

Hepatitis B Vaccination Status, Knowledge, and Attitudes among Healthcare Workers in Military Hospital, Khartoum State: A Cross-sectional Study

Saffaa Yahia, Somia Babiker, Moatasem Gasmallah Mohamed, Abazar Hussin Ahmed, Ameen Awad Al-Amin Babiker, Ehab Ahmed Altayeb, Hassan Gamal Hassan, Mubark Maisra, Ali Awadallah Saeed^{1,2}

Department of Clinical Pharmacy, Faculty of Pharmacy, Omdurman Islamic University, Omdurman, ¹Department of Pharmacology, Faculty of Clinical and Industrial Pharmacy, National University, ²Mycetoma Research Center, Khartoum, Sudan

Abstract

Background: Hepatitis B virus (HBV) is a significant public health issue that causes a substantial number of cases of hepatitis-related illness and death. It is particularly important to vaccinate healthcare workers (HCWs), as they face a higher risk of HBV infection due to their exposure to infected blood and other bodily fluids in their line of work. The Advisory Committee on Immunization Practices of the Centers for Disease Control and Prevention currently recommends HBV vaccination for adult populations at risk of infection. Therefore, this study aimed to assess the vaccination status, knowledge, and attitudes of HCWs toward HBV vaccination in a military hospital. **Materials and Methods:** An institution-based descriptive cross-sectional study performed between May 2022 and September 2022 for HCWs working in Omdurman Military Hospital who were available at the time of data collection; data were collected using a self-administered and online questionnaire; the obtained results were analyzed. **Results and Conclusion:** Only 50% of HCWs in military hospitals possessed adequate knowledge, while the majority exhibited a positive attitude toward HBV infection. In terms of vaccination status, approximately two-thirds of HCWs were immunized, but only half of them completed the recommended number of vaccine doses. The educational activities of the infection control training programs should be strengthened to enhance the awareness of HCWs regarding HBV infection and vaccination. It is necessary to implement comprehensive vaccination programs against hepatitis B in various medical fields. In addition, a mandatory and cost-free policy for hepatitis B vaccination should be established for HCWs and medical students.

Keywords: Hepatitis B virus, military hospital, vaccination, vaccination status

INTRODUCTION

Hepatitis B virus (HBV) is a viral infection of the liver.^[1] In up to 40% of untreated cases, HBV can progress to cirrhosis, and there is a risk of decompensated cirrhosis, fulminant hepatitis, hepatocellular carcinoma, and death.^[2,3] There were approximately 2 billion cases of hepatitis B worldwide.^[4] The virus is spread through blood and bodily fluid contact, sexual contact, and pregnancy, where an infected mother can infect her unborn child.^[5] The surface antigen for hepatitis B (HBsAg) can be detected in saliva, tears, sweat, semen, vaginal secretions, breast milk, cerebrospinal fluid, pleural fluid, synovial fluid, gastric juice, urine, and, very rarely, the feces of HBsAg-positive individuals.^[1]

The incidence of HBV varies between 6.8% in central Sudan and 26% in southern Sudan; this indicates that exposure to the

virus ranges from 47% to 78%.^[6] Healthcare workers (HCWs) are four times more likely than the general population to contract HBV infection due to occupational exposure to infected blood and other bodily fluid;^[7] over 90% of HBV infections occur in developing nations. Hepatitis B immune globulin in infants and/or postnatal immunization with the

Address for correspondence: Dr. Ali Awadallah Saeed,
Department of Pharmacology, Faculty of Clinical and Industrial Pharmacy,
National University, Khartoum, Sudan.
Mycetoma Research Center, Khartoum, Sudan.
E-mail: ali-awad2009@hotmail.com

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HBV vaccine is two methods for preventing the vertical transmission of HBV.^[8,9] There are currently several HBV vaccinations on the market, including 2- and 3-dose series with various administration schedules and seroprotection profiles.^[10]

The Advisory Committee on Immunization Practices of the Centers for Disease Control and Prevention presently advises the vaccination of adult populations who are at risk of contracting HBV infection.^[11] The extended interval between doses contributes to low rates of completing the series and inadequate adherence to dosing schedules, which can result in decreased rates of seroprotection rates.^[12] Moreover, research has indicated that seroprotection may be diminished in certain populations, such as older individuals, patients with chronic kidney disease, or patients with diabetes, even if they have completed a full series of a 3-dose vaccine.^[13] The World Health Organization (WHO) advises that all infants should receive the hepatitis B vaccine shortly after birth, ideally within 24 h, followed by 2 or 3 additional doses of the hepatitis B vaccine, spaced at least 4 weeks apart, to complete the vaccination regimen. The duration of protection is a minimum of 20 years and is likely to be lifelong.^[14] The WHO does not recommend booster vaccination for individuals who have already received a complete 3-dose vaccination schedule.^[15]

Aims of the study

The objective of our study was to assess the level of knowledge and attitude among healthcare professionals at Omdurman Military Hospital in Omdurman, Sudan. In addition, the study aimed to ascertain the vaccination status of these HCWs, investigating the underlying factors contributing to the lack of vaccination or incomplete vaccination. This initiative aimed to promote awareness and provide education to medical professionals, specifically, to safeguard them from the virus and emphasize the significant impact of vaccines in preventing and controlling the spread of diseases.

MATERIALS AND METHODS

Study design and site

This descriptive cross-sectional study was performed between May 2022 and September 2022, and a total of 342 HCWs in the Military Hospital in Omdurman, Khartoum state, Sudan, were recruited for the study. A self-administered questionnaire in English was distributed and delivered to HCWs in military hospitals.

A preliminary pilot study was done on 15 HCWs to test the suitability and validity of the questionnaire. The answers to the pilot study were not included in the final analysis, but the input was reviewed. The double-barreled, confusing, and leading questions were corrected, and a finalized form of the questionnaire was developed.

The sample size was determined using Solvin's formula.^[16]

Study tool

After a review of the literature,^[17-22] the standardized questionnaire was prepared in English with certain adjustments made by the researchers to meet the current study aims.

The questionnaire comprised 29 items, which were categorized into four sections. Section A included six questions about socio-demographic characteristics and consisted of data about independent variables, including socio-demographic characteristics (age, gender, experience, profession, and working department).

Section B included nine questions to assess the knowledge of HCWs about HBV vaccines; knowledge questions were checked and given a total score of 9, with scores from 0 to 4 representing insufficient knowledge and from 5 to 9 representing sufficient knowledge.

Section C included attitudes of HCWs toward HBV vaccine which contains twelve statements using five-point Likert-scale (5-1) with grades of (strongly agree, agree, uncertain, disagree, strongly disagree). Attitudes questions consist of 8 positive statements that favors strongly agree or agree and four negative statements that favor strongly disagree or disagree.

Attitudes score obtained as follows: $\geq 60\%$ good attitudes, while $<60\%$ terrible attitudes.^[13]

Section D featured the vaccination status of HCWs for HBV infection, which contains seven questions.

Statistical analysis

Descriptive analysis was done using mean/standard deviation for quantitative variables and frequency/percentage for categorical variables.

The descriptive statistics were presented as frequency tables and figures.

The Chi-square test was used to identify the association between essential demographic characteristics variables. Statistical significance was defined as a $P \leq 0.05$.

Ethical consideration

Clearance was approved by Omdurman Islamic University, Faculty of Pharmacy, and verbal approval from Omdurman Military Hospital before data collection.

Our study observed all the rights of the participants and conscious of the confidentiality of the information obtained and kept the anonymity of the participants during and after the scheduled period of the study.

RESULTS

Basic demographic characteristics

The primary demographic characteristics of the respondents who participated in this study are shown in Table 1. Three hundred (87.72%) HCWs agreed to participate

in the survey from 342 HCWs. The mean age of participant's was 24.6 ± 3.26 years, females were 52.7%. One-third (34%) of participants were nurses, and 31.1% were doctors.

Knowledge of healthcare workers regarding hepatitis B virus vaccination

Most of respondent's consider themselves at high risk of occupational HBV infection (87%), the HBV infection can be transmitted by infected blood sample (62%), and can be prevented by vaccine (80.3%). 53.3% of participants knew that HBV infection vaccines cannot be effective for those who were already infected with HBV. About 74.3% of HCWs knows that effective doses of vaccines are three doses.

Table 1: Demographic characteristics

Variables	n (%)
Gender	
Male	142 (52.7)
Female	158 (47.3)
Age (years)	
<20	10 (3.3)
20–25	198 (66)
26–30	75 (25)
More than 30	17 (5.7)
Years of experience	
1–5	185 (61.7)
6–10	115 (38.3)
Profession	
Nurse	104 (34.7)
Registrar/house officer/medical student	108 (36)
Lab specialty	24 (8)
Pharmacists	64 (21.3)

Occupational exposure to injury among healthcare workers

Half of the participants 138 (46%) had a history of exposure to occupational injury, immediate HBV testing was the most measure taken by participants 93 (67.4%) after occupational exposure. Other measures done by others were, washing with soap and water or antiseptic was done by 37 (26.8%), allowing injured area to bleed 33 (23.9%), immediate reporting done by 24 (17.4%).

Assessment of the attitude of healthcare workers toward hepatitis B virus vaccination

Majority of participants (89%) consistently agreed that HBV infection is serious public health problem, in like manner, 70% of participants confirmed that their profession put them at greatest risk of HBV infection. About 83% of participants agreed that following infection control guidelines will protect them from being infected with HBV infection, as illustrated in Table 2.

Vaccination status of healthcare workers regarding hepatitis B virus infection

Out of 202 (67.3%) participants who got the HBV vaccine, only 157 (52.3%) completed the three doses of vaccine. Fear of the side effects was the main reason for nonvaccination while waiting for the next dose, which was the main reason for uncompleted vaccination doses.

Factors associated with complete vaccination for hepatitis B virus infection

Using the Pearson Chi-square test, factors that were significantly associated with complete vaccination were years of experience ($P = 0.01$), profession ($P = 0.03$), working department ($P = 0.01$), infection control training program ($P = 0.01$), previous occupational injury ($P = 0.01$),

Table 2: Attitude of healthcare workers regarding hepatitis B virus vaccination

Statement	Scale				
	Strongly agree, n (%)	Agree, n (%)	Neutral, n (%)	Disagree, n (%)	Strongly disagree, n (%)
HBV is a serious public health problem	135 (45)	132 (44)	10 (3.3)	9 (3)	14 (4.7)
All patients should be tested for HBV before they receive healthcare	76 (25.3)	123 (41)	21 (7)	41 (13.7)	39 (13)
Being a health professional puts you at greatest risk of HBV infection	74 (24.6)	134 (44.7)	24 (8)	17 (5.7)	51 (17)
Following infection control guidelines will protect me from being infected with HBV and HCV at work	66 (22)	183 (61)	20 (6.7)	15 (5)	16 (5.3)
I deliver the same standard of care to patients with HBV as I do for other patients	39 (13)	58 (19.3)	67 (22.3)	102 (34)	34 (11.4)
A HCW can infect patients with HBV	67 (22.4)	109 (36.3)	37 (12.3)	67 (22.3)	20 (6.7)
Health professionals who are HBV-positive should not give healthcare services to patients	70 (23.3)	47 (15.7)	81 (27)	57 (19)	45 (15)
I do not trust HBV vaccine	11 (3.7)	54 (18)	64 (21.3)	92 (30.7)	79 (26.3)
HB vaccine is safe	69 (23)	135 (45)	37 (12.3)	41 (13.7)	18 (6)
HBV vaccine is expensive	23 (7.7)	51 (17)	43 (14.3)	134 (44.7)	49 (16.3)
The HBV vaccine provided by your institution was effective	30 (10)	80 (26.7)	101 (33.7)	75 (25)	14 (4.6)
After exposure to contagious fluid/material, the vaccine reduces the likelihood of being HBV-positive	54 (18)	62 (20.7)	87 (29)	68 (22.7)	29 (9.6)

HBV: Hepatitis B virus, HCV: Hepatitis C virus, HCW: Healthcare worker

and level of knowledge ($P = 0.01$). No significant association was found between complete vaccination and gender and age [Table 3].

DISCUSSION

Healthcare professionals face a significant risk of being exposed to blood-borne infections, including the HBV.^[23] Thus, it is crucial that all HCWs obtain adequate knowledge and receive vaccination against the virus in order to minimize the likelihood of infection.^[24]

There is a lack of sufficient data in Sudan regarding the knowledge and practices of health professionals regarding occupational hazards of HBV.

Our study aimed to assess the vaccination status of HCWs and their knowledge, attitudes, and practices toward vaccination.

The primary method of preventing HBV is through vaccination of populations at high risk of HBV infection.^[25] The study examined HCWs, female nurses were predominate, potentially indicating the gender composition of the profession. The

majority of participants had fewer than 5 years of experience, which corresponds to the relatively young age of the surveyed HCWs (mean age 24.6 ± 3.26 years). Medical doctors were predominantly male.

The study found that 58.3% of our participants had received training in infection control, while 87% considered themselves to be at high risk for acquiring HBV infection. This is similar to a study conducted in Ethiopia, where 58% of participants had also received training in infection control. However, only 20.7% of participants in that study believed that HCWs were at high risk of HBV infection.^[22]

This study found that 42.3% of participants recognized needlestick injury as a transmission route for HBV. In southern Sudan, 77.3% of participants held the misconception that food and water could transmit the infection, while 42.3% had the same misconception in Sudan. In a study conducted in China, 62.3% of participants stated that HBV infection can be transmitted through infected blood samples.^[19,21,26]

The recent study conducted at the military hospital revealed that 21.7% of HCWs acknowledged the efficacy of the HBV vaccine in patients who were already infected. Similarly, at Gondar Hospital in Ethiopia, approximately 34% of participants reported that the vaccine decreased the probability of testing positive for HBV after exposure.^[17,18,27]

74.3% of the participants in the study are aware of the recommended doses for HBV infection, which is higher than the percentages found in Ethiopian and Southern Sudanese studies, which were 44.5% and 22.1%, respectively. The coordinates are.^[21,27]

Concerning HCWs' perspective on hepatitis B infection and its vaccination, 94% of HCWs exhibited a positive attitude. Approximately 45% of participants strongly concurred that HBV poses a significant public health concern. Furthermore, 24.7% strongly agreed that their occupation exposes them to the risk of contracting hepatitis infection. In addition, 18% of HCWs asserted that the vaccine reduces the probability of testing positive for HBV after being exposed to infected fluid or material. Approximately 66.3% of HCWs acknowledged the importance of screening all patients for HBV before providing healthcare services. In addition, around 23.3% of HCWs strongly supported the suspension of healthcare services by HBV-positive healthcare professionals. Similar findings have been reported in other studies conducted in Ethiopia.^[22]

The study reveals that 55.7% of the participants underwent screening for HBV, which is higher than the rate reported in a study conducted in South Sudan, which was 48.8%. Nevertheless, a significant proportion of HCWs in this study, amounting to 44.3%, do not conduct screening for HBV, potentially attributed to a deficiency in awareness regarding the prevailing screening policies.

It is worth mentioning that 67.3% of HCWs received the HBV vaccine. This percentage is slightly lower than the results of a

Table 3: Factors associated with full vaccination for hepatitis B virus among healthcare workers

Factor	Complete vaccination (n=202)		Total	P
	Yes	No		
Profession				
Nurse	61	11	72	0.03*
Medical doctors	49	18	67	
Students	40	14	54	
Lab specialist	7	2	9	
Years of experience				
1–5	86	35	121	0.01*
6–10	71	10	81	
Working department				
Pharmacy	18	2	20	0.01*
Emergency	8	3	11	
Lab	8	3	11	
Medicine	29	4	33	
Obs	1	1	2	
Orthopedic	2	1	3	
Pediatric	9	3	12	
Surgery	7	7	14	
Others	75	21	96	
Infection control training program				
Yes	125	24	149	0.01*
No	32	21	53	
Previous occupational injury				
Yes	90	16	106	0.01*
No	67	29	96	
Level of knowledge				
Yes	98	18	116	0.01*
No	59	27	86	

* $P < 0.05$ statistically significant

previous study conducted in Sudan in 2015, which reported a vaccination rate of 72.6% among HCWs in ten public hospitals in Khartoum state.^[19] However, it is higher than the findings from studies conducted in Wad Medani, Sudan, where only 50% of participants were vaccinated,^[20] and at Juba Teaching Hospital, where the vaccination rate was as low as 44.20%.^[21]

Nevertheless, our outcome surpasses the results obtained from studies conducted at Adama General Hospital and Medical College, where 57.7%^[22] of individuals were immunized; in Mongolia, 47.4%;^[28] and at the University of Health and Allied Sciences, Ghana, where 58.8%^[29] of HCWs received immunization.

In our study, 52.3% of the participants received the recommended three doses of the vaccine. This percentage is higher than the findings from Adama General Hospital and Medical College, where only 25.6%^[22] received the recommended doses, and Magnolia, where 47.4%^[28] received the recommended doses.

The study found that 23.7% of participants were not vaccinated due to concerns about potential side effects, lack of interest, and being too busy. This contrasts with studies conducted in Ethiopia,^[21,27] Ghana,^[29] and South Sudan,^[21] where the primary concerns were the cost of the vaccine and its availability.

In relation to the incomplete vaccination status, approximately 15% of individuals did not receive the full recommended doses of the vaccine. This percentage is higher than the findings of a study conducted in Ghana,^[29] where all HCWs who were vaccinated completed the full course of doses. However, it is lower than the percentages reported in studies conducted in southern Sudan^[21] and Ethiopia,^[22] where 26.7% and 32.1%, respectively, did not complete the full course of doses. The primary causes of incompleteness of HBV vaccination was waiting for the next dose, followed by being busy and forgetting altogether. These reasons were consistent with those found in previous studies conducted in Ethiopia^[22] and Juba.^[21]

Out of the HCWs included in this study, 46% (138 individuals) reported having experienced an occupational injury in the past. Among these individuals, 67.4% (93 individuals) underwent immediate testing for HBV as part of the postexposure protocol. This percentage is higher compared to the 39% reported in a previous study conducted in Ethiopia.^[22] In the Ethiopian study, the predominant measure employed was the use of soap, water, or antiseptic for washing (71.3%),^[22] which surpasses the proportion observed in our study (26.8%).

The multivariate analysis of factors influencing vaccination practices demonstrated that HCWs who have a higher likelihood of contracting the HBV are more likely to receive complete immunization. This finding aligns with previous research conducted in Ethiopia, Nigeria, and Zambia,^[18,22,27] which also identified an increased risk of blood-borne disease transmission. In contrast, participants who had 6 or more years of experience had a higher likelihood of completing the vaccine due to the sporadic availability of the vaccine. Moreover,

a greater number of years of experience leads to a higher likelihood of encountering different hazardous conditions, consequently elevating the risk of contracting the disease. A study conducted in Ethiopia and Nigeria corroborated the identical discovery.^[18,22]

The department in which one works is another factor associated with being fully vaccinated. Participating in an infection-control training program was strongly linked to achieving full immunization. This correlation is consistent with the findings from Ethiopia, Nigeria, and Zambia,^[18,22,27] where immunization rates were reported as 27%, 23%, and 21%, respectively. This could be attributed to the objective of infection control programs, which prioritize the implementation of preventive measures among HCWs in hospital settings.

Limitation

One of the limitations of this study is the difficulty in accessing healthcare professionals, particularly those who are young and less experienced. The study focused exclusively on a single hospital, and the utilization of a nonprobability sampling technique further restricted the extent to which the findings can be applied to a broader population, thus constituting additional limitations.

CONCLUSION

Approximately 50% of HCWs in the military hospital possessed a satisfactory level of knowledge, while the majority of them exhibited a positive attitude towards HBV infection and vaccination. Two-thirds of HCWs received vaccinations, but only half of them completed the full recommended dosage. The primary factors contributing to the decision of not receiving vaccination were apprehension regarding potential side effects of the vaccine and a general disinterest in the process of vaccination.

There is a need to enhance the infection control training program and educational activities to increase the awareness of HCWs regarding HBV infection and vaccination. Furthermore, it is imperative to prioritize hepatitis B vaccination for HCWs and medical students, as they are at a significantly higher risk of contracting HBV.

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Data availability statement

This article presents all the raw data utilized in this study.

Authors' contributions

We declare that all authors have made substantial contributions to the conception and design of the work, have made significant contributions to the data acquisition, analysis, and interpretation, and completed revising the results and tables. All authors have made substantial contributions to

the manuscript writing, critically evaluated for important intellectual content, approved the version to be published, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Conflicts of interest

There are no conflicts of interest.

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