Prevalence and Risk Factors of Hepatitis C among Maintenance Hemodialysis Patients at a Tertiary-Care Hospital in Coimbatore, India

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ABSTRACT

Background: Haemodialysis (HD) patients are at an increased risk of Hepatitis C virus (HCV) infection, which is significantly associated with increased morbidity and mortality. This study was conducted to determine the prevalence of HCV infection among patients who were on maintenance HD and its associated risk factors.

Methods: A total of 145 patients (102 males and 43 females) were included in the study. The medical records were reviewed for details regarding history, age, sex, duration of dialysis, dialyzer reuse, blood transfusions, number of dialysis centers and other biochemical data.

Results: Out of 145 patients 18 (12.4%) patients were found to be anti-HCV positive. The mean age of the HCV positive patients was 45.8 ± 13.9 years. There were 13 (72.2%) males in the HCV positive group and 89 (70.1%) males in the HCV negative group. The mean duration of the dialysis among HCV positive group was 36.6 ± 31.6 months, while it was 18.5 ± 21.2 months for HCV negative ones. The duration of dialysis was significantly longer in HCV positive patients (p = 0.002). Similarly, patients who had dialysis at more than one centre had a higher (55.56%) positivity, which was statistically significant (p = 0.001). Binary logistic regression analysis showed that the duration of dialysis and dialysis at more than one centre were the significant variables for increased positivity.

Conclusion: The patients on HD had 12.4% positivity for anti-HCV in our dialysis unit. Further, the present study demonstrated that the duration of haemodialysis and getting the dialysis done at more than one centre were the important risk factors for acquiring HCV infection in these patients.

Key Words: Maintenance haemodialysis; Hepatitis C; Duration of dialysis, Anti-HCV

INTRODUCTION

Hepatitis C virus (HCV) infection is prevalent among patients who undergo maintenance haemodialysis (HD) and is a particular concern because of the high risk for chronic liver disease, complications in renal transplantation and death in these patients [1]. The prevalence of this infection is known to vary widely in different regions of the world. In India, a very wide range of prevalence rates for HCV (4.3-45.2%) in the HD population have been reported [2-7].

A number of risk factors have been identified for HCV infection among the dialysis patients, which include cross infections from the sharing of dialysis machines and the dialysis equipment, the reprocessing of dialyzers and blood lines and the increased requirement of blood transfusions [8, 9]. Among this, dialytic age has been considered as a powerful predictor for the risk of the acquisition of the HCV infection. A significant association between the dialytic age and anti-HCV positivity has been reported in several studies [10, 11]. Similarly, it has been suggested that the HCV infection occurs among HD patients during repeated dialysis, but not through the equipment [12]. However, the situation differs in the developed countries, regarding the prevalence of HCV infection in dialysis patients. The disease in such countries is less prevalent due to many factors including socioeconomic factors, better infection control measures, the use of erythropoietin instead of blood transfusion to treat anaemia and the lower prevalence of the HCV infection among the general population [13].

As far as the literature conveys, the prevalence of HCV infection among the HD patients varies between countries and between the dialysis units within a single country. So far, studies have reported the prevalence of HCV infection in these patients in different regions including the central, western and the northern parts of the country. However, data from the southern part of India on the prevalence of HCV among the HD patients are scanty [6, 7]. Hence, the present study was undertaken to assess the occurrence of the HCV infection in patients on maintenance HD. Furthermore, we also evaluated the risk factors which could facilitate the development of an effective strategy to minimize HCV spread among these vulnerable patients.

MATERIALS AND METHODS

Patients: A total of 145 patients who were on maintenance HD for more than three months were included in the study. Of the 145 patients 102 were males and 43 were females, with a median age of 45 years and an age range of 24-72 years. The medical records were examined for details regarding the duration of HD, the frequency of dialysis, blood transfusions in the past one year, the number of dialysis centres which were visited and the reuse of the dialyzer. The causes of renal failure were diabetes, hypertension, chronic glomerulonephritis and other diseases. Patients with acute renal failure who underwent dialysis were excluded from the study. The Institutional Human Ethics Committee approved the study protocol and written informed consent was obtained from all the patients.
Haemodialysis Unit: The HD unit had two routine HD unit areas and one isolated area each for HCV positive and HBV positive patients. The routine HD area had eight machines in each area, the HCV positive area had three machines and the HBV positive area had two machines. All the patients underwent serological testing for HCV, HBV and HIV before initiating the dialysis. Patients who were negative for HCV before initiating the dialysis were dialyzed by using the routine dialysis machines and those who were HCV positive were dialyzed on dedicated machines in the isolated areas. Patients who were seroconverted during the haemodialysis treatment were shifted to the respective isolated area. None of the staff members in the dialysis unit had a history of blood transfusion, drug abuse, or a history of hepatitis B or C infection.

All the patients were essentially treated with three sessions of routine conventional bicarbonate HD each week (3 to 4 h/session) by using standard polysulfone (PS) membranes (Fresenius F-6, 40 mm thick of 1.32 m² surface area). A dialysate with a standard composition, with bicarbonate buffer was used in all the patients. The blood flow rate was 200 mL/min and the dialysate flow rate was 500 mL/min. The dose of the dialysis was individually adjusted to maintain a Kt/V which was >1.2. All the HD machines were chemically disinfected between each dialysis session. The dialyzers were reused in all the patients.

Specimen collection and Laboratory data: The samples of blood were collected from the patients by using vacutainers (BD, USA), they were centrifuged for 15 min at 2000 rpm and the serum was separated and stored at −20°C until analysis. The data regarding the liver function tests were recorded from the patients’ dialysis records and the data was maintained anonymously. The anti-HCV assay was performed by a enhanced chemiluminescence immunosassay (Ortho/ECi), by using the vitros reagent pack and the immunodiagnostic calibrator on the vitros ECI immunodiagnostic system. The Ortho/ECi anti-HCV assay is a two-step sandwich chemiluminescence assay for the qualitative detection of human antibodies in serum or plasma to various proteins of HCV, with a total incubation time of 45 min. The Ortho/ECi system uses a small sample volume (20 µl) for each determination. The results were calculated as a normalized signal relative to the cutoff value (signal/cutoff [S/C] ratio). The patient samples with a single S/C ratio of ≥1.00 were considered to be test positive. If the S/C ratio was <0.90, the sample was considered as negative. Samples with an S/C ratio of ≥0.90 and <1.00 were retested in duplicate, based on the manufacturer’s recommendations.

STATISTICAL ANALYSIS
The data analysis was performed by determining the frequencies and the percentages for the variables under study. The unpaired Students “t” test was used to compare the quantitative parameters between the anti-HCV negative and the anti-HCV positive group. The Chi-square test was used for the categorical data. A ‘p’ value which was <0.05 was considered to be statistically significant. Logistic regression analysis was done to determine the risk factors by taking anti HCV as a dependant variable. The statistical analysis was performed by using the statistical software, SPSS version 16.0.

RESULTS
The patients included in this study were divided into two groups, anti-HCV positive and anti-HCV negative. The demographic and the clinical characteristics of these patients are shown in (Table/Fig-1). Among the 145 patients on HD, 18 patients (12.4%) were found to be anti-HCV positive. There were 13 (72.2%) males in the HCV positive group and 89 (70.1%) males in the HCV negative group. Anti-HCV antibodies were present prior to the dialysis in only eight of the patients who were included in the study population. Ten (10) of them acquired the antibodies during the course of the study. The anti-HCV positivity was 8.6% in patients who underwent dialysis at one centre, whereas the patients who had dialysis at more than one centre had a higher positivity (56%).

A comparison between the two groups, the anti-HCV positive and the anti-HCV negative groups, is shown in (Table/Fig-2). The mean duration of the dialysis among the HCV positive patients was 36.67 ± 31.68 months, while in the HCV negative patients, it was 18.50 ± 21.29 months, which was statistically significant (p = 0.002). Similarly, patients who had the dialysis at more than one centre had a higher (55.56%) positivity, which was statistically significant (p = 0.001). The proportion of surgeries was higher in the anti-HCV positive group (100.0%) as compared to that in the negative group (90.55%), (p = 0.017). There was no statistically significant difference between the two groups with regards to other risk factors (ALT, AST, ALP and blood transfusion which were received in one year).

Logistic Regression analysis was done by taking anti-HCV positivity as a dependant variable and other suspected variables (diabetes, haemodialysis duration, dialysis at more than one centre and blood transfusions) as independent variables or risk factors (Table/Fig-3). For the analysis, 145 patients were considered, as these patients contained the values of these independent variables. The duration of dialysis (p = 0.034) and the dialysis at more than one centre (p = 0.019) were found to be statistically significant. The basic disease diagnosis (diabetic or nondiabetic) and the blood transfusions were found to be statistically insignificant.

DISCUSSION
It is well known that HD patients are at a high risk for the development of HCV infection. The prevalence of the HCV infection varies widely from 8% to 45% in these patients [2-7]. Reddy et al (2005) reported 13.3% [7], Chandra et al (2004) reported 43% [6], Agarwal et al (1999) reported 42% [3], and recently, Jasuja et al (2009) reported 27.7 % [2]. The highest reported incidence from a single HD unit was 43% [6]. The reason for this variation in the prevalence rates of HCV among the HD patients which were reported from different parts is unknown. However, Reddy et al
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due to the high costs. We used

(2005) reported that stringent blood testing and the isolation of the
dialysis machines have helped in the reduction of the transmission
of hepatitis C among HD patients and that this was the reason
for the low prevalence of HCV [7]. In the present study, we found
a low anti-HCV prevalence among the maintenance HD patients
at our dialysis centre (12.4% and 72.2% in males and 27.8% in
females), which was in harmony with the results of the study which
was done by Reddy et al (2005) (13.3%) [7]. Strict adherence
to infection control measures in the dialysis setting, the use of
dedicated machines, equipments and isolated areas and separate
washing areas for the positive patients may be the reason for the
low prevalence (12.4%) in our dialysis unit. Similarly, we found a
low sero-conversion rate (7.44%) at our dialysis centre. Only 10
of the included patients became seropositive after the initiation of
dialysis. However, the acquisition of the infection by some
individuals after the initiation of dialysis was possibly because of
the breach in the infection control strategies during the dialysis.

Many factors may have contributed to the prevalence of the
positive anti-HCV in the HD patients. Some of these have been
confirmed in the present study. Of the risk factors for the HCV
transmission during HD, blood transfusion was an important factor.
Several studies [14-16] showed that the risk of acquiring the HCV
infection increased with an increase in the number of units of blood
which were transfused. However, in the present study, we found no

significant association between the blood transfusions and the anti-
HCV positivity. Few other investigators [2, 17] have also forwarded
similar results and have suggested that an association between
dialysis-associated hepatitis and transfusion does not imply a
causal relationship, but that rather it is related to the duration of
the dialysis.

Most studies concur that the duration of dialysis is closely related
to a positive anti-HCV rate [2, 15, 18]. The prevalence of HCV
infection in the HD patients in our setup was low (12.4%). However,
its association with the duration of dialysis was found to be
statistically significant. Our results also emphasized that the longer
dialysis duration was a significant risk factor for acquiring HCV
infection. Interestingly, in the present study, we found a significant
association between the anti-HCV positivity and patients who
had dialysis at more than one centre, which was a new finding of
the study. Furthermore, there are few studies [19, 20] which have
reported a higher incidence of HCV infection in the presence of
reuse of the dialyzer. In our study, there was no significant impact
of the dialyzer reuse.

As per the literature review, anti-HCV positive patients had signifi-
cantly elevated levels of liver enzymes than the HCV negative pati-
ents [15, 21, 22]. In a recent study, Jasuja et.al [2] (2009) reported
a significant correlation of HCV RNA positivity with elevated levels
of alanine aminotransferase (ALT) and aspartate aminotransferase
(AST). Moreover, the study found that ALT was a significant risk factor
for HCV RNA positivity. However, in the present study, the values of
ALT and AST were similar in both the groups. Transaminase levels
for HCV RNA positivity. However, in the present study, the values of
ALT and AST were similar in both the groups. Transaminase levels
were rarely used for the detection of liver disease in these patients,
because they are usually low even in patients with a normal hepatic
function and histology, who are on dialysis. Hence, the presence of
similar values in positive and negative patients in this study should
not be considered as being unusual.

The main limitation of the present study was the inability to adopt
HCV RNA PCR as a screening test due to the high costs. We used
enhanced chemiluminescence immunoassay as a screening test
for the HCV infection. This was more sensitive and specific than
the third generation ELISA and we used strong cutoff points to detect
the HCV positivity [23].
In conclusion, although the prevalence of the HCV infection among patients on HD at our dialysis centre was lower than that in other parts of the country, it still remains high. We believe that preventive measures and the adherence to ‘universal precautions for HCV control’ remain a priority. Hence, we recommend the use of dedicated dialysis equipment, spaces, nursing staff, separate washing areas and the screening of the patients once in 3 months, for preventing cross-infection. Furthermore, the present study demonstrated that along with the duration of HD, dialysis at more than one centre was also an important risk-factor for acquiring the HCV infection.

REFERENCES