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BRIEF REPORT

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Hepatitis C in Hemodialysis Centers of Golestan Province, Northeast of Iran (2005)

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Background and Aims: **Nosocomial transmission of blood-borne pathogens is common in a dialysis setting. Hepatitis C virus (HCV) infection is a common problem that increases morbidity and mortality in hemodialysis patients. Blood transfusion and the duration of hemodialysis are the most important factors in HCV transmission. The aim of the study was to determine the incidence rate of HCV antibody in hemodialysis patients and its association with some factors.**

Methods: **In this descriptive-analytical study, HCV antibody was measured in 93 hemodialysis patients in all hospitals affiliated to Golestan University of Medical Sciences. Standard infection prevention measures in hospital settings and dialysis units were performed including serologic testing for HCV antibody for every new patient in the dialysis unit as well as routine testing of all patients. Negative cases of hepatitis C antibody (confirmed with ELISA 2nd generation and RIBA II Immunoblot methods) were selected and followed for 18 months. Some predisposing factors such as transfusion, duration of hemodialysis, medical procedures including surgery, transplantation, invasive odontology, suspicious sexual contact, diagnostic or therapeutic manipulation, tattooing, and IV drug abuse, were registered and considered. Other rare procedures like acupuncture, manicure and pedicure, blood brotherhood rituals, perinatal risk factors, common circumcision rituals and history of abortion were also considered. We used a tight control policy through the separation of the rooms within the unit, specific hemodialysis apparatus for suspicious patients and a separate staff caring for the patients. We maintained a low rate of staff turnover in dialysis units and tried to control hepatitis B viral infection.**

Results: **Marital status and living area were significantly related to HCV antibody positivity. It means that more HCV antibody positive cases were observed in married people in urban areas. History of tattooing, medical procedures including surgery, transplantation, invasive odontology and IV drug usage were not significantly related to HCV antibody status. During the follow up, three cases (4.3%) converted to positive. There was a relationship between numbers of hemodialysis per week and HCV antibody positivity (P<0.001).**

Conclusions: **Tight control of transmission routes and severe isolation policy in this study explains an almost ideal decrease in incidence rate of HCV antibody positivity. We suggest periodical screening programs (at least every 6 months) for blood samples that remain in the dialysis apparatus and all procedures used for hemodialysis in these specific patients to achieve a better infection control.**

Keywords: **Hemodialysis, HCV, Incidence, Prevalence**

Hepatitis C virus (HCV) was first identified in 1989 when it was found to be the primary causative agent of non-A, non-B hepatitis, associated with high rates of progressive, end-stage liver disease. Since then, appreciation of the significant worldwide health impact of HCV infection has grown [1-4]. HCV is mainly transmitted by blood transfusion. The introduction of routine screening for HCV in blood donors (1990) contributed significantly to the control of HCV transmission [4-7]. The prevalence of HCV antibody

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is high in patients undergoing hemodialysis [4, 8-13].

From the one hand, nosocomial transmission of blood-borne pathogens is common in a dialysis setting and on the other hand, hepatitis C prevalence has a broad spectrum [9]. Its prevalence is 5% in Western European countries and the United States and more than 20% in Mediterranean regions [14]. Blood transfusion and the duration of hemodialysis are the most important factors in HCV transmission [11, 12, 15]. Despite screening methods and use of erythropoietin for reducing blood transmission; these patients are at the risk of hepatitis C [2, 9, 15, 16]. This study evaluated the appearance of anti-HCV antibody in hemodialysis patients and its relationship with demographic data such as marital status, domiciles and mean weekly hemodialysis.

In this descriptive-analytical study which was conducted in 2005, all hemodialysis patients referred to the hospitals affiliated to Golestan University of Medical Sciences, northeast of Iran, who completed the written consents were recruited (93 hemodialysis). Standard infection prevention measures in hospital settings and dialysis units were performed including serologic testing for HCV antibody for every new patient in the dialysis unit as well as routine testing of all patients (e.g. CBC-Diff, Na, K, BUN and Cr). Negative cases of hepatitis C antibody (confirmed by ELISA 2nd generation and RIBA II Immunoblot methods) were selected and followed up for 18 months.

Some predisposing factors such as transfusion, duration of hemodialysis, medical procedures including surgery, transplantation, invasive odontology, suspicious sexual contact, diagnostic or therapeutic manipulation, tattooing, and IV drug abuse were registered and considered. Other rare procedures like acupuncture, manicure and pedicure, blood brotherhood rituals, perinatal risk factors, common circumcision rituals, and history of abortion were considered as items in the questionnaires completed for each case. We used a tight control policy through the separation of the rooms within the unit, specific hemodialysis apparatus for suspicious patients and a separate staff caring for the patients. We maintained a low rate of staff turnover in dialysis units and tried to control hepatitis B viral infection. SPSS was used for data analysis and non-parametric and chi-square tests were applied for further analysis.

Ninety-three patients with chronic renal failure enrolled in the study. Mean age was 47.37±15.91 years. In these 93 hemodialysis patients, male to female ratio was 1:1 (Table 1). Seventy cases (75.3%) were HCV antibody negative (at the beginning) and were followed for 18 months. The remaining 23 cases (24.7%) were HCV antibody positive at the beginning of the study (prevalence rate= 24.7%). Sex ratio, ethnicity and occupation were not significantly different between positive and negative cases (23 cases vs. 70 cases).

Table 1. Demographic data of hemodialysis patients in Golestan province, Iran.

Variables		Numbers	Percentage
Gender	Male	51	54.8
	Female	42	45.2
Marital status	Married	74	79.6
	Single	19	20.4
Living area	Urban	74	79.6
	Rural	19	20.4
Job	Household	35	37.63
	Office worker	7	7.52
	Student	1	1
	Jobless	15	16.12
	Retired	6	6.45
	Farmer	9	9.67
	Driver	4	4.3
	Worker	16	17.2
Ethnicity	Turkmen	15	16.1
	Fars	71	76.3
	Sistani	6	6.5
	Afghan	1	1.1

Marital status and living area were significantly related to HCV antibody positivity in these 93 cases ($P<0.05$). It means that more HCV antibody positive cases were observed in married persons in urban areas. History of tattooing, Medical procedures including surgery, transplantation, invasive odontology and IV drug abuse were not significantly related to HCV antibody status. There was no difference between the prevalence of HBs antigen and HBs antibody at the beginning and at the end of our study. HCV antibody negative cases complained about icter more than antibody positive cases ($P>0.05$).

History of transfusion was not significantly different between two groups, in other words, the number of blood units received by the patients was not statistically associated with the HCV-Ab prevalence; but the difference in mean weekly hemodialysis sessions was significant($P<0.05$) (Table 2). The mean duration of the hemodialysis (past history in years) was higher in HCV antibody positive cases ($P<0.05$) (Table 3). During the follow up period, among 70 negative cases, three of them (incidence rate=4.3%) turned to positive and were

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Table 2. Comparison of mean weekly hemodialysis in patients with chronic renal failure according to HCV antibody status.

HCV antibody status	Number of cases	Mean hemodialysis number/week	Standard deviation	P value
Positive	26	2.7	0.51	0.008
Negative	67	2.3	0.54	

Table 3. Comparison of hemodialysis duration (year) in patients with chronic renal failure according to HCV antibody status, Golestan province, Iran.

HCV antibody status	Number of cases	Mean duration of hemodialysis (yr)	Standard deviation	P value
Positive	26	9.91	5.72	0.001
Negative	67	1.9	2.3	

confirmed by Immunoblot method. HCV risk factors were not different among these three cases and others. To summarize, in comparison between 26 positive cases and 67 negative cases at the end of the study, there were significant differences in marital status, living area, duration of dialysis (year) and mean weekly hemodialysis sessions (P<0.05).

Approximately 200 million people are infected by HCV in the world. The main transmission route of HCV is parenteral [11, 17, 18]. However, nearly 10% of the cases are sporadic, without well-defined transmission routes [19]. Affected individuals are mostly patients who undergo multiple blood transfusions, intravenous and inhalant drug users, hemophiliacs, and hemodialysis patients [11, 19, 20]. Blood-borne hepatitis is one of the major problems in hemodialysis centers [11, 21, 22]. Several studies have been done to evaluate the routes of transmission and infection control in this population., In the year 1999, an increase in HCV antibody positive prevalence up to 39% and 19% were reported in the United States [11, 14, 23, 24] and in European countries [11], respectively.

In this study, HCV antibody prevalence was 24.7% (23 cases) at the beginning, and after 6-month follow-up, the incidence rate was 4.3%. Prevalence data for patients submitted to hemodialysis vary in different regions [12, 25-27]. In Japan, the prevalence of HCV antibody was 0.4-3.3% in the general population and 9.1-51.6% in hemodialysis patients [11, 24, 28]. In a study of four hemodialysis units in Venezuela, alarming prevalence and incidence rates of HCV were reported. The observed prevalence rate was 71% and the incidence rate was 38% [11], much higher than our results. Our results showed a prevalence rate of 24.7% but at the end of the follow-up, the incidence rate was much lower (4.3%) than other studies. Tight control of transmission routes and severe isolation policy in this study can explains this almost ideal decrease in the incidence rate of HCV antibody positivity.

Marriage and living in urban areas were the two important risk factors of HCV infection in the present study. Sexual transmission, unprotected sexual habits and some other risky behaviors are among the possible explanation for this higher rate. In this study no risky behaviors such as suspicious sexual contact, diagnostic or therapeutic manipulation, tattooing and IV drug abuse were registered. No other rare procedures such as acupuncture, manicure and pedicure, blood brotherhood rituals, perinatal risk factors, common circumcision rituals, and history of abortion were reported either. On the other hand, these rare procedures had no role in our population.

Number of transfusions was not significantly different between the two groups (HCV antibody positive cases versus negative ones), but the difference in average weekly hemodialysis sessions between two groups was significant (P<0.05).

The mean duration of hemodialysis was higher in HCV antibody positive cases, too (P<0.05). In reports of studies in Peru and Lyon, France, in 2005; it was shown that the number of transfusions and the duration of hemodialysis affect the infection rate in hemodialysis patients and the increase in the duration of hemodialysis (expressed as year) is associated with a higher prevalence in infection rate [9, 12]. But nowadays, because of new screening methods, the role of transfusion is much lower than the past. Maybe the environment itself acts as a factor in dissemination of the virus in patients in hemodialysis centers [11]. It has been shown that the duration of hemodialysis and frequent hemodialysis unit changes lead to more incidences of HCV infections [9, 29]. Despite all preventive methods used in our study, 3 new cases were detected at the end of investigation. Nosocomial transmission can explain this result. Although our results were lower than other studies in Tunisia, Peru and India [2, 9, 27]; the lower rate was expected due to the policy used in the study.

Some epidemiological investigations have suggested nosocomial transmission via medical and/or nursing staff [30]. It was considered in out control policy. New molecular and phylogenetic methods can detect the evidence for this route of transmission [2, 30]. Lower incidence rates were observed in the centers that separate patients who are positive for anti-HCV antibody and in those that use separate rooms for the reutilization of the

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dialyzers [11]. It is concerned that immunodeficiency in patients with chronic renal failure, blood transfusion and invasive procedures are the main factors in the dissemination of this agent [22]. Some interesting results remain unexplained in this study; for example the higher rate of icter in those who were HCV-Ab negative. We could not find any explanations for this, but it can suggest routine checking of Bilirubin, as well as liver function tests, in all hemodialysis patients. It has been shown that monthly testing of liver function test (LFT) besides antibody testing can identify the new cases more rapidly [31].

It can be concluded that when chronic hemodialysis patients require dialysis while hospitalized, their infection status should be reviewed, and no instrument, supplies, or medications should be shared among them. For example, in our study a periodical control of HBV was done and no new cases of HBV infection were reported. Tight control of transmission routes and severe isolation policy in this study explains an almost ideal decrease in incidence rate of HCV antibody positivity. We suggest periodical screening programs (at least every 6 months) and accurate tests such as PCR in blood samples that remain in the dialysis apparatus and all procedures used for hemodialysis in these specific patients to achieve a better infection control. They should include implementation of new methodologies and infrastructure improvement of the centers; these measures could help improve the quality of life in hemodialysis patients. As there is a high risk of indirect and direct transmission of infectious agents in chronic hemodialysis, the vigilant observation of guidelines on universal precaution and regular virologic testing are the cornerstones of the effective control of chronic hepatitis in the hemodialysis settings. More studies could be helpful to find the best methods for the implementation of preventive and control measures of infection in chronic renal patients.

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