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Prevelance And Risk Factors for Hepatitis C Virus Infection in Hemodialysis Patients

[1]Rounaq Rasool, [2]Dr. Ritu Bhatnagar

[1]Research Scholar, Department of Microbiology, Faculty of Medicine, Pacific Medical University Udaipur

[2]Research Supervisor, Head of Department, Department of Microbiology, Faculty of Medicine, Pacific Medical University Udaipur

Corresponding Author

Rounaq Rasool

Email ID: rainurasool@gmail.com

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ABSTRACT

Background: Hepatitis C virus (HCV) infections continue to remain a significant global health challenge due to its morbidity and mortality profile. Among individuals undergoing hemodialysis (HD), the incidence of HCV transmission is notably higher than in the general population. Aim: this study aimed to estimate the Seroprevalence of HCV infection and associated risk factors among patients undergoing hemodialysis in a tertiary care hospital. Materials and Methods: This cross-sectional observational study included 300 patients' undergoing maintenance HD due to chronic kidney disease (CKD). Data collection involved demographic details, frequency of blood transfusion, duration of dialysis, duration of CKD, associated comorbidities, and other risk factors. All enrolled patients were screened for anti-HCV antibodies using an enzyme-linked immunosorbent assay (ELISA). Results: The prevalence of HCV was 13% among hemodialysis patients. The frequency of blood transfusion, duration of CKD, duration of hemodialysis, and not applied infection control measures were found to be significant risk factors for seroconversion. Family history of HCV infection, surgical procedures during the dialysis period, past history of surgery, temporary vascular Access, and HbsAg status were insignificant risk factors for HCV seroconversion. Conclusion: Frequent blood transfusion, longer duration of CKD, longer duration of hemodialysis and failure to applied infection control measures were significant risk factors for HCV seroconversion in dialysis patients..

Keywords: *Hepatitis C, Hemodialysis, Prevalence, HCV seroconversion, blood transfusion*.

1. INTRODUCTION

Especially in patients receiving hemodialysis (HD), where immunity is usually low, the single-stranded, enveloped, positive-sense RNA hepatitis C virus (HCV) can develop cirrhosis and hepatocellular cancer in addition to causing hepatitis [1]. With an estimated 58 million people living with a chronic infection and 1.5 million deaths each year, hepatitis C virus (HCV) infection continues to be a major global health concern. Dialysis treatment, kidney transplantation, and blood transfusions are important risk factors for HCV transmission among patients receiving hemodialysis (HD) [2, 3]. Risk factors for HCV transmission also include improper interaction between healthcare workers and patients, poor disinfection and cleaning of environmental surfaces, and improper handling of parenteral drugs [4]. In both industrialized and developing nations, the prevalence of HCV infection in patients undergoing HD can surpass 50%, while in the general population it varies from 0.5% to 1.5% [5]. For patients with end-stage kidney disease, hemodialysis is the most common kind of renal replacement therapy in the world [6]. The majority of patients contracted HCV through blood transfusions, and HCV-RNA was found 7–21 days after the transfusion. Patients who require hemodialysis and have chronic renal failure, hemophilia, thalassemia, or other illnesses that necessitate frequent blood transfusions are more in need of blood transfusions [7]. Using non-sterile medical equipment, such as endoscopy, angiography, and surgical instruments, resulted in nosocomial transmission. Due to the use of non-sterile equipment, medical procedures such gynecological and cardiology operations, angiography, endoscopy, and colonoscopy can raise the risk of HCV infection rates [8]. PCR-based HCV RNA detection is the gold standard for early HCV infection diagnosis; however, this methodology is often hampered by its poor availability and increased prices [9]. In industrialized nations, injectable medication usage or parenteral exposure to tainted blood was the main ways that HCV was spread. Although thorough testing of donated blood has reduced the spread of HCV through blood transfusions, illegal injectable drug use is still the leading cause of HCV infection in the majority of affluent nations, accounting for at least 40% of all cases of infection. Due to the reusing of contaminated or insufficiently sterilized syringes and needles used in medical, paramedical, and dental procedures, other sources, such as nosocomial transmission, are a

significant issue in developing nations, where an estimated 2.3–4.7 million new infections occur annually [10]. The theme for World Hepatitis Day 2021, "Hepatitis can't wait," emphasized how urgent it is to eradicate hepatitis in order to reach the 2030 elimination targets [11]. The main strategy to stop HCV from spreading in dialysis facilities is infection control. The Centers for Disease Control and Prevention (CDC) have recommended ways to reduce the transmission of HCV infections in patients receiving chronic hemodialysis since 2001 [12]. Every time there is a new incidence of HCV infection, the current guidelines for preventing HCV transmission in the hemodialysis unit (KDIGO 2018) advice taking aggressive steps to improve hygiene in dialysis units, including injection safety and environment cleaning [13].

2. MATERIAL AND METHODS

This was a prospective, observational, cross-sectional study carried out in the department of microbiology at a Tertiary Care Hospital in Udaipur, Rajasthan, India. All patients came from hemodialysis unit for hepatitis C virus testing during the study duration was enrolled.

Inclusion criteria

- Both genders were included, and the age range of participants was set to 18–80 years
- Those willing to give written, informed consent to participate in the study

Exclusion criteria

- Patients who have K/C/O HCV infection and were receiving treatment
- Pregnant women and patients co-infected with HIV
- Those who not give consent for the study

Relevant socio-demographic and known risk factors, such as intravenous drug abuse, immunosuppression, haemophilia, clinical, and laboratory information was obtained from all patients. The seroconverted patients were evaluated regarding the risk factors of HCV transmission (positive family history of HCV, duration of dialysis in years, frequency of blood transfusion and its handling by the medical staff, vascular access either permanent or temporary and surgical procedures) during dialysis period.

Samples of blood (5 mL) were collected from patients under aseptic conditions and transferred to collection tubes containing EDTA. All the samples were subjected to the following diagnostic tests. For HCV diagnosis, we used third-generation enzyme-linked immunosorbent assay (ELISA) for the detection of HCV antibodies.

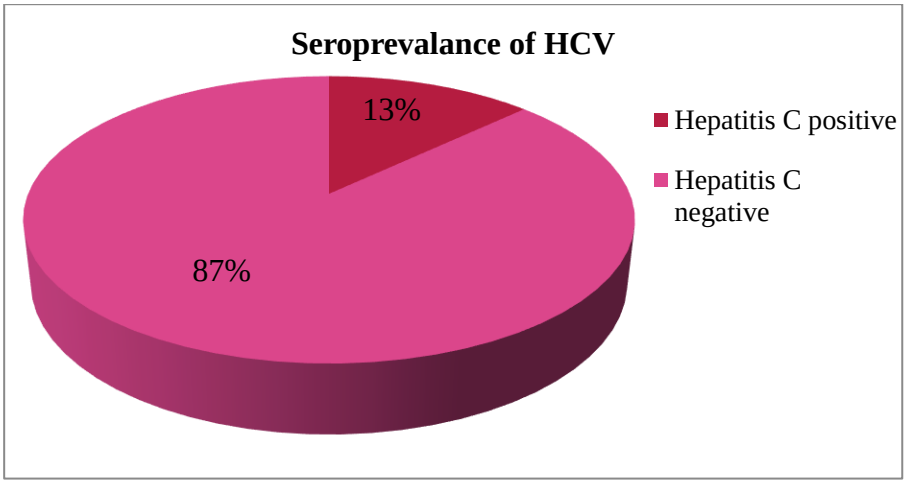
Seroprevalence of HCV were estimated and evaluated for associated risk factors

Statistical analysis: Data analysis was performed using the SPSS software (version 23.0). The chi-square test was employed to analyze categorical variables. A p-value of ≤0.05 was considered statistically significant.

3. RESULTS

A total of 300 hemodialysis patients were enrolled and tested for hepatitis C virus antibodies by third generation ELISA, out of total 39 (13%) were found to be HCV-positive.

Graph 1: Seroprevalence of hepatitis C virus among hemodialysis patients



Majority of the patients were 51-60 years age group, predominantly males. Most of them resided in urban area and belong to lower socio-economic class. Socio-demographically no statistically significant difference was found between HCV seropositive and seronegative groups (p>0.05).

Table 1: Comparisons of socio-demographic variables among sero-positive and seronegative HCV cases

Variables		**Sero-Positive (n=39)**	**Sero-Negative (n=261)**	**P-Value**
Age (In years)	≤30	2	25	0.340
	31-40	7	41	
	41-50	11	74	
	51-60	14	89	
	>60	5	33	
Gender	Male	36 (92.3%)	201 (77%)	0.287
	Female	3 (7.7%)	60 (23%)	
Residential Area	Rural	19 (48.7%)	120 (46%)	0.748
	Urban	20 (51.3%)	141 (54%)	
Socioeconomic status	Lower	18 (46.2%)	101 (38.7%)	0.614
	Middle	13 (33.3%)	107 (41%)	
	Upper	8 (20.5%)	53 (20.3%)	

Comparison between the studied groups with regard to the risk factors for HCV seroconversion showed that repeated diabetes mellitus, blood transfusion, Duration of CKD, Duration of Hemodialysis, and Infection Control Measures was not properly applied were significant risk factors for HCV seroconversion. Other factors such as the family history of HCV infection, Hypertension, Past History of Surgery, Temporary Vascular Access, HbsAg status and surgical procedures during the dialysis period were insignificant risk factors for HCV seroconversion as shown in Table 2.

Table 2: Comparisons of Risk factors among sero-positive and seronegative HCV cases

Variables		**Sero-Positive**	**Sero-Negative**	**P-Value**
Family History of HCV	Yes	17 (43.6%)	128 (49%)	0.525
	No	22 (56.4%)	133 (51%)	
Hypertension	Yes	11 (28.2%)	95 (36.4%)	0.318
	No	28 (71.8%)	166 (63.6%)	
Diabetes Mellitus	Yes	29 (74.4%)	30 (11.5%)	**<0.001**
	No	10 (25.6%)	231 (88.5%)	
Blood transfusion	Yes	27 (69.2%)	25 (9.6%)	**<0.001**
	No	12 (30.8%)	236 (90.4%)	
Operation During Dialysis Period	Yes	11 (28.2%)	59 (22.6%)	0.440
	No	28 (71.8%)	202 (77.4%)	
Past History of Surgery	Yes	5 (12.8%)	24 (9.2%)	0.474

	No	34 (87.2%)	237 (90.8%)	
Infection Control Measures	Applied	13 (33.3%)	225 (86.2%)	**<0.001**
	Not applied	26 (66.7%)	36 (13.8%)	
Duration of CKD (in months), Mean ±SD		28 ± 7.36	18 ± 12.26	**<0.05**
Duration of Dialysis (in months), Mean±SD		27 ± 6.22	17 ± 11.35	**<0.05**
Temporary Vascular Access	Yes	36 (92.3%)	224 (85.8%)	0.266
	No	3 (7.7%)	37 (14.2%)	
HbsAg	Positive	1 (2.6%)	4 (	0.346
	Negative	38 (97.4%)	257 (	

4. DISCUSSION

Hepatitis C virus (HCV) infection occurs mainly as a consequence of failures to comply with universal precautionary measures. Among hemodialysis (HD) patients, HCV infection is associated with an increased risk of progression to end-stage renal disease and cardiovascular events. Poor compliance with HCV-antiviral therapy, the lack of an effective vaccine, and adverse complications have contributed to HCV infection becoming a major global health problem. Hence, identifying HCV infection in HD patients at the earliest stage possible and the timely initiation of treatment may contribute to reducing progression and also the incidence of morbidity and mortality.

We have detected an overall HCV prevalence among Hemodialysis patient was 13%, which is comparable to the proportions reported in many other studies conducted in other regions of India: PS kumar et al [14], Rajasekaran et al [15] and Reddy AK et al [16] reported HCV prevalence were 12.4%, 13.2% and 13.4% respectively.

In contrast to our study Dhar A et al [17] reported much higher HCV prevalence (31.4%), whereas Jamil M et al [18] reported much lower HCV prevalence.

We speculate that this wide divergence in prevalence could be attributed to a number of contributory factors, including different geographical locations, a different study duration, or differences in the sensitivity and specificity of the methods used for detecting HCV infection.

In this study demographic factors not significantly associated with the HCV seroconverted and HCV seronegative patients, in agreement with the Kerollos et al [19].

Many factors are contributing to this high prevalence. Frequent blood transfusion is an important factor in the transmission of HCV infection; we found a highly statistically significant difference between HCV seroconverted and HCV seronegative patients regarding the history of frequent blood transfusion, our finding comparable with the Hinrichsen, et al [20] and Khattab OS, et al [21].

Duration of CKD, Duration of Hemodialysis, and not taken Infection Control Measures were significant risk factors for HCV seroconversion in the current research, similar results observed by Gómez-Gutiérrez C, et al [22] and Alshebani TB, et al [23].

5. CONCLUSION

Patients on haemodialysis have increased chance of acquiring HBV and HCV, although variable prevalence is observed throughout different geographical regions. The most important risk factors associated with the acquisition of HCV infection among HD patients were identified as a frequent blood transfusion, prolonged duration of CKD and a long duration of HD. Stringent screening of blood and blood products, adopting strict universal precautionary measures in HD units, proper management of HD machines, and appropriate waste management may contribute to minimizing the risk of the nosocomial spread of HCV infection

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