

## Epidemiology and risk factor of hepatitis C virus infection seen in a study conducted in tertiary care hospital in Haryana

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### Abstract

**Background:** Hepatitis C virus (HCV) is a leading cause of chronic liver disease (CLD) that can progress to cirrhosis and hepatocellular carcinoma. The purpose of this study was to describe the epidemiology and risk factor of hepatitis c virus infection in Haryana. **Methods:** One hundred (100) HCV ribonucleic acid-positive patients were included in the study. The relevant data (personal information, clinical details and history of risk factors) of the patients was collected. **Results:** In this study we found age of the study population ranged from 18 to 77 years with mean age as 44.97 years. The maximum number of patients belonged to 31-40 age group. Maximum number of patients belonged to Rohtak district followed by patients from Jind and Panipat. Maximum number of patients were asymptomatic i.e. 80 (80%) and history of injection from a local RMP is the predominant risk factor for acquiring HCV infection. **Conclusion:** From the study we concluded that HCV infection is more common in the young males belonging to rural areas. The study found that the major mode of HCV transmission was injection with unsterilized needles or re-usage of needles. So, organising public awareness and health education campaigns targeting healthcare providers, private practitioners, and the general population is the need of hour.

**Keywords:** Epidemiology, Hepatitis C, Infection.

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### Introduction

Viral hepatitis is recognized as a public health problem in India and globally. Various etiological agents (Hepatitis A, B, C, D, E and G virus) have been implicated that can lead to acute, chronic or acute on chronic infection. While Hepatitis A and E are often the cause of sporadic outbreaks of hepatitis, Hepatitis B and C can either clear spontaneously or can lead to chronic infection and thereafter sequel like cirrhosis and hepatocellular carcinoma (HCC).[1] Hepatitis C Virus (HCV) is one of the major causes of death and morbidity and recent estimates showed seroprevalence of 2.8%, corresponding to greater than 185 million infections worldwide.[2] In India there are about 6-12 million people with HCV infection with a mortality of 37,000 deaths in the year 2015.[1] HCV is a single-stranded, positive sense RNA virus belonging to family *Flaviviridae* and genus *Hepacivirus*. The genome is approximately 10 kb in length, encoding a poly-protein product consisting of structural (capsid and envelope) and non-structural viral proteins.[3] HCV infection is usually acquired through infected syringes and needles, and transfusion of infected blood. Sexual transmission of HCV occurs infrequently in heterosexual couples. It is reported to be more common in HIV-positive persons, particularly in high-risk group of males having sex with male (MSM).

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The risk of transmission of HCV from a mother to her child occurs in 4–8% of births to women with HCV infection, and in 10.8–25% of births to women with HIV and HCV co-infection. HCV causes both acute and chronic hepatitis. Acute hepatitis is often clinically mild and marked by fluctuating elevations of serum aminotransferase levels; >50% likelihood of chronicity, leading to cirrhosis in >20%.[4]

Chronic infection with HCV is usually clinically silent, and is only very rarely associated with life-threatening disease. Spontaneous clearance of acute HCV infection occurs within six months of infection in 15–45% of infected individuals in the absence of treatment. Almost all the remaining 60–80% of persons will harbour HCV for the rest of their lives (if not treated) and are considered to have chronic HCV infection. Left untreated, chronic HCV infection can cause liver cirrhosis, liver failure and HCC. Of those with chronic HCV infection, the risk of cirrhosis of the liver is 15–30% within 20 years. The risk of HCC in persons with cirrhosis is approximately 2–4% per year.[5]

### Material and Methods

A cross-sectional study was carried out in the departments of Microbiology and Gastroenterology, Pt. B.D. Sharma Post Graduate Institute of Medical Sciences, PGIMS (Rohtak), over a time period of one year. A total of 100 HCV-Ab positive patients were included in this study. The inclusion and exclusion criteria were as follows:

**Inclusion Criteria:** Patients above 18 years reporting to the Gastroenterology department were included in the study, presenting with following sign and symptoms of chronic hepatitis:

- Fever (low grade up to 102 °F)
- Fatigue
- Dark urine
- Clay coloured stools
- Abdominal pain (tenderness in the right hypochondrium)
- Loss of appetite
- Nausea
- Vomiting
- Jaundice
- Continuous weight loss
- Rashes
- Willing to participate in the current study by giving informed consent.

**Exclusion Criteria:**

- Patients below 18 yrs. of age
- Pregnant women
- Co-infection with HIV
- Patients not willing to participate.

All the outdoor patients who satisfied the already described inclusion and exclusion criteria, were provisionally included in the study. The relevant data (personal information, clinical details and history of risk factors) of the patients was collected on patient proforma. All the data was analysed using latest version of SPSS software.

#### Methods of Study

#### Observations and Results

In the current study, 100 anti-HCV Ab positive patients were enrolled. The following observations were made:

**Table 1 : Sex distribution in the study population (n=100)**

Sex	Number of Patients	Percentage
MALE	60	60.0 %
FEMALE	40	40.0 %
TOTAL	100	100.0 %
RATIO (M: F)	3:2	

Table 1 show sex distribution of the study population. In the present study three fifth of the patients were male i.e. 60 (60%) and two fifth were female. The ratio of male: female was 3:2.

**Table 2: Distribution of study population according to marital status (n=100)**

MARITAL STATUS	NUMBER OF PATIENTS	PERCENTAGE
MARRIED	87	87 %
UNMARRIED	13	13 %
TOTAL	100	100 %

Table 2 show distribution of the study population according to marital status Majority of the patients were married i.e. 87 (87%) and only 13 patients (13%) were unmarried.

**Table 3: Age distribution in the study population (n=100)**

S. no.	Age Group	Number of Patients	Percentage
1	18-30	18	18.0 %
2	31-40	25	25.0 %
3	41-50	24	24.0 %
4	51-60	16	16.0 %
5	61-70	13	13.0 %
6	>70	4	4.0 %
	Total	n =100	100 %

Table 3 show distribution of the study population as per the age group. The age of the study population ranged from 18 to 77 years with mean age as 44.97 yrs. The maximum number of patients belonged to 31-40 age group i.e. 25 (25%) followed by 41-50 i.e. 24 (24%). Only 18 (18.0%) patients found in younger age group i.e. 18-30 years and only 4 (4.00%) patients were >70 years.

**Table 4: District wise distribution of study population (n=100)**

DISTRICT	NUMBER OF PATIENTS	PERCENTAGE
BAHADURGARH	1	1%
HANSI	1	1%
HISSAR	5	5%
JHAJJHAR	3	3%
JIND	7	7%
KAITHAL	5	5%
KARNAL	1	1%
PANIPAT	7	7%
ROHTAK	52	52%
SIRSA	2	2%
SONIPAT	4	4%
UP STATE	11	11%
DELHI	1	1%
TOTAL	100	100%

The current study in conducted in the northern state of India, and table 4 show district wise distribution of the study population. According to their residential district in Haryana state maximum number of patients i.e. 52 (52%) belonged to Rohtak district followed by 7(7%) patients from Jind and Panipat and, 5 (5%) from Kaithal. Four (4%) patients belonged to Sonipat district while 3 (3%) patients were from Jhajjar and only 2(2%) from Sirsa. Only 1(1%) belonged to three districts i.e. Bahadurgarh, Hansi and Karnal. However, there were 11 (11%) patients from the neighbouring states U.P (Uttar Pradesh) and 1 (1%) from Delhi.

**Table 5: Distribution of population as per chief complaints (n=100).**

CHIEF COMPLAINTS	NUMBER OF PATIENTS	PERCENTAGE
ASYMPTOMATIC	80	80.0
FEVER ONLY	5	5.0
GENERALISED WEAKNESS	5	5.0
FEVER WITH GASTRIC UPSET AND VOMITTING	3	3.0
GASTRIC UPSET ONLY	2	2.0
INDIGESTION ONLY	1	1.0
JOINT PAIN ONLY	1	1.0
JOINT PAIN & PAIN ABDOMEN	1	1.0
PAIN ABDOMEN & DIARRHOEA	1	1.0
SKIN ALLERGY & RASH	1	1.0
TOTAL	100	100.0

Table 5 shows the presenting chief complaints of the study population. Maximum number of patients were asymptomatic i.e. 80 (80%) followed by generalized weakness and fever 5 (5%) each. Fever with gastric upset and vomiting was seen in 3 (3%) and only 2 (2%) patients presented with gastric upset only. One patient each had only indigestion, pain abdomen & diarrhoea, joint pain & pain abdomen, only joint pain, and skin allergy and rash.

**Table 6: Distribution of study population as per source of infection (n=100).**

Source of infection	Patients with positive history
H/o injection with a needle by a local RMP	46
H/o piercing and tattooing	39
H/o intravenous drug use	5
H/o surgery	39
H/o organ transplant	1
H/o blood transfusion	21
H/o unprotected sex	7

Table 6 show different sources of infection in the study population. Maximum number of patients in the study population had a history of (h/o) injection from a local RMP 46 (46%). Thirty-nine patients had a h/o piercing and tattooing and same number had past h/o surgery. Twenty-one (21%), 7 (7%), 5 (5%) and 1 (1%) had a h/o blood transfusion, h/o unprotected sex, h/o intravenous drug usage and h/o organ transplant respectively.

**Table 7: Distribution of study population as per professional history**

PROFESSIONAL HISTORY	NUMBER OF PATIENTS	PERCENTAGE
HOUSEWIFE	33	33%
FARMER	26	26%
STUDENT	11	11%
LABOURER	9	9%
PRIVATE JOB	8	8%
DRIVER	6	6%
GOVERNMENT JOB	5	5%
SMALL BUSINESS	2	2%
TOTAL	100	100%

Table 7 show distribution of study population as per professional history. It was observed that 33(33%) patients were housewives followed by farmers i.e. 26(26%). Eleven (11%), 9(9%), 8(8%), 6(6%), 5(5%) patients were students, labourers, in private jobs, drivers and in government jobs respectively. Two (2%) persons had small business.

In the present study the ratio of male: female was 3:2. Majority of the patients were married i.e. 87 (87%). The age of the study population ranged from 18 to 77 years with mean age as 44.97 yrs. The maximum number of patients belonged to 31-40 age group i.e. 25 (25%) followed by 41-50 i.e. 24 (24%). Maximum number of patients i.e. 52 (52%) belonged to Rohtak district followed by 7(7%) patients from Jind and Panipat and, 5 (5%) from Kaithal. Maximum number of patients were asymptomatic i.e. 80 (80%) followed by generalized weakness and fever 5 (5%) each. Maximum number of patients in the study population had a history of (h/o) injection from a local RMP 46 (46%). Thirty-nine patients had a h/o piercing and tattooing and same number had past h/o surgery. Twenty-one (21%), 7 (7%), 5 (5%) and 1 (1%) had a h/o blood transfusion, h/o unprotected sex, h/o intravenous drug usage and h/o organ transplant respectively. As per professional history farmers and labourers constitute the majority population.

#### Discussion

The mean age of the patients in the present study was 44.9 years with minimum age of 18 years and maximum was 77 years. In the present study, the age distribution curve shows a sharp peak in the age group 31 to 40 years i.e. 25 (25%) patients followed by 41-50 years i.e. 24 (24%). Eighteen patients (18%) were in the age group 18-30 years and 16 patients were in the age group 51-60 years. Older age group i.e. 61-70 and > 70 yrs. age group had 13 (13%) and 4 (4%) patients respectively. The highest prevalence in patients of the age group 31-40 yrs was also observed in a study conducted by Malhotra et al.[6,7] In the present study, 60% of the patients were males with male to female ratio of 3:2, as it has been observed that male's exposure of risk factors is more as compared to females. This gender bias in the current study is in congruence with a study conducted by Shah et al.[8]In the present study, the highest prevalence of chronic HCV patients is seen in Rohtak district followed by Jind and Panipat district. In the year 2011, a community-based surveillance study was conducted under the aegis of Govt. of Haryana and PGIMS, Rohtak to assess the prevalence of HCV infection in Ratia block of Fatehabad

district after the request from the local leaders to the Govt. of Haryana. In the survey, positivity rate of 22.6% was observed (1912/7533). After observing such high prevalence, the Govt. of Haryana initiated Jeevan Rekha scheme in the year 2013 with a purpose to promote and conduct free testing for HCV prevalence and provide free treatment or treatment at subsidized price to HCV positive patients. Department of gastroenterology, PGIMS, Rohtak was designated as the Nodal Treatment Center and all the HCV positive patients were being referred to PGIMS for HCV assessment and treatment.[9]

In the year 2016, a study conducted by Malhotra et al., showed highest prevalence of HCV infected patients in Kaithal and Fatehabad districts.[6] However, in the succeeding years, HCV treatment centers have been established in all the districts of Haryana with PGIMS, Rohtak being the Nodal Treatment Centre (MTC) catering to the HCV cases of Rohtak district and also the complicated cases from other districts. In the present study, the highest prevalence of HCV infection is seen in Rohtak district (52%) followed by the neighbouring districts Panipat (7%) and Jind (7%). This is due to the fact that treatment center for HCV has been established in every district thus patients prefer to take treatment from their respective district hospitals. As the present study has been conducted in PGIMS, Rohtak the highest number of patients from the Rohtak district was expected to happen. The present study emphasizes that even though the highest prevalence of HCV infection in the year 2011 and 2016 was seen in Kaithal and Fatehabad, but it has been observed that the HCV infection has engulfed almost all the districts of Haryana.

In the present study, 80% of the HCV infected patients were asymptomatic. In most of them HCV infection was detected at screening camps followed by screening during preanesthetic check-ups for surgeries and blood donation. It has been observed globally that in about 70-80% of the patients, the HCV infection is asymptomatic and hence get undetected in the early stages.[10] It is also observed that common symptoms in patients was generalized weakness (5%) and fever (5%). Other symptoms noted were fever with gastric upset and vomiting in 3 (3%), gastric upset only in 2 (2%). Joint pain and pain abdomen, pain abdomen and diarrhea, indigestion, skin allergy and rash each accounted for 1%. Similar observation was seen in study by Malhotra et al in which malaise (10.25%), fever (7.25%), abdominal pain (7%) and joint pain 4% was present in the study population.[6] In the present study various probable source of infection have been included. No single source of infection can be pointed out as the leading cause in spreading HCV infection. However, we have tried to highlight the dominant probable source of infection among the multiple sources in HCV infected patients. In the present study most probable source of infection has been found to be injections by the local RMP which has also been observed by the surveillance study conducted by Verma et al in the year 2011 in which 70% study population have had h/o injection as mode of treatment.[9] This observation is corroborated by a myth prevalent among villagers that injectable therapy is more effective than oral therapy. The second most probable source of infection of HCV in the current study has been found to be piercing and tattooing in 39% of the patients. The culture of tattooing is prevalent since ages in the rural India. Currently, the trend of piercing and tattooing has been seen in the younger urban population as well. Tattoo parlours are now present in every nook and corner in cities, and mostly the tattoo needles are being reused thus assisting in spread of HCV infection.[11]

The third most probable source of infection in the present study observed was h/o surgery which is seen in 39% of patients. It is due to the fact that in smaller town and rural settings mostly the smaller surgeries are done by poorly trained practitioners exercising least safety precautions thus increasing the risk of HCV infection. Chakravarti et al. has also showed h/o surgery in 26% of the study population as one of the most probable sources of infection.[12]

The next probable source of infection has been found to be h/o blood transfusion seen in 21% patients. The practice of screening blood units in blood banks for HCV is still done by conducting antibody

detection by ELISA. The detection limit for this is four weeks on an average i.e. if the person has acquired HCV infection within four weeks of donating the blood, the donated blood will be tested as HCV non-reactive however, it may still be harbouring HCV. The study conducted by Ghafourian et al. in thalassaemic patients requiring multiple transfusion showed 28% HCV positivity in thalassaemic patients thereby making blood transfusion as one of the leading sources of infection.[13] In the present study, it has been observed that around 82% of the females (33/40) were housewives who either had the h/o tattooing and piercing (18%), h/o surgery (18%), h/o injection from RMP (16%), or h/o blood transfusion (8%). The second most common category of profession was found to be farmers (26%) in whom again the source of infection was similar in order as seen in housewife's category. The findings of HCV infection with regard to profession in the current study has been seen to be similar to the study conducted by Garg et al. in which seroprevalence of HCV noted among farmers was 5%.[14]

#### Conclusion and suggestions:

It can be concluded that Hepatitis C is an emerging infection and one of the most common causes of chronic liver disease worldwide. It is more common in the young males belonging to rural areas. The study found that the major mode of HCV transmission was injection with unsterilized needles or reuse of needles. The following recommendations are suggested for the prevention and control of HCV infection in India:

1. Organising public awareness and health education campaigns targeting healthcare providers, private practitioners, and the general population.
2. Preventing HCV infection by usage of disposable syringes.
3. Develop a national curriculum: a general curriculum in schools and colleges to impart knowledge of risk of exposure to HCV infection; and a professional curriculum to upgrade knowledge about prevention of HCV transmission among medical, dental, nursing, and pharmacy students, as well as medical and dental assistants.
4. Develop and strengthen evaluation methodology for Integrated Disease Surveillance Project (IDSP).
5. For screening of donated blood, nuclei acid testing (NAT) should be included in the screening program.

#### References

1. Ministry of Health and Family Welfare (MOHFW) Government of India, National Viral Hepatitis Control Program operational guidelines. 2018. Available from: <https://www.inas.org.in/national-viral-hepatitis-control-program.pdf>.
2. Petruzzello A, Marigliano S, Loquercio G, Cozzolino A, Cacciapuoti C. Global epidemiology of hepatitis C virus infection: An up-date of the distribution and circulation of hepatitis C virus genotypes. *World J Gastroenterol* 2016; 22(34): 7824-40.
3. Ministry of Health and Family Welfare (MOHFW) Government of India, National Laboratory Guidelines for Testing of Viral Hepatitis Control. 2018. Available from: <http://www.inasl.org.in/national-laboratory-guidelines.pdf>.
4. Ministry of Family and Health Welfare (MOHFW) Government of India, National Guidelines for Diagnosis and Management of Viral Hepatitis. 2018. Available from: <http://clinicalestablishments.gov.in/WriteReadData/3591.pdf>.
5. WHO. Hepatitis C. Available from: <http://www.who.int/mediacentre/factsheets/details/hepatitis-c>.
6. Malhotra P, Malhotra N, Malhotra V, Chugh A, Chaturvedi A, Chandrika P, et al. Haryana in Grip of Hepatitis C. *Int Inv J Med Med Sci* 2016; Vol.3(1):xxx-xxx.
7. Vasudevan S, Shalimar AK, Kalra N, Nayak B, Thakur B, Das P, et al. Demographic profile, host, disease & viral predictive factors of response in patients with chronic hepatitis C virus infection at a tertiary care hospital in north India. *Indian J Med Res* 2016;143(3):331.

8. Shah SR, Rao PN, Sarin SK, Chowdhury A, Bhatia S, Dharamsi R. et al. Chronic hepatitis C virus infection in India. Regional demographics and distribution of viral genotypes. *Ind J Gastroenterol* 2016;35(6):469-77.
9. Verma R, Behera BK, Jain RB, Arora V, Chayal V, Gill PS. Hepatitis C: A silent threat to the community of Haryana, India: A community-based study. *AMJ* 2014; 7(1):11-16.
10. Chung RT. Acute hepatitis C virus infection. *Clin Infect Dis* 2005;41:14-7.
11. Mehta SH, Vogt SL, Srikrishnan AK, Vasudevan CK, Murugavel KG, Saravanan S, et al. Epidemiology of hepatitis C virus infection & liver disease among injection drug users (IDUs) in Chennai, India. *Indian J Med Res* 2010;132(6):706.
12. Chakravarti A, Dogra G, Verma V, Srivastava AP. Distribution pattern of HCV genotypes & its association with viral load. *Indian J Med Res* 2011;133(3):326-31.
13. Boroujerdnia MG, Zadegan MA, Zandian KM, Rodan MH. Prevalence of hepatitis-C virus (HCV) among thalassemia patients in Khuzestan Province, Southwest Iran. *Pak J Med Sci Q* 2009;25(1):113-7.
14. Garg R, Kaur S, Aseri R, Aggarwal S, Singh JP, Mann S, Kumar S, Kaur S. Hepatitis B & C Among Farmers—A Seroprevalence Study. *Journal of clinical and diagnostic research: JCDR* 2014;8(11):MC07.

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