بسم الله الرحمن الرحيم

SHENDI UNIVERSITY

Faculty of Medicine — Master of Public Health Programme

RESEARCH PROPOSAL

Knowledge, Attitude and Practice towards Hepatitis B Virus Infection among Healthcare Workers in Dongola Locality Hospitals

Study Period: November 2025 – April 2026

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Submitted to the Research Committee of the Faculty of Medicine, Shendi University, in partial fulfillment of the requirements for the Master of Public Health degree.

1. INTRODUCTION AND BACKGROUND

Hepatitis B virus (HBV) infection remains one of the most pressing public health challenges worldwide. According to the World Health Organization (WHO), an estimated 254 million people were living with chronic HBV infection in 2022, with approximately 1.2 million new infections occurring annually and 1.1 million deaths resulting mainly from cirrhosis and hepatocellular carcinoma in the same year [1] [2]. HBV is a partly double-stranded DNA virus of the family Hepadnaviridae, characterized by several serological markers: hepatitis B surface antigen (HBsAg) and anti-HBs, hepatitis B e antigen (HBeAg) and anti-HBe, and anti-HBc IgM and IgG [3]. The virus is transmitted through contact with infected blood and other body fluids, most commonly through sexual contact, sharing of contaminated needles, syringes, or other drug-injection equipment, and mother-to-child transmission at birth [1]. Because HBV is not cytopathic, both liver damage and viral control — and therefore clinical outcome — depend on the complex interplay between virus replication and the host immune response; consequently, up to 40% of men and 15% of women with perinatally acquired HBV infection will eventually die of liver cirrhosis or hepatocellular carcinoma [3].

A safe and highly effective vaccine has been available since 1981, and where universal infant vaccination has been implemented, prevalence has declined sharply. The complete three-dose series (0, 1, and 6 months) confers more than 96% protection, making HBV a largely vaccine-preventable disease [4] [5]. Nevertheless, in many low- and middle-income countries vaccine uptake remains suboptimal and the burden of infection persists, particularly in sub-Saharan Africa, where several countries are highly endemic with HBV prevalence exceeding 8% among the general population [4] [6]. Global burden analyses confirm that chronic HBV remains among the leading causes of death and disability from infectious diseases worldwide, and the WHO has set the elimination of viral hepatitis as a public health threat by 2030 [2] [7].

Healthcare workers (HCWs) constitute one of the groups at highest occupational risk of HBV infection. A systematic review and meta-analysis of global data found that the pooled prevalence of current

HBsAg infection among HCWs is 2.3%, while Africa carries the heaviest burden: the pooled prevalence of HBV serological markers among HCWs in Africa reaches up to 18%, with HBV prevalence among HCWs in Africa estimated at 6.8% and 4.9% in Sudan specifically [4] [8] [9]. In other words, HCWs face a risk roughly four times greater than that of the general adult population [5] [9]. This excess risk arises from frequent exposure to needle-stick and sharps injuries and contaminated blood and body fluids: an estimated three million HCWs sustain needle-stick injuries each year worldwide [5], and comprehensive meta-analyses report that 40.97% of nurses globally experience needle-stick injuries, with prevalence as high as 46.6% in developing countries [10]. The risk of transmission following a single percutaneous exposure is highest for HBV (approximately 30%), compared with hepatitis C virus (1–3%) and HIV (0.3%) [5].

The World Health Organization and national infection prevention guidelines therefore recommend that all healthcare workers receive HBV vaccination before beginning clinical work, together with consistent use of standard precautions and personal protective equipment [1] [11]. Despite these recommendations, global uptake remains inadequate. A 2026 systematic review and meta-analysis of 56 studies covering 1,326,944 nurses in 30 countries found that only 44.8% had completed the full three-dose vaccine series; coverage was significantly lower in low- and middle-income countries (39.3%) than in high-income countries (72.1%), and was lowest in Africa (27.5%). Importantly, the dominant barriers were structural — vaccine unavailability (33.8%) and cost (24.4%) — rather than vaccine hesitancy, and no improvement in coverage was observed over time [12]. In Sudan, the childhood HBV immunization programme was introduced only in 2005, leaving most currently practicing HCWs unvaccinated during childhood; a 2024 cross-sectional study in Dongola itself found that only 52.1% of healthcare professionals had received at least one dose and only 34.1% had completed all three doses, while 93.8% reported that the vaccine was unavailable at their facility [13].

These figures highlight the critical role of knowledge, attitude, and practice (KAP) in protecting HCWs from HBV. Knowledge determines the recognition of risk, attitude shapes the willingness to adopt preventive behaviours, and practice translates both into actual protection. In Sudan, recent local evidence consistently shows a wide gap between awareness and behaviour: medical students in North Sudan reported good knowledge (86%) and favourable attitudes (77%) but a strikingly poor practice score (15.5%), and only 33% were vaccinated [14]. Similar patterns have been reported across Africa —

in South Africa, primary healthcare staff scored well on transmission knowledge (83%) but poorly on clinical picture (50%), diagnosis (44%), and prevention and management (40%) [15]; in Liberia, 60% of HCWs reported a history of needle-stick injury with inconsistent post-exposure responses [16]; and in Mozambique, knowledge (69.6%) and attitude (92%) were moderate to good but practice was mediocre (54.8%) [17].

This proposal therefore presents a structured assessment of the knowledge, attitudes, and practices of healthcare workers towards HBV infection in Dongola locality hospitals, along with vaccination status and its determinants, in order to generate the facility-level evidence needed to design effective vaccination and infection prevention interventions.

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2. PROBLEM STATEMENT

2.1 The Occupational Hazard

HBV is the blood-borne pathogen with the highest risk of transmission after occupational exposure — approximately 30% per needle-stick injury from an HBeAg-positive source — making it 10 to 100 times more transmissible than HIV through the same route [5] [9]. HCWs are continuously exposed to this risk through needle-stick injuries, sharps injuries, and splashes of blood and body fluids onto mucous membranes or non-intact skin during routine patient care [5] [10]. In endemic settings such as Sudan, where population HBsAg prevalence ranges from about 4.4% to over 8%, the probability that an unvaccinated HCW will encounter an infectious patient during routine work is substantial [13] [14]. An infected HCW not only endangers her or his own health — with lifelong risk of cirrhosis and hepatocellular carcinoma — but may also transmit the virus to other patients and family members [4].

2.2 The Local Reality in Dongola

Dongola is the capital of the Northern State of Sudan and is served by a small number of public hospitals with limited resources. The two most recent local studies demonstrate serious protection gaps. Among medical students in North Sudan (including the University of Dongola),

only 33% had received any vaccine dose and a mere 18.6% had completed the full series despite good knowledge and favourable attitudes [14]. Among practicing professionals in Dongola Specialised and Dongola Police Hospitals, only 34.1% were fully vaccinated and 93.8% reported that the vaccine was unavailable at their facility [13]. Comparable studies across Africa attribute most of this deficit to systemic failures — unavailability, cost, absence of mandatory vaccination policies, and inadequate infection control infrastructure — rather than to individual hesitancy [12] [18] [19]. Knowledge about transmission is generally adequate, but preventive practice and vaccination consistently lag far behind, and training in infection prevention and control is infrequent and unsustained [15] [16] [17].

2.3 Statement of the Problem

Given the high endemicity of HBV in Sudan, the four-fold elevated occupational risk faced by HCWs, and the documented deficiencies in vaccination coverage and preventive practice in Dongola, healthcare workers in Dongola locality hospitals are at substantial risk of acquiring HBV during their daily work, and of unknowingly transmitting it to patients. Because HBV infection is preventable in nearly all cases through vaccination and strict adherence to infection prevention and control measures, this risk is largely avoidable — yet it persists because the current levels of knowledge, attitudes, practices, and vaccination coverage among the local workforce have not been systematically measured, monitored, or addressed. There is an urgent need to quantify these gaps precisely and identify their determinants so that targeted, evidence-based interventions — vaccination campaigns, infection control training, availability of personal protective equipment, and post-exposure prophylaxis protocols — can be planned and implemented.

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3. RESEARCH GAP

The existing literature leaves four specific gaps that this study is designed to address.

First, the gap in comprehensive KAP assessment in Dongola. Although a recent cross-sectional study in Dongola assessed vaccination status and knowledge among healthcare professionals [13], it did not measure the attitude and practice dimensions of the KAP

triad, did not cover the full spectrum of professional categories in the locality's hospitals, and did not assess determinants of practice and vaccination beyond knowledge. The second recent North Sudan study focused exclusively on medical students rather than the practicing workforce [14]. No published study has yet assessed the complete triad — knowledge, attitude, and practice together with vaccination status and their socio-demographic and occupational determinants — among physicians, nurses, laboratory technicians, and allied health staff in Dongola locality hospitals.

Second, the gap between knowledge and protective behaviour. The international and regional literature demonstrates that adequate knowledge alone does not translate into protective behaviour: KAP surveys repeatedly show reasonable awareness coupled with poor practice, low vaccination uptake, and inconsistent use of personal protective equipment [15] [16] [17] [20]. The factors that explain this knowledge–practice gap in the specific context of Dongola — including resource constraints, training availability, and institutional policies — remain unexplored.

Third, the gap in data on barriers and determinants. Recent global and African evidence identifies structural barriers (vaccine unavailability, cost, lack of mandatory policies) as the dominant obstacles to HBV vaccination of HCWs, but these findings have not been validated locally [12] [18] [19]. Understanding which barriers operate in Dongola, and how experience, professional category, and prior training shape KAP, is a prerequisite for effective local intervention.

Fourth, the timeliness gap. The burden of HBV, vaccination coverage, and infection control practices are dynamic; data from even five years ago may no longer reflect the current situation, especially given recent disruptions to health services in Sudan. Current, facility-level data collected during the 2024–2025 period are therefore required to inform immediate decision-making by hospital management and the State Ministry of Health.

By filling these gaps, this study will provide the first comprehensive, current, and actionable KAP and vaccination profile of the healthcare workforce in Dongola locality hospitals.

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4. RATIONALE AND SIGNIFICANCE OF THE STUDY

Despite global and national efforts to control HBV, healthcare workers remain among the groups at highest risk of infection because of their occupational exposure to infected blood and body fluids. While vaccination and infection prevention protocols exist, adherence remains inconsistent, especially in resource-limited and underserved areas such as Dongola locality in Northern Sudan, where vaccine availability has been reported as a major barrier [12] [13].

Identifying existing gaps in knowledge, attitude, and practice is crucial for implementing effective interventions, improving vaccination uptake, and reducing occupational risk. This study will address the lack of local data and provide evidence-based recommendations tailored to the healthcare setting in Dongola. The findings will directly inform hospital management, the Northern State Ministry of Health, and the National Ministry of Health regarding the need for mandatory HCW vaccination programmes, infection prevention and control training, personal protective equipment provision, and post-exposure prophylaxis protocols, and will contribute current data from Sudan to the published literature on occupational HBV risk in sub-Saharan Africa.

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5. RESEARCH OBJECTIVES

5.1 General Objective

To assess knowledge, attitude, and practice (KAP) towards Hepatitis B virus infection among healthcare workers in Dongola locality hospitals during the period November 2025 – April 2026.

5.2 Specific Objectives

1. To assess the level of knowledge about HBV transmission, clinical manifestations, complications, prevention, and vaccination among healthcare workers in Dongola locality hospitals.

2. To determine the attitudes of healthcare workers towards HBV prevention and control, including perceived occupational risk, vaccine beliefs, and willingness to be vaccinated.
3. To determine the practices of healthcare workers regarding HBV infection prevention and control, including standard precautions, use of personal protective equipment, safe handling of sharps, and post-exposure behaviour.
4. To determine the HBV vaccination status of healthcare workers, including the number of doses received and the principal barriers to vaccination.
5. To identify socio-demographic and occupational factors associated with knowledge, attitudes, practices, and vaccination status among the healthcare workers.

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6. RESEARCH QUESTIONS

1. What is the level of knowledge about HBV infection among healthcare workers in Dongola locality hospitals?
2. What are the attitudes of healthcare workers towards HBV prevention and control?
3. What are the current infection control practices of healthcare workers regarding HBV prevention?
4. What is the HBV vaccination coverage (any dose and complete three-dose series) among healthcare workers, and what are the barriers to vaccination?
5. What socio-demographic and occupational factors are associated with knowledge, attitude, practice, and vaccination status?

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7. HYPOTHESES

1. **H_1:** There is a significant association between the level of knowledge about HBV and the professional category of healthcare workers (e.g., doctors, nurses, laboratory technicians).
2. **H_2:** Healthcare workers who have received previous infection control training will demonstrate better preventive practices towards HBV than those who have not.

3. **H_3:** Vaccinated healthcare workers will exhibit more positive attitudes and safer practices regarding HBV prevention than unvaccinated healthcare workers.
4. **H_4:** Years of work experience are positively correlated with better HBV-related knowledge and practices.

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8. VARIABLES OF THE STUDY

8.1 Dependent Variables

Variable	Operational Definition / Examples
Knowledge	Knowledge score regarding HBV, measured as the proportion of correct answers on items covering modes of transmission, clinical manifestations, complications, vaccine availability and schedule, and post-exposure management; classified as good (≥75% correct), moderate (50–74%), or poor (<50%)
Attitude	Attitude score towards HBV prevention, including perception of occupational risk, belief in vaccine efficacy and safety, and sense of personal responsibility to be vaccinated, measured on a five-point Likert scale
Practice	Infection control practice, including routine hand hygiene, use of gloves and other personal protective equipment, safe handling and disposal of sharps, and post-exposure prophylaxis seeking behaviour
Vaccination status	Self-reported HBV vaccination status: unvaccinated, partially vaccinated (1–2 doses), or fully vaccinated (3 doses), with documentation requested where available

8.2 Independent Variables

Socio-demographic characteristics (age, sex, marital status, educational level), occupational characteristics (job title/professional category, years of experience, department or ward), previous training in

infection control, history of occupational exposure to blood or body fluids (needle-stick injury or splash), and awareness of HBV vaccination availability.

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9. LITERATURE REVIEW

9.1 The Global Burden of Hepatitis B Virus Infection

Hepatitis B remains a leading global health problem despite four decades of an effective vaccine. The WHO estimates that 254 million people were living with chronic HBV infection in 2022, with approximately 1.2 million new infections occurring annually and 1.1 million deaths that year, mainly from cirrhosis and hepatocellular carcinoma — representing 83% of all viral hepatitis deaths [1] [11]. Global Burden of Disease analyses confirm that chronic HBV was responsible for over one million deaths in 2019, with the heaviest concentration of disease in Asia and sub-Saharan Africa [2]. The infection is hyper-endemic in much of Africa, where population HBsAg prevalence frequently exceeds 8%, and where most infections are acquired perinatally or in early childhood, carrying a high probability of progression to chronic disease, cirrhosis, and hepatocellular carcinoma [4] [6]. The WHO has consequently established the elimination of viral hepatitis as a public health threat by 2030, with targets for diagnosis, treatment, and prevention, including universal HBV vaccination of healthcare workers [7] [21]. New WHO guidelines published in 2024 provide the first comprehensive recommendations for testing, treatment, and prevention across all risk groups, including healthcare personnel, offering a timely framework for countries such as Sudan to transform hepatitis care [11].

9.2 HBV as an Occupational Hazard for Healthcare Workers

HCWs are at markedly elevated occupational risk of HBV infection because of their frequent percutaneous and mucocutaneous exposure to infectious blood and body fluids during routine patient care [4] [5]. A comprehensive systematic review and meta-analysis found that the

pooled prevalence of current HBsAg among HCWs worldwide is 2.3%, placing them at an intermediate level of infection risk, with Africa carrying by far the heaviest burden — pooled seroprevalence of HBV markers among African HCWs reaching approximately 6.8% to 18% — while European HCWs showed prevalence as low as 0.6% [4] [9]. A 2022 systematic review across Asian and African populations likewise reported an overall seroprevalence of 5.0% among HCWs, higher than in the general population [22]. Sudan-specific analyses place HBV prevalence among Sudanese HCWs at 4.9%, against a background of population HBsAg prevalence of 4.4%–8% and a national HBV/HCV/HIV pooled infection burden documented in Sudanese seroprevalence reviews [8] [13] [14].

The transmission risk per exposure explains much of this hazard. Among blood-borne pathogens, HBV carries the highest transmission probability after a needle-stick injury — about 30% from an HBeAg-positive source — compared with 1–3% for HCV and 0.3% for HIV [5]. The frequency of exposure is equally concerning: an estimated three million HCWs sustain needle-stick injuries annually worldwide [5], and the largest meta-analysis of nurses found a global pooled needle-stick injury prevalence of 40.97%, rising to 46.6% in developing countries compared with 30.5% in developed settings [10]. A recent Iranian update and parallel nurse-student analyses confirm that needle-stick injuries remain highly prevalent across all healthcare cadres, making them the dominant route of occupational blood-borne pathogen transmission [23]. Because HBV can survive outside the body for at least seven days and remains infectious, even environmental contamination poses a transmission risk, underscoring the importance of standard precautions in every clinical encounter [11].

9.3 Vaccination: The Cornerstone of Protection and Its Global Deficit

Vaccination is the single most effective protective measure against occupational HBV infection. The standard three-dose intramuscular series (0, 1, and 6 months) confers more than 96% protection and is considered to provide long-lasting, probably lifelong immunity; the WHO, the CDC, and infection prevention guidelines in most countries recommend that all HCWs be vaccinated before beginning clinical work [1] [5] [24]. Post-exposure management is also well established: unvaccinated HCWs exposed to a confirmed or suspected HBV source

should receive hepatitis B vaccine — with hepatitis B immunoglobulin for high-risk exposures — as rapidly as possible, ideally within 24–48 hours [24] [25].

Despite this, global coverage remains inadequate. The most recent meta-analysis, encompassing 56 studies and more than 1.3 million nurses across 30 countries, estimated the global pooled prevalence of complete (≥3-dose) HBV vaccination at only 44.8%, with coverage of 72.1% in high-income countries versus 39.3% in low- and middle-income countries and a mere 27.5% in Africa; the dominant barriers were structural — vaccine unavailability (33.8%) and cost (24.4%) — and no temporal improvement in coverage was detected over the study period [12]. In Ethiopia, a systematic review of 18 studies estimated that only around 20% of HCWs had received the full vaccine series, against a pooled HBV seroprevalence of 5.93% [18]. Nigerian nationwide survey data document similarly suboptimal vaccination status among HCWs across all six geopolitical zones [26], and systematic reviews of low- and middle-income countries confirm that non-vaccination is driven primarily by lack of vaccine availability, cost, and absence of mandatory institutional policies rather than by hesitancy [19]. This distinction is policy-critical: passive recommendations are insufficient, and mandatory, institutionally funded vaccination programmes are required to close the coverage gap [12] [19].

9.4 KAP Studies from Africa and the Middle East

A substantial body of recent KAP research demonstrates a consistent pattern across sub-Saharan Africa and the Middle East: adequate or good knowledge of HBV transmission, moderate to favourable attitudes, but markedly deficient preventive practice and vaccination uptake. In South Africa, primary healthcare staff in Bloemfontein scored well on transmission and epidemiology knowledge (median 83%) but poorly on clinical picture (50%), laboratory diagnosis (44%), management (40%), and prevention (40%), indicating that even knowledge is unevenly distributed across domains [15]. In Liberia, a hospital-based study found that while most HCWs believed infection control guidelines would protect them, 60% reported a history of needle-stick injury, correct responses on transmission ranged only from 41.9% to 99.2%, and post-injury practices such as checking the source patient's blood-borne disease status were performed by only 27% of respondents [16]. In Mozambique, HCWs showed moderate

knowledge (69.6%), good attitudes (92%), but mediocre practice (54.8%); physicians scored highest on knowledge, and prior infection control training was significantly associated with better knowledge and practice [17]. In Afghanistan, studies in Kabul and Herat similarly report moderate knowledge and positive attitudes but poor adherence to vaccination schedules and personal protective equipment use, particularly among nurses [20] [27].

Determinants identified across these studies include professional category and education level (physicians and more highly educated cadres consistently outperform others), prior infection control training (strongly protective for both knowledge and practice), and institutional factors such as the availability of equipment and vaccines [15] [16] [17] [20]. Post-exposure prophylaxis (PEP) knowledge is a further weak point: reviews of HBV PEP in African settings show that exposure is common, that PEP pathways exist, but that awareness and timely application of PEP among HCWs are poor, leaving most exposures unmanaged [28] [29].

9.5 Local Studies from Sudan

Sudan is a hyper-endemic setting for HBV. Population-level seroprevalence estimates range from about 4.4% to 5.5% nationally and exceed 8% in Khartoum, while the HBV prevalence among Sudanese HCWs has been estimated at 4.9% [8] [13] [14]. The childhood HBV immunization programme was introduced only in 2005, meaning that most HCWs currently in practice were never covered by it [14].

Recent local KAP evidence consistently documents the knowledge–practice gap. Among 426 medical students from five North Sudanese medical colleges — including the University of Dongola — surveyed in 2023, 86% had good knowledge and 77% held favourable attitudes towards HBV prevention, yet the practice score was only 15.5%, and just 33% had received any vaccine dose with 18.6% completing the full series; older age and advanced academic level predicted better knowledge [14]. Among practicing professionals, a 2024 cross-sectional study in Dongola Specialised and Dongola Police Hospitals (n = 211) found that 52.1% had received at least one vaccine dose but only 34.1% were fully vaccinated, with 93.8% reporting vaccine unavailability at their facility; 62.1% demonstrated good knowledge, and longer work experience and greater knowledge were significantly associated with vaccination, while laboratory technologists were significantly less likely to be vaccinated than physicians [13]. A 2023 assessment of dental HCWs in Khartoum likewise reported knowledge–practice gaps

in HBV prevention [30], and earlier Khartoum-based studies reported poor knowledge of universal precautions and suboptimal glove use among HCWs, reinforcing the persistence of the problem.

9.6 Synthesis and Research Gap

Three conclusions emerge from the literature. First, HBV constitutes a serious, quantifiable occupational hazard for HCWs in Sudan and across Africa, with the risk amplified by extremely high needle-stick injury prevalence and the highest per-exposure transmission probability of all major blood-borne pathogens [4] [5] [9] [10]. Second, knowledge alone does not translate into protective behaviour: across continents, KAP surveys show adequate awareness coupled with poor practice, low vaccination uptake, and poorly applied post-exposure management, with structural barriers — unavailability, cost, and absent policies — dominating over hesitancy [12] [15] [16] [17] [19] [28]. Third, for Dongola locality specifically, existing data are confined to a vaccination-focused study of two hospitals (2024) and a student-based KAP study (2023); no published study has comprehensively assessed the complete KAP triad together with vaccination status and its determinants among the full spectrum of HCWs — physicians, nurses, laboratory technicians, and allied staff — in the locality's hospitals [13] [14]. This study is designed precisely to fill that gap and to generate current, facility-level evidence on which vaccination and infection control policy can be built.

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10. METHODOLOGY

10.1 Study Design

An institutional-based, descriptive, cross-sectional study with an analytical component will be conducted to assess the knowledge, attitude, and practice of healthcare workers towards HBV infection. This design was selected because it is efficient, economical, and appropriate for estimating the prevalence of knowledge, attitudes, practices, and vaccination status and for examining associations between them and socio-demographic factors at a single point in time.

10.2 Study Area and Setting

The study will be conducted in the public hospitals of Dongola locality, the capital of the Northern State of Sudan. The main study sites will be Dongola Specialised Hospital and the other public hospitals serving the locality, which provide secondary-level services to the urban population of Dongola and surrounding areas.

10.3 Study Period

The study will be conducted from November 2025 to April 2026.

10.4 Study Population

Target population: All healthcare workers employed in the public hospitals of Dongola locality.

Study population: Healthcare workers (physicians including dentists, nurses, midwives, laboratory technicians, and other allied health staff) actively performing clinical duties in the selected hospitals during the data collection period.

Inclusion criteria: All healthcare workers currently employed and actively working in the selected Dongola locality hospitals who consent to participate.

Exclusion criteria: Healthcare workers on sick leave, maternity leave, annual leave, or administrative leave during the data collection period, as well as those who decline to participate or who return incomplete questionnaires.

10.5 Sample Size Determination

The minimum sample size will be calculated using the single population proportion formula:

> $n = (Z^2 \times p \times (1 - p)) / d^2$

where Z = 1.96 (corresponding to a 95% confidence level), p = 50% (the proportion assumed to maximize the sample size, since no prior full KAP estimate exists for the study population), and d = 0.05 (the margin of error). This yields a minimum n of approximately 384. Because the

total number of healthcare workers in the selected hospitals is smaller than 10,000, the finite population correction formula will be applied using the actual workforce figure obtained from hospital administration to derive the final minimum sample size, and a further 10% will be added to compensate for anticipated non-response. (The final sample size should be recalculated once the exact total number of HCWs [N] in the selected hospitals is obtained.)

10.6 Sampling Technique

A stratified random sampling technique will be used. HCWs will first be stratified by professional category (physicians, nurses/midwives, laboratory technicians, and other allied health staff) according to the proportion of each category within the total workforce, and systematic random sampling will then be applied within each stratum using proportional allocation.

10.7 Data Collection Method and Tool

Data will be collected through face-to-face interviews using a structured, pre-tested, semi-closed questionnaire prepared in English (the full instrument is provided as an annex to this proposal). The questionnaire was adapted from validated KAP instruments used in recent comparable studies and consists of five sections: (1) socio-demographic and occupational characteristics; (2) knowledge of HBV (transmission routes, clinical manifestations, complications, prevention, and vaccination), with each correct item scored 1 and incorrect/don't know scored 0, and total scores graded as good (≥75%), moderate (50–74%), or poor (<50%); (3) attitudes towards HBV prevention (perceived risk, vaccine beliefs, and personal responsibility) measured on a five-point Likert scale; (4) reported infection control practices, including hand hygiene, use of personal protective equipment, safe sharps handling, disposal, and post-exposure behaviour, each scored as adequate or inadequate; and (5) vaccination status and barriers. The questionnaire will be pre-tested on 10% of the sample size (or on HCWs in a comparable facility outside the study area), and necessary modifications will be made before the main study.

10.8 Data Management and Analysis

Completed questionnaires will be checked daily for completeness, coded, and entered into a computer. Data will be analysed using SPSS version 26 (or an equivalent statistical package). Descriptive statistics (frequencies, percentages, means, and standard deviations) will be used to summarize socio-demographic characteristics and to estimate the proportions of good, moderate, and poor knowledge, positive and negative attitudes, adequate and inadequate practices, and vaccination coverage. Analytical statistics — the chi-square test (or Fisher's exact test where appropriate) and binary logistic regression — will be used to test associations between the dependent variables (knowledge, attitude, practice, and vaccination status) and the independent variables. A p-value of less than 0.05 at a 95% confidence level will be considered statistically significant.

10.9 Quality Assurance

The questionnaire will be pre-tested and refined; data collectors will receive one day of training on interview techniques and infection control terminology; field supervision will be maintained throughout data collection; and entered data will be double-checked for consistency and completeness before analysis.

10.10 Ethical Considerations

Ethical clearance will be obtained from the Research Committee of the Faculty of Medicine, Shendi University, and administrative permission will be sought from the Northern State Ministry of Health and the managements of the selected hospitals. Written informed consent will be obtained from every participant after the purpose, procedures, benefits, and risks of the study have been clearly explained. Participation will be voluntary, and participants may withdraw at any time without consequence. All information will be treated as strictly confidential and used for research purposes only; data will be stored securely, and no identifying information will appear in reports or publications. Participants identified as unvaccinated and at high occupational risk will be informed of their right to receive the HBV vaccine at the health facility.

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11. STUDY TIMELINE

Activity	Nov 2025	Dec 2025	Jan 2026	Feb 2026	Mar 2026	Apr 2026
Proposal submission and approval	X					
Ethical clearance and administrative permissions		X				
Questionnaire development and pre-testing		X	X			
Data collector training			X			
Data collection				X	X	
Data entry and analysis					X	
Report writing, review, and submission						X

12. ESTIMATED BUDGET

Item	Quantity	Unit Cost (SDG)	Total (SDG)
Stationery and questionnaire printing	1 lot	—	To be filled by candidate
Transportation to study sites	1 lot	—	To be filled by candidate
Data collector training and per diem	2	—	To be filled by candidate
Data entry and analysis (software/internet)	1 lot	—	To be filled by candidate
Printing and binding of final report	5 copies	—	To be filled by candidate
Contingency (10%)	—	—	To be filled by candidate

Item	Quantity	Unit Cost (SDG)	Total (SDG)
Total			**To be filled by candidate**

All cost figures are to be completed by the candidate according to the prevailing local prices at the time of the study.

ANNEX 1: DATA COLLECTION QUESTIONNAIRE

Knowledge, Attitude and Practice towards Hepatitis B Virus Infection among Healthcare Workers in Dongola Locality Hospitals

Interviewer ID: _____ Questionnaire ID: _____ Date: ____ / ____ / 2026 Hospital: _____

Introduction to the participant: Good day. I am a postgraduate student of the Master of Public Health programme at Shendi University. This questionnaire is part of a research study on hepatitis B virus infection among healthcare workers. Your participation is voluntary, your answers are confidential, and they will be used for research purposes only. You may stop at any time. Thank you.

Consent: I have read/explained the purpose of this study and I agree to participate. [ ] Yes [ ] No

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SECTION A: Socio-Demographic and Occupational Characteristics

A1. Age (years): _____

A2. Sex: [ ] Male [ ] Female

A3. Marital status: [ ] Single [ ] Married [ ] Divorced [ ] Widowed

A4. Highest educational level: [ ] Diploma [ ] Bachelor's degree [ ] Master's degree or above [ ] Other: _____

A5. Job title / professional category: [ ] Physician (including dentist) [ ] Nurse [ ] Midwife [ ] Laboratory technician [ ] Pharmacist [ ] Other allied health worker: _____

A6. Department/ward of work: _____

A7. Years of work experience: [ ] < 1 year [ ] 1–4 years [ ] 5–10 years [ ] > 10 years

A8. Have you ever received training in infection prevention and control? [ ] Yes [ ] No *If yes, how many times in the last 2 years?* _____

A9. In the last 12 months, have you experienced a needle-stick injury or splash of blood/body fluids onto your eyes, mouth, or broken skin? [ ] Yes [ ] No *If yes, how many times?* _____

SECTION B: Knowledge about Hepatitis B Virus (Score 1 for each correct answer; 0 for incorrect/"don't know")

B1. Hepatitis B is caused by: [ ] Bacteria [ ] Virus [ ] Parasite [ ] Fungus [ ] Don't know

B2. Which of the following are ways HBV can be transmitted? (tick all that apply) [ ] Contact with infected blood [ ] Sexual contact [ ] Sharing needles/syringes [ ] Mother to baby at birth [ ] Shaking hands/ hugging [ ] Sharing food or water [ ] Mosquito bite [ ] Don't know

B3. HBV is more infectious than HIV after a needle-stick injury. [ ] True [ ] False [ ] Don't know

B4. Which of the following are signs/symptoms of hepatitis B? (tick all that apply) [ ] Jaundice (yellowing of eyes/skin) [ ] Fatigue [ ] Dark urine [ ] Abdominal pain [ ] Skin rash [ ] Runny nose [ ] Don't know

B5. Chronic hepatitis B infection can lead to: [ ] Liver cirrhosis [ ] Hepatocellular carcinoma (liver cancer) [ ] Kidney stones [ ] Heart disease [ ] Don't know

B6. A safe and effective vaccine against hepatitis B exists. [ ] True [ ] False [ ] Don't know

B7. The recommended HBV vaccine schedule for adults is: [ ] One dose [ ] Two doses [ ] Three doses [ ] Four doses [ ] Don't know

B8. After completing the full vaccine series, protection against HBV is about: [ ] Less than 50% [ ] 50–75% [ ] More than 95% [ ] Don't know

B9. The HBV vaccine is available free of charge for healthcare workers at this hospital. [ ] True [ ] False [ ] Don't know

B10. If you are accidentally exposed to blood of a patient (needle-stick injury), what should you do first? [ ] Wash the site immediately with soap and water [ ] Squeeze the wound to bleed [ ] Ignore it [ ] Apply alcohol only [ ] Don't know

B11. After a needle-stick injury, HBV post-exposure prophylaxis (vaccine and/or immunoglobulin) should be given: [ ] As soon as possible, ideally within 24–48 hours [ ] Within one month [ ] Only if symptoms appear [ ] Not needed [ ] Don't know

B12. All healthcare workers should be vaccinated against HBV before starting clinical work. [ ] Agree [ ] Disagree [ ] Don't know

B13. HBV can survive outside the body (on surfaces) for at least 7 days and remain infectious. [ ] True [ ] False [ ] Don't know

B14. Wearing gloves prevents needle-stick injuries completely. [ ] True [ ] False [ ] Don't know

B15. A person infected with HBV can transmit the virus to others even without symptoms. [ ] True [ ] False [ ] Don't know

Total knowledge score: _____ / 15 (Good ≥75% = ≥11; Moderate 50–74% = 8–10; Poor <50% = 0–7)

SECTION C: Attitude towards Hepatitis B Prevention (Circle one response per item)

#	Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
C1	I am at risk of contracting hepatitis B in my daily work.	5	4	3	2	1

#	Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
C2	Hepatitis B is a serious public health problem in Sudan.	5	4	3	2	1
C3	The hepatitis B vaccine is safe.	5	4	3	2	1
C4	The hepatitis B vaccine is effective in preventing infection.	5	4	3	2	1
C5	Every healthcare worker has a responsibility to be vaccinated against HBV.	5	4	3	2	1
C6	Using personal protective equipment (gloves, goggles, gowns) protects me from HBV.	5	4	3	2	1
C7	I would like to receive the HBV vaccine if it were available.	5	4	3	2	1
C8	My hospital should provide the HBV vaccine free of	5	4	3	2	1

#	Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
	charge to all staff.					
C9	Infection prevention and control rules at my workplace are important.	5	4	3	2	1
C10	Reporting a needle-stick injury to my supervisor is important.	5	4	3	2	1

Attitude classification (5-point Likert scale, 10 items, maximum score 50): Positive attitude ≥ 37.5 (75% of maximum); Neutral 25–37; Negative attitude < 25.

SECTION D: Practice regarding Hepatitis B Prevention

D1. Do you routinely wash your hands (or use hand sanitizer) before and after patient contact? [ ] Always [ ] Often [ ] Sometimes [ ] Rarely/Never

D2. Do you wear gloves when there is a risk of contact with blood or body fluids? [ ] Always [ ] Often [ ] Sometimes [ ] Rarely/Never

D3. Do you recap needles after use? [ ] Always [ ] Sometimes [ ] Never

D4. Do you dispose of used needles and sharps immediately in a puncture-proof sharps container? [ ] Always [ ] Sometimes [ ] Never

D5. Are sharps containers available in your work area? [ ] Yes, always [ ] Yes, sometimes [ ] No

D6. Do you wear eye/face protection when splashes of blood are likely? [ ] Always [ ] Sometimes [ ] Never

D7. If a needle-stick injury or splash occurs, do you report it to your supervisor? [ ] Always [ ] Sometimes [ ] Never

D8. If exposed, do you seek post-exposure management (washing, reporting, PEP, laboratory testing) within 24–48 hours? [ ] Always [ ] Sometimes [ ] Never [ ] Not applicable (never exposed)

D9. Have you checked your HBV immunity status (anti-HBs blood test) after vaccination? [ ] Yes [ ] No [ ] Don't know

Practice classification: Adequate if ≥80% of applicable practices reported as "Always"; Partial if 50–79%; Poor if <50%.

SECTION E: Vaccination Status and Barriers

E1. Have you ever received the hepatitis B vaccine? [ ] Yes [ ] No

E2. If yes, how many doses have you received? [ ] 1 dose [ ] 2 doses [ ] 3 doses (complete) [ ] Don't know

E3. Where did you receive the vaccine? [ ] This hospital [ ] Another hospital/health centre [ ] During university/medical school [ ] Private clinic [ ] Don't know

E4. If NO or incomplete, what is the main reason? (tick all that apply) [ ] Vaccine not available at my facility [ ] Cost too high [ ] No time / too busy [ ] Fear of side effects [ ] Not offered / not required by employer [ ] Did not know it was important [ ] Believed I am already immune [ ] Other: _____

E5. Do you know whether HBV post-exposure prophylaxis (PEP) is available at your hospital? [ ] Yes [ ] No [ ] Don't know

Thank you for your participation.

ANNEX 2: SCORING AND CLASSIFICATION SUMMARY

Domain	Items	Maximum Score	Classification
Knowledge (Section B)	15	15	Good ≥11 (≥75%); Moderate 8–10 (50–74%); Poor 0–7 (<50%)

Domain	Items	Maximum Score	Classification
Attitude (Section C)	10	50	Positive ≥37.5; Neutral 25–37; Negative <25
Practice (Section D)	9 applicable items	100%	Adequate ≥80%; Partial 50–79%; Poor <50%
Vaccination status (Section E)	—	—	Unvaccinated / Partially vaccinated (1–2 doses) / Fully vaccinated (3 doses)

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