



RESEARCH ARTICLE

PREVALENCE OF HEPATITIS B INFECTION AND POSSIBLE RISK FACTORS AMONG PATIENTS UNDERGOING HEMODIALYSIS IN JEDDAH, 2015-2018

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ABSTRACT

Background and Objective: Hepatitis B is considered as a potentially life-threatening infection in the liver caused by the hepatitis B virus. One of the high-risk groups to develop HBV infection is the patients undergoing hemodialysis. Despite the recent findings, information regarding the prevalence and determinants of hepatitis B infection among hemodialysis patients remain unclear in Jeddah due to lack of available studies. Therefore, this study aimed to determine the prevalence of hepatitis B infection and possible risk factors among patients attending renal dialysis centers in Jeddah from 2015 to 2018. **Methods:** A retrospective study was conducted in 5 renal dialysis centers located in Jeddah, Saudi Arabia from 2015 to 2018. All patients diagnosed with HBV infection who have undergone hemodialysis during the period of the study were included. Data was collected from the medical records of patients. A simple descriptive statistics was used to describe the characteristics of the study variables using counts and percentages for the categorical and nominal variables, while continuous variables are presented in mean and standard deviation. **Results:** Out of the total 1,205 patients who have undergone hemodialysis from 2015 to 2018, a total of 52 patients were found to be HBV-positive in this study (4.3%). All of whom were adults aged from 34 to 88 years (mean age of 58.73±11.5 years). Majority of the patients were male (78.4%), married (88.0%), and Saudi nationals (69.2%). Our findings presented 20 out of the 52 patients had a history of diabetes mellitus (38.5%), while 10 patients have undergone renal transplantation (19.2%). Duration of hemodialysis ranged from 0.1 to 28.0 years (6.01±6.3). The most common cause of renal failure was hypertension (48.1%), followed by diabetes mellitus (36.5%), and end-stage renal disease (23.1%). A co-infection rate of 7.7% was also found among the HD patients. **Conclusion:** Based on the findings of our study, the prevalence rate of HBV infection among HD patients in Jeddah is 4.3%. We also identified possible factors that may influence HBV infection, which include gender (male), marital status (married), history of diabetes mellitus, history of renal transplantation, and etiology of renal failure (hypertension, diabetes mellitus, and end-stage renal disease). Our findings indicate improper and ineffective implementation of safety protocols during hemodialysis procedure. Strict adherence to a comprehensive infection control measures suggested by higher authorization in dealing with hemodialysis patients, will help in reducing the burden of hepatitis B infection.

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INTRODUCTION

Hepatitis B is viewed as a global public health concern in the past decades. It is considered as a potentially life-threatening infection in the liver caused by the hepatitis B virus (HBV). It can cause chronic infection that could lead to liver cirrhosis and liver cancer, or even death in some cases (World Health Organization, 2019). Majority of the patients diagnosed with hepatitis B usually do not report symptoms until the onset of the liver cirrhosis or end-stage liver disease (Centers for Disease Control and Prevention, 2019). According to the Center of Disease Control and Prevention (CDC), 1,715 mortality reports have been associated to HBV in 2015, which was much lower than the estimated annual deaths of 14,000 (Centers for Disease Control and Prevention, 2019).

An estimated prevalence of hepatitis B among adults was reported by the World Health Organization (WHO) to be 6.2% in the Western Pacific Region and 6.1% in the African Region. On the other hand, lower prevalence rates of 3.3%, 2.0%, and 1.6% were reported in the Eastern Mediterranean Region, South-East Asian Region, and European Region, respectively. Hepatitis B virus can be easily transmitted through percutaneous or mucosal exposure to the infected blood or other bodily fluids. In order to protect clean blood against HBV infection, blood safety strategies such as safe injection practices, eliminating unnecessary and unsafe injections have been implemented (World Health Organization, 2019). A vaccine against HBV was developed in 1982, and it was tested to be 95% effective in preventing the infection and the development of chronic diseases and liver cancer caused by the

virus (World Health Organization, 2019). Strategies in order to help control HBV infection include strict adherence to infection control measures, isolation of HBV-positive patients, and use of modern therapies (Bernieh, 2015). One of the high-risk groups to develop HBV infection is the patients undergoing hemodialysis (HD) (Centers for Disease Control and Prevention, 2019). Infection of HD patients could possibly result to an increase in the rate of hospitalization and their susceptibility to other nosocomial infection. As hepatitis B continues to be a significant public health problem in HD population, several researches have been conducted worldwide in order to determine the incidence, prevalence and risk factors of HBV infection among HD patients. A recently published systematic review of 36 studies conducted in Iran showed that the prevalence rate of HBV infection among HD patients tended to vary from 0.0% to 9.75% throughout several regions. Iran's national prevalence of HBV infection as of 2018 was estimated to be between 2.1% and 18.2% (4). Another study conducted in Iraq presented 3 confirmed cases of HBV infection among the 94 patients who attended Duhok dialysis center every month (5). A higher rate of 6.7% were found among 252 HD Palestinian patients included in a retrospective cohort study (6). Patients with chronic renal failure (CRF) undergoing hemodialysis reported positive HBV infection in 15 out of 172 patients attending four HD centers in Posadas City, Argentina (7) and in 7% among the 143 patients recruited from a private HD clinic located in Fortaleza, Brazil (Bernieh, 2015).

In order to determine the risk factors associated to HBV infection, a recent study was done in Iraq (2017) among 94 HD patients. History of HBV vaccination were found in 42.6% of the patients. Majority of the HBV-positive patients (80%) were reported to have undergone blood transfusion in the past. However, dental history and tattooing showed no significant difference between the two groups of HBV-positive and HBV-negative patients (Ibrahim *et al.*, 2018). A research conducted in Dhahran, Saudi Arabia, showed that 14% of the HD patients were HBV-positive and the long duration of hemodialysis was identified as a significant factor influencing HBV positivity (8). Other determinants have been reported in a study from Argentina, wherein 15 out of 172 HD patients were found with HBV-positive result and among these patients, history of blood transfusion and elevated serum alanine aminotransferase (ALT) enzyme were found to have a significant correlation with HBsAg (Salvatierra *et al.*, 2016). Despite the recent findings, information regarding the prevalence and determinants of hepatitis B infection among hemodialysis patients remain unclear in Jeddah due to lack of available studies. Furthermore, surveillance for infections is required to monitor the effectiveness of infection control practices. Therefore, in order to decrease the infection rate among hemodialysis patients attending different renal dialysis units and improve the infection control measures, this study was conducted to determine the prevalence of hepatitis B infection and possible risk factors among patients attending renal dialysis centers in Jeddah from 2015 to 2018.

MATERIALS AND METHODS

Study design and population: A retrospective study was conducted in 5 renal dialysis centers located in Jeddah, Saudi Arabia from 2015 to 2018 including the Anaeem Divarum Dialysis Centre, Prince Abdul-Majedd Divarum Dialysis

Centre, East Jeddah Davita Dialysis Centre, Hisham Attar Charity Centre, and the King Abdulaziz Davita Dialysis Centre. All patients diagnosed with HBV infection who have undergone hemodialysis in the five renal dialysis centers in Jeddah from 2015 to 2018 were included in the study; however, patients who missed follow-up due to any reason (e.g. death, transferred to another center, etc.) were excluded from participation in the study.

Data collection: Data was collected from the medical records of patients undergoing HD and diagnosed with HBV infection during the conduct of the study. A pilot study was conducted on 10% of the sample size in order to assess the methodology, feasibility and duration of the study. After this, necessary changes were implemented. The results of the pilot study were not included in the final analysis.

Study outcomes and variables: The primary outcome was the number of patients infected with HBV during HD treatment, and the secondary outcome was the identified factors associated with the HBV-positive patients. The dependent variable of this study was the HBV rate caused by hemodialysis. On the other hand, the independent variables included sociodemographic data (age, gender, nationality, marital status), duration of hemodialysis in years, etiology of renal failure, history of surgery, history of diabetes mellitus, and history of renal transplantation.

Data analysis: A simple descriptive statistics was used to describe the characteristics of the study variables using counts and percentages for the categorical and nominal variables, while continuous variables are presented in mean and standard deviation.

Ethical considerations: Ethical approval was obtained from the ethical committee of Family Medicine-Joint Program, Jeddah. Permission was also obtained from the Ministry of Health and each renal dialysis center included in the study. All collected data was kept confidential and access was restricted to the purposes of this research.

RESULTS

Demographic profile of the study samples: Out of the total 1,205 patients who have undergone hemodialysis from 2015 to 2018, a total of 52 patients were found to be HBV-positive in this study (4.3%). All of whom were adults aged from 34 to 88 years (mean age of 58.73 ± 11.5 years). As shown in Table 1, majority of the patients were male (78.8%), married (88.6%), and Saudi nationals (69.2%). Among the 52 patients, 15 came from Diaverum Hisham Attar Charity Center (28.8%), another 15 from Prince Abdulmajeed Center (28.8%), 11 came from East Jeddah Center (21.2%), 7 from King Abdulaziz Center (13.5%), and the remaining 4 patients were from Diaverum Al Naeem Dialysis Center (7.7%).

Clinical features of the study samples: Table 2 shows the clinical characteristics of the study samples (N=52). Our findings presented 20 out of the 52 patients had a history of diabetes mellitus (38.5%), while 10 patients have undergone renal transplantation (19.2%). In terms of duration of hemodialysis in years, it ranged from 0.1 to 28.0 years (6.01 ± 6.3).

Etiology of renal failure: We identified 8 causes of renal failure in this study including hypertension, diabetes mellitus,

diabetes nephropathy (Diabetes Mellitus), end-stage renal disease (Diabetes), rheumatoid arthritis, chronic renal failure (hypertension), renal vascular disease, lupus erythematosus, glomerulosclerosis, glomerulonephritis, polycystic kidney disease. We also identified 3 associated diseases including hyperlipidemia dilated cardiomyopathy HCV infection (Table 3). According to our results, the most common cause of renal failure was hypertension, which affected 25 patients (48.1%). This was followed by 19 cases of diabetes mellitus (36.5%), then 12 patients with end-stage renal disease (23.1%).

Table 1. Demographic characteristics of the study samples

	N	Min	Max	Mean	SD
Age	52	34	88	58.73	11.5
Total		52		100.0	
Gender	Male	41		78.8	
	Female	11		21.2	
	Single	2		4.0	
Marital Status	Married	46		88.6	
	Widowed	2		3.8	
	Divorce / Separated	2		3.8	
Nationality	Saudi	36		69.2	
	Non Saudi	16		30.8	
Center	DiaverumHisham Attar Charity Center	15		28.8	
	Prince Abdulmajeed Center	15		28.8	
	East Jeddah Center	11		21.2	
	King Abdulaziz Center	7		13.5	
	Diaverum Al Naeem Dialysis Center	4		7.7	

Table 2. Clinical characteristics of the samples

	Count	%			
History of diabetes mellitus	20	38.5			
History of renal transplantation	10	19.2			
	N	Min	Max	Mean	SD
Duration of hemodialysis in years	49	.1	28.0	6.01	6.3

Table 3. Etiology of renal failure and associated diseases

	Count	%
Hypertension	25	48.1
Diabetes mellitus	19	36.5
Diabetes neuropathy	2	3.8
End-stage renal disease	12	23.1
Hyperlipidemia	1	1.9
Rheumatoid arthritis	1	1.9
Dilated cardiomyopathy	1	1.9
Chronic renal failure	9	17.3
Renal vascular disease	2	3.8
Lupus erythematosus	1	1.9
Glomerulosclerosis	2	3.8
Glomerulonephritis	2	3.8
Polycystic kidney disease	1	1.9
HCV infection	4	7.7

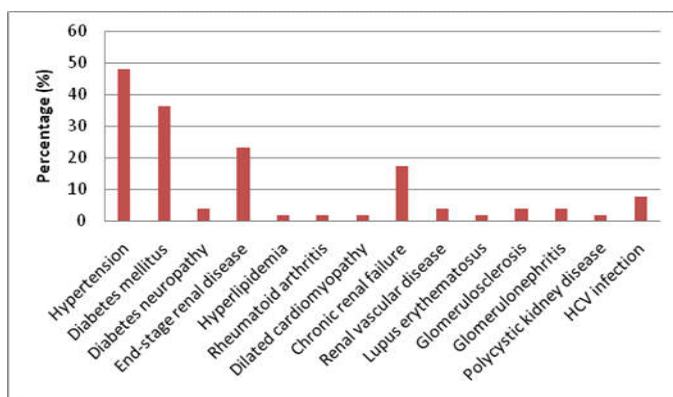


Figure 1. Etiology of renal failure and associated diseases

Among the 52 HBV-positive patients undergoing HD, 3.8% was caused by diabetes nephropathy, 1.9% by hyperlipidemia, 1.9% by rheumatoid arthritis, and 1.9% by dilated cardiomyopathy. A relatively high rate of 17.3% was caused by chronic renal failure, while 3.8% was caused by renal vascular disease. Renal failure caused by lupus erythematosus was rated at 1.9%, while 3.8% was caused by glomerulosclerosis, another 3.8% was caused by glomerulonephritis, meanwhile only 1.9% was caused by polycystic kidney disease, on the other hand, a higher rate 7.7% was caused by HCV infection. As shown in Figure 1, hypertension was the most common cause of renal failure among the patients with the highest rate of 48.1%, while hyperlipidemia, rheumatoid arthritis, dilated cardiomyopathy, and lupus erythematosus were the least common cause with the lowest percentage of 1.9% in each disease.

DISCUSSION

Prevalence rates tend to be dependent on baseline population rates(3). Based on our results, the prevalence rate of HBV infection among hemodialysis patients in Jeddah is 4.3%. Comparable findings were reported in other countries. Asystematic analysis of data from Iranian hemodialysis patients showed an HBV prevalence of 0.0 to 9.75% across different provinces and a national prevalence of 2.1 to 18.2% (4). In contrast, a Palestinian study found that the prevalence of hepatitis B surface antigen (HbsAg) positivity was 6.7% Reports from much smaller cohorts elsewhere have indicated (Badareen, 2016). HbsAg positivity rates of 3.2% in Iraq, 8.7% in Argentina, and 6.2% in Cameroon (Ibrahim *et al.*, 2018; Salvatierra, 2016; Halle *et al.*, 2016). It was previously reported in a review that in the Middle East, the prevalence of HBV was 11.8% in Saudi patients, 3.7% in Bahrainis (Almawi *et al.*, 2004) and 2.2% in a HD unit in the UAE (Bernieh, 2015). These studies showed varying HBV prevalence rates in HD patients that may indicate the influence of differences in organizational structure or the work process at each hemodialysis center (Ribeiro Barbosa *et al.*, 2017). Different processes may include the frequency of hygiene and sterilization of equipment in the dialysis room, reuse of capillaries and distribution of patients according to the number of health care professionals (Carrilho *et al.*, 2004; Chang *et al.*, 2014; Moreira *et al.*, 2010; Santos *et al.*, 2007). Various risk factors were identified by different studies worldwide. In our study, gender (male) and marital status (married) were identified as possible factors that may increase the risk to HBV among hemodialysis patients. Due to the high percentage of 78.4% in males and 88.0% in married patients. To our knowledge, no previous studies have reported these two factors as possible determinants. Therefore, further investigation on these possible risk factors is needed in the future. We also noticed other possible factors including history of diabetes mellitus (38.5%) and history of renal transplantation (19.2%). DM is reported to be one of the most common causes of renal failure, which is the indication for hemodialysis. Renal transplantation is also very common when it comes to HD patients, and transplantation usually requires blood transfusion. History of transfusion has been reported to be associated with increased risk of HBV infection (Salvatierra *et al.*, 2016). According to our results, the most common cause of renal failure was hypertension (48.1%), followed by diabetes mellitus (36.5%), and end-stage renal disease (23.1%). A comparable study conducted by Badareen in 2016 among HD patients reported that diabetes mellitus (33.7%), and

hypertension (23.8%) were the most common etiology for end-stage renal disease among the patients(6). Furthermore, a study in Aleppo, Syria also presented that diabetes mellitus (19.5%), hypertension (21.1%), and nephritis (20.5%) as the most common causes (16). In another study conducted in India, the most common causes were diabetes mellitus (31%), nephritis (14%) and hypertension (Rajapurkar *et al.*, 2012). Studies on co-infection of both HBV and HCV infections in hemodialysis patients are uncommon, despite having similar transmission way for both infections. Our findings showed that 7.7% of the HBV patients were also HCV-positive, which indicates co-infection. Previous studies have reported co-infection rates ranging from 1.2% to 30.4%, however, these literatures did not investigate whether patients were undergoing HD or not (Bhaumik *et al.*, 2012).

Conclusion

Based on the findings of our study, the prevalence rate of HBV infection among HD patients in Jeddah is 4.3%. We also identified possible factors that may influence HBV infection during hemodialysis among CRF patients. These include gender (male), marital status (married), history of diabetes mellitus, history of renal transplantation, and etiology of renal failure (hypertension, diabetes mellitus, and end-stage renal disease). A co-infection rate of 7.7% was also found among the HD patients. Compared to previous studies, our findings were relatively higher, indicating possible improper and ineffective implementation of safety protocols during hemodialysis procedure. Strict adherence to a comprehensive infection control measures suggested by higher authorization in dealing with hemodialysis patients, will help in reducing the burden of hepatitis B infection.

List of abbreviations

CRF: chronic renal failure.

CDC: centers for disease control and prevention.

HBsAg: hepatitis B surface antigen.

HBV: hepatitis B virus.

HCV: hepatitis C virus.

HIV: human immune deficiency.

HD: hemodialysis.

WHO: world health organization.

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