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# Hepatitis B infection among hemodialysis patients in Al-Jazirah State: a seroepidemiological survey

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### ABSTRACT

Hemodialysis patients are more susceptible to HBV infection because they have low immunity and can be inflicted through an improperly sterilized machine or through a tainted blood transfusion. A cross-sectional study aimed to study the prevalence of HBV among hemodialysis patients in Aljazeera State, Hospital for Renal Disease and Surgery during the period between March and August 2018. A total of ninety-one blood samples were obtained randomly from hemodialysis patients. The plasma was examined for the presence of HBsAg using a sandwich Enzyme-Linked Immuno-Sorbent Assay (ELISA). Data collected by a structured questionnaire included sociodemographic data such as age, sex, marital status, education level, duration of dialysis, previous HBV vaccination, history of surgical operation, history of jaundice and history of blood transfusion. Detectable marker for HBV infections (HBsAg) were found in 21 (23.1%) patients, while the remaining 70 patients (76.9%) were negative. We noted that education level and a history of jaundice had a significant effect on the seroprevalence of HBV, with a P value <0.05. The study concluded that HBV infection among hemodialysis (HD) patients is high. So, extensive effort to enroll HD patients in a vaccination programme against HBV is recommended. Moreover, periodically screening for early detection of HBV infection among hemodialysis patients is deemed essential in order to for therapeutic measures to be promptly initiated, and for the prevention and protection of other patients and staff in the hemodialysis unit.

### INTRODUCTION

Hepatitis B virus (HBV) is the causative organism for viral hepatitis. The manifestations of acute infection usually occur in immunocompetent individuals, in contrast to an immuno-compromised patient who is more vulnerable to develop a chronic disease. Such patients also become a nidus for infections. The age of the infected patient has a significant impact on the chance of developing chronic, and infants and young children are more prone to develop chronic infection. The HBV carrier rate in high endemic areas is more than 8%, while it is not more than 2% in low endemic regions. In intermediate endemicity areas, a carrier rate between 2% and 8% is estimated.

Dialysis can be defined as the diffusion of molecules in solution across a semipermeable membrane along an electrochemical concentration gradient. Hemodialysis is the effective management option used to treat end-stage renal failure. Patients on regular dialysis are more vulnerable to acquiring HBV. Furthermore, they also show different disease manifestations compared with individuals not on hemodialysis and are more likely to become chronic carriers.

Sudan is one of the countries which has high hepatitis B virus seroprevalence, with exposure rate ranging between 47%-78%, however, hepatitis B surface antigen prevalence ranging from 6.8% in central Sudan to 26% in southern Sudan. Studying the epidemiology and factors that increase the susceptibility to acquiring HBV infection among hemodialysis patients is crucially important to develop the evidence base data necessary to implement prevention,

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management, and control plans which can be adopted by both of care providers and decision makers.

Chronic hepatitis B infection affects more than 350 million people worldwide, and has recognizable geographic distribution. Most (75%) live in the Asia – Pacific region, followed by people residing in Africa and the Amazon basin. In areas of high endemicity, the lifetime infection rate is above 50%, and more than 8% of the population are chronic carriers. By contrast, in low endemic regions like Australia, fewer than 2% of the population are chronic HBV carriers. Children are the most affected age group in high endemic areas through either horizontal transmission from other children or perinatally from maternal carriers. Parenteral transmission is the most common mode of acquiring the infection.

In Sudan, the hemodialysis units have improved their practice patterns and infection control measures that are designed to reduce all bloodborne viral infections like HBV, HCV, and HIV. However, it is difficult to eliminate the risk of viral transmission, and these infections persist within hemodialysis units. Moreover, the parenteral way of transmission through contaminated blood, which is typical for blood-transmitted viruses, is the reason for investigating HBV among hemodialysis patients. Therefore, this study was aimed to study the seroprevalence of hepatitis B surface antigen (HBsAg) among hemodialysis patients in Al-Jazirah Hospital for Renal Disease and Surgery. Notably, the study concentrates on understanding the potential risk factors associated with the infection (including age, sex, duration of dialysis, history of jaundice, history of blood transfusion, history of surgical operation, education level, material status and vaccination).

**MATERIAL AND METHOD**

**Ethics Approval**

Ethical approval to carry out this study was obtained from the Institutional Ethics Committee, Deanship of Scientific Research, Sudan University of Science and Technology. Approval NO: (DSR – IEC 03-08) which ensures that all ethical considerations for researching in a way that protects the patient’s confidentiality and privacy were followed. Informed consent was obtained from all participants before starting the study.

**Study area and Population**

The study was a descriptive cross-sectional study conducted at Al-Jazirah Hospital for Renal Disease and Surgery in Aljazeera State during the period from March to August 2018. A total of ninety-one patients (n=91, this small sample size is mainly due to financial constraint) admitted for hemodialysis were selected randomly in this study (each patient has an equal chance of being chosen). Both qualitative and quantitative data were collected using a structured questionnaire that includes sociodemographic information such as age, sex and marital status, and potential risk factors like duration of dialysis, education level, vaccinated with HBV vaccine (if participants had received complete doses (three doses) of hepatitis B vaccine, they considered as vaccinated in this study), previous surgery, jaundice and blood transfusion.

**Detection of HBsAg**

The blood was collected from fistula by using a sterile syringe (5 ml), the blood was then dispensed in a sterile EDTA container and centrifuged at 3000 for 5 minutes to obtain plasma, and then the plasma was preserved at -20°C until the serological analysis.

All plasma were analyzed for the presence of HBsAg by a commercially available ELISA kit (Fortress Diagnostics Limited, UK). All manufacturer’s instructions were strictly followed for all tests.

**Data analysis**

The data was analyzed using a statistical package for social sciences (SPSS) software programme version 20 (SPSS Inc., Chicago, IL). The Chi-square test was applied to correlate between seropositive rate and socio-demographic variations and risk factors. A P value of <0.05 was considered significant.

**RESULT**

Ninety-one samples were processed for HBsAg by ELISA, out of it, 23.1% (21/91) were HBV positive, while the other 76.9% (70/91) were HBV negative. The patients were classified into four age groups, (Table 1). Of the study population, 68/91 (74.7%) were married, 16/68 (17.6%) of them were positive, 23/91 (25.3%) were single, 5/23 (5.5%) of them were positive. According to the duration of dialysis, the patients were classified into four groups. Interestingly, there was a correlation between the education level and HBV infection; with P value 0.016, The 10 positive results (10.98%) were obtained from patients who had a primary level of education, as seen in Table 1.

**Table 1.** Sociodemographic characteristic and risk factors of HD patients enrolled in this study

Variables	Total (N=91)	HBsAg result		P value
		Positive (N=21)	Negative (N=70)	
Age group:				0.431
<15	1	0	1	
15-30	15	4	11	
31-45	29	8	21	
46-60	31	4	27	
>60	15	5	10	
Sex:				0.604
Male	63	16	47	
Female	28	5	25	
Material Status:				1.000
Married	68	16	52	
Single	23	5	18	
Duration of dialysis (years):				0.842
<1	17	4	13	
1-5	38	9	29	
6-10	27	5	22	
>10	9	3	6	
Education level:				0.016*
Illiteracy	11	5	6	
Primary	38	10	28	
Secondary	28	6	22	
Collectors	14	0	14	
Previous jaundice:				0.0001*
Yes	31	15	16	
No	60	6	54	
Surgical operation:				1.000
Yes	36	8	28	
No	55	13	42	
Blood transfusion:				0.362
Yes	85	18	67	
No	6	3	3	
Vaccination:				0.088
Yes	29	3	26	
No	62	18	44	

\*P value of <0.05 was considered significant

Out of 91 patients, 31 (34.1%) were previously jaundiced, of which 15 (16.5%) were positive. Also, 36 (39.6%) had a history of surgical operation of which 8 (8.8%) were positive. Moreover, 85 (93.4%) of the study group had had previous blood transfusion and 18 (19.8%) were positive, while 29 (31%) had had the HBV vaccine, of which 3 (3.3%) were positive. In contrast, 62 (68.1%) had not had the HBV vaccination and 18 (19.8%) of them were positive.

## DISCUSSION

HBV is a serious growing problem in the developing countries, and it has a significant effect on the community and future generation's health. Hence, considerable efforts are needed to conduct studies that may give rise to guidelines for proper planning to deal with the health problem that is related to HBV infection. Thus, this study, which was conducted in Al-Jazirah State where they have their own cultures, customs, traditions and behaviours which are different from any other state in Sudan. Al-Jazirah has a typical rural character and most of the population has not completed even primary education. This study screened the seroprevalence of HBV among hemodialysis patients attending Aljazeera Hospital for Renal Disease and Surgery without reviewing their clinical data. The intent was to correlate the presence of HBsAg and other factors (age, sex, duration of dialysis, history of jaundice, history of blood transfusion, history of surgical operation, education level, material status, and vaccination).

Out of 91 HD patients enrolled in this study, 21 (23.1%) were HBsAg seropositive; which yield a similar result to many studies that considered that Hemodialysis patients are more susceptible to HBV infection because they can be infected through improperly sterilized medical equipment or through blood transfusion, and because of their low immunity.

HBsAg-positive serology can be observed during late acute HBV infection, and detection of HBV-DNA is the most efficient method to evaluate viral replication in HD patients infected with HBV. A determination of an individual being HBsAg seronegative does not mean that he/she does not have HBV. Rather, they may have occult Hepatitis B, which can be characterized by HBV DNA positivity. Indeed, previous studies have reported that some HBsAg seronegative patients have occult HBV. Thus, more studies are needed to determine the presence of HBV DNA in the absence of HBsAg in HD patients.

In our study, HBsAg seropositivity was detected in 23.1% of the test population, which is similar to that reported from hemodialysis centers in Sudan (23.7%), and high compared with hemodialysis centers elsewhere (8.5%). This can be explained by the difference in the implementation of infection control measures in these hemodialysis units.

Unfortunately, more than half of the prevalence percentage (17.6%) were obtained from married patients, this situation might have considerable implications due to the risk of transmission of the virus among individuals in the same house. This document increases the knowledge for HBV prevention and infection control programs planning and decision making.

In agreement with previous reports, low educational level and history of surgery were identified in this study as independent risk factors for HBV infection.

A vaccine for hepatitis B has been available since 1982 and protection is conferred by antibody response to an antigen which is common to all subtypes. In Sudan, Intramuscular vaccine administration at 0, 1, 6 months produces 85-90% seroprotection rate in adolescents. Vaccination against HBV is necessary for protecting HD patients, however, not all people respond to the vaccine, a few fail to produce the protective antibodies against HBV after they received all doses of the vaccine and thus stay at risk of infection with HBV. In this study, the seropositive percentage of vaccinated patient vs. unvaccinated were 3.3% and 19.8%, respectively, and this finding is similar to Edey *et al.*, who reported that HBV vaccination led to a dramatic reduction in the incidence of HBV infection in hemodialysis patients. Despite the World Health Organisation recommendations for vaccinating patients with end-stage renal disease prior starting dialysis, in Sudan, the implementation of a hepatitis B vaccination program is less common and not well organized. Of note, vaccination is the most effective means of preventing hepatitis B, cirrhosis and hepatocellular carcinoma worldwide.

The use of HBsAg alone as a single marker for infection while ignoring the other markers (anti-HBs and anti-HBc) can be considered as a limitation of this study, as well as sample size. Unfortunately, this is so because this is a cross-sectional study performed in a low resource country setting.

## CONCLUSION

Our study findings highlight the significant association between seropositive rates, history of jaundice and educational level, thus, the identification of the risk factors that may, if addressed, help curtail the spread of HBV infections in HD developing countries.

A periodical screening of HBV in the high-risk groups for viral infections such as HD patients is required. Further study is, however, needed to identify the genotyping of HBV infection, and other markers for HBV should be investigated. This study provides primary epidemiological data, as it includes some original and useful data for such patient settings.

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## AUTHORS' CONTRIBUTIONS

Ehssan Moglad wrote the manuscript and supervised the study, Hajir E. E. Mohammed did all practical work and statistical analysis, and Hatim T.O. Ali revised the manuscript and supervised the study.



## CONFLICT OF INTERESTS

All the authors declare no conflict of interests.

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