

## Original article

### Knowledge, immunization against hepatitis B and use of biosafety measures by health students at a University in the interior of Minas Gerais, Brazil

*Conhecimento, imunização contra hepatite B e uso das medidas de biossegurança por estudantes da área da saúde em uma universidade no interior de Minas Gerais, Brasil*

*Conocimiento, inmunización contra hepatitis B y uso de las medidas de bioseguridad por estudiantes del área de la salud en una universidad en el interior de Minas Gerais, Brasil*

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#### ABSTRACT

**Introduction and objective:** The hepatitis B virus has a high global prevalence, with a strong impact on public health, which justifies surveillance strategies and prevention of possible diseases. The risk of exposure to the virus among health students and health professionals is a major concern, showing that public adherence to biosafety measures is low. The objective was to evaluate knowledge, immunization against hepatitis B and use of biosafety measures by health students at a university in the interior of Minas Gerais. **Methods:** This is a cross-sectional, descriptive study with self-administered questionnaire composed of sociodemographic variables and questions about biosafety. **Results:** Of the 540 students who participated in the study, 37.2% declared no knowledge about biosafety, and of these, 28.9% were not vaccinated against hepatitis B; 32.4% of the students considered them not exposed to biosafety hepatitis B virus, and of these 25.7% were not vaccinated. Still, the study showed that 13.3% of the students did not use gloves and of these 41.7% were not vaccinated. **Conclusion:** There are gaps in the knowledge and use of biosafety measures, among them, the failure of immunization against hepatitis B. Thus, the adoption of policies of permanent education with systematic inclusion of biosafety and mechanisms that will guarantee these students' immunization is necessary.

**KEYWORDS:** Containment of Biohazards. Hepatitis B. Education Continuing.

## RESUMO

**Justificativa e Objetivo:** O vírus da hepatite B tem alta prevalência mundial, com forte impacto na saúde pública, o que justifica as estratégias de vigilância e prevenção dos possíveis agravos. O risco da exposição ao vírus entre os estudantes e profissionais de saúde constitui uma grande preocupação, mostrando-se baixa a adesão desse público às medidas de biossegurança. O objetivo foi avaliar o conhecimento, imunização contra hepatite B e uso das medidas de biossegurança por estudantes da área da saúde em uma universidade no interior de Minas Gerais, Brasil. **Métodos:** Estudo transversal, descritivo, com aplicação de questionário, de autoperenchimento, a estudantes da área da saúde, composto por variáveis sociodemográficas e referentes ao tema biossegurança. **Resultados:** Dentre os 540 estudantes que participaram do estudo, 37,2% declararam não ter conhecimento sobre biossegurança, e desse total, 28,9% não foram vacinados contra a hepatite B, 32,4% dos estudantes consideraram que não estavam expostos ao vírus da hepatite B, e desses, 25,7% não eram vacinados. Ainda o estudo mostrou que 13,3% dos estudantes não usavam luvas e, destes, 41,7% não eram vacinados. **Conclusão:** Verificou-se que existem lacunas em relação ao conhecimento e uso das medidas de biossegurança, entre estas, a falha da imunização contra hepatite B. Neste sentido, faz-se necessária a adoção de políticas de educação permanente com inclusão sistemática do tema biossegurança e adoção de mecanismos que garantirão a imunização desses estudantes. **DESCRITORES:** Contenção de Riscos Biológicos. Biossegurança. Hepatite B. Educação Permanente.

## RESUMEN

**Justificación y Objetivos:** El virus de la hepatitis B tiene alta prevalencia mundial, con fuerte impacto en la salud pública, lo que justifica las estrategias de vigilancia y prevención de los posibles agravios. El riesgo de exposición al virus entre los estudiantes y los profesionales de la salud constituye una gran preocupación por la baja adhesión de este público a las medidas de bioseguridad. El objetivo fue evaluar el conocimiento, inmunización contra la hepatitis B y el uso de las medidas de bioseguridad por estudiantes del área de la salud en una universidad en el interior de Minas Gerais, Brasil. **Métodos:** Estudio transversal, descriptivo, con cuestionario de autorrelleno aplicado a estudiantes del área de salud compuesto por variables sociodemográficas y sobre el tema bioseguridad. **Resultados:** Entre los 540 estudiantes que participaron en el estudio, el 37,2% declararon no tener conocimiento sobre bioseguridad, y de ese total, el 28,9% no fueron vacunados contra la hepatitis B, el 32,4% de los estudiantes consideraron que no estaban expuestos al virus de la hepatitis B, y de estos el 25,7% no eran vacunados. Aún el estudio mostró que el 13,3% de los estudiantes no usaban guantes y, de estos, un 41,7% no eran vacunados. **Conclusión:** Se verificó que existen lagunas en relación al conocimiento y uso de las medidas de bioseguridad, entre estas, el fallo de la inmunización contra la hepatitis B. En este sentido, se hace necesaria la adopción de políticas de educación permanente con la inclusión sistemática del tema bioseguridad y la adopción de medidas que garantizarán la inmunización de esos estudiantes.

**PALABRAS CLAVE:** Contención de Riesgos Biológicos. Bioseguridad. Hepatitis B. Educación Continua.

## INTRODUCTION

Infection by the Hepatitis B Virus (HBV) is the main cause of chronic hepatitis, liver cirrhosis and hepatocellular carcinoma, and its transmission occurs by sexual contact, contaminated material used in health care or aesthetics services, blood transfusion and

derivatives, as well as by vertical transmission.<sup>1-3</sup> In health care settings, the incidence rate of HBV infection is high, mainly because of the risk associated with occupational exposure.<sup>4</sup>

HBV was responsible for 1.34 million deaths in 2015, which is compatible with the deaths caused by tuberculosis and HIV. According to the Pan American Health Organization, viral hepatitis is considered a major public health challenge.<sup>5,6</sup> The main strategies used to fight HBV infection include (i) the vaccination of students and health professionals, (ii) the use of Personal Protective Equipment (PPE) and (iii) post-exposure management.<sup>5,7</sup> However, the population does not meet the recommendations and most vaccinated individuals do not follow up on immunization through laboratory tests, which confirm or not the effectiveness of immunization, as serum markers of immunity (anti-HBs) and, or the assessment of presence of HBV surface antigen (HBsAg) and the quantification of the virus in the bloodstream (viral load / HBV-DNA).<sup>2</sup>

The number of people infected with HBV is estimated at 257 million.<sup>5</sup> The prevalence of hepatitis B is highest in the Western Pacific Region and Africa, where 6.2% and 6.1%, respectively, of the adult population are infected. In Eastern Mediterranean, Southeast Asia and Europe, it is estimated that 3.3%, 2.0% and 1.6%, respectively, of the general population are infected.<sup>6</sup> In Ethiopia, a study carried out with health students showed that despite the majority (> 80.0%) reporting knowledge about the infectious process, transmission and prevention concerning HBV, only 50% performed safe practices regarding occupational risk of infection.<sup>8</sup> Similarly, in a study done with dentistry students, it was observed that only 45.0% of the students were vaccinated, although 86% of them showed knowledge about the HBV infection process.<sup>6</sup> Similar results were found in studies conducted in Australia, Iran and Nigeria.<sup>1-3</sup>

In Brazil, the Secretariat of Health Surveillance recorded the occurrence of 218,257 cases of HBV infections in 2017, with an increase from 6.5 to 11.9 cases per 100,000 inhabitants compared to 2016.<sup>9</sup> Among medical students, Antunes et al. found that 55.2% do not know the universal precautions and, worryingly, 13.89% were not vaccinated against HBV, with 10% declaring some type of accident with biological risk.<sup>10</sup>

The risk of exposure to HBV among health students and professionals is a major concern, and different studies show that adherence to safety measures is low and some individuals are even unaware of it.<sup>10</sup> Among the different accidents reported by health service professionals, injury from sharps is the most prevalent, which is a form of possible exposure to HBV.<sup>2,8</sup> Thus, the present study aimed to assess knowledge, immunization against hepatitis B and the use of biosafety measures by health students at a University in the interior of Minas Gerais.

## **METHODS**

A cross-sectional, descriptive study was conducted at a university in the interior of Minas Gerais, Brazil, from November 2017 to April 2018, with all students regularly enrolled in the Nursing, Pharmacy and Physical therapy courses at the School of Biological Sciences and Health (FCBS) and Medicine at the Diamantina Medical School (FAMED). Students enrolled in the first period of these courses were excluded from the study.

The students answered a structured, self-administered and voluntary questionnaire. The approach was done during the students' regular classes with the prior authorization of the professor, and reading and signing the Free Informed Consent Term (ICF). Three attempts were made to collect the data. The time taken to complete the questionnaire was approximately 20 minutes. It evaluated (i) sociodemographic variables (age group; gender; period of enrollment in the course) and (ii) the topic of biosafety (knowledge and use of biosafety measures; report on immunization against hepatitis B; risk of exposure to HBV and HIV; Work with contaminated material; Accident reporting; Disposal of sharps; Use of personal protective equipment).

Data statistical analysis was performed using EpiData version 3.1 and Statistical Package for the Social Sciences (SPSS) 22.0 programs. The absolute and relative frequencies of the variables were calculated, and Pearson's chi-square test was performed to assess the association between the data. The level of significance considered was 5% ( $p < 0.05$ ).

The project was approved by the Research Ethics Committee of UFVJM, Diamantina, Minas Gerais, under opinion number 1.906.279, CAAE 61212816.7.0000.5108. This study was developed in compliance with the ethical precepts of research.

## **RESULTS**

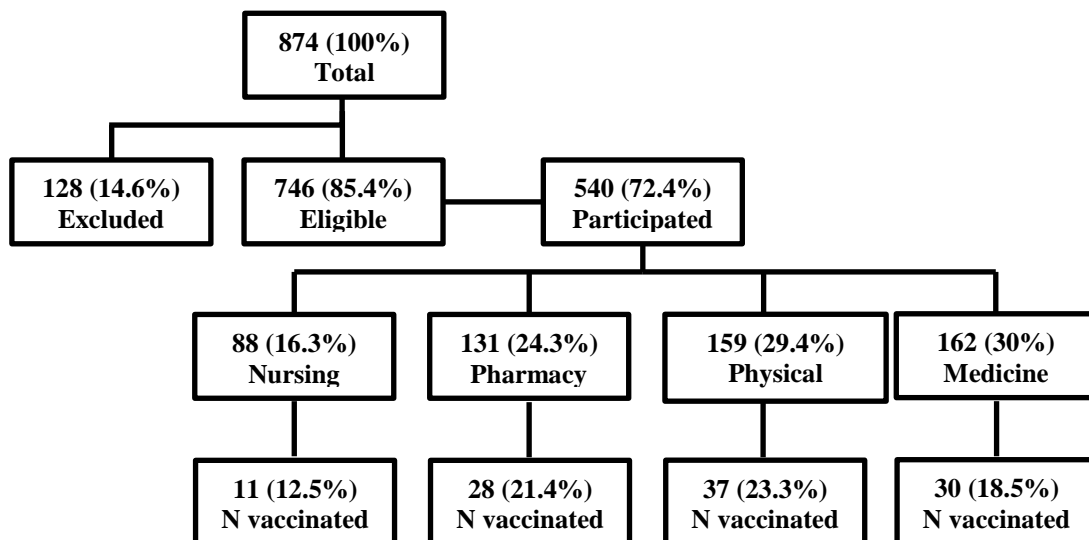
Of a total of 874 students regularly enrolled in the Nursing, Pharmacy, Physical therapy and Medicine courses, 85.4% (746) were eligible and 14.6% (128) did not participate in the study for attending the first period of the course, respecting the one exclusion criteria. Among those eligible, 72.4% (540) participated in the survey and answered the questionnaire, where 16.3%, 24.3%, 29.4% and 30% belonged to nursing, pharmacy, physical therapy and medicine courses, respectively. Considering sociodemographic variables, 76.1% (411) of the students were female and aged 21-30 years (66.9%) (Table 1).

Regarding immunization against hepatitis B, the number of unvaccinated students varied, with 23.3% (37), 21.4% (28) and 18.5% (30) of students from Physical therapy,

Pharmacy and Medicine courses, respectively, not being vaccinated. The lowest prevalence was observed among nursing students (12.5%), in which only 11 students out of a total of 88 were not vaccinated (Figure 1).

As for gender, a higher percentage of male students (26.4%) was not vaccinated compared to female students (17.5%). The percentage of immunization between age groups ranged from 71.4 to 84.8%, with a higher value for the group with the highest students concentration (21-30 years).

As for course period, most students (19.6%) were in the second while the minority (14.1%) was in the ninth period (Table 1). The highest percentage of vaccinated students was found in the last periods of the courses (82.6-95.6%), whereas the highest percentage of non-vaccinated students was found in the initial periods (24.5-31.7%).



**Figure 1.** Scheme of the sample selection for the study.

**Table 1.** Prevalence of students vaccinated against hepatitis B, regarding sociodemographic variables, Diamantina / MG, Brazil, 2017-2018.

Total	%	Vaccinated	%	No vaccinated	%	p Value
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	(n= 540)		(n= 434)		(n= 106)		
<b>Gender</b>							<b>0.02<sup>#</sup></b>
Male	129	23.9	95	73.6	34	26.4	
Feminine	411	76.1	339	82.5	72	17.5	
<b>Age range</b>							<b>0.00<sup>*</sup></b>
18-20 years	165	30.6	118	71.5	47	28.5	
21-30 years	361	66.9	306	84.8	55	15.2	
> 30 years	14	2.6	10	71.4	4	28.6	
<b>Current period</b>							<b>0.00<sup>#</sup></b>
2 <sup>o</sup>	106	19.6	73	68.9	33	31.1	
3 <sup>o</sup>	53	9.8	40	75.5	13	24.5	
4 <sup>o</sup>	63	11.7	43	68.3	20	31.7	
5 <sup>o</sup>	65	12.0	55	84.6	10	15.4	
6 <sup>o</sup>	76	14.1	68	89.5	8	10.5	
7 <sup>o</sup>	51	9.4	44	86.3	7	13.7	
8 <sup>o</sup>	58	10.7	49	84.5	9	15.5	
9 <sup>o</sup>	23	4.3	19	82.6	4	17.4	
10 <sup>o</sup> or greater	45	8.3	43	95.6	2	4.4	

<sup>#</sup>Pearson's chi-square. <sup>\*</sup>Fisher's exact test.

Regarding basic knowledge about biosafety measures, 37.2% (201) of the students declared no knowledge of the measures and, of this total, 28.9% were not vaccinated against hepatitis B (Table 2). For those who declared knowledge (62.8%), a smaller percentage (14.2%) was not vaccinated against HBV. Considering the use of biosafety measures (Table 2), 23.3% (126) do not use them and, of these, 34.1% (43) were not vaccinated. Among those who used the measures (45.4%), the percentage of non-vaccinated fell to 9.8% (24).

A total of 62.6% of the participants did not perform a test to verify the effectiveness of immunization against hepatitis B or did not remember (24.4%) (Table 2). Of the total number of students who did not evaluate immunization, 82.5% were vaccinated (279). Even among the unvaccinated, 32.6% of the individuals answered "I don't remember" to the same question.

A total of 32.4% of the students considered themselves unexposed to the HBV or HIV virus during the course, of which 25.7% (45) were not vaccinated against HBV. When asked if they work with contaminated material (Table 2), 64.6% (349) answered "no" and, of these, 23.5% (82) were not vaccinated.

Of the total number of students, 90.4% (488) said they did not use cell phones or drinking fountains with gloves on (Table 2). Regarding injury with sharps, 11.5% (62) of the

students suffered accidents with some material and 4.1% (22) stated that they had already splashed blood or fluids in their eyes. Regarding the disposal of needles or other sharp material, 13.3% (72) reported discarding sharps in plastic bags. For these questions, there was no statistically significant association ( $p > 0.05$ ) concerning the prevalence of vaccinated or unvaccinated.

This part of the questionnaire ended with the question “do you judge the information you receive about biosafety sufficient” (Table 2) and 67% (362) answered “no”. Of these, only 22.7% (82) were vaccinated against HBV, while among those who felt the information was sufficient (33.0%), 86.5% (154) were vaccinated.

**Table 2.** Prevalence of students vaccinated against hepatitis B, regarding basic knowledge about biosafety measures, Diamantina / MG, Brazil, 2017-2018.

	<u>Total</u> (n= 540)	%	<u>Vaccinated</u> (n= 434)	%	<u>No vaccinated</u> (n= 106)	%	p Value
<b>Know the biosafety measures</b>							<b>0.00</b>
Yes	339	62.8	291	85.8	48	14.2	
No	201	37.2	143	71.1	58	28.9	
<b>Makes use of biosafety measures</b>							<b>0.00</b>
Yes	245	45.4	221	90.2	24	9.8	
No	126	23.3	83	65.9	43	34.1	
Sometimes	169	31.3	130	76.9	39	23.1	
<b>Tested to see if you were immunized against hepatitis B</b>							<b>0.00</b>
Yes	70	13	66	94.3	4	5.7	
No	338	62.6	279	82.5	59	17.5	
I do not remember	132	24.4	89	67.4	43	32.6	
<b>Do you think you are exposed to hepatitis B and HIV</b>							<b>0.01</b>
Yes	365	67.6	304	83.3	61	16.7	
No	175	32.4	130	74.3	45	25.7	
<b>Works with material that may be contaminated</b>							<b>0.01</b>
Yes	191	35.4	167	87.4	24	12.6	
No	349	64.6	267	76.5	82	23.5	
<b>Answer your cell phone or use a drinking fountain while wearing gloves</b>							0.56
Yes	22	4.1	16	72.7	6	27.3	
No	488	90.4	395	80.9	93	19.1	
Sometimes	30	5.6	23	76.7	7	23.3	
<b>Have you ever had an accident with sharps</b>							0.33
Yes	62	11.5	47	75.8	15	24.2	
No	478	88.5	387	81.0	91	19.0	
<b>Have you ever spilled blood or fluids in your eyes or mouth</b>							0.86
Yes	22	4.1	18	81.8	4	18.2	
No	518	95.9	416	80.3	102	19.7	



<b>Do you discard a needle or other sharp material in plastic bags?</b>							0.27
Yes	72	13.3	53	73.6	19	26.4	
No	435	80.6	355	81.6	80	18.4	
Sometimes	33	6.1	26	78.8	7	21.2	
<b>Judges the information about biosafety received sufficient</b>							<b>0.01</b>
Yes	178	33.0	154	86.5	24	13.5	
No	362	67.0	280	77.3	82	22.7	

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Pearson's chi-square.

Table 3 presents the results for using four different PPEs. It was observed that most students (86.7 and 94.8%, respectively) wear gloves or a lab coat/apron, with a high prevalence of immunized people (83.8 and 81.3%, respectively). Among the 72 (13.3%) students who did not wear gloves in academic practices, 41.7% (30) were not vaccinated. The percentage of students who did not wear a mask and glasses was 61.5% (332) and 82.4% (445), respectively, with approximately 23% of them not being immunized (Table 3).

**Table 3.** Prevalence of students vaccinated against hepatitis B, regarding the use of personal protective equipment, Diamantina / MG, Brazil, 2017-2018.

	Total (n= 540)	%	Vaccinated (n= 434)	%	No vaccinated (n= 106)	%	p Value
<b>Gloves</b>							<b>0.00<sup>#</sup></b>
Yes	468	86.7	392	83.8	76	16.2	
No	72	13.3	42	58.3	30	41.7	
<b>Mask</b>							<b>0.01<sup>#</sup></b>
Yes	208	38.5	182	87.5	26	12.5	
No	332	61.5	252	75.9	80	24.1	
<b>Glasses</b>							<b>0.00<sup>*</sup></b>
Yes	95	17.6	88	92.6	7	7.4	
No	445	82.4	346	77.8	99	22.2	
<b>Apron or lab coat</b>							<b>0.02<sup>#</sup></b>
Yes	512	94.8	416	81.3	96	18.8	
No	28	5.2	18	64.3	10	35.7	

<sup>#</sup>Pearson's chi-square. <sup>\*</sup>Fisher's exact test.

## DISCUSSION

Vaccination against hepatitis B is essential for health students security when starting their activities in practical classes and/or internships. In the USA, in 2002, the Center for Disease Control and Prevention reaffirmed the guideline that highlighted the ethical commitment of universities and health institutions to carry out active surveillance of students and professionals before the beginning of curricular activities in healthcare establishments.<sup>11</sup> In Brazil, according to Ordinance 597 of the Ministry of Health, educational institutions have a fundamental role in monitoring the vaccination status of their students, making HBV vaccination mandatory as a basic requirement for enrollment in educational institutions.<sup>12</sup> Thus, administrative policies in educational institutions must ensure that students receive the three doses of the vaccine, either by making them available in the university environment or by conducting campaigns at the university to stimulate immunization and tests to evaluate seroconversion.

In this study, the majority of students (80.4%) stated that they had been immunized against HBV. However, the number of doses fulfilled in the vaccination schedule (3 doses) was not questioned. A previous study found that although 68.4% of medical students at a Brazilian public university were vaccinated, only 48.9% received the three necessary doses.<sup>13</sup> Similarly, other authors found that while 93.9% of students reported vaccination upon entering medical school in Saudi Arabia, only 59.5% had completed the three-dose schedule.<sup>14</sup> Health professionals from the municipal administration of an Ethiopian city reported that only 10% of respondents had received one or more doses of hepatitis B vaccination and 69.2% declared some type of occupational accident with blood exposure to unprotected mucous membranes and skin.<sup>15</sup>

When asked about the test to check the effectiveness of HBV immunization, most of the students declared that they had not done it (62.6%) or did not remember having done it (24.4%). After the completion of the three doses, a serological test is necessary to evaluate seroconversion (anti-HBsAG  $\geq$  10 IU / ml), and one of the conducts for a negative result is, after the third dose, to repeat the schedule (zero, one and six months).<sup>16</sup>

The highest percentage of students interviewed was female (76.1%), with the majority being vaccinated (82.5%), with a predominance of the 21 to 30 age group. The study by Souza and Teixeira carried out with medical students also found a predominance of participants who declared themselves to be female (59.7%), but with a lower prevalence of vaccination among them (49.6%) and an average age of 22, 8 years.<sup>13</sup> Considering the report of accidents between health students and health professionals, it was found that 70% of the individuals declared themselves to be female, with an average of 21 to 30 years of age.<sup>17</sup> The higher percentage of vaccination among female students can be explained by the lower demand for health services among male individuals.<sup>18</sup> The prevalence of vaccinated students in the age group of 21 to 30 years is justified by the history of implementation of the vaccine schedule against HBV in Brazil. The hepatitis B recombinant DNA vaccine appeared in 1986 and was gradually implemented for children under 20 in Brazil, reaching 30% of this population in 2001, 30% in 2002 and 40% in 2003.<sup>19</sup>

Considering the biosafety measures, most students claimed to know them (62.8%) and use them (45.4%). However, a large number of individuals stated that they were not immunized against HBV. The percentage of students immunized increased over the periods, probably because the greater contact with professional classes alerts them to the need to comply with the preventive vaccination schedule. Knowing the risks of the environment in which the work is

carried out, mainly related to hepatitis B, a disease of rapid seroconversion, minimizes exposure to this virus, HIV and other biological agents that are related to the risks of practical activities.<sup>20</sup>

When asked whether or not they were at risk of exposure to HBV and HIV viruses 32.4% believed they were not exposed, with the prevalence of non-vaccinated among them being considerable (25.7%). In similar studies evaluating biosafety education in clinical analysis laboratories, it was observed that institutional support for the permanent training of professionals provides safe practices with the reduction of accidents at work.<sup>21</sup> A study with dentistry students at the same institution present study is focusing on, found that 11.5% and 17.9% of students did not use biosafety measures and full use of PPE, respectively, even though they knew biosafety measures.<sup>22</sup> These authors, similarly to the present study (67%), observed that a large part of the students (48.7%) considered teaching on the topic of biosafety insufficient during academic training.

Accidents with sharps are especially important because of greater exposure to HBV. There was a worrying rate (11.5%) of accidents with sharps among unvaccinated students, which are generally justified due to less practical experience, nervousness and insecurity during procedures.<sup>23</sup> A study carried out with health professionals found that 40.5% suffered accidents with sharps, of which 14.6% were not vaccinated.<sup>24</sup>

Although PPE is, in the first analysis, fundamental equipment for preventing accidents with sharps, it appears that there is a lack of knowledge regarding their use.<sup>23</sup> In the present study, there was a high prevalence of students who declared no use of mask and glasses during academic activities that require the use of the respective PPE. Ignoring this equipment increases the risk of contamination and aggravates work accidents. Among these individuals, the prevalence of non-vaccinated against hepatitis B was high, that is, individuals highly vulnerable to accidental exposure, which, similarly to the present study (approximately 23%), reached a prevalence of 28.6% among medical students in Ethiopia.<sup>24</sup>

In the learning process, professors are essential in teaching accident prevention. The topic of biosafety must be worked systematically in existing subjects in the curricula of the courses from the initial periods, so there is permanent education. Students who are exposed to infection must comply with the HBV vaccination schedule. Immunization protects the student and is a precaution for the patient, since the student can also transmit infections and cause health problems to them.<sup>25</sup>

As this is a cross-sectional study, it was not possible to establish a relationship between cause and consequences. Although students provided information in the self-report, because of

memory bias, the data may not match the real situation of seroconversion. Therefore, further studies should be carried out with the execution of a seroconversion test.

This study addressed a relevant public health problem that must be discussed and explored in the academic community. There was a scarcity of data found on biosafety measures, both regarding research studies and the teaching of this topic in health courses. At the local university, only one study on biosafety was found among dentistry students.<sup>22</sup> Therefore, the present work contributed to the situational diagnosis by covering other courses in the health area, enabling actions based on real data to allow changing this scenario.

The diagnosis made brought a scientific basis that allowed to identify gaps concerning knowledge and use of biosafety measures, among them, the failure of immunization against hepatitis B among students. Thus, the adoption of permanent education policies with a systematic inclusion of the topic of biosafety in the curricula of health courses is necessary. Teachers should also be encouraged to carry out periodic training on the topic. The use of mechanisms that will guarantee the immunization of these students as a mandatory action for entering university is still necessary.

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**Authors' contributions:**

All authors contributed to the conception and design of the study, analysis and interpretation of results, writing and relevant critical review of their intellectual content, approved the final version of the manuscript and are responsible for all aspects of the work, ensuring its accuracy and integrity.