the lack of an effective vaccine and the increased risk of serious complications, it is important to focus on the prevention and early detection of HCV. Hence, a continuous periodic screening of Hepatitis C especially in high-risk groups like patients with frequent blood transfusion recipients, IV drug users, patients having multiple sex partners, etc., are essential for an early diagnosis. Scaling up the screening for an early diagnosis can improve clinical outcomes in the patient, as appropriate therapy and management can be initiated at the earliest, thus, decreasing mortality and morbidity seen in hepatitis C infection. RT-PCR positivity among Hepatitis C screening-positive individuals will help in the detection of the actual prevalence of confirmed cases of Hepatitis C and thus help in program implementation. Further effective health education will play an important role in the prevention of transmission among individuals and thus decreasing morbidity and mortality.

Acknowledgement

The authors wish to thank NVBDCP Assam for providing a kit for screening as well as diagnosing the Hepatitis C patient in our study.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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