

PREVENTION MEASURES OF HEPATITIS B IN HEALTHCARE INSTITUTIONS FROM THE PERSPECTIVE OF THE NURSING SCOPE OF WORK

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Abstract: Viral hepatitis B (hepatitis B) poses a significant public health challenge on a global scale, particularly affecting populations in middle- and low-income countries, including those in the developing world. It primarily impacts individuals engaging in risky behavior and healthcare workers directly or indirectly involved in providing services to these patients.

This paper will present information from pertinent professional and scientific sources on hepatitis B, preventive measures, and the role of nurses in their implementation. This review paper is a valuable contribution, providing recommendations and insights derived from the professional practice of nurses across all levels of healthcare.

Keywords: infection, preventive measures, healthcare, intrahospital hepatitis B infections.

INTRODUCTION

Viral hepatitis B (hepatitis B) remains a significant global public health concern, particularly in developing regions, impacting about one-third of the world's population. Approximately 350 million individuals are chronic carriers of the hepatitis B virus (HBV), with only 2% experiencing spontaneous recovery each year and developing seroconversion, indicated by anti-HBs antibodies (1). Primary HBV infection typically presents as asymptomatic, and complete recovery is anticipated in 90-95% of patients within three months (1). Various medical interventions, blood transfusions, or the use of contaminated needles, such as in cases of drug addiction or tattoos, can contribute to hepatitis B infections. Additionally, hepatitis B may manifest in individuals with other conditions, such as AIDS patients (2).

The term “Contagious Jaundice” traces back to the era of Hippocrates (460 - 370 BC), and evidence indicating the blood-borne nature of hepatitis dates back to 1885 (3, 4).

In Bremen, following the smallpox vaccination of 1,289 port workers in 1947, it was discovered that 15% of those vaccinated contracted hepatitis. Subsequently, Maccahun introduced the designations “hepatitis A” (formerly infectious hepatitis) and “hepatitis B” (previously serum hepatitis) (4). In 1964, Blumberg et al. identified a specific antigen in the serum of an Australian native, later named the “Australia antigen” (5). This antigen was subsequently linked to serum hepatitis. In 1970, Krugman et al. made a crucial discovery that cooking serum containing HBV destroyed the virus's infectivity after just one minute while preserving its immunogenicity. This pivotal knowledge laid the foundation for the development of vaccines against HBV (3, 4, 6).

The aim of this paper is to present information from relevant scientific/professional data sources related to epidemiology and prevention measures of hepatitis B in healthcare institutions, focusing on the nursing scope of work.

Etiology and Pathogenesis of Hepatitis B

Hepatitis B virus is a DNA virus that primarily targets hepatocytes and can lead to chronic infection. It is characterized by a spherical particle with a diameter of 47 nm, present in the blood in two forms: a round antigen with a size of 22 nm and a filamentous one of variable length, known as hepatitis B surface antigen (HBsAg).

The hepatitis B virus encompasses several crucial antigenic systems, including: HBsAg (Surface Antigen), HBcAg (Core Antigen), HbeAg (Core Protein Antigen). These antigenic systems collectively form the hepatitis markers (7).

Epidemiology

The Balkans and the Mediterranean region exhibit substantial genetic heterogeneity of Hepatitis B Virus (HBV) in Europe (8).

According to the World Health Organization (WHO), approximately 257 million people globally are chronically infected with hepatitis B, with 13 million cases in Europe, resulting in about 887 000 deaths annually. In Western Europe and North America, the prevalence is less than 1% of the population. Notably, Montenegro has seen a decline in hepatitis B incidence over the past two decades due to vaccination, although it remains a significant public health concern (9).

Worldwide, HBV infection occurs sporadically in certain regions. About 45% of the global population resides in areas with a high prevalence of chronic HBV infection, particularly in the Republic of China, South-east Asia, tropical Africa, Central and Eastern Europe, Latin America, the Mediterranean, and the Middle East. The prevalence is most pronounced in poor and developing countries (9).

Data from WHO indicates that there are over 400 million chronic carriers of the virus, with 75% residing in Asia and the Western Pacific. Individuals acquiring chronic HBV infection in childhood face a 5% increased risk of developing hepatocellular carcinoma (HCC) per decade of life, which is significantly higher than the rate observed in uninfected individuals. Annually, 500 000 to 1.2 million people die due to liver failure, cirrhosis, or HCC, with at least 75% of these deaths attributed to HBV infection, ranking it as the tenth leading cause of death globally (10).

Routes of Transmission of HBV

Hepatitis B virus has been detected in all body fluids (11, 12) and is transmitted through sexual contact, percutaneous exposure, nosocomial transmission, blood and blood product transfusion, and perinatally (12, 13).

In underdeveloped and developing countries, vertical transmission is more common, whereas horizontal transmission is predominant in developed countries. In the USA, approximately 40% of new infections result from heterosexual transmission, and 25% from homosexual transmission, classifying hepatitis B as one of the most common sexually transmitted diseases. Healthcare workers, including doctors, nurses,

and hospital staff, are particularly at risk. Prophylactic measures are mandatory for these professionals. In the event of injury with a sharp object/needle contaminated with the blood of an HBsAg and HBeAg positive patient, serological markers of HBV infection are detected in 37-62% of cases. Nosocomial infections are relatively rare and are usually associated with inadequate implementation of universal prevention measures or improper handling of medical instruments, needles, and medical waste (9).

Hepatitis B Prophylaxis

Understanding the various modes of hepatitis B transmission—such as sexual contact, blood inoculation, and vertical transmission—enables the implementation of several prophylactic measures to prevent the spread of hepatitis B. These measures encompass both general and specific protection strategies (12).

Individuals testing positive for HBV should receive education on appropriate home behavior, proper excrement disposal, the use of dedicated utensils, and the importance of protection during sexual intercourse. Specialized education is essential for intravenous drug users (14). General prevention measures within healthcare institutions mandate healthcare workers to utilize prescribed personal protective equipment (masks, gloves, glasses, aprons, caps) to prevent contact with infectious materials. Ensuring asepsis and antisepsis quality, proper infectious waste disposal, and comprehensive blood testing for all donors contribute significantly to infection control (12).

Special protection measures include pre-exposure and post-exposure immunoprophylaxis (12). Pre-exposure prophylaxis is carried out by vaccination. The use of vaccines against hepatitis B has three goals: prevention of virus transmission, prevention of clinically manifest disease, and prevention of the development of chronic hepatitis (15). Post-exposure prophylaxis is used in newborns of HBsAg-positive mothers in the first few hours after exposure, then after a single exposure to the HBV virus (a stabbing incident) and in persons who had sexual contact with infected persons (15).

Nurse/Technician Procedures in Primary Hepatitis B Prevention

Primary prevention of hepatitis B targets unvaccinated individuals, aiming to modify their attitudes and behaviors to avoid contracting the disease. This includes vaccination and health education (16).

Vaccination

Prior to the systematic implementation of vaccination, preventive measures were deployed to either

avert HBV infection or, if contracted, to control its impact. The advent of vaccination marked a significant stride in prevention efforts. The HBV vaccine received approval in 1982, with a recombinant DNA vaccine against hepatitis B introduced in 1986. This pioneering vaccine, derived through genetic engineering on yeast fungi, represents the world’s first approved recombinant vaccine. Two recombinant vaccines, Engerix B and Recombivax HB, are currently in use. The vaccine must be stored between 2 to 8 degrees Celsius and should not be frozen or exposed to higher temperatures, as this diminishes its efficacy (10, 17).

The recombinant vaccine’s high effectiveness and safety prompted the World Health Organization (WHO) to recommend its inclusion in the mandatory immunization schedule for infants in their first year of life in 1992 (18). Vaccination against hepatitis B infection is also advocated for individuals at increased risk due to risky behaviors and occupational hazards, particularly healthcare workers in contact with the hepatitis B virus (Table 1) (18).

Health workers (doctors, nurses, laboratory technicians, etc.), play a pivotal role in promoting and disseminating information about healthy lifestyles within the realm of primary health care. Their activities involve ensuring early treatment of diseases and advocating for preventive measures (18). Nurse technicians in primary health care are responsible for improving the health of patients through evidence-based recom-

mendations, and they encourage individuals to receive preventive services such as examinations, counseling, and preventive medications. Nurses are important in promoting public health. Traditionally, the focus of health promotion by nurses has been on disease prevention and changing the behavior of individuals regarding their health. However, their importance as health promoters is more complex, as they have multidisciplinary knowledge and experience in health promotion in their nursing practice (19).

At the primary healthcare level, nurses engage in diverse activities, ranging from healthcare and medical-technical tasks to health education, educational work, and investigations. They actively participate in all stages of organizing and implementing vaccinations. The preparation phase, serving as the initial and crucial link in vaccination organization, significantly influences its success. Activities in this phase include program adoption, expert methodological instructions, planning, organizing immunization calls, ensuring vaccination conditions, supervising vaccine handling and storage, and conducting employee education and health awareness programs for the population. The implementation of vaccination is meticulously planned to meet the population’s needs, aiming to provide immunization to all healthcare users. The evaluation phase, assessing the success of immunization, serves as a critical component in the vaccination process. It allows health workers to identify potential shortcomings in

Table 1. Persons with increased and occupational risk of contact with the Hepatitis B virus

Persons at Increased Risk
Newborns
Individuals living with hepatitis B patients or infected individuals
Residents of regions with a high prevalence of hepatitis B
Individuals in direct contact with blood and blood derivatives
Patients on a chronic hemodialysis program
Patients with hematological diseases, e.g., those suffering from hemophilia
Promiscuous individuals, i.e., those with more than one sexual partner
Individuals with a history of sexually transmitted diseases
Intravenous users of psychoactive substances
Individuals who are HCV and HIV positive
Men who have sex with men
Individuals at professional risk of contact with the hepatitis B virus
a. Health workers and hygienists employed in health institutions
b. Police and prison staff
c. Firefighters
d. Non-medical personnel of emergency medical assistance and emergency centers
e. Employees in utility companies (e.g., sewage, waste)
f. Travelers to areas with a high prevalence of HBV

their efforts and undertake corrective actions for improvement (20).

Vaccination Against Hepatitis B in Montenegro

In Montenegro, the vaccination against hepatitis B is meticulously regulated by the Rulebook on conditions and methods for the implementation of mandatory immunoprophylaxis and chemoprophylaxis against certain infectious diseases. The Rulebook was published in the "Official Gazette of Montenegro", no. 36/2020 and 35/2022.

As per the current rulebook, specifically Article 27, active immunization against hepatitis B is initiated in newborns and is intended to be completed by the time the child reaches 12 months of age (21). The vaccination program ensures comprehensive coverage to protect the population from the risks associated with hepatitis B.

Moreover, the rulebook, under Article 30, stipulates mandatory immunization for individuals based on epidemiological and clinical indications. This includes both active and passive immunization against hepatitis B. All persons who work in health institutions, encompassing pupils and students within the health field, are obligated to undergo immunization if they are unvaccinated or incompletely vaccinated. This requirement applies to those individuals whose academic responsibilities entail direct contact with infectious material (22).

The regulatory framework thus underscores the significance of protecting individuals within health-care settings from the risks associated with hepatitis B through a robust vaccination strategy.

Health Education in Hepatitis B Prevention

Health education serves a vital role in preventing hepatitis B and its associated complications. It is a dynamic and individualized process that should be tailored to the specific needs and characteristics of each patient or target population. Here are key aspects of health education in the context of hepatitis B.

- **Individualized Approach:** Conducting health education requires recognizing that it is an individualized process. A one-size-fits-all approach is not effective, and the content of education should be adjusted based on factors such as cognitive abilities, social context, and economic situation relevant to the age group being targeted (22, 23).

- **Continuous and Permanent Education:** Health education is not a one-time event but a continuous process. It extends beyond the healthy population to

encompass those who are sick, during illness, hospitalization, after discharge, and throughout the lifelong journey for virus carriers (24, 25).

- **Adaptation to Age Groups:** Different age groups have varying needs and capacities for understanding health information. Health education materials, both oral and written, should be adapted to suit the cognitive abilities and preferences of each age category.

- **Oral and Written Instructions:** Health education efforts include both oral and written instructions. In addition to verbal communication, producing informative and educational brochures, leaflets, and written materials ensures a comprehensive approach. The content of these materials should be accessible and relevant to individuals of all ages.

- **Lifelong Learning:** Health education is not confined to specific stages of life; it is a lifelong learning process. Even after initial education, individuals, including those with hepatitis B, need ongoing information and support. This is particularly important during illness, hospitalization, and the transition back to regular life after being discharged.

By adopting these principles, health education becomes a powerful tool in promoting awareness, prevention, and management of hepatitis B, contributing to better health outcomes for individuals and communities.

The importance of nurses/technicians in the secondary prevention of hepatitis B

Secondary prevention of hepatitis B refers to the timely recognition and detection of potential patients in the early stages of the disease, in order to stop its further progress. There are no jobs for healthcare workers that do not involve a certain degree of risk. In their daily work, the nurse/technician meets with potential patients and carriers of HBV. In doing so, he must pay great attention to preventing the spread of infection among patients, but also among healthcare workers (who should be vaccinated). Wards with an increased risk of transmission of HBV infection (intensive care units, operating rooms, hemodialysis centers, surgical wards, etc.) represent a risk of the emergence and spread of blood-borne infections. Infection transmission can be prevented by applying general (standard) prevention measures (24).

Measures to protect health workers from HBV infection

In many cases, the risk of nosocomial transmission of infections is highest before a definitive diagnosis is made and before precautions can be taken in accordance with that diagnosis. These measures are

designed to reduce the risk of transmission of microorganisms from recognized and hidden sources of infection in the hospital (25, 26).

The most important measure to reduce the risk of transferring microorganisms from one person to another, through direct or indirect contact, is hand hygiene. Hand hygiene involves washing hands with liquid soap with or without the addition of antiseptics and/or applying a disinfectant solution in the form of a solution or gel to dry hands, where the five moments of hand washing are respected. Hand hygiene must be performed before and after contact with each patient and after contact with blood, body fluids, secretions and excreta, as well as contaminated equipment and objects. Hand hygiene is mandatory even when the hands are protected by gloves during the listed actions (21).

Protective equipment consists of protective masks and eye protectors, protective aprons/coats, protective shoes, and slippers (21).

Proper handling of sharp objects - the use of sharp objects should be minimized. Immediately after use, dispose of sharp objects in designated containers, i.e. containers (with impenetrable and waterproof walls). Single-use objects and equipment used for patient care should be discarded in impermeable bags, subject to proper disposal as potentially infectious waste.

Procedure after professional exposure of healthcare workers to material potentially infected with the hepatitis virus

Bearing in mind the characteristics of HBV and the ways of its transmission, healthcare workers, that is, persons employed in healthcare institutions, represent a high-risk cohort for HBV infection compared to the general population. Occupational exposure is defined as risky contact of health workers with potentially infectious material (26).

The risk is related to the frequency of exposure to blood at the workplace and the number of contacts with patients who are HBsAg positive (a marker of high viral replication). The most common incident situations that carry the risk of HBV transmission are:

- injuries through the skin, i.e. needlesticks (stabbing incident)
- injuries by sharp objects.
- splashing of bodily fluids on the skin and mucous membranes (26).

Stab incidents occur every day in healthcare facilities. The procedure for a stabbing incident includes (26):

- immediate treatment of the wound,

- immediate reporting procedure to superiors within 24 hours,
- exposure risk assessment,
- testing the exposed person,
- testing the source of infection (if the source is known) with the signing of the consent i
- application of post-exposure prophylaxis.

Stab incidents most often occur during the use of sharps while working with a patient or after disposing of used sharps in the sharps waste section. If an incident occurs, the healthcare worker is obliged to report it to the department for hospital infections, which is necessary both for counseling the injured worker and for the application of timely post-exposure prophylaxis. Timely prophylaxis is applied within 24 to 48 hours together with HB immunoglobulin. HBIG provides passive immunity. The vaccine is given in four doses: day zero, after one month, after two and twelve months. The vaccine after exposure to the HBV virus does not provide completely safe protection but reduces the risk of infection (27).

Research has shown that most healthcare workers do not report a stabbing incident. The reasons are as follows: they do not know how to report, they consider the procedure too complicated, they are afraid of losing their job, they think that only removing blood and other body fluids from the skin is enough to prevent infection, or they think that the exposure is a consequence of their irresponsibility (27).

Counseling after occupational exposure to potentially infectious material

Healthcare professionals generally correctly estimate the risk of hepatitis B virus infection, while estimating the risk of HIV and hepatitis C to be higher than it is. These two infections were discovered later, so some healthcare workers probably know less about them. In addition, there is no adequate protection (vaccine) for any of them, and the perception of an extremely unfavorable outcome, fear of possible social consequences, i.e. the so-called "social contamination" (the possibility of projecting onto health workers the characteristics of the patients they care for, especially before there is sufficient evidence that more social stigma occurs against AIDS and hepatitis C sufferers than against those suffering from other communicable or non-communicable diseases), fear intensifies and risk is overestimated. That is why it is extremely important that a healthcare worker reports to the Counseling Center for HIV and Viral Hepatitis after an incident at the workplace, where they will have an interview with an epidemiologist and perform a risk assessment together with him, receive the neces-

sary information and be adequately advised and cared for. The advice, support, and encouragement of the healthcare worker are especially important both for post-exposure prophylaxis and for continuing to work. If it is an effort for a health worker, it is necessary to include psychosocial support and the help of a medical psychologist (27, 28, 29).

CONCLUSION

Healthcare workers can greatly contribute to the prevention of transmission of infections in healthcare facilities. Nurses are trained for active participation in the prevention of transmission of infections in health institutions, as well as blood-borne diseases among health workers, within their independent functions. The implementation of activities related to general and specific measures for preventing HBV infection can be achieved through well-designed programs tailored to the needs and challenges identified within healthcare institutions and among healthcare workers. They can

be realized through several stages. By collecting data through supervision and from the institution's staff, and analyzing them, it is possible to identify current and potential problems related to knowledge, attitudes, and behavior at work, which may be related to the risk of infection with the hepatitis B virus. Identifying priorities, planning further activities, and setting goals is the basis for the successful implementation of the activities of nurses in the prevention of HBV infection in health institutions at all levels of health care.

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Sažetak

MERE PREVENCIJE HEPATITISA B U ZDRAVSTVENIM USTANOVAMA IZ UGLA SESTRINSKOG DELOKRUGA RADA

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Virusni hepatitis B (hepatitis B) je značajan javno zdravstveni problem koji pogađa ljudsku populaciju na globalnom nivou, pretežno u zemljama sa srednjim i niskim dohotkom, kao i zemlje u razvoju. Najčešće pogađa osobe rizičnog ponašanja, a takođe su u riziku i zdravstveni radnici koji direktno ili indirektno učestvuju u pružanju zdravstvenih usluga ovim pacijentima. U ovom radu biće predstavljene informacije iz relevant-

nih stručnih/naučnih izvora podataka o Hepatitisu B, merama prevencije i procedurama medicinske sestre u sprovođenju istih. Ovaj revijalni rad predstavlja koristan prilog u kome se nude preporuke i iskustva iz područja struke, tj. profesionalne prakse medicinskih sestara na svim nivoima zdravstvene zaštite.

Ključne reči: infekcija, mere prevencije, zdravstvena zaštita, intrahospitalne hepatitis B infekcije.

REFERENCES

- Alter MJ. Epidemiology of hepatitis B in Europe and worldwide. *J Hepatol.* 2003; 39 (Suppl1): S64-9. doi: 10.1016/S0168-8278(03)00141-7.
- Lam JP, McOmish F, Burns SM, Yap PL, Mok JY, Simmonds P. Infrequent vertical transmission of hepatitis C virus. *J Infect Dis.* 1993; 167(3): 572-6. doi: 10.1093/infdis/167.3.572.
- Seeff LB, Beebe GW, Hoofnagle JH, Norman JE, Buskell-Bales Z, Waggoner JG, et al. A serologic follow-up of the 1942 epidemic of post-vaccination hepatitis in the United States Army. *N Engl J Med.* 1987; 316(16): 965-70. doi: 10.1056/NEJM198704163161601.
- Khuroo MS, Sofi AA. The discovery of hepatitis viruses: agents and disease. *J ClinExp Hepatol.* 2020; 10(4): 391-401. doi: 10.1016/j.jceh.2020.04.006.
- Khuroo M.S. A review of acute viral hepatitis including hepatitis E. In: Ozaras R., Arends J.E., editors. *Viral Hepatitis: Acute Hepatitis Switzerland.* Springer International Publishing.; 2019. pp. 77–107.
- Jacobsen KH, Wiersma ST. Hepatitis A virus seroprevalence by age and world region, 1990 and 2005. *Vaccine.* 2010; 28(41): 6653-7. doi: 10.1016/j.vaccine.2010.08.037.
- Ott JJ, Stevens GA, Groeger J, Wiersma ST. Global epidemiology of hepatitis B virus infection: new estimates of age-specific HBsAg seroprevalence and endemicity. *Vaccine.* 2012; 30(12): 2212-9. doi: 10.1016/j.vaccine.2011.12.116.

8. Vratnica Z, Zehender G, Ebranati E, Sorrentino C, Lai A, Vujošević D, et al. Hepatitis B virus genotype and subgenotype prevalence and distribution in Montenegro. *J Med Virol*. 2015; 87(5): 807-13. doi: 10.1002/jmv.24083.
9. Amponsah-Dacosta E. Hepatitis B virus infection and hepatocellular carcinoma in sub-Saharan Africa: Implications for elimination of viral hepatitis by 2030? *World J Gastroenterol*. 2021; 27(36): 6025-38. doi: 10.3748/wjg.v27.i36.6025.
10. Blumberg BS. Australia antigen and the biology of hepatitis B. *Science*. 1977; 197(4298): 17-25.
11. Burek V. Laboratorijska dijagnostika virusnih hepatitisa B i C [Laboratory diagnosis of viral hepatitis B and C]. *Acta Med Croatica*. 2005; 59(5): 405-12. [Article in Croatian].
12. Veronese P, Dodi I, Esposito S, Indolfi G. Prevention of vertical transmission of hepatitis B virus infection. *World J Gastroenterol*. 2021; 27(26): 4182-93. doi: 10.3748/wjg.v27.i26.4182.
13. Li M, Zu J, Shen M, Zhuang G, Chen S, Wang F, et al. Evaluating the independent influence of sexual transmission on HBV infection in China: a modeling study. *BMC Public Health*. 2021; 21(1): 388. doi: 10.1186/s12889-021-10408-5.
14. Mojsovic Z. i sur. Zdravstvena njega u zajednici. Visoka zdravstvena škola, Sestrinstvo u zajednici – Priručnik za studij sestrinstva / Keros, Predrag (ur.) Zagreb; 2005.
15. Kempainen V, Tossavainen K, Turunen H. Nurses' roles in health promotion practice: an integrative review. *Health Promot Int*. 2013; 28(4): 490-501. doi: 10.1093/heapro/das034.
16. Lewis JD, Enfield KB, Sifri CD. Hepatitis B in healthcare workers: transmission events and guidance for management. *World J Hepatol*. 2015; 7(3): 488-97. doi: 10.4254/wjh.v7.i3.
17. Sekamatte T, Isunju JB, Mutyoba JN, Tetui M, Mugambe RK, Nalugya A, et al. Predictors of Hepatitis B screening and vaccination status of young psychoactive substance users in informal settlements in Kampala, Uganda. *PLoS One*. 2022; 17(5): e0267953. doi: 10.1371/journal.pone.0267953.
18. Bogdanović V. Opšte i specifične mere prevencije hepatitisa B virusne infekcije među zdravstvenim radnicima [disertacija]. Univerzitet u Novom Sadu, Medicinski fakultet; 2021.
19. Massaquoi TA, Burke RM, Yang G, Lakoh S, Sevalie S, Li B, et al. Cross sectional study of chronic hepatitis B prevalence among healthcare workers in an urban setting, Sierra Leone. *PLoS One*. 2018; 13(8): e0201820. doi: 10.1371/journal.pone.0201820.
20. Nelson NP, Weng MK, Hofmeister MG, Moore KL, Doshani M, Kamili S, et al. Prevention of Hepatitis A virus infection in the United States: recommendations of the Advisory Committee on Immunization Practices, 2020. *MMWR Recomm Rep*. 2020; 69(5): 1-38. doi: 10.15585/mmwr.rr6905a1.
21. Umar M, Hamama-Tul-Bushra, Umar S, Khan HA. HBV perinatal transmission. *Int J Hepatol*. 2013; 2013: 875791. doi: 10.1155/2013/875791.
22. Pravilnik o uslovima i načinu sprovođenja obavezne imunoprofilakse i hemioprofilakse protiv određenih zaraznih bolesti "Službeni list Crne Gore" br.36/2020 I 35/2022. Available on: <https://me.propisi.net/tekstovi-objavljenih-propisa-službeni-list-cg-br-36-2020/>.
23. Qin H, Qiu Y, Ying M, Ren J. Evaluation of the health promotion effect of hepatitis B prevention and treatment in the Zhejiang demonstration area, China. *BMC Public Health*. 2022; 22(1): 2073. doi: 10.1186/s12889-022-14540-8.
24. Vasić B, Andjelić S, Lukić R, Jevtović D, Grbović L, Vasiljević T, et al. [Postexposure prophylaxis against hepatitis B, hepatitis C and human immunodeficiency virus infection in healthcare workers]. *Vojnosanit Pregl*. 2011; 68(11): 975-8. Serbian. doi: 10.2298/vsp1111975v.
25. Abdullahi LH, Kagina BM, Ndze VN, Hussey GD, Wiysonge CS. Improving vaccination uptake among adolescents. *Cochrane Database Syst Rev*. 2020; 1(1): CD011895. doi: 10.1002/14651858.CD011895.pub2.
26. Nguyen T, Pham T, Tang HK, Phan L, Mize G, Lee WM, et al. Unmet needs in occupational health: prevention and management of viral hepatitis in healthcare workers in Ho Chi Minh City, Vietnam: a mixed-methods study. *BMJ Open*. 2021; 11(10): e052668. doi: 10.1136/bmjopen-2021-052668.
27. Poplašen Orlovac D, Knežević B. Ubodni incidenti kao ozljeda na radu. *Sigurnost*. 2012; 54(2): 217-9.
28. Zhang L, Li Q, Guan L, Fan L, Li Y, Zhang Z, et al. Prevalence and influence factors of occupational exposure to blood and body fluids in registered Chinese nurses: a national cross-sectional study. *BMC Nurs*. 2022; 21(1): 298. doi: 10.1186/s12912-022-01090-y.
29. Brnović DD, Peličić DN, Boljević TV. Knowledge and attitudes of healthcare professionals employed in tertiary healthcare institutions about hepatitis B and prevention measures. *Hospital Pharmacology*. 2023; 10(3): 1323-35. doi: 10.5937/hpimj2303323B.

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