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Research Article

Hepatitis B Vaccination After Occupational Exposure Among Healthcare Workers in a Tertiary Hospital in Delhi

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A B S T R A C T

Introduction: Hepatitis B virus (HBV) poses a major public health challenge for healthcare workers (HCWs) due to frequent exposure to infected bodily fluids. Despite effective vaccines and protocols, adherence is suboptimal, risking transmission. This study highlights critical gaps in HBV knowledge and vaccination compliance among HCWs in a major Delhi hospital.

Objectives: It is thus important to evaluate and highlight - Knowledge of post-exposure management strategies and first aid following exposure to blood and bodily fluids, Prevalence of hepatitis B infection among HCWs, hepatitis B vaccination rates and post-exposure prophylaxis, Post-vaccine immune status of HCWs.

Materials & Methods: An observational, individual-based, cross-sectional survey was carried out in a tertiary care teaching hospital in India. A stratified sampling technique was utilised to select participants.

Results: Only 55 (59%) respondents measured their hepatitis B titres after two months of vaccination, while 31 (41%) did not. Alarmingly, 17 (23%) were unaware that anti-HBs titres should be measured. Additionally, 16 (21%) still capped needles with both hands, ignoring safe techniques like the One-Hand Scoop. For first aid after a needle injury, 19 (25%) incorrectly advised washing with alcohol, and 3 (3.9%) used sodium hypochlorite on contaminated needle injuries.

Conclusion: The majority of the study respondents did not demonstrate a satisfactory level of awareness and attitude regarding hepatitis B transmission and prevention. 68 (89.5%) doctors stated that they did not undergo post-exposure prophylaxis in the form of hepatitis B vaccination.

Keywords: Hepatitis B, HBV, Hepatitis, Needle Stick Injury, Vaccine, Post-Exposure, Prophylaxis, Awareness, First Aid, Occupational Exposure, Occupational Medicine

Introduction

Hepatitis B infection is a major public health concern, which causes serious health problems globally. According to the most recent estimate, globally 2 billion people have serologic tested evidence of hepatitis B virus infection and about 350 million people have or are at risk of developing a chronic liver infection.[1,2]

Healthcare Workers (HCWs) are defined as persons (e.g., employees, students, contractors, attending clinicians, public-safety workers, or volunteers) whose activities involve contact with patients or with blood or other body fluids from patients in a healthcare, laboratory, or public-safety setting. An exposure that might place HCWs at risk for HBV, HCV, or HIV infection is defined as a percutaneous injury (e.g., a needle-stick or cut with a sharp object) or contact with mucous membrane (of eyes, mouth, nose, etc.) or non-intact skin (e.g., exposed skin that is chapped, abraded, or afflicted with dermatitis) with blood, tissue, or other body fluids that are potentially infectious.[3]

In addition, HBV has been demonstrated to survive in dried blood, at room temperature, and on environmental surfaces, for a long time. Thus, HBV infections that occur in HCWs with no history of exposure might have resulted from direct or indirect blood or body fluid exposures that inoculated HBV into the mucosal surfaces or cutaneous scratches and other lesions.[3] The potential for HBV transmission through contact with environmental surfaces has been demonstrated in investigations of HBV outbreaks among patients and staff of haemodialysis units.[4] Blood contains the highest HBV titres of all body fluids and is the most important vehicle of transmission in healthcare settings. HBsAg is also found in several other body fluids, including breast milk, bile, cerebrospinal fluid, faeces, nasopharyngeal washings, saliva, semen, sweat, and synovial fluid. However, the concentration of HBsAg in body fluids can be 100–1000 folds higher than the concentration of infectious HBV particles.[5] Therefore, most body fluids are not efficient vehicles of transmission because they contain low quantities of infectious HBV, despite the presence of HBsAg.

Hepatitis B Vaccine

Vaccination for hepatitis B is essential for the prevention and elimination of the infection. The hepatitis B vaccine is a safe and effective vaccine that is recommended for all infants at birth and for children up to 18 years.[6] The hepatitis B vaccine is also recommended for adults living with diabetes and those at high risk for infection due to their jobs, lifestyle, living situations, or country of birth. Since everyone is at some risk, all adults should seriously consider getting the hepatitis B vaccine for lifetime protection against preventable chronic liver disease.[7]

The hepatitis B vaccine is also known as the first "anti-cancer" vaccine because it prevents hepatitis B, the leading cause of liver cancer worldwide. Research from 2018[2] showed that the HBV vaccine results in long-term defence against the virus. Studies indicated protection for at least 30 years among healthy vaccinated individuals who started the hepatitis B vaccination before they were 6 months old. As per international guidelines set by CDC[7] as well as WHO[8] and NHS - All HCWs should be vaccinated against HBV, with a standard vaccination schedule. Three standard doses of recombinant HBV vaccine should be administered intramuscularly in the deltoid region at 0, 1, and 6 months.

Despite all the recommendations and guidelines, compliance remains a major issue everywhere. Although PEP as a combination of passive immunisation and hepatitis B vaccine is easily available, the most cost-effective method to control HBV infection is preventive vaccination along with strict compliance with infection control protocol. A study reports that a large number of HCWs remain unvaccinated and many of the needlestick injuries were never reported despite a low rate of occurrence.[9] An Indian study reported 3.85 needle stick injuries per HCW and further highlighted that 14.8% of the injured HCWs had not taken any precautions.[10] Other studies done to assess the availability of sufficient equipment for the prevention of HBV reported < 18.8% of HCWs double gloved during any procedure and 55.3% of them never used the blunt-tip suture needles in the operation theatres despite their adequate availability.[11,12]

Knowledge, Attitude, and Practices of Healthcare Workers Toward Hepatitis B

Hepatitis B, a major global health burden, can be prevented to a great extent by the correct knowledge, attitude, and practice of the HCWs involved with the management of this infection.[13] It is a general presumption that HCWs are better informed and more knowledgeable about infections and control measures than the general population as they are in practice and are being regularly trained. Hence, our three-fold objectives of - determining hepatitis B vaccination coverage levels among healthcare workers, testing awareness regarding first aid following exposure to blood and bodily fluids and assessing how many workers took post-exposure prophylaxis and reported occupational exposure - would not only indirectly assess the general public but will also go a long way in the implementation of prevention programs in a better way.

Materials & Methods

A non-experimental, observational, individual-based, cross-sectional survey was carried out in a 2000+ bedded tertiary care teaching hospital in Delhi, North India in the months

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of April, May, and June 2023. The permission from The Ethics Committee of COEH, Maulana Azad Medical College was obtained prior to conducting this Study.

Sample Size and Sampling Technique

Using systematic random sampling methods, 150 subjects were sent questionnaires using a list of staff, interns and residents, assigned to each department of the hospital as a sampling frame. Stratified Sampling technique was utilised to select participants. A total of 150 subjects were questioned using systematic random sampling methods using a list of staff, interns and residents, assigned to each department of the hospital as a sampling frame. 50 nurses, 50 doctors, 50 orderlies and sanitarians were stratified into 3 categories based on occupational exposure (doctors had maximum exposure as they did phlebotomy, sampling, and blood glucose measurement placing them at the highest risk). Sanitarians and orderlies are placed in the 2nd Category as they are responsible for the appropriate disposal, transportation and handling of contaminated sharps. 3rd Category of subjects is nurses who do not handle sharps as frequently as Categories 1 and 2 yet still come in contact with bodily fluids during cannulation, bronchoalveolar lavage etc. All the subjects received written information and provided written informed consent prior to participation in the study.

Research Methods and Statistical Analysis

A prevalence survey was taken at a tertiary care hospital utilising a pre-tested, structured questionnaire that was distributed to doctors, staff and paramedical personnel by their respective departmental representatives to maintain the anonymity by the researchers. Out of a total of 150 subjects, 76 (n = 76) responded. Data analysis was done using pie charts, bar graphs and percentages.

Inclusion Criteria

All healthcare workers were to be registered with respective medical councils and the nurses were registered with nursing councils. The paramedical personnel were under active-duty contracts with the hospitals and possessed their requisite graduate-level educational qualifications.

Exclusion Criteria

Doctors, and paramedical personnel who had no exposure to patients/ biological substances directly on a regular basis were excluded from the study. Those who gave negative consent were also excluded from the study.

Results

Routes of Exposure

Common routes of exposure (Figure 1) were: exposure through knicks and contaminated needles in 42 respondents (55.3%) out of 76, splashes onto unbroken skin in 45 respondents (59.2%), splashes of blood/ bodily fluids in the eye in 19 (25%) respondents, splashes of blood/ bodily fluids in the mouth in 6 respondents (7.9%).

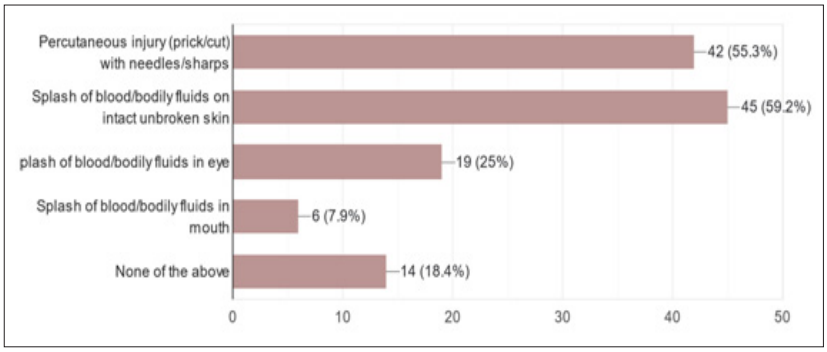

Figure 1.What type of occupational exposure did you have of blood and bodily fluids?

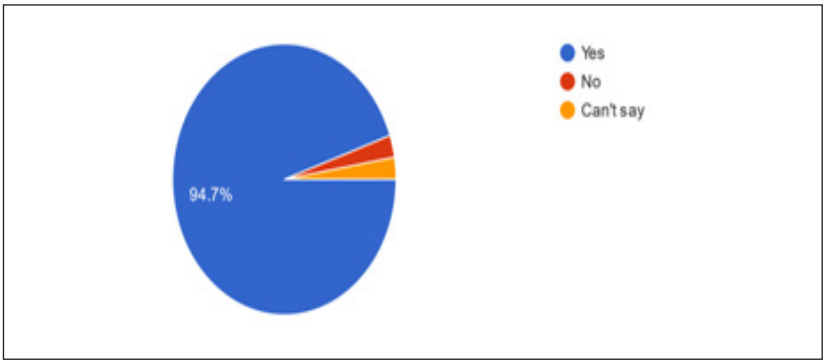

Figure 2.Do you agree that your job has exposed you to risk of Hepatitis B infection?

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Coverage Levels & Prophylaxis After Occupational Exposure

72 (94%) respondents agreed that their jobs had exposed them to the risk of hepatitis B infection (Figure 2). Yet only 48 (63%) recalled that they had been immunised (Figure 3). 68 (89.5%) doctors stated that they did not undergo post-exposure prophylaxis in the form of hepatitis B Vaccination (Figure 4). Ideally, this number should be zero as this increases the risk of a debilitating infection. After completion of the questionnaire, HCWs were encouraged to complete their vaccination. On follow-up, 45 (59%) respondents never got their anti-HBs titres measured (Figure 5), thus not knowing whether they have been conferred immunity or not, luring them into a false sense of security because of which they may skip testing and contract hepatitis on being exposed to blood and bodily fluids, not knowing that they turned out to be non-responders to the vaccine. Alarmingly, 17 (23%) respondents did not even know that anti-Hbs titers are supposed to be measured, not knowing whether they had responded to the vaccine or not (Figure 6). It was disturbing to note that 10 (13%) respondents still capped needles with both hands and 6 (8%) were unaware of safe capping techniques like the One-Hand Scoop Technique (Figure 7).

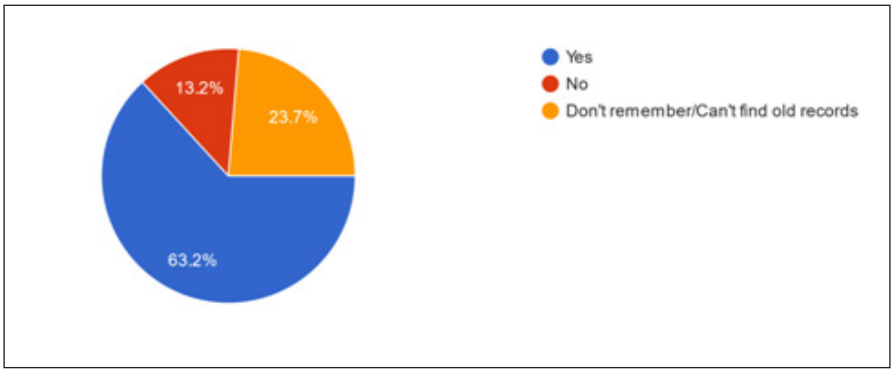

Figure 3.Have you completed th Hepatitis B primary immunization as per schedule in your infancy?

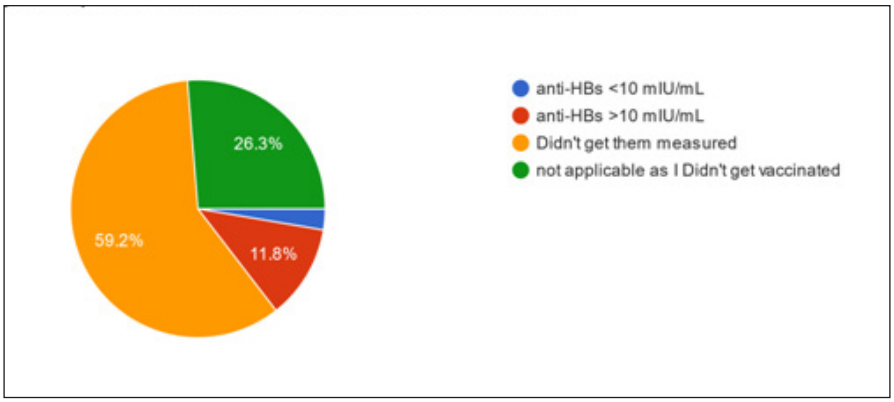

Figure 4.What were your hepatitis B primary immunization as per schedule in your infancy?

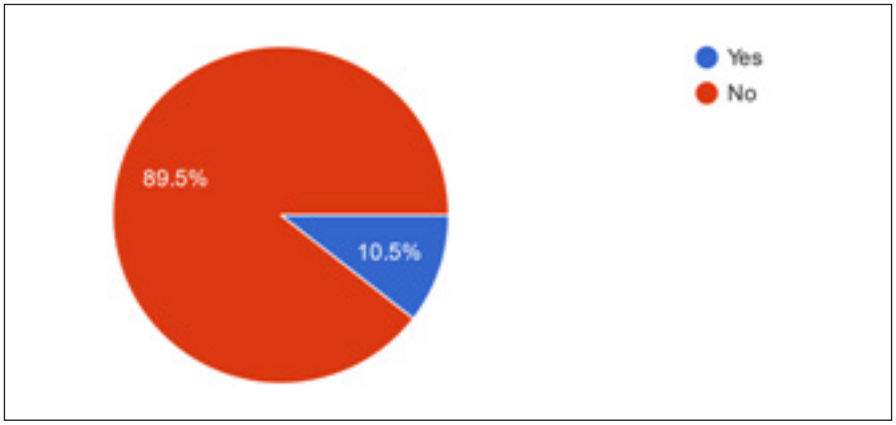

Figure 5.Did you undergo post-exposure prophylaxis as per schedule in your infancy?

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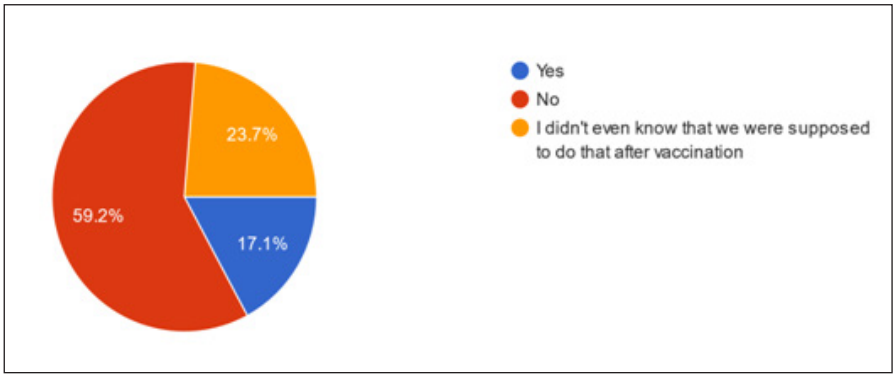

Figure 6.Did you get your hepatitis B titres measured 2 month post-Vaccination?

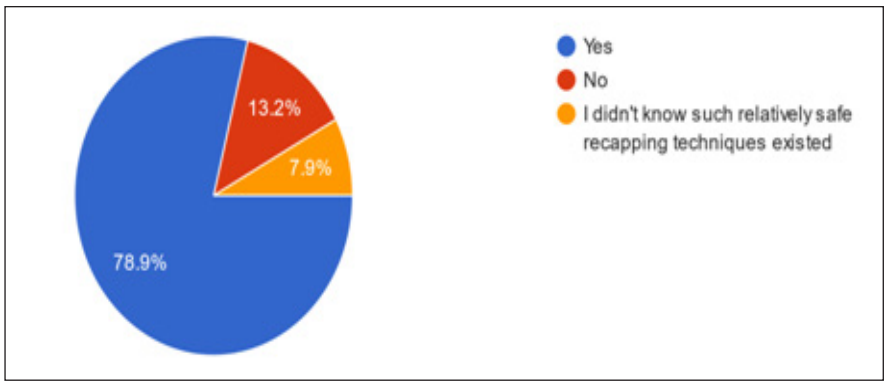

Figure 7.Do you use One-Hand Scoop technique as an alternative to recapping with both hands?

Level of Awareness Regarding First Aid After Exposure

When asked about first aid measures for a contaminated percutaneous needle or sharp injury, 6 (7.9%) respondents incorrectly stated that they would immediately arrest the bleeding, and 19 (25%) advised wrongly to wash the site with alcohol. Furthermore, 3 (3.9%) personnel disclosed that they had poured sodium hypochlorite on the injury site (Figure 8).

19 (25%) respondents wrongly stated that eyes that are splashed with blood should be irrigated with normal saline and 2 personnel advocated using soapy water to wash eyes; thus highlighting the insufficient knowledge of first aid (Figure 9). 29 (38.2%) respondents wrongly advocated the application of alcohol-based antiseptics on unbroken skin that is splurged with bodily fluids (Figure 10).

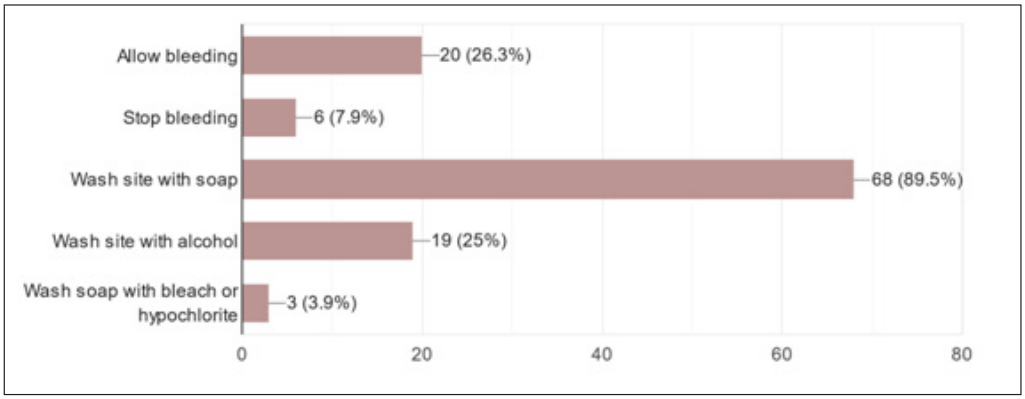

Figure 8.What type of first aid will you adminsiter to contaiminated/ percutaneaous, Sharp injury?

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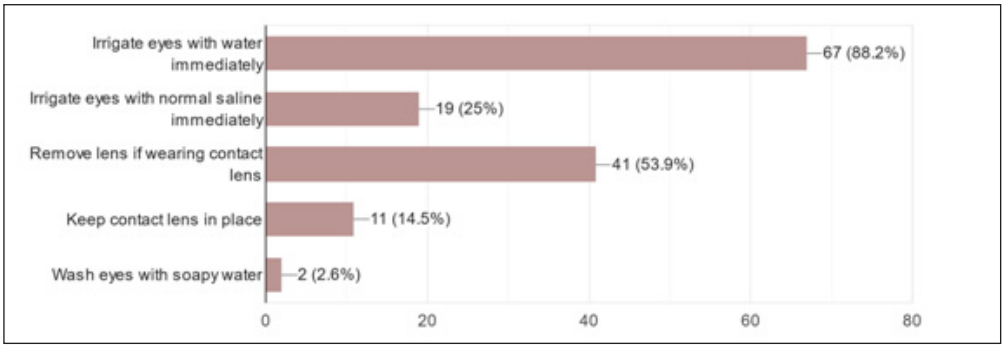

Figure 9.What type of first aid will you administer to eye splashed with blood/ bodily fluids?

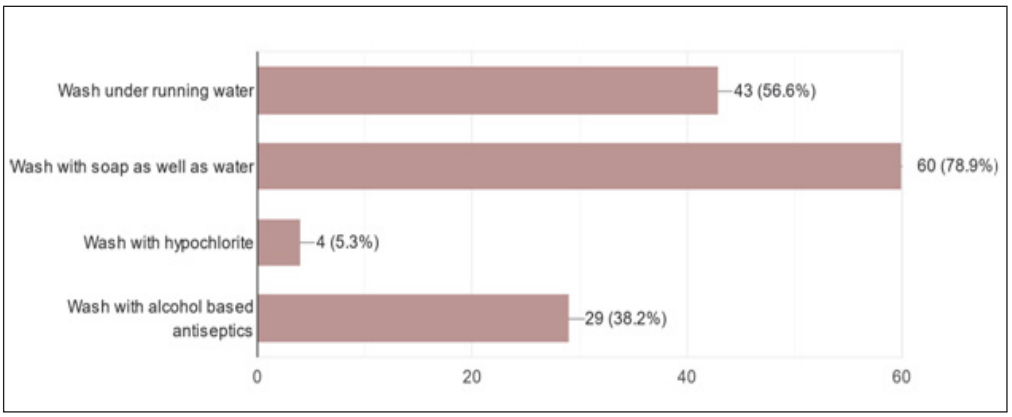

Figure 10.What type of first aid will you administer to unbrokenn Intact Skin splashed with blood/ bodily fluids?

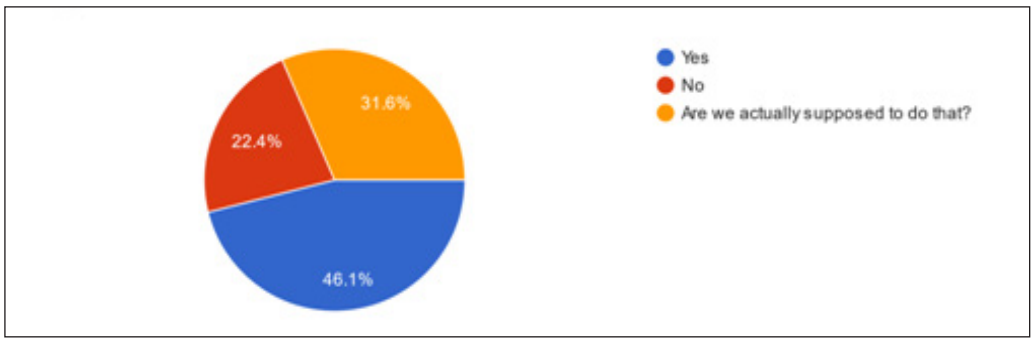

Figure 11.Post exposure to blood, fluids, was a formal report filed/ Senior informed with the respective department in which you were posted

Lapses in Reporting and Communication

Reporting incidents of exposure to blood/ bodily fluids ensures that affected individuals receive prompt medical attention, including post-exposure prophylaxis (PEP) or other necessary interventions to minimise the risk of infections. It demonstrates the hospital's commitment to providing a safe working environment for its staff and adherence to protocols designed to protect healthcare workers. Follow-up assessments and monitoring can be conducted to assess the long-term health of the affected individual. While 17 (22%) HCWs failed to report incidents, it was disheartening to find that 23 (31%) HCWs were unaware of any reporting protocols (Figure 11).

Discussion

There was incomplete hepatitis B vaccination in Doctors, Laboratory staff, and Allied Health Workers without follow-up of anti-HB titres even though the hospital provides coverage for the hepatitis B vaccination. Despite 71 (94%) HCWs agreeing that their job had exposed them to the risk of hepatitis B, only 8 (10.5%) HCWs undertook post-exposure prophylaxis. After completion of the questionnaire, HCWs were encouraged to complete their vaccination. On follow-up, only 10 (17.1%) HCWs had their hepatitis B titres measured 2 months post-vaccination. 54 (71%) HCWs felt that their knowledge of first aid administration post-

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exposure to blood/ bodily fluids was inadequate, made evident by their responses highlighted in Figures 8–10.

Strengths and Limitations

Selection bias was removed by using stratified sampling technique. Researcher bias was removed by publicising research plans and methods before results were known, reducing the temptation to manipulate outcomes. Data was monitored independently by a research supervisor. Transparent and detailed data collection and reporting were ensured. Social desirability bias was removed by assuring participants of anonymity, and confidentiality in self-administered questionnaires that had a neutral, non-judgmental tone. Despite these bias reduction strategies and transparent data collection and reporting, the sample size of 150 subjects (out of which 76 responses were relevant and recorded) might limit the generalisability of the findings. As the questionnaire was self-administered, there might be limited control over the participants' understanding of the questions, potentially impacting response quality. The vaccination status was assessed through self-provided information, which is prone to recall bias.

Conclusion and Suggestions

These findings highlight the need to impose measures to sensitise HCWs and enforce mandatory full vaccination as per the recommended vaccination schedule which should be followed by confirmation of serological status post-vaccination to ensure safety and reduce transmission rates. We further recommend that the government vaccination programmes consider documentation of HBV vaccinations received for future reference. Infections acquired through occupational exposure are largely preventable through strict control measures such as the use of safe devices, proper waste disposal, immunisation and prompt management of exposures including the use of post-exposure prophylaxis. Teaching first aid to everyone is imperative, viz. encouraging bleeding, washing a wound with water, rinsing mucus membranes with plain water, and irrigating eyes with plain water. So, educational interventions should be planned and implemented to increase the knowledge and awareness related to hepatitis B and hepatitis B vaccination among healthcare workers. A well-defined vaccination policy for part-time employees should be prioritised to improve hepatitis B vaccination coverage and first aid measures post-exposure to bodily fluids should be taught. Moreover, factors influencing vaccination status should be identified. Building confidence in the hepatitis B vaccine's safety among HCWs and increasing access to the vaccination could improve the rates. SIP (Sharp Injury Protection) syringes with hinged covers and automatic retractable syringes should be considered for regular usage in hospitals.

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Conflict of Interest: None

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