Prevalence of hepatitis B and C virus infections and immunity among hemodialysis patients in the Mazandaran province, Northern Iran

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Abstract

Background: Hemodialysis (HD) is one of the most common causes of blood-borne infections. In order to prevent viral hepatitis and confront with the virus on the next step, health providers specify infected patients by screening and vaccination. This study is designed to investigate the prevalence of Hepatitis B virus (HBV) and Hepatitis C virus (HCV) infections in HD patients in Mazandaran, Iran.

Methods: The medical records of 216 patients referred to the hemodialysis centers were evaluated in this cross-sectional study between 2019 and 2020. The collected data was analyzed using t-test and Chi-square.

Results: Among 216 patients, 106 cases were female (49.07%) and 110 subjects were male (50.9%). The mean age was 40.1 y/o in females and 50.9 y/o in the male patients. The study recorded nine HBs-Ag positive (prevalence: 0.06%) and 15 HCV-Ab positive (prevalence: 6.94%) patients. Also, the most common co-morbidities were diabetes and hypertension. It was observed that 13 patients from 34 patients with negative HBs-Ag (who had 10–100 U HBs-Ab in the first stage) experienced sudden drop in the antibody titration to less than 10 U (P < 0.05). From 50 HBs-Ag negative patients with HBs-Ab more than 100 U in the first stage, antibody titration of five patients was decreased to less than 10 U in the second stage (P < 0.05).

Conclusions: The prevalence of HCV and HBV was low in HD patients in Mazandaran province. However, due to the large number of patients with non-protective HBs-Ab levels, there is a risk of an increased prevalence of the disease.

Keywords: HBs-Ab, HBV, HCV, hemodialysis, viral hepatitis

Introduction

Hemodialysis (HD) is considered as an alternative approach for purifying blood in patients with renal diseases, and especially in individuals with end-stage renal disease (ESRD).[^1] Among the various complications related to HD, blood-borne infections have been attributed with challenges.[^2] According to the reports, the prevalence of viral infections, particularly hepatitis viruses in individuals performing HD is higher in comparison to the general population. Additionally, subjects undergoing prolonged HD potentially have a higher risk of exposure with hepatitis B virus (HBV), hepatitis C virus (HCV), Human immunodeficiency virus (HIV), and other blood-borne complications.[^3,4] According to estimations, over 240 million individuals are chronic carriers of HBV and over 780 thousand mortalities occur because of HBV.[^5] Reports demonstrate an increasing frequency of ESRD in Iranian individuals.[^6] Notwithstanding, a recent systematic review demonstrated that the national prevalence of HBV was between 2.1% and 18.2%.[^7] Additionally, based on a 2008

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systematic review, approximately 2.5% of Iranians were infected with HBV between 2001 and 2007, regardless of 94% of people being vaccinated for HBV in 2005. In fact, reports estimate a 2.2% of Iranian general population being infected with HBV. Hence, Iran is classified as a country with a low-intermediate prevalence of HBV infection.

HCV is also a blood-borne infection attributed to HD. Infection by HCV has been associated with liver diseases, and cirrhosis of liver at the intense stages, and cause significant rate of mortality among general population as well as those under HD. Although a remarkable decline in the prevalence of HCV has been reported among Iranian individuals undergoing HD, it remains a subject of challenge and concern for health priorities. Reports indicate that 54,000 individuals are dead annually due to HCV infection. Life expectancy of the HD subjects is under the impression of HCV infection. According to studies, HCV infection led to 57.29, 59.92, and 66.45 (per 100 thousand individuals) disability-adjusted life years (DALYs), respectively, in 1990, 2000, and 2010 in the Asian-pacific countries. Nonetheless, a decreasing trend for death rates and DALYs were reported for the HCV-related cirrhosis. But, there was a promoting trend of DALYs and mortality for HCV-related acute hepatitis and liver cancer. In relation to the developed countries, no consistent reports are available about the prevalence estimates of HCV infection in the individuals undergoing HD in the developing countries. According to the reports by systematic review on the national data, a 0.16% seroprevalence of HCV infection was estimated between 2001 and 2008. In addition, the prevalence of HCV infection in cases undergoing HD was 30%–90%. Studies demonstrated that the seroprevalence of HCV infection in the subjects with HD in the Iranian population was 14.4% in 1999 and 4.5% in 2006, which reported a decreasing trend. In a 2010 systematic review, the prevalence of HCV infection in the Iranian individuals under HD was reported to be 7.61%. But, a 2017 systematic review and meta-analysis study indicated that the estimated pooled prevalence of HCV infection in the subjects undergoing HD was 11% (95% confidence interval [CI] = 10%–13%).

Here in this study, we retrospectively evaluated the prevalence of HBV and HCV infections in the Mazandaran province, Iran during 2019–2020.

**Study Subjects and Methods**

This retrospective cross-sectional descriptive study was conducted on 261 subjects under HD referred to three dialysis centers in the Mazandaran province from 2019 to 2020. Baseline characteristics and demographic specifications of the study subjects including sex, age, weight, and duration under dialysis were recorded from the medical history of subjects. Among the inclusion criteria of the subjects were aging above 15 years, a duration of dialysis more than 6 months, and availability of data for hepatitis B surface antigen (HBS-Ag), hepatitis B surface antibody (HBS-Ab), and HCV-Ab. If the patients did not have complete data, they would be excluded from the study. The local ethical committee of Mazandaran University of Medical Sciences approved the protocol of this study.

Analysis of data was conducted using the Statistical Package for the Social Sciences (SPSS) version 23 software for windows (SPSS, Chicago, IL, USA). To compare scale variables, independent samples t-test was used. Chi-square test was exerted for the comparison of nominal variables. Data were presented as either mean ± standard deviation (SD) for scale variables or frequency (percentage) for the nominal variables. A P value less than 0.05 was considered as statistically significant [Table 1].

**Table 1: Descriptive Statistics**

| Variable | n  | Minimum | Maximum | Mean ± Std. deviation |
|----------|----|---------|---------|-----------------------|
| AGE      | 216| 26.00   | 95.00   | 62.24 ± 13.71         |
| Weight   | 213| 33      | 113     | 68.19 ± 15.02         |

**Results**

From the 1377 subjects available, we evaluated the medical records of 280 subjects under HD in the dialysis centers of Mazandaran province. Finally, 216 individuals met the inclusion criteria and were studied.

The study group comprised 110 (50.9%) males and 106 (49.1%) females. The mean age of subjects was 62.25 ± 13.71 years. The mean age was 40.1 ± 11.52 in females and 50.9 ± 9.43 in the male patients. Subjects had a mean weight of 68.19 ± 15.52 Kg. The most common co-morbidities were diabetes [138 subjects (63.8%)] and hypertension [96 subjects (44.4%)].

The study recorded nine cases with HBs-Ag positive (prevalence: 0.65%) and 15 subjects with HCV-Ab positive (prevalence: 6.94%). Overall, nine cases (37.5%) with positive hepatitis virus (either HBV or HCV) were females and 15 cases (62.5%) were males [Table 2].

The mean weight of non-hepatitis HD subjects [193 (89.4%)] was 68.25 ± 15.03 kg and that of hepatitis HD cases [23 (10.6%)] was 67.65 ± 15.23 kg. Hence, no significant difference was observed in the weight of HD cases with hepatitis and non-hepatitis individuals (P = 0.85). Additionally, age of non-hepatitis HD cases and hepatitis HD individuals was 62.79 ± 13.09 years and 57.65 ± 17.81 years, respectively, with no statistically significant difference (P = 0.85; Table 3).

It was observed that 13 patients from 34 patients with negative HBs-Ag (who had 10–100 U HBs-Ab in the first stage) experienced sudden drop in the antibody titration to less than 10 U (P < 0.05). From 50 HBs-Ag negative patients with HBs-Ab more than 100 U in the first stage, antibody titration
Discussion

Viral infections, particularly HBV and HCV are considered as the critical complications in the individuals performing HD. The transmission of viruses and contamination of subjects undergoing HD stem primarily from the contamination of devices employed for performing hemodialysis because of an ineffectual sterilizing among the dialysis sessions. In spite of availability of vaccine (for HBV), diagnostic tests, and preventive approaches developed by WHO, the risk of HBV and HCV infection during dialysis remain a challenging issue. Nonetheless, the HBV prevalence is lower than HCV. The HBV prevalence was reported to be 2.53% in 2011, which stayed at a similar level over the course of following years.

In the Guilan province (which is in vicinity to the Mazandaran province), Mohtasham-Amiri et al. in 2003 reported that the prevalence of HCV was 24.8% in subjects with HD. According to the reports by Alavian et al. in 2003 performed in a hemodialysis unit in the Mazandaran province, the prevalence of HCV in cases undergoing HD was 12%. Five years later, Alavian et al. in 2008 reported that the prevalence of HCV in cases undergoing HD was 11.8% in the Mazandaran province. Nonetheless, Hasanjani Roushan et al. in 2016 reported that the prevalence of HCV in the subjects undergoing HD was 8.27% in the Mazandaran province, which indicates a decline in the prevalence of HCV among HD cases from the Mazandaran province. However, our study revealed that the prevalence of HCV was even lower (6.94%) compared to the 2016 study (8.27%). This might be due to higher commitment to the hygiene recommendations by the medical staff and improvement in the sterilization of the devices used in the medical systems.

In 2007, it was reported that the prevalence of HBV in Iranian subjects with HD was 4.6%. Mansour-Ghanaci et al. reported that the prevalence of HBV in the subjects undergoing HD in the Guilan province was 3.06%. Hasanjani Roushan et al. reported that the prevalence of HBV in the subjects under HD was 2.1% in the Mazandaran province during 2012–2014. Our study indicated that the HBs-Ag positivity was detected in 0.65% of subjects. Again, our investigation suggests decreased prevalence of HBV in the HD cases from 2.1% to 0.65% in 2012–2016 in the Mazandaran province. This might be due to higher commitment to increased number of vaccinated subjects and the hygiene recommendations by the medical staff and improvement in the sterilization of the devices employed in the medical systems. In addition, it appears that due to the geographical location of Mazandaran province and the long distance of some cities from the referral centers of this province, HBS-Ag positive patients living in the eastern and especially western cities of the province prefer to refer to neighboring provinces, which can falsely represent a lower prevalence of HBV.

It was observed that 13 patients from 34 patients with negative HBs-Ag (who had 10–100 U HBs-Ab in the first stage) experienced sudden drop in the antibody titration to less than 10 U. From 50 HBs-Ag negative patients with HBs-Ab more than 100 U in the first stage, antibody titration of five patients was decreased to less than 10 U in the second stage (P < 0.05; Table 4).

Table 4: The immunization developed by HD subjects against HBV

| Specification      | Total | HBV | HCV |
|--------------------|-------|-----|-----|
| Age; Year          | 62.25±13.71 | 57.65±17.81 | 62.79±13.7 |
| Sex; Male/Female   | 110 (50.9%)/106 (49.1%) | 6/3 | 104/103 |
| Weight; kg         | 68.19±15.32 | 63±4.6 | 68±3.5 |
| Dialysis duration (month) | 48±8 | 38±5 | 48±8 |
| Co-morbidities     | 194 (89.8%) | 9 | 207 |

HBs-Ag, Hepatitis B surface antigen; HCV, Hepatitis C virus; HBs-Ab, Hepatitis B surface antibody
years. Nonetheless, due to the large number of patients with non-protective HBs-Ab levels, there is a risk of an increased prevalence of the disease. The most common co-morbidities were diabetes and hypertension in our study subjects. Although it is unclear that the infection by HCV or HBV might contribute to the co-morbidities, further attempts are mandatory to decrease the rate of HD-associated complications and their related co-morbidities.

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Conflicts of interest
There are no conflicts of interest.

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