Original Article



# Frequency of Hepatitis C in Patients with Chronic Kidney Disease Undergoing Hemodialysis

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## Article Info

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## Abstract

**Objective:** To determine the frequency of HCV in patients with CKD undergoing hemodialysis.

**Methodology:** This cross-sectional study, conducted from May 12, 2023, to November 12, 2023, included 172 patients with CKD stage V on hemodialysis for at least 3 months. Blood samples were tested for HCV antibodies using enzyme immunoassay (EIA) and confirmed with HCV-RNA polymerase chain reaction (PCR). Data on age, gender, body mass index (BMI), duration of CKD, hemodialysis duration, and comorbidities were analyzed using SPSS version 22.

**Results:** Among 172 patients (mean age 45 ± 12.29 years; 53% male), 53 (31%) tested positive for HCV. No significant associations were found between HCV status and age, gender, BMI, CKD duration, hemodialysis duration, diabetes, hypertension, or coronary artery disease (P > 0.05).

**Conclusion:** The frequency of HCV in hemodialysis patients at Ayub Teaching Hospital was 31%, highlighting a significant public health burden. Targeted screening and infection control measures are essential.

**Keywords:** Chronic Kidney Disease, Diabetes Mellitus, Hepatitis C, Hemodialysis, Polymerase chain reaction, Prevalence, Renal dialysis.



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# Introduction

Hepatitis C virus (HCV) and chronic kidney disease (CKD) are major global health concerns, with approximately 80 million people affected by HCV in 2013, 50–85% of whom develop chronic infection, potentially leading to cirrhosis or hepatocellular carcinoma.[1] In Pakistan, HCV prevalence is estimated at 6.2%, with rates as high as 25% in rural areas, while CKD prevalence ranges from 12.5% to 25%.[2,3] Hemodialysis patients are particularly vulnerable to HCV due to repeated blood transfusions, frequent hospitalizations, and exposure to contaminated dialysis equipment.[4,5] Global prevalence of HCV in hemodialysis patients varies widely, from 1.4% to 41.9%, with higher rates in developing countries (4.7–41.9%) compared to developed nations (1.4–28.3%).[4] In Pakistan, studies report HCV prevalence in hemodialysis patients ranging from 16.8% to 68%, with a meta-analysis estimating a pooled prevalence of 32.33%.[6]

The intersection of HCV and CKD represents not only a biomedical burden but also a human one, affecting quality of life, treatment continuity, and survival. HCV infection in patients receiving maintenance hemodialysis contributes to both hepatic and extrahepatic complications, including progressive renal impairment and heightened cardiovascular risk. Ongoing transmission within dialysis units underscores systemic lapses in infection control, routine screening, and staff training. Furthermore, limited resources and variable implementation of safety protocols in low- and middle-income settings magnify patient vulnerability. Addressing these challenges requires a patient-centered, evidence-based approach that strengthens preventive strategies and enhances long-term care outcomes.

Pakistan's healthcare system faces challenges, including inadequate screening of blood transfusions, with nearly 40% of transfusions unscreened for infectious diseases.[6] This study aims to determine the frequency of HCV among hemodialysis patients at Ayub Teaching Hospital, Abbottabad, providing local data to inform preventive and management strategies.

# Methodology

**Study Design and Setting:** This cross-sectional study was conducted at the Department of Medicine and Nephrology, Ayub Teaching Hospital, Ayub Medical College Abbottabad, Pakistan, from May 12, 2023, to November 12, 2023.

**Sample Size and Selection:** The sample size of 172 patients was calculated using the WHO sample size calculator, based on an anticipated HCV prevalence of 32.33% in hemodialysis patients, with a 95% confidence level and 7% margin of error.[6] Consecutive sampling was used. Inclusion criteria were patients aged ≥18 years, both genders, diagnosed with CKD stage V, and on hemodialysis for ≥3 months. Exclusion criteria included hemodialysis for acute kidney injury, drug overdose, or prior HCV positivity before hemodialysis initiation.

**Data Collection:** After obtaining ethical approval and written informed consent, a detailed history was collected, including duration of hemodialysis, comorbidities (diabetes, hypertension, coronary artery disease), and drug history. Blood samples were collected via standard venipuncture and tested for HCV antibodies using EIA, with positive results confirmed by HCV-RNA PCR. Routine laboratory tests included renal function tests and serum electrolytes. Data were recorded using a structured questionnaire.

**Data Analysis:** Data were analyzed using SPSS version 22. Descriptive statistics included mean ± standard deviation for quantitative variables (age, BMI, CKD duration, hemodialysis duration) and frequencies/percentages for qualitative variables (gender, HCV status, comorbidities). HCV status was stratified by age, gender, BMI, CKD duration, hemodialysis duration, and comorbidities, with associations tested using the chi-square test ($P \leq 0.05$ considered significant).

# Results

Among 172 patients, the mean age was 45 ± 12.29 years, with 5% aged 18–30 years, 24% aged 31–40 years, 33% aged 41–50 years, and 38% aged 51–60 years. Males comprised 53% (n=91) and females 47% (n=81). Mean BMI was 27 ± 3.02 kg/m$^2$, with 62% having BMI ≤27 kg/m$^2$. CKD duration averaged 13 ± 5.08 months, with 59% having CKD for >12 months. Hemodialysis duration averaged 5 ± 3.19 months, with 65% on dialysis for >6 months. Diabetes was present in 58% (n=100), hypertension in 40% (n=69), and coronary artery disease in 12% (n=21).

Demographic characteristics are shown in table 1:

HCV was detected in 53 patients (31%). Stratification showed no significant associations between HCV positivity and age (P=0.9128), gender (P=0.7509), BMI (P=0.4895), CKD duration (P=0.7066), hemodialysis duration (P=0.6004), diabetes (P=0.4643), hypertension (P=0.8035), or coronary artery disease (P=0.4405). These figures are shown in table 2-4

# Discussion

This cross-sectional study determined that 31% of patients with chronic kidney disease (CKD) undergoing maintenance hemodialysis at Ayub Teaching Hospital were infected with hepatitis C virus (HCV). This prevalence is substantial and aligns closely with prior meta-analytic data of 32.33 % reported from Pakistan [6]. The lack of significant association between HCV infection and demographic or clinical parameters—such as age, gender, BMI, duration of CKD, or hemodialysis


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**Table 1. Demographic Characteristics and HCV Status**

| Variable | Category | Frequency (n) | Percentage (%) |
|---|---|---|---|
| Age | 18–30 | 9 | 5 |
| Age | 31–40 | 41 | 24 |
| Age | 41–50 | 57 | 33 |
| Age | 51–60 | 65 | 38 |
| Gender | Male | 91 | 53 |
| Gender | Female | 81 | 47 |
| BMI | ≤27 | 107 | 62 |
| BMI | >27 | 65 | 38 |
| Comorbidity | Diabetes | 100 | 58 |
| Comorbidity | Hypertension | 69 | 40 |
| Comorbidity | CAD | 21 | 12 |
| HCV Status | Positive | 53 | 31 |
| HCV Status | Negative | 119 | 69 |

**Table 2. Stratification of Hepatitis C with Respect to Duration of Hemodialysis**

| Duration (months) | HCV Positive (n, %) | HCV Negative (n, %) | P-Value |
|---|---|---|---|
| ≤6 | 19 (35.8%) | 41 (34.5%) | 0.6004 |
| >6 | 34 (64.2%) | 78 (65.5%) | |
| Total | 53 (31%) | 119 (69%) | |

**Table 3. Stratification of Hepatitis C with Respect to Diabetes Mellitus**

| Diabetes | HCV Positive (n, %) | HCV Negative (n, %) | P-Value |
|---|---|---|---|
| Yes | 32 (60.4%) | 68 (57.1%) | 0.4643 |
| No | 21 (39.6%) | 51 (42.9%) | |
| Total | 53 (31%) | 119 (69%) | |

**Table 4. Stratification of Hepatitis C with Respect to Age**

| Age Group | HCV Positive (n, %) | HCV Negative (n, %) | P-Value | |
|---|---|---|---|---|
| 18–30 | 3 (5.7%) | 6 (5.0%) | 0.9128 | |
| 31–40 | 13 (24.5%) | 28 (23.5%) | | |
| 41–50 | 18 (34.0%) | 39 (32.8%) | | |
| 51–60 | 19 (35.8%) | 46 (38.7%) | | |
| Total | 53 (31%) | 119 (69%) | | |

**Figure 1: Prevalance of HCV**

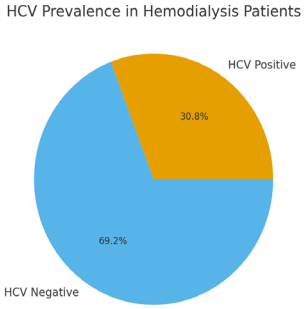
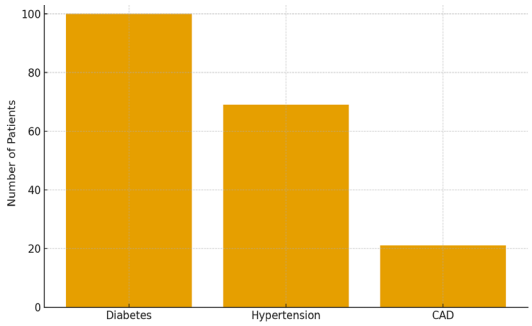



**Figure 2: Other comorbidities in hemodialysis**




duration—suggests that environmental or procedural factors within dialysis settings may play a more pivotal role than individual patient characteristics in viral transmission.

The prevalence found in this study (31%) is consistent with figures from other regions of Pakistan, where HCV infection rates in hemodialysis populations range between 16.8% and 68%. The variability reflects differences in infection control practices, blood screening reliability, and dialysis unit infrastructure across provinces. In Punjab, pooled estimates have reached 37–38%, whereas Khyber Pakhtunkhwa—where this study was conducted—typically reports lower rates (22–26%), making the 31% prevalence observed here notably high for this province.[6] In contrast, studies from developed countries show markedly lower HCV prevalence (1.4–10%), primarily due to stringent infection prevention protocols, universal blood screening, and dedicated dialysis machines for HCV-positive patients.[7] Another study reported a 27.2% HCV prevalence by ELISA, with 74.4% of ELISA-positive cases confirmed by PCR, aligning with our findings.[8]

Contrary to the established understanding that prolonged dialysis duration increases HCV risk, this study found no statistically significant association between HCV status and duration of hemodialysis (P=0.6004). Possible explanations include the relatively short mean duration of dialysis (5 ± 3.19 months), insufficient for cumulative exposure to manifest risk; improved infection control protocols recently adopted at Ayub Teaching Hospital, potentially reducing new transmissions; and the cross-sectional design limitations that preclude temporal causation.

Despite these nonsignificant associations, the 31% prevalence remains alarming. It reflects systemic issues in Pakistan's healthcare infrastructure, including inadequate blood screening, reuse of dialysis consumables, and insufficient isolation of HCV-positive patients within dialysis centers. These findings underscore a preventable public health problem, rooted in lapses of infection control rather than patient characteristics.[9]

The absence of association between HCV positivity and diabetes, hypertension, or coronary artery disease implies that transmission dynamics are procedural, not host-dependent. While diabetes can increase healthcare interactions, it does not independently increase susceptibility to HCV unless invasive procedures are more frequent.

The high prevalence of HCV among hemodialysis patients carries profound implications i.e. HCV infection in CKD patients accelerates liver disease progression and worsens cardiovascular and renal outcomes.[10]It complicates eligibility for kidney transplantation and reduces post-transplant graft survival. Routine HCV-RNA testing (not just antibody screening) should be incorporated into dialysis unit protocols to identify active infection early .[11]

Strict adherence to KDIGO guidelines (2008) is essential, including use of dedicated machines for HCV-positive patients, regular staff training on infection control, and quarterly HCV screening for all dialysis patients .[13-15]

There is a compelling need for a national dialysis registry with infection surveillance. Government and hospital administrators must ensure mandatory HCV screening of all blood donations and dialysis patients using PCR-based methods. Access to direct-acting antivirals (DAAs) should be expanded, as these agents are now safe and effective in CKD and ESRD patients, with sustained virological response rates exceeding 95% .[16-20]

The cross-sectional design limits causal inference between exposure duration and infection. The single-center setting restricts generalizability to broader CKD populations. Possible underreporting of prior blood transfusions—a major transmission pathway—and lack of genotype data may limit deeper epidemiologic insight. Future studies should adopt multicentric, longitudinal designs to track seroconversion rates and evaluate antiviral therapy outcomes.

## Conclusion

The frequency of HCV among CKD patients undergoing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hemodialysis at Ayub Teaching Hospital was 31%, highlighting a significant public health burden. Enhanced infection control, routine screening, and targeted antiviral therapies are critical to reducing HCV transmission in this population.

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**Authors' Contribution Statement**

IK contributed to the conception, design, acquisition, analysis, interpretation of data, drafting of the manuscript, and critical review of the manuscript. NAK contributed to the design, acquisition, analysis, and interpretation of data. AH contributed to the acquisition, analysis, interpretation of data, and drafting of the manuscript. MNS contributed to the design, acquisition, analysis, and interpretation of data. MT contributed to the acquisition, analysis, and interpretation of data. SJK contributed to the conception, design, critical review of the manuscript, and final approval of the version to be published. All authors are accountable for their work and ensure the accuracy and integrity of the study.

**Conflict of Interest**

Authors declared no conflict on interest

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None

**Data Sharing Statement**

The data that support the findings of this study are available from the corresponding author upon reasonable request.