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Seroprevalence occurrence of viral hepatitis and HIV among hemodialysis patients

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ABSTRACT

Background: Patients with chronic renal failure (CRF) were on maintenance invasive hemodialysis (HD) procedure. This procedure by itself affects immunity of the patients and became more susceptible to viral infections.
Aim of the study: to investigate the occurrence of HBV, HCV and HIV infections in patients with hemodialysis.
Patients and methods: A retrospective study of 430 end-stage renal failure patients, referred to hemodialysis department at XXXX Teaching Hospital, Baghdad-Iraq from January-2015 to January-2017. Patients were investigated for HBs-Ag using enzyme-labeled antigen test (Foresight-EIA-USA), HCV- Abs (IgG) specific immunoglobulin using an HCV enzyme-labeled antigen test (Foresight-EIA-USA)and anti - HIV Abs (IgG) using enzyme-labeled antigen test (Foresight-EIA-USA).
Results: The frequency of HBV infection in the first year was not significant between males (1.11%) and females (0.00%) (P = 0.295). About HCV also there are no significant differences between males (12.63%) and females (9.31%) (P = 0.347). After one year of follow up the frequencies of HBV and HCV were not significant between two sexes. Additionally, no any one of the patients had HIV infection.
Conclusions: This study brings a light on that HBV and HCV were having the same frequencies in both genders and lower occurrence with time. Furthermore, HIV was not detected in those patients.

1. Introduction

One of the treatments for chronic renal failure (CRF) is maintenance invasive hemodialysis (HD) procedure. This procedure by itself affects innate immunity like changes in a chemotactic factor for leukocytes, the phagocytic function of neutrophils and monocytes and natural killer cell [1–3]. Moreover, adaptive immunity is affected for example defect in the proliferation of T lymphocytes and down-regulation of phosphorylation pathways of lymphocytes [4–6]. Therefore, HD patients are more susceptible to blood born viral infection like hepatitis B virus (HBV), hepatitis C virus (HCV) and Human immunodeficiency virus (HIV) due to the disturbance in the immune system [7].

Infection with these viruses is the main reason for morbidity in HD patients. However, precautions' must be taken to prevent spread of viruses in the unit like available treatments and vaccines [8]. In USA, approximately 2.8% of the end-stage renal disease population is hepatitis B positive while 27.7% of the USA hemodialysis units were positive for HBV [9]. A study showed that chronic HBV infection had a relation with mortality [10]. Additionally, there are 170 million hepatitis C virus carriers worldwide and one of the risk group is HD patients and the risk of death was 1.57 times more than others in association with liver cirrhosis and hepatocellular carcinoma [11,12].

Subsequently, infections of the liver with viruses were fatal for patients on HD and constitute 1.9% of all deaths [13]. An additional virus that is important in HD patients is HIV. The prognosis of this virus was changed significantly due to the administration of Highly Active Anti-Retroviral Therapy (HAART), stage of HIV disease at the time of dialysis start and T helper ($CD4^+$) lymphocyte count [14–16].

The goal of the present study is to investigate the occurrence of viral infection like HBV, HCV, and HIV in patients with the end-stage renal failure on hemodialysis.

2. Patients and methods

A retrospective study of 430 end-stage renal failure patients, referred to hemodialysis unit of XXX Teaching Hospital, Baghdad-Iraq from January-2015 to January-2018. All patients were subject to the process of hemodialysis.

Hemodialysis patients' were a case for the study if their serum tested positive for HBV, HCV, and HIV. In contrast, the patients receiving

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hemodialysis were considered as a “control” if their serum tested negative for those three viruses. For every case, one age- and gender-matched control receiving hemodialysis was selected. The patients were observed and followed for the second and third year of hemodialysis.

The Broad of Medical Ethics has been approved for these patients and accepted their review of XXX College of Medicine and XXX Teaching Hospital. The knowledgeable permission was obtained from patients. Data collected from both groups including demographic information age, sex, marital status, occupation, residential status, the onset of renal failure and hemodialysis history.

2.1. Serological testing

430 patients were investigated for HBs-Ag using enzyme-labeled antigen test (Foresight-EIA-USA), HCV- Abs (IgG) specific immunoglobulin using an HCV enzyme-labeled antigen test (Foresight-EIA-USA) and anti - HIV Abs (IgG) using enzyme-labeled antigen test (Foresight-EIA-USA).

The principle for detection antibodies in the serum are illustrated as follows using leaflet kit:

The micro-wells are coated with Ags then the serum will be added that contains Abs lead to the formation a complex. After incubation, washing was done and enzyme conjugated with Abs was added. After incubation and washing were done; substrate A and B were added. The color was formed and the reaction was stopped by sulfuric acid. The results were interpreted after reading with micro plate reader at 450 nm within 30 min. Samples with an optical density below the cutoff were recorded as negative, those with optical densities (< 10% - > 10%) of the cutoff were equivocal, and all others were positive. The sample was retested when the absorbance was within 10% of the cutoff level.

2.2. Statistical analysis

Data were analyzed statistically using:

- Descriptive statistics: frequencies, mean and standard deviation.
- Inferential statistics: Chi-square tests and Fisher exact test.

All of these were done using Minitab statistical software program 13.20. A P- value ≤ 0.05 was considered to be significant.

3. Results

A total of 430 patients with chronic kidney disease (renal failure) were on hemodialysis during the study period. The proportion of males 269 (62.55%) was more than that of female 161 (37.44%). Their ages ranged from 16 to 76 years, (median = 35), (31.2 ± 0.80). The frequency of HBV infection in the first year was not significant between males (1.11%) and females (0.00%) (P = 295) as shown in Table 1-About HCV also there is no a significant difference between males (12.63%) and females (9.31%) (P = 0.347). In the second year of hemodialysis, the frequency of HBV and HCV was not significant (P = 1.00) between two sexes as was mentioned in (Table 2-). After the third year of observation and follow-up, there was no significant difference (P = 1.00)in the frequency of HBV and HCV as shown in Table 3-. The mortality rate during this period was 0.159 in hemodialysis patients. HIV was not affecting any of HD patients. There was a significant decrease (P = 0001) in the frequency of infection with HCV while the occurrence of HBV was not changed (Table 4-).

4. Discussion

Chronic renal failure patients receiving hemodialysis are often acquiring blood-borne viral infection over their long treatment periods like HBV, HCV, and HIV. In our study, HD patients had HBV and HCV infection and after follow them the percentage of HBV decreased. Additionally, HCV still in the same percentage. There was no significant difference regarding gender in the frequency of these viruses. There was a significant decrease in the frequency of infection with HCV table-3-with time. A study done in Tehran included 360 HD patients showed that 1.39% of them were HBsAg positive [17]. This is in agreement with our study (1.1%) in 2015 and then (0.0%) in 2016 and 2017. About 5.5% of Tunisian HD patients had HBV DNA infection using molecular methods and 3.7% patients had detectable DNA with anti-HBc antibodies. So the molecular investigation that detects HBV-DNA using nested PCR is helpful for patients with anti-HB core Ab positive, negative for HBs-Ag and anti-HBs Abs [18]. It is recommended to analyze HBV-DNA annually and biopsy from liver [19]. An additional study done in Cameroon reported that the frequency of HBs Ag and HCV Abs infections in HD patients was 10.6% and 19.2%, respectively [20,21]. In India, out of 262 patients, 88 (33.5%) were found to be having HCV infection, 4 (1.5%) were found to be positive for HBsAg and dual infection was observed in 2 (0.8%) patients [22,23]. The lower occurrence of HBV in this study may be caused by sample size, the method used for detection the virus, less blood transfusion and, blood products for the patients and screening of blood for blood-borne viral infections before transfusion. The availability of erythropoietin leads to lowering blood transfusion times to the patients. The only three patients with HBs-Ag positive were treated and recover from the disease. Consequently, HBV did not detect after one year of following. Management patients with HBV vaccine, separation of the infected patient on a separate machine, and habitual surveillance for HBV infected patients in the hospitals leads to lower rates of infection with HBV.

Regarding the frequency of HCV infection was higher than HBV in our study while, other studies reported less prevalence of HCV infection in HD patients like Tanta [24] and Iran [25]. This may be due to sample size, the method of detection and screening blood for antibodies against HCV with control measures in hospitals. Double infection with two viruses (HBV and HCV) in the same patient were not detected in our study while in other studies were 4.4% [26, 27]. The lower number of the patients who were positive for anti- HCV after one year of follow-up was due to their deaths. About HIV infection; there were no cases of this virus in HD patients in our study due to control measures of this disease. The prevalence of this virus varies in different countries depending on the district of the countries [28,29]. Within the USA the incidence of acute kidney injury with HIV infection that needs dialysis was 1.35% [30]. HD patients should be investigated by ELISA, Western blot and serum HIV-RNA for positive cases. The prognosis of HIV infected HD patients has considerably better by using Highly Active Anti-Retroviral Therapy (HAART) [31], stage of HIV disease at initiation of dialysis

Table 1
Frequency of viral infection in patients in the first year of hemodialysis.

Viral markers	HD Patients positive for the viruses males No. %	HD Patients negative for the viruses Males No. %	HD Patients positive for the viruses females No. %	HD Patients negative for the viruses Females No. %	P -value
HBs-Ag	3 1.11	266 98.88	0 0	161 100	0.295[a]
Anti HCV Abs	34 12.63	235 87.36	15 9.31	146 90.68	0.347[a]
Anti HIV Abs	0 0	0 0	0 0	0 0	–

[a] Not significant.