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HEPATITIS B IMMUNIZATION IN HEALTHCARE WORKERS AND DETERMINANTS OF VACCINATION COVERAGE: A REVIEW

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სტატია ეხება ბ ჰეპატიტის სანინააღმდეგო ვაქცინაციით სამედიცინო პერსონალის მოცვას და ვაქცინაციასთან დაკავშირებულ ფაქტორებს, გლობალურ პრობლემას და განიხილავს ვაქცინაციის პოლიტიკის განახლების, არსებული იმუნიზაციის ინფრასტრუქტურის შესაძლებლობების გაზრდის და ვაქცინაციის პროგრამების ეფექტურად მართვის გადამწყვეტ როლს ინფექციის პრევენციაში.

Introduction: Hepatitis B virus (HBV) is a significant global health concern, causing chronic infection and potentially leading to death. Hepatitis B virus (HBV) is a blood-borne pathogen and out of 60 or more microbial agents responsible for blood-borne transmissible infectious biological agents HBV is one of the infectious most frequently transmitted to HCWs globally [6,14]. Approximately 3 million healthcare workers per year receive an injury with an occupational instrument, with around 2000000 exposures to hepatitis B virus (HBV) [6,21]. Comprehensive guidelines for administering hepatitis B vaccination to health workers are crucial for effective and efficient vaccination management to reduce the risk of HBV infection among this high-risk population [27]. Although an effective HBV vaccine has been available since the early eighties, and despite the worldwide application of universal vaccination programs started in the early nineties, HBV still remains a prominent agent of morbidity and mortality [21] and vaccination coverage is suboptimal. A recent systematic review and meta-analysis showed that healthcare workers (HCWs) are at an intermediate level (2%-8%) of hepatitis B virus (HBV) infection worldwide. The pooled seroprevalences of current HBsAg, current HBeAg, and acute HBV infection among HCWs were 2.3% [95% confidence interval (CI): 1.9-2.7], 0.2% (95%CI: 0.0-1.7), and 5.3% (95%CI: 1.4-11.2), respectively [16].

Goal and Objectives: The study aimed to determine HB vaccination status, immunization coverage and determinants of uptake of HB vaccines in HCWs.

Methods: Articles were searched in PubMed, Google Scholar and ScienceDirect, Hepatitis B Abstract Library, between 2005-2024 on HB vaccination coverage among healthcare workers worldwide. Priority was given to original articles, systematic reviews and meta-analysis. The search words were: Hepatitis B vaccination, coverage, immunization, immunity.

Results and discussion: Hepatitis B is a vaccine-preventable disease and an effective HBV vaccine has been available since 1982 [12]. Vaccination is the most effective tool to control nosocomial

transmission of HB virus in healthcare institutions. The World Health Organization (WHO) recommended that all HCWs should be vaccinated against HBV [8], however approximately 24% of global health care workers remain unvaccinated [17]. In WHO report HBV vaccination coverage amongst health care providers is only 18–39% in low and middle-income countries compared to 67–79% in high-income countries [25]. The World Health Organization working group on vaccine hesitancy considers evaluation of vaccine uptake as essential to detecting the extent of the problem and designing interventions tailored to the needs of local communities [13]. Public health authorities strongly recommend and, in some cases, mandate vaccinations for HCPs [18]. The CDC recommends that all health care workers receive a 3-dose vaccine series with an approximate protection rate of 30–55% after the first dose, 75% after the second dose, and >90% after the third dose in adults aged ≤ 40 years [24]. There is drastic variation in full vaccination coverage across countries: In the United States and China overall, 63.4% and 60% of HCW received complete ≥ 3 doses of hepatitis B vaccination respectively [5,29]. In Africa, only a quarter of HCWs were fully vaccinated for HBV, with an estimated full hepatitis B vaccination coverage of 24.7% [2]. Awoke H, Mulgeta H. et al. in their systematic review and meta-analysis noted that the prevalence of full-dose hepatitis B vaccination coverage among health care workers ranged from 1.3 to 62.7. A cross-sectional study conducted at a tertiary academic hospital affiliated in the Gauteng province of South Africa showed that about 49.0% of HCWs were fully vaccinated. Post-vaccination immunity testing was conducted on 15.1%, and 24.0% of HCWs paid for vaccinations. Nursing staff and those with > 10 years of work experience were 2.5 and 2.6 times more likely to be vaccinated, respectively. Cleaning staff has a low coverage with HB vaccination [23]. A study from one industrialized country showed that 3.2% of vaccinated individuals had no measurable anti-HBs antibodies and required a revaccination programme [10]. This low number could also be attributed to the fact that post-immunization screening was never done at the time of data collection, and this become particularly important considering that up to 10.0% of adults who receive three HB vaccine doses do not develop protection [9]. While there may be several reasons for the lower rates of coverage, one could be the lack of programs and policies to vaccinate HW in LIC and LMIC. There are controversial data regarding the factors associated with HB vaccination by work category or professional occupation: in some studies nurses were more likely than doctors to be vaccinated [23,4,1]. Male health care workers were 35% less likely to take full-dose hepatitis B vaccination than females in Ethiopia [3]. The study conducted at a tertiary care hospital in India showed higher vaccination rate among female HCWs [22]. Older age was an important risk factor for no vaccine uptake against hepatitis B [26]. Health care providers who received training on infection-prevention were almost three times more likely to complete the vaccine than those who had not received it [3,29,19]. Health care workers having an educational level of diploma and below were 53% less likely to receive full-dose vaccination against hepatitis B as compared to those having an educational level of degree and above [15,3,11]. Provision with HB vaccine free of charge was also associated with the level of vaccination [3,23]. Sex, educational level, work experience, training on infection prevention, and history of exposure to blood and body fluids were found to be significantly associated with full-dose hepatitis B vaccination coverage [3]. Gaviola GC and co-authors reviewing health worker vaccination programs in low, middle and upper middle-income countries postulated that in many instances, the vaccination was not provided for free to healthcare workers (HW) nor included in routine vaccination schedules, showing significant variability by vaccine and country. The study highlighted that utilizing existing immunization infrastructure like the Expanded Programme on Immunization (EPI) and effectively managing vaccination programs were crucial factors in successfully vaccinating HCW.

References:

1. Aaron D., Nagu Tumaini J. et al. Hepatitis B vaccination coverage among healthcare workers at national hospital in Tanzania: How much, who and why? *BMC Infect Dis.* 2017 Dec 20; 17(1):786.
2. Auta A, Adewuyi E.O., Kureh G.T. et al. Hepatitis B vaccination coverage among health-care workers in Africa: A systematic review and meta-analysis. *Vaccine.* 2018 Aug 6; 36(32 Pt B):4851–4860. doi: 10.1016/j.vaccine.2018.06.043.
3. Awoke N., Mulgeta H. et al. Full-dose hepatitis B virus vaccination coverage and associated factors among health care workers in Ethiopia: A systematic review and meta-analysis. *PLoS One.* 2020 Oct 27;15(10): e0241226.
4. Biset Ayalew M, Adugna Horsa B. Hepatitis B vaccination status among health care workers in a tertiary hospital in Ethiopia. *Hepat Res Treat.* 2017; 2017:6470658.
5. Byrd K.K., Lu PJ., Murphy T.V. Hepatitis B vaccination coverage among health-care personnel in the United States. *Public Health Rep.* 2013 Nov-Dec;128(6):498–509. 10.1177/003335491312800609
6. Coppola N, De Pascalis S. et al. Hepatitis B virus and hepatitis C virus infection in healthcare workers. *World J Hepatol.* 2016 Feb 18;8(5):273–81. doi: 10.4254/wjh.v8.i5.273.
7. Gaviola G.C., McCarville M., Shendale S. et al. A review of health worker vaccination programs in low, middle and upper middle-income countries. *Public Health Pract (Oxf).* 2023 Jul 26;6:100415. doi: 10.1016/j.puhip.2023.100415.
8. Global hepatitis report 2017. World Health Organization; 2017.
9. Health. "National guidelines for the management of viral hepatitis". National Department of Health [homepage on the Internet]. 2019 [cited 2022 Apr 10].
10. Are booster immunisations needed for lifelong hepatitis B immunity? European Consensus Group on Hepatitis B Immunity. *Lancet.* 2000 Feb; 355(9203):561–565.
11. Karaivazoglou K., Triantos. C., Lagadinou M. et al. Acceptance of hepatitis B vaccination among health care workers in Western Greece. *Arch Environ Occup Health.* 2014;69(2):107–11. doi: 10.1080/19338244.2012.750586.
12. Kwon S.Y., Chang H.L. Epidemiology and prevention of hepatitis B virus infection. *Korean J Hepatol.* 2011 Jun;17(2):87–95. doi: 10.3350/kjhep.2011.17.2.87.
13. Lane S., MacDonald N.E. et al. Vaccine hesitancy around the globe: analysis of three years of who/unicef joint reporting form data-2015-2017. *Vaccine.* 2018 Jun 18;36(26):3861–3867. doi: 10.1016/j.vaccine.2018.03.063.
14. Lewis J.D., Enfield K.B., Sifri C.D. Hepatitis B in healthcare workers: Transmission events and guidance for management. *World J Hepatol.* 2015 Mar 27;7(3):488–97. doi: 10.4254/wjh.v7.i3.488.
15. Lu PJ, Euler GL. Influenza, hepatitis B, and tetanus vaccination coverage among health care personnel in the United States. *Am J Infect Control.* 2011 Aug;39(6):488–94. doi: 10.1016/j.ajic.2010.10.009.
16. Mahamat G, Kenmoe. S. et al. Global prevalence of hepatitis B virus serological markers among healthcare workers: A systematic review and meta-analysis. *World J Hepatol.* 2021 Sep 27;13(9):1190–1202. doi: 10.4254/wjh.v13.i9.1190.
17. Malewezi B, Omer S.B. et al. Protecting health workers from nosocomial Hepatitis B infections: A review of strategies and challenges for implementation of Hepatitis B vaccination among health workers in Sub-Saharan Africa. *J Epidemiol Glob Health.* 2016 Dec; 6(4):229–241. 10.1016/j.jegh.2016.04.003.
18. Maltezou H.C., Poland G.A. Vaccination policies for healthcare workers in Europe. *Vaccine.* 2014 Aug 27;32(38):4876–80. doi: 10.1016/j.vaccine.2013.10.046.

19. Mungandi N., Makasa M., Musonda P. Hepatitis B vaccination coverage and the determinants of vaccination among health care workers in selected health facilities in Lusaka district, Zambia: an exploratory study. *Ann Occup Environ Med.* 2017 Aug 10;29:32. doi: 10.1186/s40557-017-0191-y.
20. Global hepatitis report 2017. World Health Organization; 2017.
21. Prüss-Ustün A., Rapiti E., Hutin Y. Estimation of the global burden of disease attributable to contaminated sharps injuries among health-care workers. *Am J Ind Med.* 2005 Dec;48(6):482-490.
22. Rao T.V., Suseela. I.J., Sathiavathy K.A. Estimation of antibodies to HBsAg in vaccinated health care workers. *Indian J Med Microbiol.* 2008 Jan-Mar;26(1):93-4. doi: 10.4103/0255-0857.38876.
23. Razwiedani L.L., Mogale N.M., Mawela M.P.B. Hepatitis B vaccination coverage amongst healthcare workers in a tertiary academic hospital in Gauteng province, South Africa. *S Afr J Infect Dis.* 2022 Jul 27;37(1):393. doi: 10.4102/sajid.v37i1.393.
24. Immunization of health-care personnel: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Recomm Rep.* 2011 Nov 25;60(RR-7):1-45.
25. Schillie S., Murphy T.V. et al. CDC Guidance for Evaluating Health-Care Personnel for Hepatitis B Virus Protection and for Administering Postexposure Management. *MMWR Recomm Rep.* 2013 Dec 20;62(RR-10):1-19.
26. Vrachnaki O., Vergadi E. et al. Determinants of low uptake of vaccination against influenza, measles, and hepatitis B among healthcare professionals in Greece: a multicenter cross-sectional study. *Hum Vaccin Immunother.* 2020 Nov 1;16(11):2663-2669.
27. WHO. (30 October 2023). Guidelines for Hepatitis B Immunization for Medical and Health Personnel. <https://www.who.int/indonesia/news/publications/other-documents/guidelines-for-hepatitis-b-immunization-for-medical-and-health-personnel>.
28. Global hepatitis report 2017. World Health Organization; 2017.
29. Yuan Q, Wang F. et al. Hepatitis B vaccination coverage among health care workers in China. *PLoS One.* 2019 May 7;14(5):e0216598. doi: 10.1371/journal.pone.0216598.

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SUMMARY

Hepatitis B is a blood-borne virus and health care workers are a greater risk for HB infection due to occupational exposure to blood and body fluids. Hepatitis B Vaccination is the most effective tool to control nosocomial transmission of the virus in healthcare institutions. WHO recommended that all HCWs should be vaccinated against HBV, however approximately 24% of global health care workers remain unvaccinated. The review highlights that updating vaccination policy, utilizing existing immunization infrastructure and effectively managing vaccination programs are crucial factors for preventing HBV infection in HCWs.

Keywords: Hepatitis B, immunization, healthcare workers, vaccination coverage

