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Frequency of Hepatitis C Virus in Chronic Kidney Disease Patients on Regular Hemo Dialysis at Tertiary Care Hospital

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ABSTRACT

Introduction: The hepatitis C virus (HCV) is the significant cause of morbidity and mortality in patients on haemodialysis. Hemodialysis patients are also in a high risk of getting infected with HCV and the infection rate is much higher when compared to non-haemodialysis patients. The purpose of the research is to determine the frequency of Hepatitis C Virus (HCV) infection and determine the risk factors in the case of chronic kidney disease (CKD) patients receiving routine haemodialysis. **Subjects and Methods:** It was a cross-sectional study conducted at the Department of Medicine, DHQ Teaching Hospital/Gomal Medical College, Dera Ismail Khan between December 2024 and May 2025. One hundred and one adult patients with chronic kidney disease of stage 4 or 5 who were receiving maintenance haemodialysis were recruited. The diagnosis of HCV infection was made by the third generation Enzyme-Linked Immunosorbent Assay (ELISA) of anti-HCV antibodies. Demographic and clinical information was collected and stratified analysis was done to establish relationship with HCV status using Chi-square test. **Results:** The overall rate of the HCV infection was 28.1% (34 out of 121). The population average age was 38.23 years old with a standard deviation of 12.55 and majority of the population being male (60.3%) and 73.6% were urban inhabitants. Stratification revealed significant negative relationship between hypertension and HCV status and more so, hypertension was more prevalent among non-hypertensive (37.5% vs. 20.0%, p=0.033). Residency was found to have a significant trend, with a much higher prevalence of HCV found in rural patients (40.6%) as compared to urban patients (23.6%, p=0.066). There were no significant relationships of HCV status and gender, age, BMI, diabetes, or CKD length. **Conclusions:** According to our study, the prevalence of haemodialysis population with regard to HCV infection is high. The significant association between the absence of hypertension and the significant pattern of living in rural areas indicates the need to have better, assessed infection control strategies and targeted screening strategies on the high-risk groups with a view to reducing the burden of HCV among the at-risk group.

INTRODUCTION

Chronic kidney disease is a significant health issue impacting around 11% of the global adult population (1). Chronic kidney failure, or end-stage renal disease, is often managed by renal replacement therapy. Haemodialysis is a form of renal replacement therapy utilised to eliminate toxic waste products from the blood, including urea, and to normalise potassium and serum bicarbonate levels, as well as to remove excess fluid that accumulates in the body. Blood is extracted from the body via an arteriovenous fistula or a dialysis catheter. (2,3)

Patients undergoing haemodialysis are susceptible to viral infections such as hepatitis C, hepatitis B, and human immunodeficiency virus, among others. Patients undergoing haemodialysis face a significant risk of exposure to infected individuals due to the absence of standardised preventive measures, effective vaccination, and the presence of contaminated or cross-contaminated dialysis devices. Hepatitis C is a viral illness linked to chronic kidney failure in people undergoing haemodialysis. (4,5) Hepatitis C is a viral infection caused by a single-stranded RNA virus from the Flaviviridae (6) family and is a widespread pathogen responsible for morbidity and mortality globally. (7) Chronic hepatitis C is highly prevalent worldwide, impacting around 170 million individuals and is among the primary causes of mortality. (8) Chronic hepatitis C results in consequences such as cirrhosis and hepatocellular cancer. (9) Approximately 143 million total cases were reported globally, with 1.7 million new cases documented in 2015. (10)

Patients with Chronic Kidney Disease (CKD) receiving Haemodialysis therapy are categorised as high-risk individuals for Hepatitis C virus infection. Hepatitis C in chronic kidney disease patients can diminish life expectancy. Hepatitis C virus infection (HCV) is more progressive in people with end-stage chronic kidney disease (CKD). Moreover, HCV infection independently elevated mortality rates in patients with CKD. (11)

A robust causal link exists between chronic hepatitis C infection and kidney disease, particularly of glomerular origin. Multiple glomerular disorders, such as mixed cryoglobulinemia, membranous nephropathy, membranoproliferative glomerulonephritis, and polyarteritis nodosa, are linked to hepatitis C. (12) Risk factors for HBV and HCV in dialysis patients encompass blood transfusions, cumulative dialysis duration, intravenous drug use, and a history of kidney transplantation. The risk associated with dialysis is approximately 2%, fluctuating by country. (13)

A comprehensive literature review indicates that chronic hepatitis C is linked to chronic renal damage in people receiving haemodialysis. This prompts us to contemplate the purpose of ascertaining the prevalence of Hepatitis C Virus in CKD patients receiving frequent haemodialysis. This study will furnish the most recent and updated data regarding the prevalence of Hepatitis C Virus patients receiving regular haemodialysis in our population, as no similar research has been conducted in the past five years. The findings of this study will be disseminated to other health professionals to inform future research strategies.

MATERIALS AND METHODS

The study was carried out as a cross-sectional study in the Department of Medicine, DHQ Teaching Hospital/Gomal Medical College, Dera Ismail Khan. The research aimed to determine the occurrence of Hepatitis C Virus (HCV) infection among patients on chronic kidney disease (CKD) undergoing regular haemodialysis. The selection of the sample occurred through the World Health Organisation (WHO) sample size calculator to determine the size, which included a 95 percent level of confidence, a 5 percent error margin, and an expected HCV prevalence of 16.4 percent as reported by Mahmud HM et al. The sample size was determined as 121 participants and was selected using the non-probability sequential sampling methodology over a six-month period of time between December 2024 and May 2025. The participants in this trial were adult patients (age 18-60), both male and female, with Stage 4 or 5 chronic kidney disease (CKD) that had received a minimum of three months of haemodialysis, twice per week. Hematological malignancies and anaemia patients and those who previously used intravenous drugs were exempted to minimize confounding bias. The informed consent of all eligible individuals was obtained on the basis of signed informed consent after the institutional ethics committee gave a clearance. The data were collected with the involvement of a full history, clinical examination, and review of the medical records to confirm the diagnosis of CKD. Chronic Kidney Disease (CKD) is defined as the glomerular filtration rate (GFR) of less than 30 mL/min/1.73 m 2 which continues beyond three months and which is computed using the Modification of Diet in Renal Disease (MDRD) research equation. The sample size of each participant was 5 mL of blood used to detect HCV. The samples underwent testing in the hospital laboratory of the Anti-HCV antibodies using a third-generation Enzyme-Linked Immunosorbent Assay (ELISA) with the cutoff value of more than 2.00 (Biokit, Strip Reader). Laboratory procedure was done under the supervision of a single certified pathologist who had over five years of experience to ensure consistency. The analysis of data was done with the assistance of version 22 of SPSS. Descriptive statistics were obtained; continuous variables (e.g. age, BMI) were summarized by means and standard deviations, and categorical variables (e.g. gender, HCV status) were summarized by frequencies and percentages. The initial outcome, which is HCV prevalence, was established. Stratification was done to determine the correlation between HCV status and other independent variables, such as age, gender, BMI, residence, CKD duration, hypertension, diabetes and the smoking status. These stratified analyses were conducted using the Chi-square test and a p-value of less than 0.05 was taken into consideration as statistically significant.

RESULTS

This paper involved a sample of 121 chronically renal failure patients (CKD) under regular haemodialysis treatment. Analysis of the continuous variables revealed that the mean age of the sample was 38.23 +/-12.55 years, which represents quite a young research population. The mean body mass index (BMI) was at 24.88 ± 4.52 kg/m^2 which falls in the normal range. Table 1 is a comprehensive analysis of all the quantitative variables. The sample was mostly male (60.3) and urban (73.6). The age group of 35 years and below (43.8%) comprised the majority of the patients. Most of the patients were of normal BMI (60.3%), and 27.3% were overweight, and 12.4% were obese. There was a high prevalence of comorbidities with hypertension recorded in 53.7 percent of patients and Type 2 Diabetes Mellitus (T2DM) in 47.9 percent. Major percentage of the patients (57.9) had a history of chronic kidney disease of five years and above. On the smoking status, 52.1% of the respondents were non-smokers. Table 2 outlines the clinical and demographic attributes of the patients. Hepatitis C Virus (HCV) infection was the most common outcome of this study, and data analysis revealed that there were 34 patients who were positive of HCV and hence the overall prevalence was found to be 28.1% (figure 1). HCV infection prevalence was stratified using a number of demographic and clinical parameters to identify possible related factors. The stratified analysis showed that there was a statistically significant relationship between hypertension and HCV status (p=0.033). Patients who were deprived of hypertension had a much higher prevalence of HCV infection (37.5%) compared to that of hypertension (20.0%). No statistically significant findings were observed at residential status (p=0.066); however, there was a distinct trend in Residence. The HCV prevalence was much higher among patients in rural (40.6%) compared to urban areas (23.6%). The percentage of ex-smokers who were positive on HCV (44.0) was higher than the current and never smokers;

however, this value was not statistically significant (p=0.092). They did not find any significant associations between HCV status and gender, age, BMI, diabetes, and CKD length. Table 3 shows the overall stratification analysis.

Table 1

Descriptive Statistics of Quantitative Variables in the Study Population (N=121)

Variable	Mean	Standard Deviation	Minimum	Maximum
Age (years)	38.23	12.55	18.00	60.00
Weight (kg)	70.49	10.47	37.60	108.50
Height (m)	1.69	0.09	1.47	1.90
BMI (kg/m^2)	24.88	4.52	14.20	38.40
Duration of CKD (years)	5.17	2.95	1.00	10.00

Figure 1

Frequency of Hepatitis C Virus Infection among Study Population

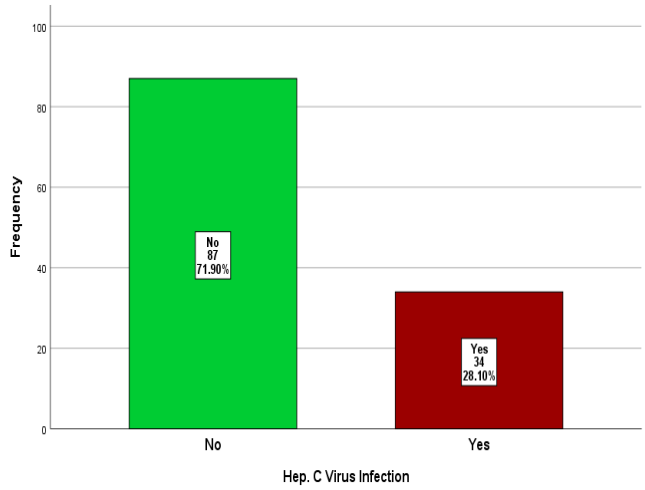

Table 2

Frequency Distribution of Qualitative Variables in the Study Population (N=121)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	73	60.3%
	Female	48	39.7%
Age Group	Upto 35 years	53	43.8%
	36-50 years	39	32.2%
	>50 years	29	24.0%
BMI Class	Normal	73	60.3%
	Overweight	33	27.3%
	Obese	15	12.4%
Residence	Urban	89	73.6%
	Rural	32	26.4%
Hypertension	Yes	65	53.7%
	No	56	46.3%
Type 2 Diabetes (T2DM)	Diabetic	58	47.9%
	Non-Diabetic	63	52.1%
CKD Duration	≥5 Years	70	57.9%
	<5 Years	51	42.1%
Smoking Status	Never	63	52.1%
	Current	33	27.3%
	Ex-Smoker	25	20.7%

Table 3

Stratification of Hepatitis C Virus Infection by Patient Characteristics (N=121)

Characteristic	Category	Total (N)	HCV Negative (n=87)	HCV Positive (n=34)	*p*-value
Gender	Male	73	55 (75.3%)	18 (24.7%)	0.299
	Female	48	32 (66.7%)	16 (33.3%)	
Age Group	≤35 years	53	40 (75.5%)	13 (24.5%)	0.742
	36-50 years	39	27 (69.2%)	12 (30.8%)	
	>50 years	29	20 (69.0%)	9 (31.0%)	
BMI Class	Normal	73	51 (69.9%)	22 (30.1%)	0.397
	Overweight	33	23 (69.7%)	10 (30.3%)	
	Obese	15	13 (86.7%)	2 (13.3%)	
Residence	Urban	89	68 (76.4%)	21 (23.6%)	0.066
	Rural	32	19 (59.4%)	13 (40.6%)	
Hypertension	No	56	35 (62.5%)	21 (37.5%)	0.033
	Yes	65	52 (80.0%)	13 (20.0%)	
Type 2 Diabetes (T2DM)	Non-Diabetic	63	45 (71.4%)	18 (28.6%)	0.904
	Diabetic	58	42 (72.4%)	16 (27.6%)	
CKD Duration	< 5 Years	51	39 (76.5%)	12 (23.5%)	0.340
	≥5 Years	70	48 (68.6%)	22 (31.4%)	
Smoking Status	Never	63	46 (73.0%)	17 (27.0%)	0.092
	Current	33	27 (81.8%)	6 (18.2%)	
	Ex-Smoker	25	14 (56.0%)	11 (44.0%)	

DISCUSSION

This research was able to set the HCV infection prevalence in CKD patients under maintenance haemodialysis to 28.1%. The given discovery is not a single phenomenon but aligned with a disturbing global and countrywide trend with HCV remaining a significant nosocomial infection in dialysis centers, particularly in underdeveloped countries. The results of our study, combined with the risk factors identified, have been well validated and put into perspective when compared to the existing literature. Our centre is within the range of HCV frequency in CKD reported in much of the research in Pakistan and other similar socioeconomic settings with a frequency of 28.1%. Many epidemiological researches have been performed to determine how common hepatitis C is among the people under haemodialysis. Hepatitis C is common in haemodialysis patients in Pakistan whose prevalence ranges between 16.4 to 44.1%. (14,15) A study done in Rawalpindi, Pakistan reported a prevalence of 29.56% (16) though another study was done in Gujrat which reported a prevalence of 42.55% (17). A multi-center study in Jordan showed an incidence rate of 16.5% (18), whereas a large study in India showed an incidence rate of 27.7% (19). These figures are very contrasting to the much lower rates in the wealthy nations, which are typically between 2 and 5 percent, as highlighted in a comprehensive evaluation (20). This is where the critical role of strict infection control measures, more thorough screening of blood supplies, and maybe the seclusion of HCV-positive individuals is revealed, which are more successfully implemented in high-income countries. Nosocomial transmission can be attributed to the high rates in our environment and similar settings. The main reason why haemodialysis centres cause HCV transmission according to Timofte et al. (20) is the lack of adherence to infection control policies. In resource-deprived regions, this is further aggravated by factors like dialyser reuse, high patient to staff ratio, and congested

unit which could facilitate cross-contamination.

A stratification study that we conducted showed some significant correlations and trends which are widely known and recorded in the literature. It was important to note that the hypertension and HCV status were significantly inversely correlated (37.5% vs. 20.0, p=0.033). This could be explained by the differences in the underlying aetiology of chronic kidney disease and survivor bias. Hypertensive nephrosclerotic patients might develop a specific clinical course and possibly a high rate of cardiovascular mortality at the initial stages of the chronic kidney disease process, which will reduce their survival time in the dialysis unit. On the other hand, when patients with the other underlying renal diseases (e.g., glomerulonephritis) are exposed to HCV, they can live much longer on dialysis, therefore, increasing their seroprevalence within the non-hypertensive cohort. The latter fact is indirectly supported by the study of Padilla-Machaca et al. (21) in Peru, where the unidentified or glomerulonephritis aetiology of CKD was often prominent, with the prevalence of HCV being astonishingly high at 35.1% seropositivity. The significant tendency of HCV prevalence to be higher in rural patients (40.6% vs. 23.6, p=0.066) is of clinical significance and perhaps shows disparities in healthcare access. The rural patients can start dialysis at later stages, and most probably they have undergone other less-regulated centers, with poor infection control and have subsequently been transferred to the tertiary centre. Jasuja et al. (19) have found out that 39 per cent of the patients receiving dialysis in multi centres were found to be positive in terms of HCV RNA compared to 20 per cent in single centres (p=0.024). This fits perfectly well with our finding, which suggests a similar dynamic where the commute of rural patients to definitive care increases their cumulative exposure risk. As our investigation failed to show statistically significant correlation between CKD duration and HCV status (p=0.340), the data showed the presence of discernible trend: the prevalence of 31.4% in patients undergoing 5 and more years of dialysis versus 23.5% in those undergoing 5 and less years. This is one of the risk factors that have been widely recorded all over the world. Both Kumar et al. (22) and Jasuja et al. (19) found a direct relationship, the latter deciding on a wide cut-off of 16 months. The risk accrued due to the long-term dialysis is inherent to the epidemiology of HCV in the given population, which is why it is important to continually monitor the prevention of the infection. The higher prevalence in ex-smokers (44.0%), albeit not statistically significant (p=0.092) may indicate a broader range of health-risk behaviours, or is a proxy variable in other unmeasured social or clinical factors. This finding requires further analysis using a larger sample population.

The HCV seroprevalence of 28.1% is very high, and thus it requires immediate response. There is then a need to conduct a detailed audit and improvement of infection control procedures in the haemodialysis unit. Though not directly addressing the issue, successful programs in the West, such as those by Timofte et al. (20) and KDIGO guidelines, point out the extreme importance of observing all standard precautions, including extensive hand hygiene, disinfection of surfaces and machines, and aseptic injections. Risk factors, in particular, rural location, demonstrate that the intervention of the public health should be aimed at strengthening the referral pathways and educating the peripheral healthcare organizations about the issue of infection management. In addition to this, there is the need to introduce universal, regular screening of HCV among all haemodialysis patients. The case study by Padilla-Machaca et al. (21) in Peru indicated the importance of confirmatory RNA tests that only 20.11% of their sample had active viremia with a seropositivity of 35.1. Timely intervention via administration of direct acting antivirals (DAAs) is possible with prompt identification because these agents are well tolerated and effective especially in dialysis patients (20,21). Therapy of HCV boosts the personal results of patients and reduces the viral reservoir of the dialysis population, which helps to eradicate it at some point in the unit.

Limitations

The limitations of our work are similar to many other assessed articles, especially the fact that it is cross-sectional and is conducted in one centre only, which restricts the generalisability of the results. The estimated size of the sample could have lacked power to reveal statistically significant relationships of some factors including residence and smoking status by the presence of pronounced trends. We did not collect information about the number of blood transfusion and specific infection control measures that were used by previous dialysis centres which are important confounding factors. These need to be incorporated in future multi-center prospective studies that incorporate them with molecular genotyping to monitor nosocomial transmission.

CONCLUSIONS

This research indicates that there is a high prevalence of HCV (28.1 percent) in our hemodialysis unit, which presents a serious nosocomial problem. The strong correlation to non-hypertension and the notable tendency of rural dwelling reveal the main risk patterns, which are indicative of underlying problems in the access of healthcare and the resistance to infections. Such results require a proactive change in generalized strategies to focused ones. We strongly suggest serious infection control audits, high-risk patient stratified screening, and access to direct-acting antiviral treatment to everyone. These measures should be implemented to make dialysis units safer and minimize the significant HCV burden in the vulnerable group.

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