
Hepatitis C Virus Infection in Zliten Dialysis Centre, Libya

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Abstract:

Hepatitis C virus is a major health problem in haemodialysis units worldwide. The present study revealed that the prevalence of hepatitis C virus (HCV) infection in Zliten dialysis center is 62%. The incidence of HCV sero-conversion in Zliten was 51.3% in the years 2002-2004. The most important risk factors contributing to this high prevalence rate could be the failure to adhere to the universal precautions, prolonged duration of dialysis and dialysis in other dialysis centers.

The prevalence of HCV in this dialysis centre is high and reflects the need for a well-designed infection control policy. The control program should emphasize that dialysis therapy must be delivered using universal precautions to avoid contact with blood and blood products. Intensive efforts to prevent cross-infection should, therefore, be directed towards sterilization of dialysis consoles, liberal use of disposable materials and a greater awareness of medical and paramedical personnel along a supplementary midday sterilization of dialysis monitors and personal disposable dressing kits.

Introduction:

Hepatitis C Virus (HCV), which, before its identification was labeled "non – A, non-B hepatitis" is a linear, single-stranded, positive sense, 9600-nucleotide RNA virus, the genome of which is similar in organization to flaviviruses and pestiviruses; HCV is the only member of the genus Hepacivirus in the family Flaviviridae. At least six distinct genotypes, as well as subtypes within

genotypes, of HCV have been identified by nucleotide sequencing.¹

It took many years before communities realized the importance of the hepatitis C epidemic. Chronic HCV infection is estimated to affect 170 million individuals world-wide,² (Fig. 1). These individuals are at risk of developing hepatologic and nonhepatologic manifestations.

Transaminite (1970)	◆ Not a disease
Non A, non B hepatitis (1980)	◆ Mild disease
Hepatitis C (1990)	◆ Major public health issue

Fig 1: Perception of HCV epidemic.

Hepatitis C can cause liver cirrhosis, digestive hemorrhage, liver failure and liver cancer. Together with alcoholic cirrhosis, hepatitis C is the major reason for liver transplant in Europe and in the United States. Cumulative evidence strongly suggests that the increase of mortality due to hepatocellular carcinoma in most western countries is due to hepatitis C infections.³⁻⁶

Transmission of HCV is mainly related to contact with blood and blood products (Table 1). Blood transfusion and the use of shared,

non-sterilized needles and syringes have been the main causes of the spread of HCV. With routine blood screening for HCV antibody (in 1991 in most countries), transfusion related hepatitis C has virtually disappeared.³ At present, injection drug use is the most common risk factor. However, many other patients acquire HCV without any known exposure to blood or to drug injection. A recent survey suggests that patients with high-risk sexual behavior are at higher risk perhaps in association with herpes simplex 2 infection.

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Table 1: Risk factors for HCV infection

Major high-risk groups:	
	- Blood transfusion (before 1991).
	- Frequent exposure to blood products: hemophilia; transplants; hemodialysis; chronic renal failure; gamma globulins; cancer chemotherapy.
	- Injection drug use.
	- Health care worker with needle-stick accidents.
	- Infants born to HCV infected mothers, particularly those co-infected with HIV.
Moderate risk groups:	
	- High-risk sexual behavior, multiple partners, history of herpes simplex 2 infection.
	- Cocaine use, with sharing of intranasal administration equipment.

HCV infection has become one of the principal infectious problems in patients on haemodialysis where as many as 5% to 78% are infected.¹¹⁻¹⁸ It has become a major problem in many dialysis centers with a prevalence rate of 5% in North Europe, 15-20% in France, 10-20% in USA, 42.8% in Saudi Arabia, 24.2% in Jordan, 34.4% in Sudan and 29.6% in Tunisia.¹¹⁻¹⁸ The prevalence rate of HCV infection among dialysis population in Libya is 20.5% in Tripoli, 42% in Sebha, 78% in Benghazi and 62% in Zliten.¹⁴⁻¹⁵

HCV infection affects the survival of chronic dialysis patients as well as renal transplant recipients.^{9,10,19}

The mechanism responsible for HCV transmission to haemodialysis patients is not entirely clear. Transfusion with blood non-screened for HCV was strongly involved in the past. Prospective studies have despite the use of blood screened for HCV, cases of HCV infection still occur among haemodialysis patients indicating that mechanisms other than blood transfusion may operate.²⁰ Cumulative evidence suggests that nosocomial transmission within the haemodialysis unit plays a key role in demonstrate that HCV transmission to these patients.²¹

Passage of HCV through dialysis membrane is theoretically not possible since the estimated size of the virus is much larger than the pore size of membranes.²²

Thus transmission of HCV is probably not associated with the haemodialysis procedure itself if it is performed with strict application of universal precaution, however, disruption of the membrane integrity could permit the passage of the virus to the blood compartment.²³

This study was conducted to investigate the incidence and risk factors for hepatitis C sero-

conversion in Zliten haemodialysis Center, in Libya.

Subjects and Methods:

This study was carried out in the Kidney Division at Zliten Teaching Hospital in the period from 1st October 2002 to 30th September 2005. The first phase of the study consisted of retrospective analysis of incidence of HCV sero-conversion in 37 patients [group A] admitted for regular haemodialysis therapy in the period from 1st October 2002 to 30th September 2004 and assessment of potential risk factors such as blood transfusion, dialysis access, dialysis in other centers duration of dialysis treatment association with HBsAg positive that could operate in HCV transmission.

The second phase consisted of the incidence of HCV sero-conversion in 27 patients [group B] admitted into chronic dialysis programme as from 1st October 2004 to 30th September 2005. The patients were divided into two groups.

Group 1: complete isolation of 13 patients, dialyzed on sero-negative machines by separated dialysis staff in a separated dialysis rooms implementing the strict universal infection control policy. (Table 2; 3).

Group 2: Incomplete isolation of 14 patients, dialyzed on sero-negative machines by separate dialysis staff but in room with sero-positive patients.

Serum samples were collected from patients and tested in the same day by enzyme linked immune-sorbent assay (ELISA) kits every 3 months. Serum samples were collected from the staff working in the dialysis unit every six months and tested in the same day.²⁶⁻²⁸

Collected data were subjected for analysis using chi-square test, testing table 2 by 2. A P-value of less than 0.05 was considered significant.

Table 2: Summary of universal precautions.

- Specimens, including blood, blood products, and body fluids, obtained from all patients should be considered hazardous and potentially infected with transmissible agents.
- Hand washing should be performed before and after patient contact, after removing gloves, and immediately if hands are grossly contaminated with blood.
- Gloves should be worn when hands are likely to come in contact with blood or body fluids.
- Gowns, protective eye wear and masks should be worn when splashing, splattering, or aerolization of blood or body fluids is likely to occur.
- Sharp objects ("sharps") should be handled with great care and disposed of in impervious receptacles.
- Needles should never be manipulated, bent, broken or recapped.
- Blood spills should be handled by initial absorption of spill with disposable towels, cleaning area with soap and water, followed by disinfecting area with 1:10 solution of household bleach.
- Contaminated reusable equipment should be decontaminated using heat sterilization or, when heat is impractical; using a mycobacterial cleansers.
- Pocket masks or mechanical ventilation devices should be available in areas where cardiopulmonary resuscitation procedures are likely.
- Health care workers with open lesions or weeping dermatitis should avoid direct patient contact and should not handle contaminated equipment.
- Private rooms are not required for routine care; select circumstances, however, such as the presence of concomitant transmissible opportunistic enteric, or contact isolation.

Table 3: Universal precautions in dialysis centers.

- Screening of all dialysis patients for HBV, HCV, and HIV .
- Vaccination of all workers and patients against HBV.
- Minimize blood transfusion by the use of erythropoietin.
- Dialyze HBsAg-positive and HCV-positive patients in a separate room using separate machines, equipment, instruments, and supplies.
- Staff members caring for HBsAg-positive patients should not care for negative patients.
- Wear disposable gloves when caring or touching the patient or equipment at the dialysis station, and remove gloves and wash hands between each patient and station.
- Non-disposable items that cannot be cleaned, and disinfected like adhesive tape, blood pressure cuffs should be dedicated for use only on a single patient.
- Unusual medication (including multiple dose vials) or supplies (syringes, alcohol swabs) taken to the patient station should be used only for that patient and should not be returned to a common clean area or use on other patients.
- Do not use common medication carts to deliver medications to patients.
- Do not carry vials, syringes, alcohol swabs, or supplies on pockets.
- Do not handle and store medications or clean supplies in the same or an adjacent area to where used equipment or blood samples are handled.
- Use external venous and arterial pressure transducer filters for each patient to prevent blood contamination of dialysis machine pressure monitors.
- Clean and disinfect the dialysis station (chairs, beds, tables, machines) between patient and isolation of the patient or dialysis machine which is ever possible.

Results:

The first phase retrospective study of 37 patients [group A] that had entered dialysis treatment before implementation of the strict universal infection control policy showed that 19 patients (5.13%) became sero-positive.

The second phase prospective study of 27 patients admitted for chronic dialysis therapy showed that the incidence of HCV sero-conversion was zero in its both subgroups.

Table 4 shows that 27 patients out of 37 patients, received blood transfusion during the first phase of study, only 13 patients (14.1%) became HCV sero-positive. Chi-square testing revealed that the result was statistically insignificant indicating that other factors, rather than blood transfusion might have been responsible for HCV sero-conversion.

Table 4: Effect blood of transfusion on HCV sero-conversion.

	HCV sero-conversion	No sero-conversion	Total
Received blood transfusion	13	14	27
No blood transfusion	6	4	10
Total	19	18	37

Group A comprised 37 patients, 33 patients with temporary vascular accesses and only four with arteriovenous fistula. Seventeen patients, (51.5%) out of 33 patients, with temporary accesses became HCV sero-positive in contrast

to 2 patients of out of four- with arteriovenous fistula (Table 5).

In two phase study, 24 patients, out of 27, had started dialysis with temporary access, with no HCV sero-conversion by the end of study.

Table 5: Dialysis with temporary vascular access.

	HCV sero-conversion	No sero-conversion	Total
Temporary vascular access	17	16	33
Arteriovenous fistula	2	2	4
Total	19	18	37

Table 6 shows that, during the first phase of this study, 20 patients had dialysis in patients other dialysis centers, 16 patients became HCV sero-positive, giving a statistically significant difference ($P < 0.001$).

During phase two (prospective study) a patient had dialysis in other centers, with no HCV sero-conversion following introduction of infection control policy.

Table 6: Effect of dialysis in another dialysis centers on HCV sero-conversion.

	HCV sero-conversion	No sero-conversion	Total
Dialysis in other centers	16	4	20
No dialysis in elsewhere	3	14	17
Total	19	18	37

In the initial retrospective phase of study, 24 patients out of 37 patients, had dialysis for ≥ 6 months, 18 patients became HCV sero-positive by the end of the study, in contrast to one patient out of six who received dialysis for less than six months ($P < 0.001$). During the phase two prospective study following introduction of infection control policy, 22 patients had dialysis for ≥ 6 months, with zero HCV sero-conversion.

Table 7: Relation of duration of on HCV sero-conversion.

Duration	HCV sero-conversion	No sero-conversion	Total
≥ 6 months	18	6	24
< 6 months	1	12	13
Total	19	18	37

Discussion:

Hepatitis C virus (HCV) is frequent in patients with end-stage renal disease. HCV infection affects the survival of chronic dialysis patients as well as renal transplant recipients.^{3,9} The present study has shown that the incidence of HCV sero-conversion, in Zliten dialysis center in 2002 to 2004, was very high (51.3%),

in comparison to other international centers.^{17,20,29}

However, following introduction of universal precaution policy, the incidence has fallen to zero% in 2004-2005. Blood transfusion had been an important risk factor, however, as a consequence of changes in the donor population resulting from self-exclusion of

individuals with risk factors for blood-borne viruses, the introduction of surrogate testing of blood donors (serum ALT $\geq$ twofold upper normal and HBsAg) and from markedly improved anti-HCV screening with second generation assays, transfusion associated HCV-infection became a rarity in this center. This policy has proved effective in several haemodialysis centers with concomitant fall in HCV-infection from 50% to 22%.¹⁷

The current study has shown a significant association of HCV sero-conversion with the length of time on hemodialysis and prolonged use of dialysis catheters ($P < 0.001$) raising the possibility of cross-infection in this center. This finding is consistent with reports from other haemodialysis centers where despite screening of blood for HCV and the wide use of erythropoietin to reduce blood transfusion requirements, some patients still became infected by HCV.^{16,17}

This could be counteracted by the introduction of a policy of early, and ideally elective pre-dialysis establishment of an arteriovenous fistula and planning early for kidney plantation.

In this study, 16 patients (80%) out of 20 patients who started dialysis in another center or received dialysis in other centers, became sero-positive in comparison to 3 patients (18%) out of 17 patients who started dialysis in our center who became sero-positive. This finding correlates with a previous study in the United Arab Emirates which showed that 42% of

patients starting dialysis in other centers or receiving sessions of dialysis during holidays became HCV sero-positive.²⁹

During the second phase prospective study, 9 patients had received dialysis in other centers with zero sero-conversion. This might be explained by the implementation of the policy of strict universal precaution in these centers. Thereby intensive efforts to prevent cross-infection is directed towards sterilization of dialysis consoles, liberal use of disposable materials and a greater awareness of medical and paramedical personnel along a supplementary midday sterilization of dialysis monitors and personal disposable dressing kits. Alpha interferon therapy has been shown to be effective in the treatment of chronic hepatitis C in patients with chronic renal failure. In addition to relief of symptoms, treatment might eradicate HCV and therapy eliminates infectivity and reduce on-going HCV-induced liver injury.^{3,30} Studies evaluating the use of gamma-globulin as pre- or post-exposure prophylaxis have had inconsistent results.

Ultimately, prevention of infection depends on the development of an effective vaccine. Work is currently underway to determine viral isolates capable of eliciting neutralizing antibodies. Other approaches, such as adoptive immune-therapy and the development of a T-lymphocyte-based HCV vaccine are on the drawing boards and hold considerable research interest.³

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