Biological and Clinical Sciences Research Journal
eISSN: 2708-2261; pISSN: 2958-4728
www.bcsrj.com
DOI: https://doi.org/10.54112/bcsrj.v2023i1.571
*Biol. Clin. Sci. Res. J., Volume, **2023**: 571*
Original research article

FACTORS ASSOCIATED WITH SEROCONVERSION IN HEMODIALYSIS PATIENTS

ALI FF[1*], RIZVI N[2], HANIF A[3]

[1]Department of Nephrology, The University of Lahore, Lahore, Pakistan
[2]Department of Nephrology (Head of Dept.), Ghurki Trust Teaching Hospital, Lahore, Pakistan
[3]Department of Public Health (biostatistician)/ Director Research Unit Faculty of Allied Health Science University of Lahore, Lahore, Pakistan
**Correspondence author email address:* faisalnaeemi499@gmail.com

(Received, 27th June 2023, Revised 20th November 2023, Published 12th December 2023)

Abstract: *In this prospective cohort study conducted at Hijaz Hospital in Lahore from January 2022 to January 2023, we aimed to investigate the prevalence and factors influencing HCV seroconversion in hemodialysis patients. A total of 380 patients participated in the study, responding to a structured questionnaire covering sociodemographic factors and hemodialysis duration. ELISA testing was conducted quarterly, resulting in two groups: HCV-positive and HCV-negative. Results revealed that 63.4% (241 individuals) experienced seroconversion from HCV-negative to HCV-positive status during hemodialysis. Significant associations were observed between HCV seroconversion and emergency hemodialysis at a site other than the primary one (P = 0.017). Other significant associations included IV drug abuse (P = 0.007), blood transfusions (P = 0.001), and dental procedures (P = 0.005). The presence of anemia and the lack of vascular access at the start of hemodialysis were also significantly associated with HCV seroconversion (P = 0.001). However, no associations were found between HCV seroconversion and age, surgical procedures, needle stick injuries, or alcohol intake. In conclusion, this study highlights an alarming HCV seroconversion rate among hemodialysis patients. Factors such as anemia, blood transfusions, duration of dialysis, lack of vascular access, and emergency dialysis demonstrated strong correlations with HCV infectivity. These findings emphasize the importance of implementing stringent infection control measures and vigilant monitoring to mitigate the risk of HCV transmission in hemodialysis settings.*

Keywords: Hemodialysis, Hepatitis C virus, Seroconversion, Renal disease

Introduction

HCV is a single-stranded RNA virus belonging to the Flavi iradae family. (Roger et al., 2021) The most important routes of transmission of HCV are intravenous or nasal drug use, vertical transmission, and unsafe medical or surgical procedures. The mode of transmission is blood-borne, due to which there is an increased risk of morbidity and mortality among patients on maintenance dialysis. (Drafting Committee for Hepatitis Management Guidelines, 2020; Holden et al., 2020) The most critical risk factor for getting HCV infection in dialysis patients is the duration of dialysis. IV drug abuse and a history of organ transplantation are other significant factors for transmission. (Guntipalli et al., 2021)HCV infection during dialysis has dramatically increased the morbidity and mortality of dialysis patients. It increases the risk of cardiovascular, hepatic, thrombotic, uremic, and non-uremic morbidity and mortality. (Qayum and Shah, 2023) Chronic HCV infection decreases life expectancy, leads to renal transplant rejection, increases mortality, and diminishes the quality of life. (Bhattacharya et al., 2023) HCV also increases renal insufficiency due to renal injury and cirrhosis with subsequent renal impairment. HCV can be transmitted pre-dialysis, intra-dialysis, or post-dialysis. The factors may include the number of blood transfusions, duration of blood transfusions, mode of dialysis, prevalence of HCV in the hemodialysis unit, and non-compliance with standard infection control practices. Many of these patients had severe uremic anemia and needed blood transfusion, which is the primary cause of HCV transmission. (Wong et al., 2020) Laboratory diagnosis and detection procedures for HCV have improved dramatically in the past twenty years. This has caused a decline in the spread and transmission of HCV infection. (Zhang et al., 2020) (Khan et al., 2020) However, the association between Hep C and dialysis patients is vague. The present study verifies the previous findings, explores the risk factors, and identifies the prevalence of factors in hemodialysis patients that lead to the conversion of seronegative patients to seropositive. Detecting those factors and then taking steps to reduce them can lead to reduced disease burden and added load on a patient's health and quality of life.

Methodology

The prospective study was conducted in Hijaz Hospital, Gulberg, Lahore, from January 2022 to January 2023. The study included patients of both genders, aged between 16-80 years, who had renal failure and were on hemodialysis. Patients who had chronic liver disease, who had a family history of HCV, and who were seropositive before the start of the study were excluded. A total of 380 patients were included in the study. The informed consent of the participants was taken. The hospital's ethical review committee approved the study.

A structured questionnaire containing questions about sociodemographic factors and the duration of hemodialysis patients was used to collect data. Data was collected from

the nephrology department at Hijaz Hospital, Gulberg, Lahore. Patients underwent ELISA testing once at the start of initiating dialysis and then quarterly. Two groups were made: disease (HCV) positive and disease (HCV) hostile. Data was analyzed using SPSS version 21. Qualitative data was measured from percentages. Mean ± Standard Deviation was calculated for quantitative data, i.e., age and disease duration. Post–stratification Chi-square test was used for the association of socio-demographical factors, gender, and duration of disease with seroconversion of hemodialysis patients. P value of less than or equal to 0.05 ($P \leq 0.05$) was taken as significant.

Results

The study consisted of 380 patients in total who were undergoing hemodialysis sessions thrice weekly. Of these 380 patients, 64.21% (244) were males and 35.7 %(136) were female. The results reveal that 63.4 % of patients (241) seroconverted from negative to positive HCV status during the hemodialysis. 65.6% of males and 34.4% of females seroconverted while on HD, but this difference was insignificant.

57.3% of patients undergo hemodialysis in emergency sites and acquire the illness. There was a significant association between HCV seroconversion and HD in emergencies other than the primary site (P =0.017). The hemodialysis duration was significantly associated with HCV seroconversion in patients (P=0.035). The duration of 1-5 years was found to be associated with most of the seroconverted cases. There was a significant association of HCV seroconversion with IV drug abuse (P=0.007), blood transfusions (P=0.001), and dental procedures (P=.005). 61.5% of hemodialysis patients had anemia and required blood transfusions. The presence of anemia is found to be significantly associated with HCV seroconversion.

The lack of vascular access at the start of hemodialysis was associated with HCV seroconversion. 14.9 % of patients had a proper vascular route when starting renal replacement therapy. The rest of the 85.1% population did not have a pre-formed vascular route to initiate dialysis. These 85.1% (205) patients developed HCV during their dialysis later on (P=.001). There was no association of HCV seroconversion with age, surgical procedures, needle stick injury, and alcohol intake.

Table I Factors associated with HCV seroconversion in HD patients

Variables	Constructs	Yes	No	*P*-value
Gender	*Male*	158 (65.6%)	86 (61.9%)	0.471
	Female	83 (34.4%)	53 (38.1%)	
Age	*18-35*	56 (23.2%)	36 (25.9%)	0.844
	36-55	104 (43.2%)	58 (41.7%)	
	56-75	81 (33.6%)	45 (32.4%)	
HD was done at the emergency	*Yes*	138 (57.3%)	62 (44.6%)	0.017
	No	103 (42.7%)	77 (55.4%)	
Is the place of dialysis the same as the start	*Yes*	44 (18.3%)	51 (36.7%)	0.001
	No	197 (81.7%)	88 (63.3%)	
Alcohol intake	*Yes*	2 (0.8%)	4 (2.9%)	0.132
	No	239 (99.2%)	135 (97.1%)	
Dental treatment	*Yes*	43 (17.8%)	7 (5.0%)	0.001
	No	198 (82.2%)	132 (95.0%)	
IV drug abuse	*Yes*	8 (3.3%)	0 (0.0%)	0.007
	No	233 (96.7%)	139 (100.0%)	
History of surgical procedure	*Yes*	10 (4.1%)	8 (5.8%)	0.483
	No	231 (95.9%)	131 (94.2%)	
Blood transfusion	*Yes*	111 (46.1%)	38 (27.3%)	0.001
	No	130 (53.9%)	101 (72.7%)	
Anemia	*Yes*	148 (61.4%)	38 (27.3%)	0.001
	No	93 (38.6%)	101 (72.7%)	
Needle stick injury	*Yes*	2 (0.8%)	2 (1.4%)	0.58
	No	239 (99.2%)	137 (98.6%)	

[Citation: Ali, F.F., Rizvi, N., Hanif, A., (2023). Factors associated with seroconversion in hemodialysis patients *Biol. Clin. Sci. Res. J.*, **2023***: 571*. doi: https://doi.org/10.54112/bcsrj.v2023i1.571]

Discussion

Pakistan is a country with a considerable HCV prevalence rate. It is a well-acknowledged finding that patients undergoing hemodialysis are at an elevated risk of acquiring hepatitis C infection. The present study found that 63.4% of hemodialysis patients seroconverted from negative to positive status during dialysis. The prevalence rate of HCV in the general population is around 6.2%. (Khan et al., 2020) Compared to this general prevalence rate, our study reported a more than 10 times higher incidence rate of HCV among hemodialysis patients. This prevalence rate complies with an earlier study that reported a 75% positivity rate of HCV in patients undergoing hemodialysis. (Jadoul et al., 2019) According to a pooled analysis of 19 Pakistan-based studies on the prevalence rate of HCV in hemodialysis patients, 32.33% of the population with end-stage renal disease suffer from HCV. The higher incidence rate in our study could be due to the limited sample size (380 patients) compared to 3446 hemodialysis patients analyzed in the meta-analysis. (Akhtar et al., 2020)

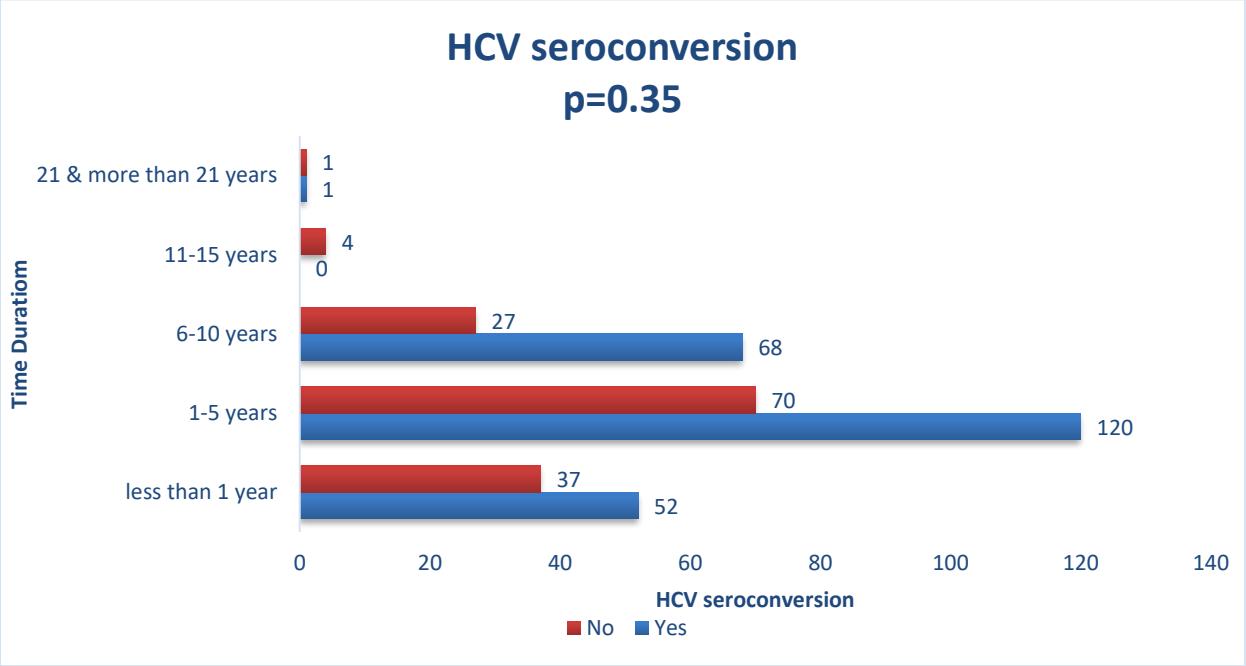

Figure 1: Association of time duration with HCV seroconversion in HD patients

The study found that a significant number of patients (17.3%) who developed HCV underwent dental treatment, designating dental procedures as a significant source of HCV in hemodialysis patients. Similar results were found by Ali et al., who found dental treatment as a potential source of transmitting HCV in 13.3% of hemodialysis patients. (Akhtar et al., 2020) Blood transfusion is considered one of the important vehicles of hepatitis transmission due to the absence of proper blood screening protocols before transfusion. Multiple studies in Pakistan(Haqqi et al., 2019), (Mehmood et al., 2020)and around the globe(Jadoul et al., 2019) affirmed that transfusion of blood products acts as a significant risk factor in acquiring HCV. In our study, the duration of hemodialysis is a significant risk factor, and many previous studies confirmed this factor as an independent risk factor for developing HCV. (Abdelsalam et al., 2019) In our study, the absence of vascular access at the start of the hemodialysis procedure also acted as a source of HCV. A similar retrospective study reported vascular access's role in acquiring HCV. The authors explained that the patients with synthetic grafts and arteriovenous fistula were more prone to HCV transmission than those who had permanent catheters. (Dharmesti et al., 2022) In our study, 33.3% of hemodialysis patients weren't infected with the hepatitis C virus. However, the present study was single-point prevalence research. The negative results don't exclude the risk of nosocomial transmission of Hep C over time. The study, however, found no significant correlation between gender, needle pricks, Alcohol intake, IV drug administration, and surgical procedures with the development of HCV in hemodialysis patients. In contrast to our results, a previous study found that male patients are at higher risk of developing HCV than their female counterparts. (Vinayakumar and John, 2020) Another study also reported contrasting findings revealing the significant role of previous surgery in the positivity rate of HCV infection. (Kerollos et al., 2020) The limitation of our study is the small sample size; more extensive multicenter studies are recommended to confirm the findings of our study.

Conclusion

The HCV seroconversion rate is found to be extremely high in dialysis patients. The presence of anemia, blood transfusions, duration of dialysis, lack of vascular access, and emergency dialysis were strongly correlated with HCV infectivity.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.
Ethics approval and consent to participate.
Approved by the department Concerned.
Consent for publication
Approved
Funding
Not applicable

Conflict of interest

The authors declared an absence of conflict of interest.

Authors' Contribution

FAIQA FATIMA ALI
Conception of Study, Development of Research Methodology Design, Study Design, Review of Literature, Drafting article, Review of manuscript, final approval of manuscript
NABIHA RIZVI
Review of Literature, Drafting article
ASIF HANIF
Data entry and Data analysis

References

Abdelsalam, M., Tawfik, M., Reda, E. M., Eldeeb, A. A., Abdelwahab, A., Zaki, M. E.-s., and Abdelkader Sobh, M. (2019). Insulin resistance and hepatitis C virus-associated subclinical inflammation are hidden causes of pruritus in Egyptian hemodialysis patients: A multicenter prospective observational study. *Nephron* **143**, 120-127.

Akhtar, S., Nasir, J. A., Usman, M., Sarwar, A., Majeed, R., and Billah, B. (2020). The prevalence of hepatitis C virus in hemodialysis patients in Pakistan: A systematic review and meta-analysis. *PLoS One* **15**, e0232931.

Bhattacharya, D., Aronsohn, A., Price, J., and Lo Re III, V. (2023). Hepatitis C Guidance 2023 Update: AASLD-IDSA Recommendations for Testing, Managing, and Treating Hepatitis C Virus Infection. *Clinical Infectiou Diseases*, ciad319.

Dharmesti, N. W. W., Wibawa, I., and Kandarini, Y. (2022). Hepatitis C Seroconversion Remains High among Patients with Regular Hemodialysis: Study of Associated Risk Factors. *International Journal of Hepatology* **2022**.

Drafting Committee for Hepatitis Management Guidelines, t. J. S. o. H. (2020). Japan Society of Hepatology guidelines for the management of hepatitis C virus infection: 2019 update. *Hepatology Research* **50**, 791-816.

Guntipalli, P., Pakala, R., Kumari Gara, S., Ahmed, F., Bhatnagar, A., and Endaya Coronel, M. (2021). Worldwide prevalence, genotype distribution and management of hepatitis C. *Acta gastroenterol. belg* **84**, 637-56.

Haqqi, A., Munir, R., Khalid, M., Khurram, M., Zaid, M., Ali, M., Shah, Z. H., Ahmed, H., and Afzal, M. S. (2019). Prevalence of hepatitis C virus genotypes in Pakistan: current scenario and review of literature. *Viral immunology* **32**, 402-413.

Holden, R. M., Mustafa, R. A., Alexander, R. T., Battistella, M., Bevilacqua, M. U., Knoll, G., Mac-Way, F., Reslerova, M., Wald, R., and Acott, P. D. (2020). Canadian Society of Nephrology commentary on the Kidney Disease Improving Global Outcomes 2017 clinical practice guideline update for the diagnosis, evaluation, prevention, and treatment of chronic kidney disease-mineral and bone disorder. *Canadian Journal of Kidney Health and Disease* **7**, 2054358120944271.

Jadoul, M., Bieber, B. A., Martin, P., Akiba, T., Nwankwo, C., Arduino, J. M., Goodkin, D. A., and Pisoni, R. L. (2019). Prevalence, incidence, and risk factors for hepatitis C virus infection in hemodialysis patients. *Kidney international* **95**, 939-947.

Kerollos, K. M. N., El-Ameen, H. A., El Wahed, L. A., and Azoz, N. M. A. (2020). Prevalence and seroconversion of hepatitis C among hemodialysis patients in Assiut governorate, Egypt. *The Egyptian Journal of Internal Medicine* **32**, 1-6.

Khan, M. U., Mahmoud, M. I., and Butt, A. A. (2020). Hepatitis c virus and chronic kidney disease. *Expert Review of Gastroenterology & Hepatology* **14**, 579-590.

Mehmood, S., Raza, H., Abid, F., Saeed, N., Rehman, H. M., Javed, S., and Khan, M. S. (2020). National prevalence rate of hepatitis B and C in Pakistan and its risk factors. *Journal of Public Health* **28**, 751-764.

Qayum, A. H. K., and Shah, D. A. (2023). Seroprevalence And Molecular Detection Of Hepatitis B Virus (Hbv) And Hepatitis C Virus (Hcv) In Peshawar District, Khyber Pakhtunkhwa, Pakistan. *Journal of Pharmaceutical Negative Results¦ Volume* **14**, 720.

Roger, S., Ducancelle, A., Le Guillou-Guillemette, H., Gaudy, C., and Lunel, F. (2021). HCV virology and diagnosis. *Clinics and Research in Hepatology and Gastroenterology* **45**, 101626.

Vinayakumar, A. N., and John, R. (2020). Seroprevalence of hepatitis C infection in patients undergoing haemodialysis in a tertiary care centre. *Journal of Patient Safety and Infection Control* **8**, 48-53.

Wong, X. Z., Gan, C. C., Mohamed, R., Yahya, R., Ganapathy, S., Tan, S. S., and Lim, S. K. (2020). Hepatitis C core antigen testing to diagnose active hepatitis C infection among haemodialysis patients. *BMC nephrology* **21**, 1-6.

Zhang, Y., Gao, Z., Wang, S., Liu, J., Paul, N., He, T., Liu, C., Zhang, H., Lv, Y., and Cao, R. a. (2020). Hepatitis C virus genotype/subtype distribution and evolution among Chinese blood donors: Revealing recent viral expansion. *PloS one* **15**, e0235612.