



Prevalence of Hepatitis C Infection among Hemodialysis Patients in Karbala

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Abstract

Liver diseases associated with the hepatitis C virus (HCV) significantly contribute to mortality and morbidity in patients with end-stage renal disease undergoing dialysis. HCV infection may result in acute or chronic hepatitis, cirrhosis, and/or hepatocellular cancer. The incidence of hepatitis infections in the dialysis units of Imam Hussein City in Karbala has significantly increased from 2021 to 2023. **Aim:** Determine the HCV infection burden in hemodialysis patients in Imam Hussein Medical City from 2021-2023 and review the main risk factors associated with HCV infection in those patients. **Method:** Analytical cross-section study in hemodialysis units (Adel Al-Sabbah and Habeeb bin Mudhaher Al-Asdi centers) in Imam Hussein Medical City, Karbala, Iraq, from 2021 to 2023. These centers offer hemodialysis health services for residents of Karbala. **Result:** The demographic attributes of 122 hemodialysis patients, both with and without hepatitis C infection, at Imam Hussein Medical City were examined. The prevalence of hepatitis C among patients on dialysis was (10.37%).

A significant difference was observed in the occupation distribution between the two groups. Self-employed individuals were more likely to have Hepatitis C infection compared to other occupational groups. The study shows that dialysis in other centers, surgical operations, blood transfusion, and duration of dialysis are statistically significant risk factors for HCV infection. **Conclusions:** HCV transmission in the hemodialysis unit is multifactorial. Dialysis in other centers, surgical operations, blood transfusion, and duration of dialysis are risk factors for HCV infection.

Introduction:

The primary renal replacement treatment for people with end-stage kidney disease is hemodialysis (HD). Patients with renal failure are at significant risk of getting blood-borne infections like HBV and HCV from this treatment strategy [1].

Hepatitis C virus (HCV) infection is an important cause of morbidity and mortality among HD patients and causes problems in managing patients in renal dialysis units [2]. It is the major cause of chronic liver disease and can lead to cirrhosis and hepatocellular carcinoma. About 75% - 85% of acute HCV infections slowly progress to chronic infection, and 10% -20% of those chronic infections are at risk of developing liver cirrhosis within 20-30 years and of those with cirrhosis 1-5% per year will develop hepatocellular carcinoma [3].

Furthermore, HCV is regarded as a global health issue due to its transmission via interfamilial contact, intravenous drug use, blood transfusions, and contamination during medical operations [4]

The prevalence of HCV infection among HD patients varies among the countries, ranging from 2.9% to 68%, with greater rates observed in developing nations compared to Western countries [5].

Rationale:

The transmission of HCV in hemodialysis settings is a significant issue in developing nations, with the incidence rate rising in dialysis centers from 2021 to 2023. This study was done to ascertain the reasons and situations that contributed to this growth.

Aims:

Determine the HCV infection burden in hemodialysis patients in Imam Hussein Medical City from 2021-2023 and review the main risk factors associated with HCV infection in those patients.

Methodology:

Study design: analytic cross-section study

Study area: Hemodialysis units (Adel Al-Sabbah and Habeeb bin Mudhaher Al-Asdi centers) in Imam Hussein Medical City, Karbala, Iraq, from 2021 to 2023. These centers offer hemodialysis health services for residents of Karbala and patients referred from other districts as emergency cases.

Study population: The study subjects included all hemodialysis patients admitted to Adel Al-Sabbah Center in Imam Hussein Medical City from January 1, 2021, to December 31, 2023. The dialysis center accommodates 588 patients, who are distributed across various shifts throughout the day.

Inclusion criteria:

All patients on regular hemodialysis with positive HCV antibodies and a sample of patients on regular hemodialysis with negative HCV antibodies were selected randomly. The first patient was chosen according to a random digit generated by computer software, and the rest of the patients were selected as a control group of every other 3 patients.

Exclusion criteria:

Seven patients were infected with the hepatitis B virus, one patient was co-infected with hepatitis B and C, and one patient was infected with the human immunodeficiency virus.

Sample size:

convenience sample. At Imam Hussein Medical City, a study was conducted involving sixty-one hemodialysis patients with hepatitis C infection and sixty-one hemodialysis patients without hepatitis C infection.

Operational definitions:

Prevalence is defined as the number of affected persons present in the population at a specific time divided by the number of persons in the population at that time [6].

Hepatitis C Infection is defined as the presence of HCV-RNA and anti-HCV antibodies in serum or plasma [3].

Hemodialysis: is a life-sustaining treatment for patients with kidney failure and severe acute kidney injury. It involves the creation and maintenance of vascular access, generation of water suitable for making dialysate, circulation of blood through an extracorporeal circuit, and administration of medications such as heparin, and intravenous iron [7].

Data collection tools:

Patients on regular hemodialysis who were admitted between January 2021 and December 2023 at Habeb bin Mudhaher Al-asdi dialysis center were screened for HCV infection using a third-generation enzyme-linked immunosorbent assay (ELISA) to detect HCV antibodies. HCV-RNA PCR further evaluated those who tested positive for HCV antibodies. The initial monthly screening and follow-up divided the study population into two groups: patients with negative HCV antibodies throughout the study (selected randomly) and patients who tested positive for HCV antibodies before dialysis.

Face-to-face interviews were conducted with those patients, and demographic characteristics were collected: age, gender, occupation, residence, history of chronic diseases, surgical and dental interventions, blood transfusions, and other risk factors.

Statistical analysis:

All participant responses to the questionnaire were put into a data sheet and given a serial identity number. To prevent errors, several entries were used. The statistical package for the social sciences programmer, version 28.0 (IBM, SPSS, Chicago, Illinois, USA), and the real statistics resource software for Mac (Release 7.2) of the resource pack for Excel 2016, were used to create the data analysis for this project. copyright (2013 – 2020) (2013 – 2020)

Descriptive statistics were performed on each group's participants' data. Values were N (%) for categorical variables. The distribution of the data was checked for normality. Inferential data analysis Chi-square was used to measure the association between categorical variables. Fisher's exact test was used as an alternative when the chi-square was inapplicable.

Ethical consideration:

Ethical approval for this study was obtained from the training and human development center in Karbala and from the Medical City. The investigators visited the hemodialysis centers in Medical City, explained the nature of the study, and obtained verbal consent from study subjects who agreed to participate in the study.

Results:

Table (1) Demographics characteristics and comorbidity of hepatitis C infection among hemodialysis patients' group in Imam Hussein Medical City

Variable	Groups	Frequency	Percentage%
Age group	30-40	9	14.8
	41-50	15	24.6
	51-60	21	34.4
	61-70	16	26.2
Sex	Male	38	62.3
	Female	23	37.3
Residences	City Center	27	44.3
	Hussaini	9	14.8
	Hindia	11	18
	Others	14	23
Occupation	self-employees	17	27.9
	Retired	8	13.1
	Housewife	18	29.5
	officer	18	29.5
Hypertension	Yes	51	83.6
	No	10	16.4
Diabetes mellitus	Yes	38	62.3
	No	23	37.7
Other disease	Yes	16	26.2
	No	45	73.8

Figure (2) Shift work and Types of vascular access in Imam Hussein Medical City

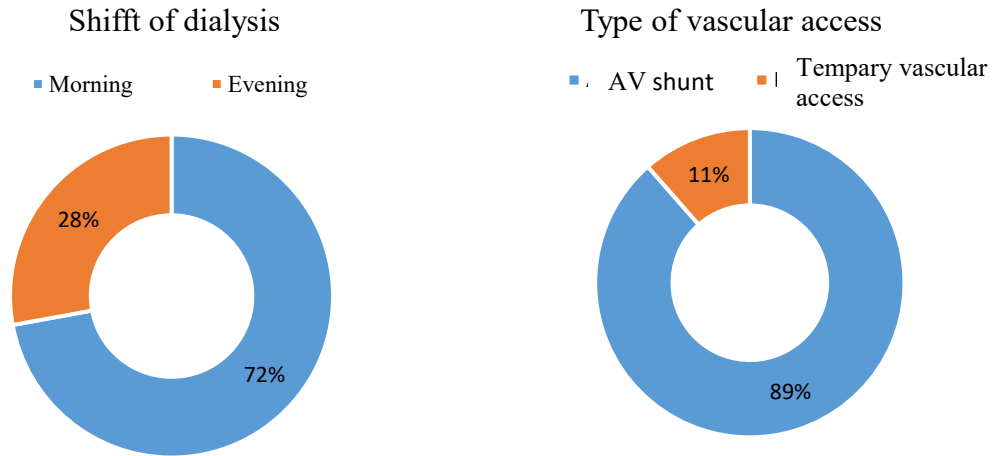


Table (3) Frequency of dialysis sessions in another center:

Variable	Groups	N	%
Was the dialysis done in another center	Yes	31	50.8
	No	30	49.2
Time	≤ one year	5	16.1
	> one years	26	83.9
Number of dialysis	1-4	23	74.2
	More than 4	8	25.8

Table (4) Frequency of potential transmission of hepatitis C infection through surgical interventions, dental procedures, plastic surgery, or blood transfusions

Variable	Groups	N	%
Was the dental examination or surgery performed?	Yes	25	41
	No	36	59
Dental interference time	≤ one year	8	32
	> one years	17	68
Number of dental surgeries	One	15	60
	> one	10	40
Was the surgical / plastic operation	Yes	38	62.3
	No	23	37.7
Date of surgical / plastic operation	≤ one year	4	10.5
	> one year	34	89.5
Number of surgical / plastic operation	One	24	63.2
	> one	14	36.8
Was the patient a recipient of blood for any reason	Yes	54	88.5
	No	8	11.5
Time of transfusion	≤ one year	18	34
	> one year	35	66
Time of transfusions	1-4	37	69.8
	More than 4	16	30.2

Table (5) History of hepatitis C infection among hemodialysis patients' group in Imam Hussein Medical City

Variable	Groups	N	%
History of infected	≤ one year	29	47.5
	> one year	32	52.5

Table (6): Comparison of risk factors in patients with and without HCV infection

Variable	Groups	Hepatitis C N (%)	No hepatitis C N (%)	P value
Hypertension	Yes	51(83.6%)	47(77%)	0.362[NS]
	No	10(16.4%)	14(23%)	
Diabetes mellitus	Yes	23(37.7%)	25(41%)	0.711[NS]
	No	38(62.3%)	36(59%)	
Duration of dialysis (years)	1-2	12(19.7%)	30(49.2%)	0.041[S]
	3-4	23(37.7%)	15(24.6%)	
	More than 4	26(42.6%)	16(26.2%)	
Shift of dialysis	Morning	44(72.1%)	49(81.7%)	0.214[NS]
	Evening	17(27.9%)	11(18.3%)	
Type of vascular access	Temporary vascular access	7(11.5%)	0(0%)	----
	AV shunt	54(88.5%)	61(100%)	
Dialysis is done in another center	Yes	31(50.8%)	14(23%)	0.001[S]
	No	30(49.2%)	47(77%)	
Time	≤ one year	5(8.19%)	6(9.8%)	0.137[NS]
	> one years	26(42.6%)	8(13.1%)	
Number of dialysis	1-4	10(32.3%)	7(50%)	0.256[NS]
	More than 4	21(67.7%)	7(50%)	
dental examination or surgery performed?	Yes	25(41%)	12(19.7%)	0.010[S]
	No	36(59%)	49(80.3%)	
Dental interference date	≤ one year	8(32%)	5(41.7%)	0.961[NS]
	> one years	17(68%)	7(58.3%)	
Number of dental surgeries	One	15(60%)	10(83.3%)	0.201[NS]
	> one	10(40%)	2(16.7%)	
Surgical /plastic operation	Yes	38(62.3%)	19(31.1%)	0.001[S]
	No	23(37.7%)	42(68.9%)	
Time of surgical / plastic	≤ one year	4(10.5%)	3(15.8%)	0.459[NS]
	> one year	34(89.5%)	16(84.2%)	
Number of surgical or plastic	One	24(63.2%)	13(68.4%)	0.609[NS]
	> one	14(36.8%)	6(31.6%)	
Blood transmission	Yes	53(86.9%)	41(67.2%)	0.010[S]
	No	8(13.1%)	20(32.8%)	
Date of blood transfusion	≤ one year	18(34%)	27(65.9%)	0.139[NS]
	> one year	35(66%)	14(34.1%)	
Number of blood transfusion	1-4	37(69.8%)	17(41.5%)	0.34[NS]
	More than 4	16(30.2%)	24(58.5%)	

Discussion:

This study revealed that the frequency rate of HCV infection among HD patients was 10.37%, this rate remarkably higher than that of the general population in Iraq 0.4% by [8]. It's more than that reported among HD patients in Holy Karbala, which were 6.6% [9]. Also, this rate is higher than the rate reported by a study done in Baghdad by [10] in Iraqi Renal Transplant Center, which was 7.1%. This rate may

be due to underlying impaired cellular immunity, exposure to prolonged vascular access, contaminated equipment, and medical staff handling. In addition, HD patients require a blood transfusion, frequent hospitalization, and surgery, which increases the opportunity for getting a nosocomial infection [2].

Nonetheless, it was lower than the results reported for patients undergoing hemodialysis in Iraq, which was 20% overall and particularly 42.6% in southern Iraq [1]. Various studies indicated differing rates, such as 26% at Baghdad Teaching Hospital [11], 21.2% at AL-Diwaniyah Teaching Hospital [12], 36% in AL-Muthanna City [13], and 21.30% at Imam Hussien Medical City, Holy Karbala [14].

The total frequency of HCV infection among patients receiving HD in the Middle East is 25.3%, with varying rates between countries: 31.1% in Libya, 51% in Egypt, 12% in Iran, and 7.9% in Turkey [1].

This study revealed a significant association between HCV infection and both residency and occupation, indicating that self-employed individuals had a greater propensity for HCV infection. However, the reasons for this remain unclear. Moreover, no substantial differences were observed in the distribution of additional demographic attributes, including age and gender. This discovery corresponds with the study by [1], which similarly identified no correlation between gender and the prevalence of HCV infection. Nonetheless, it contradicts another facet of the same study, which found that HCV-infected individuals were older than their non-infected peers. Conversely, a study by [11] demonstrated no correlation between HCV prevalence and demographic factors.

Our study reveals no significant differences between chronic diseases (hypertension and diabetes mellitus) and the prevalence of HCV infection. This finding matches research conducted at Baghdad Teaching Hospital by [11], which also indicated no significant differences in HCV infection prevalence concerning hypertension. However, that study reported a high frequency of HCV infection among diabetes mellitus patients.

Our findings may be attributed to varying modes of transmission, distinct pathophysiological mechanisms, demographic factors, risk populations, epidemiological differences, and disparities in screening and awareness related to these conditions.

A recent study identifies dialysis conducted at external centers and surgical procedures as the most significant risk factors for HCV infection prevalence ($p < 0.001$). This finding aligns with the research of Adel Amber et al. (2020) and Sinjari & Bakr (2018), which established a positive significant correlation between multicenter and single-center dialysis. Additionally, it corroborates studies from Khuzestan province, southwest Iran, by [15], potentially linked to varying levels of disinfection of hemodialysis machines, instruments, and environmental surfaces to mitigate nosocomial transmission [16]. Surgical procedures are significantly associated with HCV infection ($p < 0.001$); this finding aligns with the study by Sinjari and Bakr (2018), which identifies unsafe medical practices and instruments as well-established risk factors for HCV infection. Additionally, this result corroborates the studies conducted by [2,11]

Blood transfusion in this study is identified as a risk factor for HCV infection ($p < 0.010$), our findings correlate with those of [2,10], who also recognized blood transfusion as a significant contributor to HCV transmission, potentially attributable to inadequate blood screening protocols. Other research [1,11] indicated that no significant correlation was identified.

A recent study demonstrates a significant association between HCV infection and the duration of dialysis ($p < 0.041$), corroborating findings by [1,11, 17 -18] This suggests that nosocomial transmission is linked to dialysis, as an extended duration increases the risk of infection acquisition. Our findings contradict the study by [2], which indicated that the duration of dialysis was insignificant.

Limitation of study:

Testing for HCV depends on a third-generation ELISA to detect anti-HCV antibodies and then confirmed by PCR for HCV-RNA, partial immunosuppression in patients undergoing hemodialysis in poor antibody response to HCV infection underestimates serological screening of HCV.

Conclusion:

HCV transmission in the hemodialysis unit is multifactorial. The study shows that dialysis in other centers, surgical operations, type of vascular access, blood transfusion, and duration of dialysis are statistically significant risk factors for HCV infection. Dialysis at different locations: Patients who receive dialysis at different centers may be more exposed to different infection control procedures, which could raise their risk of spreading HCV. Surgical procedures, particularly in environments lacking sufficient sterilizing processes, may serve as a possible source of HCV exposure via infected tools.

Blood transfusion: receiving blood transfusions has been a risk factor for HCV infection, especially in instances when blood was insufficiently tested (e.g., in areas or times with inadequate screening methods). The duration of dialysis correlates with an elevated cumulative risk of HCV infection, attributable to prolonged interactions with the healthcare system, shared equipment, or other potential transmission routes.

Recommendations:

1. t Health education program and training of patients, their families, and all hemodialysis staff about HCV and methods of transmission and prevention.
2. Adherence all hemodialysis patients about dialysis in a single center and not in a multicenter to decrease the risk of acquiring HCV infection.
3. Measuring ought to be taken to maintain a strategic distance from blood transfusion as much as possible by replacing blood transfusion with recombinant erythropoietin in treating anemic patients and ensuring the safety of the transfused blood units.
4. Surveillance for detection of the virus by screening all patients before dialysis.
5. Encourage the patients to receive antiviral treatment, which showed high efficacy, achieving sustained viral response.

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