

KNOWLEDGE AND ATTITUDES OF HIGHER MEDICAL SCHOOL STUDENTS TOWARD HEPATITIS B INFECTION: A CROSS-SECTIONAL STUDY

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Abstract: Purpose: Hepatitis B virus infection poses a significant health risk, particularly for healthcare professionals and students in medical training. This study aims to assess the knowledge and attitudes of students at the Higher Medical School, University St. Kliment Ohridski Bitola, regarding hepatitis B transmission, prevention, vaccination, and post-exposure management. The study also explores the willingness of the students to treat hepatitis B-infected individuals and their perception of occupational risks.

Methodology: A cross-sectional study was conducted during March and April 2024, involving 103 students from different academic years. It was used structured, self-administered questionnaire to collect data on knowledge of hepatitis B transmission routes, vaccination protocols, infection prevention measures, and attitudes toward treating infected individuals. The survey was based on World Health Organization guidelines and existing literature. Descriptive statistics and chi-square tests were used to analyze the data, examining associations between knowledge levels and attitudes.

Results: The study found that 96% of students correctly identified blood as a primary transmission route, and 95% recognized needlestick injuries as a significant occupational risk. While 95% acknowledged vaccination as the best preventive measure, only 88% were aware of the full three-dose vaccination regimen. Knowledge gaps were identified in infection prevention (54%) and awareness of HBsAg as a marker of chronic infection (51%). Although 73% of students showed adequate knowledge, only 66% expressed a willingness to treat hepatitis B-infected individuals, and 69% reported anxiety about occupational exposure. A significant positive correlation ($r = 0.42$, $p < 0.001$) was found between knowledge levels and positive attitudes toward vaccination and infection control.

Conclusions: The findings suggest that while students have a strong understanding of hepatitis B transmission and the importance of vaccination, gaps persist in infection prevention measures and serological knowledge. Additionally, fear and stigma surrounding HBV-infected individuals remain a challenge, affecting students' readiness to provide care.

Recommendations: To improve hepatitis B awareness and preparedness among future healthcare professionals, customized educational interventions should be integrated into the curriculum. These should include practical training on infection control, interactive case-based learning on hepatitis B management, and structured workshops emphasizing universal precautions and post-exposure protocols. Institutional policies should also reinforce mandatory hepatitis B vaccination compliance and ensure continuous infection control education.

Additional data: This study provides information about the knowledge gaps and misconceptions surrounding hepatitis B among medical students, emphasizing the need for improved training and awareness programs. The findings can inform future policies and curriculum modifications aimed at enhancing the safety and competency of healthcare professionals in managing hepatitis B related risks.

Keywords: Hepatitis B, Medical Students, Vaccination, Infection, Occupational Safety, Healthcare Education

1. INTRODUCTION

Hepatitis B virus (HBV) infection remains a major global public health concern due to its potential to cause both acute and chronic liver diseases. According to the World Health Organization (WHO), in 2019, approximately 296 million people worldwide were living with chronic HBV infection, with an estimated 820,000 deaths occurring due to HBV-related complications, such as cirrhosis and hepatocellular carcinoma (HCC) (WHO, 2022). These figures highlight the persistent burden of hepatitis B and emphasize the need for effective prevention, early detection, and management strategies.

In the Republic of North Macedonia, HBV prevalence is estimated to be within the low-to-intermediate range, affecting approximately 2–4% of the population (ECDC, 2020). While this prevalence is lower compared to endemic regions, the risks associated with HBV transmission remain significant, particularly among healthcare workers who are exposed to potential occupational hazards, including needlestick injuries and direct contact with infected bodily fluids (Schillie et al., 2013). Studies indicate that healthcare professionals are 2–10 times more likely to contract HBV compared to the general population due to their occupational exposure (Khosravanifard ET AL., 2014). Consequently, the WHO strongly advocates for universal HBV vaccination among healthcare workers to mitigate transmission risks (WHO, 2015).

Medical students, particularly those in clinical training, are also at risk of exposure to HBV during patient-care activities. It is essential that they possess comprehensive knowledge about HBV transmission, vaccination protocols, and post-exposure prophylaxis (PEP) to prevent nosocomial transmission and safeguard themselves and their patients. Previous research has indicated that inadequate knowledge among healthcare providers often correlates with negative attitudes toward HBV patients, whereas a higher level of knowledge is associated with improved patient care and reduced stigma (Oliveira et al., 2022). Furthermore, structured educational interventions have been shown to significantly enhance medical students' understanding of HBV transmission, preventive measures, and vaccination practices (Sareetha et al., 2018; Sannathimmappa et al., 2019).

Despite these findings, knowledge disparities remain among medical students, necessitating continuous assessment and targeted educational interventions. By evaluating their knowledge and attitudes toward HBV infection, educators can tailor curricula to reinforce best practices, promote vaccination adherence, and ensure a safer clinical environment for both students and patients. This study focuses on assessing the knowledge and attitudes of students at the Higher Medical School, University St. Kliment Ohridski Bitola, regarding HBV infection. The study will examine students' understanding of HBV transmission, prevention, vaccination, and post-exposure management. Additionally, it will explore their attitudes toward treating HBV-infected patients and their perception of occupational safety measures.

2. MATERIALS AND METHODS

This study utilized a cross-sectional survey design to assess the knowledge and attitudes of students at the Higher Medical School, University St. Kliment Ohridski Bitola, regarding hepatitis B virus (HBV) infection. Given the importance of HBV awareness among future healthcare professionals, this study aimed to identify knowledge gaps and attitudes toward vaccination, infection control, and treatment of HBV-infected individuals. The study sought to provide insights that could inform targeted educational interventions to enhance students' understanding and preparedness in clinical settings. The study population comprised 103 students enrolled in the Higher Medical School at University St. Kliment Ohridski Bitola. A suitability sampling method was employed, including first-, second-, and third-year students in the in the spring semester of the academic 2023/24 year, who voluntarily agreed to participate. The age distribution and gender breakdown of the participants were recorded, along with their academic year. A self-administered questionnaire was designed based on existing literature and World Health Organization (WHO) guidelines on HBV. The questionnaire consisted of three main sections:

- Demographic Information: Age, gender, and year of study.
- Knowledge Assessment: Multiple-choice and true/false questions evaluating HBV transmission routes, vaccination, prevention measures, and complications.
- Attitudes Assessment: A 5-point Likert scale (1 = strongly disagree to 5 = strongly agree) was used to measure students' attitudes toward HBV vaccination, caring for HBV-infected patients, and the importance of universal precautions.

The survey was conducted from March and April 2024. Participation was voluntary, and students completed the questionnaire in a supervised setting to ensure accuracy and completeness. Completed questionnaires were entered into SPSS software for statistical analysis. Descriptive statistics (frequencies, means, and standard deviations) were used to summarize demographic and knowledge data. Chi-square test (χ^2) was applied to examine associations between categorical variables, particularly between knowledge levels and positive attitudes. Statistical significance was set at $p < 0.05$ to determine meaningful associations.

3. RESULTS

The study included 103 participants with the mean age: 21.4 ± 1.2 years and gender distribution: 88% female (n = 91), 12% male (n = 12). Regarding the year of study 42 students were first-year, 29 were second-year and 32 were third-year students.

Table 1. Results of students correct answers regarding the knowledge section.

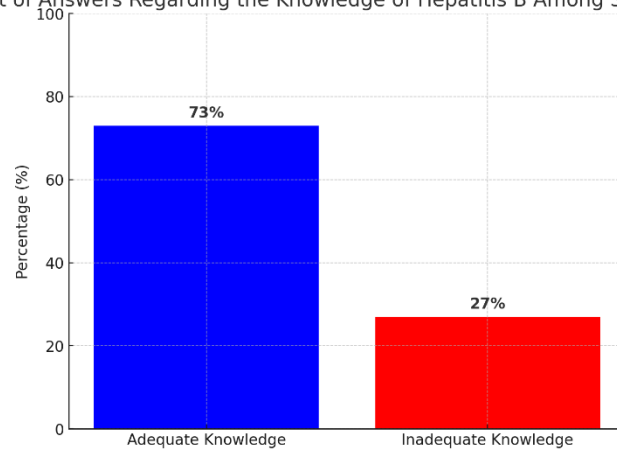
Question	Key concept	% Correct (n)
What is the main mode of transmission of hepatitis B?	Blood-borne transmission	96% (n=99)
Can HBV be transmitted through unprotected sexual contact?	Sexual transmission	88% (n=91)
Can HBV be passed from an infected mother to her child at birth (vertical transmission)?	Mother-to-child transmission	87% (n=90)
4. Is vaccination the best way to prevent hepatitis B in healthcare settings?	Importance of vaccination	95% (n=98)
5. Should all healthcare workers receive the HBV vaccine?	Universal vaccination recommendation	72% (n=74)
6. Do three doses of the HBV vaccine typically provide full immunization?	HBV vaccination schedule	88% (n=91)
7. Can HBV infection progress to cirrhosis if left untreated?	Long-term complications (cirrhosis)	73% (n=75)
8. Can chronic HBV infection lead to liver cancer (hepatocellular carcinoma)?	Long-term complications (HCC)	73% (n=75)
9. Are needlestick injuries a significant risk factor for acquiring HBV in clinical practice?	Occupational risk	95% (n=98)
10. Should PEP (e.g., HBIG + vaccine) be initiated ideally within 24 hours of a needlestick injury?	Post-exposure prophylaxis timing	91% (n=94)
11. Is HBsAg (Hepatitis B surface antigen) a key marker of chronic HBV infection?	Diagnostic marker (HBsAg)	51% (n=53)
12. Does safe disposal of sharps (needles, scalpels) reduce the risk of transmitting HBV?	Infection control measures (sharps management)	54% (n=56)
13. Is proper hand hygiene crucial for preventing the spread of HBV?	Infection control measures (hand washing)	54% (n=56)
14. Can hepatitis B be easily cured with standard antibiotics?	Misconception about treatment (no antibiotic cure)	80% (n=82)

Source: Authors' research

Results presented in Table no1 shows high awareness of blood-borne and occupational risks. Over 96% of students knew that HBV can spread through infected blood, and 95% identified needlestick injuries as a significant risk, around 95% recognized vaccination as the best preventive measure, although fewer (88%) were correct about the standard three-dose regimen, 91% knew PEP should ideally start within 24 hours of exposure, highlighting an area for educational reinforcement and 80% recognized that standard antibiotics do not cure HBV. While only 54% of the students know the measures for infection prevention, 51% were aware that HBsAg indicates chronic infection, and in total, 73% (n = 76) of participants scored ≥ 10 correct answers and were classified as having “adequate knowledge.”

Figure 1. Overall percent of answers regarding the knowledge of Hepatitis B among students in Higher Medical School Bitola.

Chart no1. Overall Percent of Answers Regarding the Knowledge of Hepatitis B Among Students in Higher Medical School



Source: Authors' research

Figure 1 presents the proportion of students who demonstrated adequate and inadequate knowledge about hepatitis B infection. 73% of students were classified as having adequate knowledge (blue bar) and 27% of students were classified as having inadequate knowledge (red bar). This figure shows that while the majority of students possess sufficient knowledge about HBV, some portion still lacks essential understanding, highlighting the need for further educational interventions to improve awareness and preparedness among future healthcare workers.

Table 2. Results of students correct answers regarding the knowledge section.

Key concept	% Correct (n)	1 st year (n=42)	2 nd year (n=29)	3 rd year (n=32)
Blood-borne transmission	96% (n = 99)	93%	97%	97%
Sexual transmission	88% (n = 91)	88%	84%	93%
Mother-to-child (vertical) transmission	87% (n = 90)	81%	96%	94%
Importance of vaccination	95% (n = 98)	88%	100%	100%
HBV vaccination schedule (3 doses)	88% (n = 91)	86%	88%	90%
Chronic progression to cirrhosis	73% (n = 75)	67%	79%	87%
Chronic progression to liver cancer (HCC)	73% (n = 75)	67%	79%	87%
Occupational risk: needlestick injuries	95% (n = 98)	88%	97%	97%
Timing of PEP (< 24 hours post-exposure)	91% (n = 94)	85%	90%	94%
HBsAg as marker of chronic infection	51% (n = 53)	50%	51%	56%
Safe disposal of sharps reduces HBV transmission risk	54% (n = 56)	54%	51%	60%
Importance of hand hygiene for preventing HBV	54% (n = 56)	54%	51%	60%
Antibiotics do not cure HBV	80% (n = 82)	61%	89%	93%

Source: Authors' research

Table 2 presents the question-specific correct response rates among first-, second-, and third-year students. Several domains emerged as high-performing. For instance, blood-borne transmission of HBV (Q1) and the timing of post-exposure prophylaxis (PEP) (Q10) each exceeded 90% correctness across all cohorts. Similarly, 95% of respondents answered correctly regarding both the significance of HBV vaccination (Q4) and occupational risk posed by needlestick injuries (Q9). Notably, among second- and third-year students, correctness for needlestick-related questions reached $\geq 97\%$.

Moderate knowledge areas include sexual transmission (Q2) and three-dose vaccination schedule (Q6) where both items show 88–90% correct responses. However, first-year students scored slightly lower (Q2 = 88%, Q6 = 86%), indicating a need for additional reinforcement of these topics early in their studies. Approximately 73% of students answered correctly about chronic progression to cirrhosis or HCC (Q7, Q8), although third-year students scored notably higher at 87%.

Lower performing or variable domains are presented in table 2 regarding the safe disposal of sharps and hand hygiene (Q12, Q13) the correctness overall is 54%, with small gains from first to third year. HBsAg as marker of chronic infection (Q11) stands out with the lowest overall correctness at 51%. Students are mixing up HBsAg with other markers (e.g., Anti-HBs), particularly in the first year (50%) and second year (51%). High perceived importance of vaccination (95%, $n = 98$): A majority of students strongly agreed that HBV vaccination is crucial for all healthcare workers. This positive outlook likely stems from their recognition of the increased occupational risks inherent in clinical practice, as well as general public health messaging emphasizing the vaccine's role in preventing chronic hepatitis B and its severe complications (e.g., cirrhosis, hepatocellular carcinoma).

Positive clinical attitude in willingness to care patients with HBV infection (66%, $n = 68$): a significant low proportion of respondents expressed readiness to treat HBV-infected individuals. These results indicate that educational efforts to reduce stigma around infectious diseases are still not effectively permeating the student body. Anxiety in clinical settings (69%, $n = 71$): over two third of the respondents reported feeling somewhat anxious about potential HBV exposure. While heightened awareness can encourage vigilance, excessive worry may impede learning and decision-making. This anxiety highlights a gap in practical knowledge or confidence regarding universal precautions, personal protective equipment (PPE), and post-exposure prophylaxis (PEP).

A moderate, positive correlation was found between knowledge scores and attitude scores, $r = 0.42$, $p < 0.001$, indicating that students with higher HBV knowledge also tend to have more positive attitudes toward caring for HBV-infected patients and the importance of vaccination. Among students with adequate knowledge ($n = 76$), 86.6% expressed a positive attitude toward HBV prevention and care, compared to 53.6% of those with inadequate knowledge. A chi-square test indicated this relationship was statistically significant, $\chi^2 (1, N=95) = 8.72$, $p = 0.003$, suggesting that a higher level of HBV knowledge is associated with a more positive attitude toward vaccination and patient care.

4. DISCUSSIONS

In this cross-sectional study of 103 students, the results indicate robust baseline awareness of HBV fundamentals—including transmission routes and the need to initiate post-exposure prophylaxis (PEP) within 24 hours (91%). These findings align with similarly high knowledge rates (86.2%) reported in Northwest Ethiopia and Cameroon, which underscore both strong understanding of HBV's transmission dynamics and recognized preventive strategies (Abdela et al., 2016; Noubiap et al., 2013). Nonetheless, the presence of some knowledge gaps highlights the ongoing need to reinforce comprehensive HBV education within the curriculum.

Likewise, 95% of respondents identified HBV vaccination as an essential preventive measure, aligning with World Health Organization (WHO) guidelines that underscore the vaccine's pivotal role in reducing chronic HBV complications such as cirrhosis and hepatocellular carcinoma (WHO, 2017). This study shows that 88% of students displayed correct knowledge of the full three-dose HBV immunization schedule, suggesting a need for more detailed reinforcement of vaccination protocols in the early stages of their medical curriculum.

Despite the generally positive results among students, several moderate- and low-performing areas emerged. Moderate knowledge levels regarding sexual transmission and chronic progression to cirrhosis or HCC highlight partial gaps in students' understanding of long-term HBV consequences. Similar findings have been reported in research from Iraq, Saudi Arabia, Nepal, and Ethiopia, where 74.2%, 75.5%, 80.6%, and 81.3% of students, respectively, acknowledged that hepatitis B infection can cause liver cancer (Naqid et al., 2023; Shrestha et al., 2020; Alhawaish et al., 2017). Notably, third-year students performed better on the latter, likely reflecting increased exposure to clinical case discussions and advanced coursework as other similar study (Wutayd et al., 2019).

Lower-performing domains report more substantial deficiencies. Only 54% of students knew correct measures for safe disposal of sharps and effective hand hygiene, echoing concerns from the Centers for Disease Control and Prevention (CDC) that compliance with standard precautions remains inconsistent among healthcare trainees (CDC,

2021). Our findings are in agreement with, and support the need to train students in preventive practices regarding infectious risk of HBV, universal precautions to handle the needles or cutting objects, and to protect oneself against secretions, should be taught and emphasized (Al-Hazmi, 2019). Report from Saudi Arabia among dentists was in line with the similar findings (Al-Hazimi, 2015). In our study, only 51% of participants correctly identified HBsAg as the marker of chronic infection, indicating confusion with other serological markers such as Anti-HBs or Anti-HBc IgG. This shortfall was especially pronounced in first- and second-year groups, affirming that additional emphasis on HBV serology early in the curriculum is vital. Negative attitudes toward HBV infection and unwillingness to provide care for CHB patients has been well documented in previous studies among medical students and HCWs in Vietnam, Japan, Iran, Saudi Arabia and other countries (Pham et al., 2019; 23. Shindano et al., 2017; Eguchi et al., 2013; Wada et al., 2016; Ishimaru et al., 2016; Mokaya et al., 2018; Ishimaru et al., 2017; Akazong et al., 2020). Approximately 69% reported some anxiety about contracting HBV in clinical settings—while some degree of concern can foster safer practices, excessive worry may deter hands-on learning experiences or patient engagement.

The correlation analysis reinforces the connection between knowledge and attitudes ($r = 0.42$, $p < 0.001$), showing that higher HBV knowledge aligns with a more positive attitude toward vaccination and caring for infected patients. Moreover, a chi-square test confirmed that those classified with “adequate knowledge” (≥ 10 correct answers) displayed significantly higher readiness to engage in preventive measures and patient care ($\chi^2(1, N=95) = 8.72$, $p = 0.003$). Similar studies also pointed out that students’ attitude is positively correlated with their mean knowledge scores (Mansour-Ghanaei et al., 2013).

Overall, these results confirm that while foundational HBV transmission and preventive knowledge is high, essential concepts such as universal immunization, serological markers, and thorough compliance with standard precautions require targeted curriculum revision. More interactive strategies—including practical demonstrations of sharps disposal, additional workshops on hand hygiene, and deeper case-based discussions on HBV serology—could help bridge the knowledge gaps. By focusing on areas of confusion (e.g., HBsAg vs. Anti-HBs) and addressing persistent anxieties about occupational exposure, educational institutions can further empower future healthcare providers to deliver safe and informed HBV care.

5. CONCLUSIONS

This study shows the important role of HBV knowledge in shaping the attitudes of medical students toward vaccination, occupational safety, and patient care. Findings reveal that students with higher factual knowledge demonstrate a greater willingness to treat HBV-infected patients and lower anxiety regarding potential workplace exposure. Despite a high level of awareness in key areas such as transmission and vaccination, knowledge gaps remain in infection prevention measures, serological markers, and post-exposure protocols. Addressing these deficiencies through targeted educational interventions is essential for ensuring a well-prepared healthcare workforce.

As future implications, incorporating comprehensive HBV education into medical training, including theoretical content, clinical case discussions, and practical simulations, can reinforce key concepts and improve knowledge retention. Also, structured infection control workshops focusing on sharps disposal, post-exposure management, and universal precautions will help bridge critical knowledge gaps. Given the observed hesitation in treating HBV-infected individuals, educational campaigns should emphasize reducing stigma and improving professional attitudes toward HBV patients. Future implications also should strengthen institutional policies to ensure medical students receive and follow up on HBV vaccination can enhance occupational safety. By improving HBV-related knowledge and fostering positive clinical attitudes, medical schools can contribute to safer healthcare environments, reduced nosocomial transmission, and improved patient outcomes.

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