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ICT Function In Detecting Hepatitis C Antibodies In Haemodialysis Patients

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Abstract:

The usefulness of fast tests in the detection of HCV in haemodialysis patients was investigated. In this study, the Immuno Chromatography Test (ICT) was utilized to detect anti-HCV antibodies in haemodialysis patients. A total of 315 blood samples were taken from haemodialysis patients and analyzed for anti-HCV antibodies using ICT kits. This study was conducted in the Department of Microbiology at Narayan Medical College and Hospital (NMCH) in Sasaram, Bihar. A total of 315 blood samples were obtained from haemodialysis patients and analyzed for anti-HCV antibodies. Anti-HCV antibodies were detected in 18 (5.71%) individuals. Males had a higher prevalence of HCV than females. The most frequently impacted age group was 51- 60 years (9.25%), followed by 41-50 years (7.52%), and the unaffected age group was 10 to 20 years. This study demonstrates that an ideal quick ICT is a useful tool in emergency scenarios such as dialysis.

Keywords: HCV, ICT, Haemodialysis, Seroprevalence

INTRODUCTION

Hepatitis C virus is a tiny, enclosed, positive single-stranded RNA virus from the Flaviviridae family [1]. It is the most prevalent blood-borne infection and a primary cause of morbidity and mortality because it causes liver illnesses such as liver cirrhosis and hepatocellular carcinoma [2]. In 2023, the World Health Organization estimated that approximately 50 million people worldwide were living with chronic hepatitis C virus (HCV) infection, with approximately 1 million new infections occurring annually; this represents a significant decrease from previous years, indicating progress in combating the disease [3].

Hepatitis C virus infection is expected to contribute to over 400,000 deaths each year, with most people uninformed that they are infected, due to the serologic gap between HCV infection and the detection of particular antibodies. HCV infection varies from person to person, hence it is commonly referred to as the silent pandemic. In many resource constrained settings, HCV commonly goes undetected until a patient arrives to a health-care facility with cirrhosis or hepatocellular cancer [4].

HCV prevalence is continuously higher among haemodialysis patients than in the general population, and it has been linked to higher morbidity and mortality [5]. The high prevalence of HCV infection in haemodialysis patients has been attributed not only to the frequency of blood transfusions, but also to increasing years on dialysis, implying that HCV may be transmitted among patients in the dialysis unit, most likely as a result of poor infection control practices [6]. In a research from Hyderabad that included both renal transplant and renal failure patients on haemodialysis, the HCV prevalence reached 46% [7]. Another study from Hyderabad estimated the prevalence of HCV in haemodialysis patients to be 13.23% [8].

Several commercial methods for HCV diagnosis are available, including fast immunochromatographic technique (ICT), enzyme-linked immunosorbent test (ELISA), and polymerase chain reaction. Rapid ICTs are single-use assays that come with simple-to-use devices and usually do not require any additional reagents for the test kits. They are superior alternatives to other tests for large-scale HCV screening [9]. Rapid ICTs have lower sensitivity and specificity than ELISA, but they can diagnose, treat, and manage a specific disease more quickly in laboratories with limited infrastructure and testing capabilities. Many rapid HCV ICTs are commercially available and can provide results in 15-20 minutes. However, their performance and analytical sensitivity can vary [10]. The current study was conducted to assess the performance of an anti-HCV fast test on clinical samples collected at a tertiary care center in Sasaram, Bihar.

Materials and Methods:

Study design:

This observational study was conducted in the Department of Microbiology, Narayan Medical College and Hospital (NMCH), Sasaram, Rohtas District, Bihar. This study was conducted out from April 2022 to May 2025. Meril Diagnostics Pvt Ltd. in Vapi, Gujarat, India, supplied the ICT Kit. The kit was stored at the temperature specified by the kit manufacturers.

Collection of Blood Samples:

A total of 315 blood samples were taken from haemodialysis patients and analyzed for anti-HCV antibodies using ICT kits. Blood samples were collected aseptically using a disposable 5ml syringe in approved containers free of anticoagulants. The investigation eliminated specimens with Hepatitis B or co-infection. The study excluded specimens that were insufficient, haemolyzed, or had missing data.

Processing of Blood Samples:

The samples were centrifuged at 1500 RPM for 10 minutes to separate the serum, which was then transferred into a sterile fresh pre-labeled tube with a micropipette and stored at -20°C. Each material was subjected to a quick ICT test.

Rapid ICT Test Procedure:

1. The test kit was stored at room temperature.
2. Added three drops of assay buffer to the untested device and let it absorb completely.
3. Added one drop (40 ul) of serum to the sample window.
4. Added three drops of assay buffer to the sample window to remove any nonspecific binding.
5. Added two drops of gold conjugates. The gold conjugates bind precisely to the Fe regions of the patient antibodies trapped on the membrane.
6. Added 3 drops of assay buffer to properly wash the unbound gold conjugates.
7. Results were observed within 15-20 minutes.

Results:

A total of 315 blood samples from haemodialysis patients were tested for anti-HCV antibodies. Males made up 168 (53.33%) of the study population, while females made up 147 (46.66%). The maximum age range for both sexes was 41-50 years. This suggests that a sizable proportion of patients are middle-aged. The lowest incidence was seen in the youngest (10-20 years) and oldest (>80 years) age groups (Table 1). Anti-HCV antibodies were detected in 18 cases (5.71%). Patients are served using the ICT approach. The remaining 297 samples (94.28%) tested negative using the ICT technique (Table 2).

Table 1: Distribution of Haemodialysis Patients According to their Age Group and Gender.

Age Group (in Year)	Male		Female	
	No	Percentage (%)	No	Percentage (%)
10 - 20	2	1.19%	1	0.68%
21 - 30	7	4.16%	4	2.72%
31 - 40	35	20.83%	36	24.48%
41 - 50	48	28.57%	45	30.61%
51 - 60	31	18.45%	23	15.64%
61 - 70	29	17.26%	26	17.68%
71 - 80	14	8.33%	10	6.80%
Above 80	2	1.19%	2	1.36%
	Total = 168 (53.33%)		Total = 147 (46.66%)	

Distribution of Haemodialysis Patients According to their Age Group and Gender.

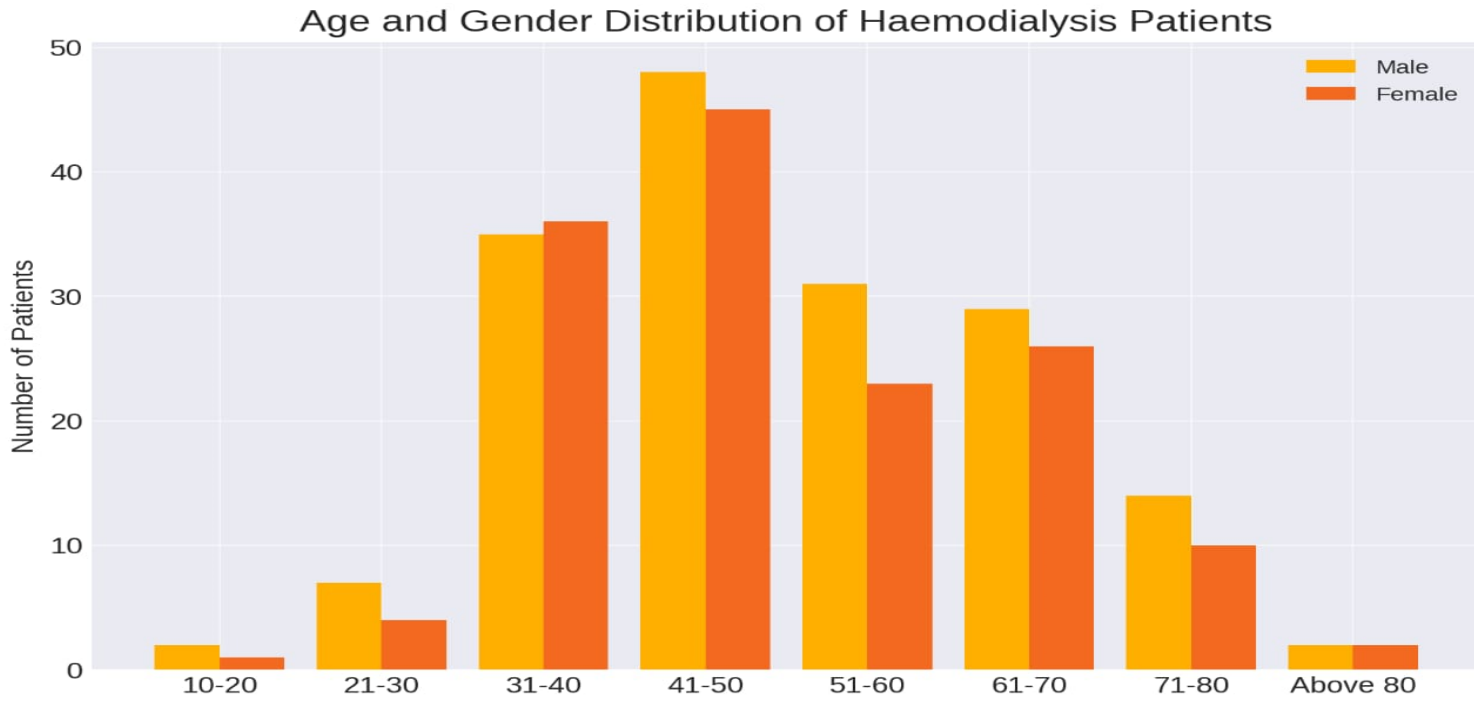
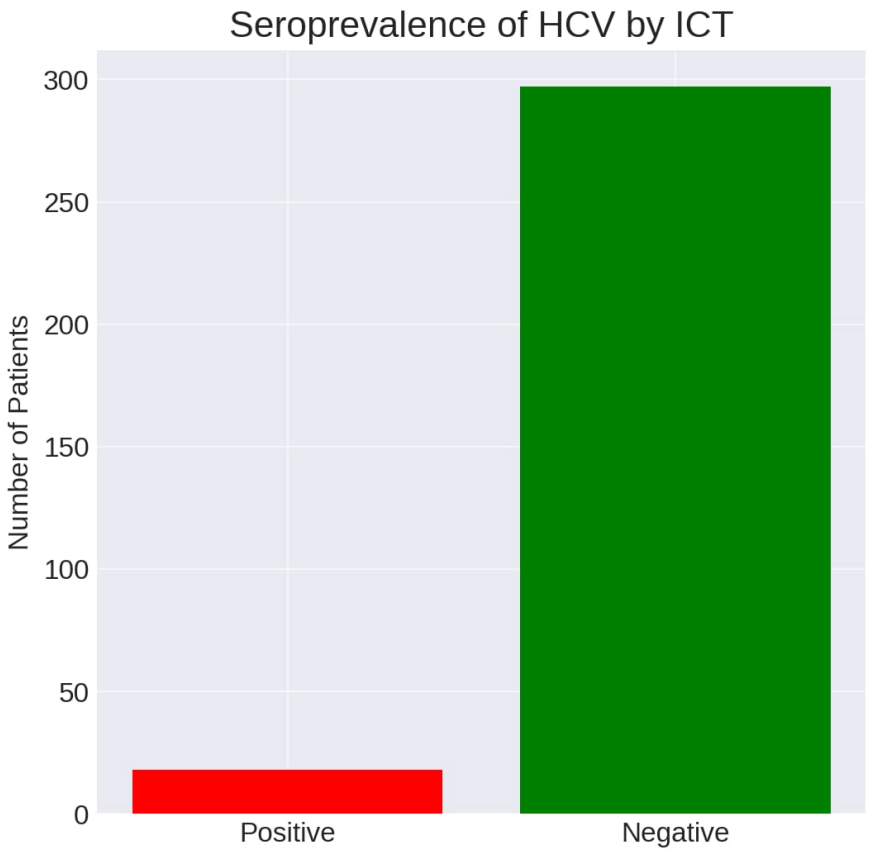


Table 2: Seroprevalence of HCV by Immunochromatography

Test	Total Patients	Total Positive	Percentage (%)	Total Negative	Percentage (%)
Rapid Anti HCV Test	315	18	5.71%	297	94.28%

Seroprevalence of HCV by Immunochromatography

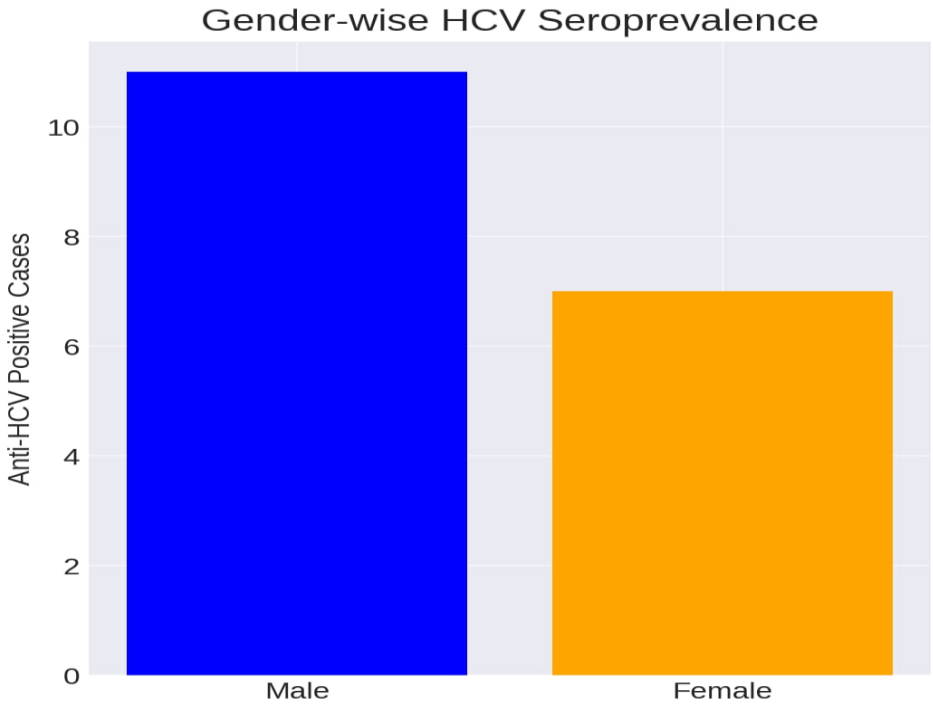


Out of 168 male patients tested for Anti-HCV antibodies, 11 (6.54%) patients were positive. Among female anti-HCV antibodies were positive in 7 (4.76%) samples out of the total 147 samples. Males had a higher prevalence of HCV compared to females (Table-3).

Table 3: Seroprevalence of HCV in Haemodialysis Patients According to Gender

Gender	Total Patients	Anti HCV Positive
Males	168	11 (6.54%)
Females	147	7 (4.76%)
Total	315	18 (5.71%)

Seroprevalence of HCV in Haemodialysis Patients According to Gender

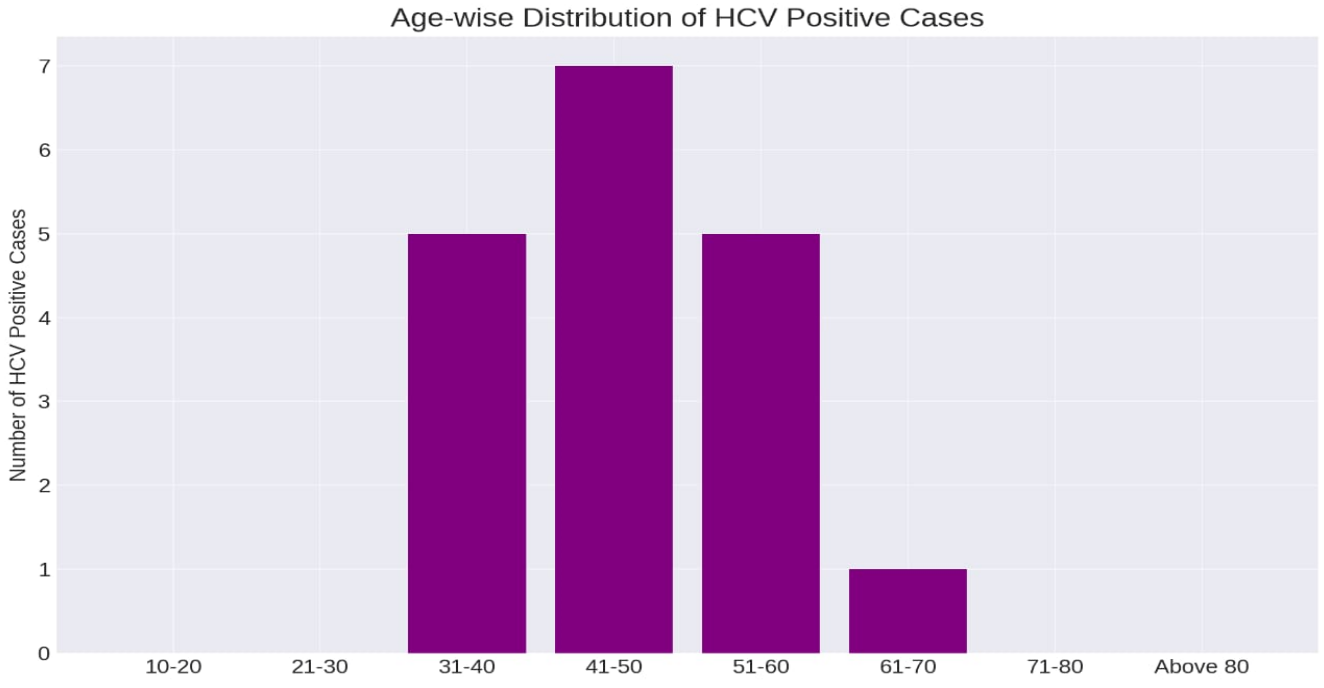


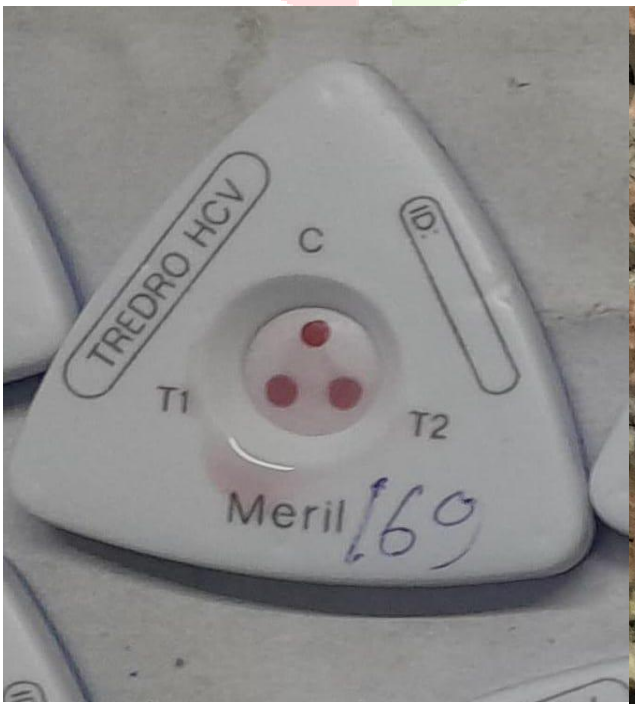
The current investigation found that individuals of advanced age were infected with hepatitis C viruses. The age distribution of the samples is presented in Table 4. The most typically impacted age group was 41 to 50 years old. Anti-HCV antibodies were negative for extreme ages, such as less than 20 and more than 80.

Table 4: Age Wise Distribution of HCV Positive by ICTs

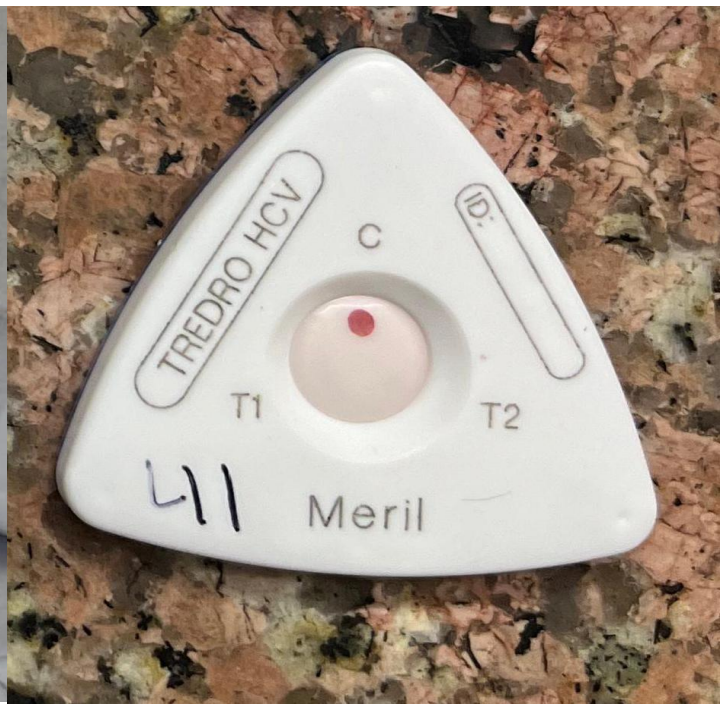
Age Group (in Years)	Total	HCV Positive
10 - 20	3	00 (0%)
21 - 30	11	00 (0%)
31 - 40	71	5 (7.04%)
41 - 50	93	7 (7.52%)
51 - 60	54	5 (9.25%)
61 - 70	55	1 (1.81%)
71 - 80	24	00 (0%)
Above 80	4	00 (0%)
	Total = 315	

Age Wise Distribution of HCV Positive by ICTs





Positive HCV Test



Negative HCV Test

Discussion:

Haemodialysis has been linked to an increased risk of blood-borne viral infection, but the prevalence varies by haemodialysis center, location, and nation. It is unclear if this diversity is related to the disease's overall prevalence in the community [11]. In this study, male patients aged 31 to 40 and 41 to 50 were the most likely to receive haemodialysis treatment, with 22.1% and 25.1%, respectively [12]. The current study found that 53.33% of haemodialysis patients are male and 46.66% are female. This study is consistent with the findings of Ahmed et al, who discovered that female kidneys have natural estrogen protection, whereas men have greater diabetes and high blood pressure, which contributes to this gender difference [13].

In the current study, anti-HCV antibodies were detected in 18 (5.71%) haemodialysis patients using ICT techniques (Table 2). This is consistent with Reddy et al. (2005), who found a 5.9% prevalence of HCV [14]. Almarie et al. (2005) found that the frequency was 6.1% [15]. The global prevalence of HCV ranges from 0.2 to 2%. In India, it is estimated that 1.8-2.5% of the population is infected with HCV [16]. The prevalence of HCV infection varies by location due to local socioeconomic conditions, which may influence transmission [17].

In this investigation, 11 (eleven) positive samples were male (Table 3). This is similar to the study of Khan et al., 201l, which found a higher frequency among males [18]. However, Hamissi et al. (2011) showed nearly comparable prevalence among males (8.8%) and females (10.5%) [19]. Mindolli and Salmani (2015) found that the seroprevalence of HCV was 2.8% in males and 2.5% in females [17]. In this study, the seroprevalence of HCV among males and females was 6.54% and 4.76%, respectively. The current finding differs from the findings by Mindolli and Salmani. In another study from the National Referral Hospital in Rwanda, ladies had a higher frequency than males [20]. This finding is not consistent with the current study.

The current study found that individuals of a higher age group were infected with the Hepatitis C virus. The most commonly impacted age group was 51-60 (9.25%), followed by 41-50 (7.52%), and the unaffected age group was 10-20 years. Mindoli and Salmani (2015) observed that the age range 40-49 years had the highest seroprevalence of HCV [17]. Another study, Rawat et al., (2023), found that the most prevalent afflicted age group was 21 to 40 years [21]. The findings of Rawat et al. were completely different from the current study. Tomar et al. (2021) discovered that different age groups had varying degrees of positivity, with the maximum number of positive instances finding between the ages of 50 and 65, and no positive cases identified above the age of 80 [22]. Tomar et al.'s findings were more or less identical to the current findings.

Since HCV vaccination is not currently available, identifying and isolating infected HCV patients may help to reduce its spread in dialysis facilities [23]. This study demonstrates that an ideal quick ICT is a useful tool in emergency scenarios such as dialysis. An additional test, if available, can detect HCV infection and helps to prevent nosocomial transmission of HCV infection in patients on haemodialysis with low antibody titre.

Conclusion:

The recent study found 5.71% HCV infection in haemodialysis patients. Infection was more likely to develop in older people (51-60 years) than in younger ones. According to this study, males were more likely to be infected than females. An ideal quick test is beneficial in time sensitive scenarios like as dialysis. HCV screening using a fast test is simpler, more timesaving, and can be conducted by any skilled health care practitioner at any time of need; it should undoubtedly be recommended as a screening test not only before haemodialysis but also for other emergency surgeries. As a result, we recommend that HCV screening should be performed first using a fast test, followed by a supplementary ELISA.

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