

# Hepatitis B vaccination in adolescents living in Campinas, São Paulo, Brazil

*Vacinação contra hepatite B em adolescentes residentes em Campinas, São Paulo, Brasil*

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**ABSTRACT: Introduction:** Viral hepatitis is an important public health problem in Brazil and around the world. **Objective:** To evaluate vaccination coverage against hepatitis B in adolescents and to identify the associated factors and reasons for non-adherence. **Methods:** A cross-sectional population-based study with sampling by clusters and in two stages, carried out from records of 702 adolescents aged 11 to 19 years old, non-institutionalized, living in an urban area of Campinas, São Paulo, Brazil, in 2008/2009. The data were obtained from the Health Survey in the city of Campinas (ISACamp). **Results:** The prevalence of vaccination (3 doses) was 72.2%. An independent and negative association with the vaccine was observed for the adolescents who were not born in the municipality. The orientation of a health care provider was positively and significantly associated with vaccination. The main reasons for non-adherence were the lack of orientation and not considering the vaccine necessary. Socioeconomic factors, health behaviors and conditions did not restrict the access to vaccination, but the coverage was below the target established by the Ministry of Health in Brazil. **Conclusion:** Health education programs, addressing the importance of vaccination to prevent the disease; strategies to actively reach out adolescents that did not complete the schedule; as well as orientation from the health care professional about the benefits of the vaccine to the adolescents, parents and guardians can extend the vaccination coverage.

**Keywords:** Hepatitis B. Vaccination. Prevalence. Adolescent health. Health Education. Health Surveys. Brazil.

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**RESUMO:** *Introdução:* As hepatites virais constituem importante problema de saúde pública no Brasil e em todo o mundo. *Objetivo:* Avaliar a cobertura vacinal contra hepatite B em adolescentes e identificar os fatores associados e motivos da não adesão. *Métodos:* Estudo transversal de base populacional com amostra por conglomerados e em 2 estágios realizado a partir de 702 registros de adolescentes com idade entre 11 e 19 anos, não institucionalizados, residentes em área urbana no município de Campinas, São Paulo, em 2008/2009. Os dados foram obtidos do Inquérito de Saúde no município de Campinas (ISACamp). *Resultados:* A prevalência de vacinação (3 doses) foi de 72,2%. Associação independente e negativa com a vacina foi observada para os adolescentes não naturais do município. A orientação de profissional de saúde esteve positiva e fortemente associada à vacinação. Os principais motivos para a não adesão foram a falta de orientação e não considerar a vacina necessária. Condições socioeconômicas, comportamentos e condições de saúde não restringiram o acesso à vacinação, mas a cobertura esteve abaixo da meta estabelecida pelo Ministério da Saúde. *Conclusão:* Programas de educação em saúde, abordando a importância da vacinação na prevenção da doença, estratégias para busca ativa aos adolescentes que não completaram o esquema, bem como a orientação do profissional de saúde sobre os benefícios da vacina aos adolescentes, pais e responsáveis podem ampliar as coberturas vacinais.

*Palavras-chave:* Hepatite B. Vacinação. Prevalência. Saúde do adolescente. Educação em saúde. Inquéritos epidemiológicos. Brasil.

## INTRODUCTION

Viral hepatitis is a major public health problem in Brazil and around the world<sup>1,2</sup>. The infection with hepatitis B virus (HBV) is one of the main causes of acute and chronic liver disease. About 2 billion people have been infected with the virus, of whom an estimated 350 million are chronically infected and at risk of serious complications and deaths from cirrhosis and hepatocellular carcinoma<sup>1</sup>.

HBV can be transmitted through contact with blood or other body fluids by parenteral, sexual and vertical routes (blood transfusions, contaminated sharp objects, semen, saliva, across the placenta or through breast-feeding)<sup>1,3-5</sup>. The chances of transmission through sexual intercourse are higher than those of HIV, because HBV is considerably more infectious<sup>1,6</sup>. The natural history of the disease takes on a different course depending on the age at which the infection occurs, among other factors<sup>3,7</sup>: more than 90% of newborns, almost 50% of children and adolescents and about 5 to 10% of adults that were infected develop the chronic disease<sup>3,6</sup>.

In Brazil, in 2011, the results of the most comprehensive survey about viral hepatitis carried out in seven years, with interviews and collection of blood samples of 26,102 people in all Brazilian State capitals and the Federal District, revealed that 7.4% of them had been infected with HBV, although only 0.4% presented hepatitis at the time of the survey. The percentage of those exposed to HBV was 1.14% in the population between 10 and 19 years old and 11.6% for people between 20 and 69 years old<sup>8</sup>.

Studies show that the hepatitis B vaccine is highly immunogenic, effective and virtually free of complications<sup>1,2,6</sup>. Composed of fragments of the antigen of hepatitis B virus (HBsAg)<sup>9</sup>, the immunization is carried out in 3 intramuscular doses, with a 1 month interval between the 1<sup>st</sup> and 2<sup>nd</sup> doses and a 6 month interval between the 1<sup>st</sup> and 3<sup>rd</sup> doses (0, 1 and 6 months)<sup>2,3,6</sup>. Regarding the immunological response, a complete series gives a protective response for 90% of adults and for more than 95% of healthy children and adolescents<sup>2,3</sup>. The protection decreases over time, but the antibody levels remain for at least 15 years after the complete vaccination series<sup>9</sup>.

It should be noted the singular importance of vertical transmission in the adolescence (pregnant women to newborn). Data from the Ministry of Health indicated an increased number of pregnant women with HBV between the years 1999 and 2006, with 11,281 confirmed cases. In 2009, there were 1,556 cases, and the detection rate in Brazil was 0.5 per thousand live newborns<sup>8</sup>. Almost all babies contaminated at birth develop chronic infection if prophylactic measures are not taken early, still in the first 12 hours of life<sup>1,3</sup>.

Studies have shown a decrease in the prevalence of HBV infection in the era of vaccination<sup>10,11</sup>. In Brazil, most of the serological and vaccination coverage of hepatitis B surveys presents results of specific groups or populations from highly endemic regions<sup>12-14</sup>. There are few data on hepatitis B vaccination in population-based studies<sup>7,15</sup>.

Data from the Health Department of the State of São Paulo (*Secretaria de Estado da Saúde de São Paulo*) suggest that 1 in 3 people from São Paulo aged 15 to 19 years old has not been immunized against hepatitis B, despite free availability of the vaccine at public health units<sup>16</sup>. Considering that the vaccination against hepatitis B was incorporated to the immunization schedule in 1998 for all children under 1 year old, and that the age range has been expanded since 2001, extending also to people over 20 years old, recent efforts have sought to achieve adequate coverage among adolescents<sup>5,16</sup>. In this sense, the present study aimed at estimating vaccination coverage against hepatitis B in adolescents living in Campinas, São Paulo, verifying the associated factors and identifying the reasons for non-adherence to the vaccination.

## METHODS

A cross-sectional population-based study carried out from 702 records of adolescents (11 to 19 years old), who were not institutionalized and lived in an urban area in Campinas, São Paulo, Brazil, between 2008 and 2009. The data were obtained from the Health Survey in Campinas (ISACamp).

The investigation had as an objective to study aspects related to 3 age groups: adolescents (10 to 19 years old), adults (20 to 59 years old) and elderly (60 years old or older), which constituted the study's domains. We chose to draw equal sized

samples, of a thousand people, for each of the age groups, considering the situation corresponding to the maximum variability in the frequency of the studied events ( $p = 0.50$ ), a confidence coefficient of 95% in the determination of confidence intervals ( $Z$  score = 1.96), sampling error between 4 and 5 percentage points and design effect equal to 2.

The sample of the survey was obtained by probabilistic sampling techniques by clusters and in two stages: census tract and residence. In the first stage, 50 census tracts were drawn with probability proportional to size (number of residences). The draw was systematic, ordering the sectors by the percentage of heads of household that had university education, producing an implicit stratification by the educational level of the head of the household. In each residence, all the residents of the selected age group were interviewed. The final weight assigned to each individual respondent was a result of the multiplication of the design (inverse of sampling fraction), non-response (inverse of response rate) and post-stratification weights, according to age and gender. To obtain the post-stratification weights, we used data from the State System Foundation for Data Analysis (FSEADE 2007) for the population living in Campinas in 2007, in the following age groups: 10 to 19, 20 to 39, 40 to 59 and 60 years old or more, of both genders\*.

The information were obtained through a questionnaire structured in thematic blocks, previously tested and applied in home interviews, carried out by trained and supervised interviewers.

In this study, the survey data referring to adolescents aged 11 to 19 years old were used, considering the age recommended by the vaccination schedule for adolescents at the time of the survey. Based on the responses, the participants were divided into two groups: those who reported vaccination and had already received the three doses and those who have not been vaccinated or had not completed the vaccination schedule. So, from that criterion, vaccination against hepatitis B with three doses (yes or no) was considered a dependent variable<sup>2,3,9,17</sup>.

The reasons for non-adherence to the preventive procedure were inquired using the question: "Why did you not take the vaccine against hepatitis B?"

For the analysis of factors associated with the vaccination against hepatitis, the following independent variables were selected:

- characteristics of the residence and surrounding: type of residence (apartment/house, shack/room/other), condition of the property (own/paid/financed, rented, transferred/other), condition of the surrounding (considering the existence of paving, curbs and gutters, street lighting, services of sewerage and public collection of trash in the street of the residence and categorized as "adequate", when all the conditions were present, and "inadequate", in the absence of any of the investigated aspects) and housing (besides the type of residence, the existence of water from the general network or the tap, internal piped water, water closet

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\*Details of the survey's sampling process are described in: [http://www.fcm.unicamp.br/fcm/sites/default/files/plano\\_de\\_amostragem.pdf](http://www.fcm.unicamp.br/fcm/sites/default/files/plano_de_amostragem.pdf)

- and electric lighting in the residence of the adolescent were also considered). The place was characterized as “adequate” when all the conditions were present and “inadequate” if any of these attributes was not available in the residence at the time of the survey;
- demographic and socioeconomic: gender, age, referred skin color/race, educational level of the head of household, *per capita* family income (in minimum wages), number of household members, occupation (works or does not work), school attendance and place of birth;
  - health-related behaviors: smoking (considering the condition of passive smoking, that is, exposure to cigarette smoke, for the adolescent); consumption of alcohol and frequency of use; body mass index (BMI = kg/m<sup>2</sup>), calculated from reported weight and height data and recommended cutoff points for adolescents<sup>18</sup> and physical activity in the leisure context;
  - health conditions and characteristics associated with the use of health services: morbidity reported in the two weeks prior to the study, presence of chronic disease (hypertension, diabetes, cardiovascular disease, tumor/cancer, rheumatism/arthritis/arthrosis, osteoporosis, asthma/bronchitis/emphysema, tendinitis/repetitive stress injuries (RSI)/work related musculoskeletal disease (MSDs), circulation problems and others), reports of health problems/complaints (frequent headaches, allergies, dizziness/vertigo, insomnia), search of health care service or professional for health-related problems in the last 15 days, dental appointments and hospitalizations in the last year, membership in a medical health care plan, orientation regarding immunization that was evaluated through the question: “Were you oriented by a health professional about the importance of taking the vaccine against hepatitis B?”

The association between the mentioned vaccination and the independent variables was assessed using the Rao-Scott test at a 5% significance level. We estimated the prevalence ratios and 95% confidence intervals (95%CI), and the adjusted analysis was carried out with the Poisson multiple regression, using Stata 11.0 software.

The research project was approved by the Ethics Committee at the Universidade Estadual de Campinas (protocol no. 079/2007). All the respondents/guardians signed the Informed Consent, and there is no conflict of interest.

## RESULTS

Among the adolescents interviewed in the survey, 807 answered the question: “Have you ever taken the vaccine against hepatitis B?” Of these, 71.4% (95%CI 67.4 – 75.4) responded that they have taken the vaccine at some point, 15.5% (95%CI 12.3 – 18.8)

reported not having taken the vaccine, and the rest (13.1%) did not know or did not answer the question. Excluding those who could not provide information on the vaccination, 702 adolescents were considered, with a mean age of 14.8 years (95%CI 14.6 – 15.0), of whom 49.9% (95%CI 46.6 – 53, 2) were male. The characteristics of the studied population are shown in Table 1.

For the adolescents that reported vaccination, the number of doses was investigated, from the question: “How many doses did you take?”. The response categories were three doses, less than three doses and do not know/did not answer. Thus, considering only the answers with information and the criterion adopted for the composition of the categories of the dependent variable, data from 685 adolescents were analyzed, of whom 72.2% (95%CI 67.0 – 77.5) had received the 3 doses of the vaccine.

Regarding where the adolescents were vaccinated, 97.5% (95%CI 92.6 – 98.8) reported the public health service. The main reason mentioned by the adolescents for being immunized in the it was a preference for the private service.

In the assessment of the residence and surrounding characteristics, we observed higher prevalence of vaccination against hepatitis B in adolescents living in shacks, rooms or other types of housing, compared to those living in houses or apartments, with the prevalence ratio (PR) of 1.30 and 95%CI 1.14 – 1.48 (these data were not shown in a table).

Among the demographic and socioeconomic variables, there was a higher prevalence of vaccination in adolescents born in Campinas, and in those with lower *per capita* income in the limit of statistical significance. The remaining analyzed variables did not present an association with the vaccination (Table 2).

As for health-related behaviors, it is possible to observe in Table 3 a negative association between alcohol consumption and vaccination, in other words, lower prevalence of immunization in the adolescents that reported use of alcohol.

In Table 4, we present the prevalence of vaccination according to health conditions and characteristics associated with the use of health services. The recommendation of a health care professional about the importance of taking the vaccine against hepatitis B was positively associated with the vaccination (PR = 2.27, 95%CI 1.68 – 3.08).

The results of the Poisson multiple regression analysis are presented in Table 5. An independent and negative association with the vaccination was observed for adolescents not born in the city, from other cities or other State. The orientation of a health care professional about the vaccine was positively and strongly associated with the hepatitis B vaccination ( $p < 0.01$ ).

The main reasons mentioned by adolescents with an incomplete schedule (less than 3 doses) were forgetting (35.9%) and lack of orientation/information about the need for 3 doses of the vaccine (7.3%). In few cases, the adolescent said he or she would still complete the schedule, and, in many cases (25.3%), respondents did not know or did not answer why the schedule was incomplete. Among the adolescents that did not take the vaccine against hepatitis B and answered the question about the reasons for

Table 1. Distribution of adolescents, according to socio-demographic, health-related behaviors, health status and use of health services variables. Campinas, SP, Brazil. Health survey in the city of Campinas 2008/2009.

Variables and categories	n = 702	% (95%CI)
Demographic and socioeconomic		
Gender		
Male	347	49.9 (46.6 – 53.2)
Female	355	51.1 (46.8 – 53.4)
Age group		
11 to 14	331	47.2 (43.4 – 51.0)
15 to 19	371	52.8 (49.0 – 56.6)
Skin color/race		
White	450	65.0 (57.1 – 72.9)
Non-white	250	35.0 (27.1 – 42.9)
Educational level of the head of household		
9 or more years	190	26.6 (19.6 – 33.6)
5 to 8 years	309	45.1 (35.6 – 54.6)
0 to 4 years	203	28.3 (22.9 – 33.7)
Per capita monthly income (minimum wages)		
≥ 1	252	36.6 (28.4 – 44.9)
≥ 0.5 and <1	219	30.9 (25.3 – 36.2)
< 0.5	231	32.5 (24.5 – 40.6)
Place of birth		
Campinas	532	75.7 (67.2 – 84.2)
Another city/State	170	24.3 (15.8 – 32.6)
Health-related behaviors		
Passive smoker		
No	551	84.3 (80.1 – 88.5)
Yes	103	15.7 (11.5 – 19.9)
Use of alcohol		
No	559	84.3 (80.1 – 88.5)
Yes	120	15.7 (11.5 – 19.9)
Health conditions and characteristics related to the use of health services		
Presence of chronic disease		
No	563	80.6 (76.3 – 84.8)
Yes	138	19.4 (15.2 – 23.7)
Hospitalization in the last year		
No	656	93.5 (91.7 – 95.2)
Yes	46	6.5 (4.8 – 8.3)
Medical health care plan		
No	461	64.7 (54.6 – 74.8)
Yes	238	35.3 (25.2 – 45.4)
Orientation about vaccination		
No	162	25.8 (19.0 – 32.5)
Yes	469	74.2 (67.5 – 80.9)

95%CI: 95% confidence interval.

Table 2. Prevalence of the mentioned vaccination against Hepatitis B in adolescents, according to demographic and socioeconomic variables. Campinas, SP. Health survey in the city of Campinas 2008/2009.

Variables and categories	n	Prevalence (%)	p-value*	PR (95%CI)
<b>Gender</b>				
Male	337	71.1	0.57	1
Female	348	73.4		1.03 (0.92 – 1.15)
<b>Age group</b>				
11 to 14	321	71.9	0.82	1
15 to 19	364	72.6		1.00 (0.93 – 1.10)
<b>Skin color/race</b>				
White	439	72.4	0.95	1
Non-white	244	72.2		1.00 (0.94 – 1.06)
<b>Educational level of the head of household</b>				
9 years or more	300	72.1	0.63	1
5 to 8 years	198	70.0		0.97 (0.83 – 1.13)
0 to 4 years	187	74.9		1.03 (0.92 – 1.17)
<b>Per capita monthly income (minimum wages)</b>				
≥ 1	245	68.5	0.08	1
≥ 0.5 and < 1	213	69.1		1.01 (0.86 – 1.18)
< 0.5	227	79.3		1.16 (1.00 – 1.34)
<b>No. of people in the residence</b>				
1 to 3	160	69.4	0.63	1
4 to 5	353	72.5		1.04 (0.91 – 1.20)
6 or more	172	74.4		1.07 (0.93 – 1.24)
<b>Occupational activity</b>				
Yes	130	67.7	0.17	1
No	546	73.3		1.08 (0.96 – 1.22)
<b>Goes to school</b>				
Yes, private	121	67.1	0.28	1
Yes, public	449	72.4		1.08 (0.90 – 1.29)
No	114	77.4		1.15 (0.96 – 1.39)
<b>Place of birth</b>				
Campinas	519	74.3	0.06	1
Another city/State	166	66.0		0.89 (0.78 – 1.01)

\*p-value of the Rao-Scott test; PR: prevalence ratio; 95%CI: 95% confidence interval.



Table 3. Prevalence of the mentioned vaccination against hepatitis B in adolescents, according to health-related behaviors. Campinas, SP. Health survey in the city of Campinas 2008/2009.

Variables and categories	n	Prevalence (%)	p-value*	PR (95%CI)
Passive smoker				
No	538	72.2	0.88	1
Yes	99	71.4		0.99 (0.86 – 1.14)
Use of alcohol				
No	565	74.1	0.05	1
Yes	117	65.2		0.88 (0.77 – 1.00)
Body mass index				
Underweight/eutrophic	477	71.8	0.71	1
Overweight/obese	143	70.2		0.98 (0.86 – 1.11)
Physical activity during leisure time				
No	222	68.5	0.09	1
Yes	463	74.0		1.08 (0.94 – 1.23)

\*p-value of the Rao-Scott test; PR: prevalence ratio; 95%CI: 95% confidence interval.

non-adherence, the main ones were: lack of orientation (65.2%), and not considering the vaccine necessary (13.0%). Other referred reasons (17.9%) included: not being old enough to receive the vaccine, difficulty to get the vaccine, lack of time and forgetting. It is worth noting that the adolescents who mentioned insufficient age to receive the vaccine were 12 to 17 years old.

## DISCUSSION

The results of this study showed that 72.2% of the adolescents living in Campinas in 2008 had completed the 3-dose schedule of the hepatitis B vaccine, with greater coverage among those who were born in the city (74.3%) and those who received orientation from a health professional about the importance of the vaccination (85.3%).

Table 4. Prevalence of the mentioned vaccination against hepatitis B in adolescents, according to health conditions and characteristics related to the use of health services. Campinas, SP. Health survey in the city of Campinas 2008/2009.

Variables and categories	n	Prevalence (%)	p-value*	PR (95%CI)
Morbidity in the last 15 days				
No	560	73.7	0.14	1
Yes	125	66.0		0.90 (0.77 – 1.04)
Presence of chronic disease				
No	548	72.2	0.88	1
Yes	134	71.7		0.99 (0.89 – 1.10)
Account of the following health problems/complaints**				
Frequent headache/migraine	179	71.0	0.70	0.98 (0.86 – 1.10)
Allergy	276	70.5	0.48	0.96 (0.85 – 1.08)
Dizziness/vertigo	45	60.2	0.08	0.82 (0.64 – 1.06)
Search of service or professional for health problems in the last 15 days				
No	588	72.2	0.90	1
Yes	97	72.8		1.01 (0.87 – 1.17)
Dental appointment in the last 12 months				
No	282	70.5	0.48	1
Yes	402	73.4		1.04 (0.93 – 1.16)
Hospitalization in the last year				
No	640	72.6	0.53	1
Yes	45	68.0		0.94 (0.75 – 1.16)
Medical health care plan				
No	452	72.2	0.88	0.99 (0.86 – 1.13)
Yes	231	72.9		1
Orientation about vaccination				
No	157	37.5	< 0.01	1
Yes	463	85.3		2.27 (1.68 – 3.08)

\*p-value of the Rao-Scott test; \*\*reference class: negative response for the presence of the problem; PR: prevalence ratio; 95%CI: 95% confidence interval.

Table 5. Poisson multivariate regression model for the mentioned vaccination against hepatitis B in adolescents. Campinas, SP. Health survey in the city of Campinas 2008/2009.

Variables	Adjusted PR (95%CI)	p-value	Standard error	Deff*
Place of birth				
Campinas	1			
Another city/State	0.89 (0.80 – 0.98)	0.02	0.04	0.73
Orientation about vaccination				
No	1			
Yes	2.26 (1.67 – 3.06)	< 0.01	0.34	2.05

Adjusted PR: adjusted prevalence ratio using Poisson multivariate regression (620 adolescents were included in the final model); \*design effect.

The adolescent's origin was strongly associated with the occupational activity ( $p < 0.001$ ; data not presented), in other words, a significantly higher proportion of adolescents not born in Campinas performed work activities at the period of the survey, which could influence the search of health services for this preventive procedure. A study carried out by Slonimet al.<sup>19</sup> shows that the lack of knowledge about the disease and the low perceived susceptibility are important barriers to the adherence to vaccination. The vaccination is a preventive procedure that cannot be considered essential by groups that have less time to seek this care, which demands that health services identify these segments and employ specific strategies to increase the coverage among adolescents and young adults that are part of the labor market.

The orientation of a health professional about the importance of taking the vaccine against hepatitis B was an independent factor and strongly associated with the immunization. The indication of the vaccine and the information about its benefits are strategic for greater adherence. Studies about factors associated with the vaccination, related to other vaccine-preventable diseases and age groups<sup>20,21</sup>, highlight the importance of counseling and orientation from health teams to improve adherence to vaccination.

Although the expansion of the hepatitis B vaccine for age groups within 1 to 19 years has occurred in 2001, partial national data from 2009 referring to this population showed that 80.9% received the third dose, revealing that there were still vaccination opportunities<sup>6</sup>. For the Southeast Region, in the historical series of 3<sup>rd</sup> doses applied in the 1994 to 2011 period (preliminary data from January to May), coverage of 91.8 and 60.6% was observed in the age groups of 11 to 14 years and 15 to 19 years, respectively. In Campinas, there was 77.5% of cumulative coverage for the population between

11 and 14 years old and only 45.0% among adolescents aged 15 to 19 years old<sup>22</sup> in the referred period.

Considering gender, age, referred skin color, *per capita* family income and school attendance, no differences were observed between the coverages for the analyzed subgroups. A study conducted in Michigan, United States, discovered greater acceptance by the male adolescents<sup>19</sup>. However, other studies have shown that the female adolescents are more likely to complete the vaccination schedule<sup>23-25</sup>. For the age group, the findings of this study differ from what was observed for most of the municipalities of the West Metropolitan Region of São Paulo<sup>7</sup> and what was verified from official data for many municipalities<sup>22</sup>. Homogeneity of coverage was found in Campinas.

Regarding *per capita* income, an upward trend of immunization was observed in those with lower income, at the limit of statistical significance. Middleman et al.<sup>23</sup> found that individuals with lower financial status are more likely not to complete the vaccination schedule. In this study, the socioeconomic conditions of the adolescents did not restrict the access to vaccination, indicating the reach of the campaigns. As for school attendance, there was no statistical difference in the prevalence of immunization against hepatitis B. Some studies highlight the importance of the school environment as a facilitator for obtaining the full schedule of three doses<sup>23,26</sup>.

In this study, no significant associations were observed between hepatitis B vaccination and health-related behaviors, except for the use of alcohol with lower prevalence at the limit of statistical significance. Alcohol is one of the psychoactive substances that are consumed earlier by young people<sup>27</sup>, raising the risk of future dependence. The adolescents, more susceptible to peer pressure and holders of a greater sense of invulnerability and immortality, face difficulties associating current risky behaviors with future consequences<sup>25,27,28</sup>. Articulated actions between different fields of knowledge and focused on the biopsychosocial needs of the adolescents can positively influence their development<sup>28</sup>.

Among the limitations of this study, it should be considered that the information on the vaccination was referred, subject to the memory bias. A study carried out in Braga, Portugal, found that, among 272 adolescents who confirmed immunization, 14% had negative anti-HBs, and, among those who reported no dose, 3.3% tested positive<sup>29</sup>. The ISACamp is comprehensive and included several topics related to health. Given the difficulty of the interviewers to access the adolescent's vaccine cards, the findings should be considered with caution.

Among the adolescents interviewed, 13.1% (n = 105) did not know their status when it came to hepatitis B vaccination, the reason why they were excluded from the analysis. However, the distribution of these adolescents, according to socio-demographic variables, health-related behaviors, health conditions and characteristics related to the use of health services revealed no differences compared to those who could inform

about vaccination. Yet, the response categories used for the question about the number of doses included the alternatives “three doses”, “less than three doses” and “do not know/did not answer”, it was not possible to investigate the proportion of individuals that received two doses of the vaccine, which could possibly give some protection<sup>3,9,25</sup>. It is possible that some adolescents had an incomplete schedule because the minimum interval between doses was not complete at the time of the data collection, but the survey data did not allow such an assessment. In this sense, it was only possible to evaluate the complete schedule versus incomplete/no dose.

Regarding the reasons for non-adherence to vaccination, the main ones mentioned by adolescents with incomplete vaccination schedule were forgetting and lack of orientation/information about the need for three doses of the vaccine. The protection against hepatitis B vaccine increases with the number of doses. In healthy adolescents and adults, the antibody response rates are 20 to 30% after one dose and 75 – 80% with two doses<sup>9</sup>. Still, in the general population, some healthy individuals can react in a non-satisfactory manner to the vaccination against hepatitis B, and this percentage ranges from 5 to 10%<sup>3,9</sup>.

In many cases, the respondents did not report why they had not taken three doses of the vaccine. Identifying these reasons is essential to guide specific actions for these subgroups, enabling the increase of the coverage. Adolescents may believe they are immune to the infection after one dose of vaccine. In this sense, the information given by the health professionals during the application about the need for three doses are strategic, particularly regarding the 3<sup>rd</sup> dose, for protection and an appropriate response<sup>9</sup>.

Among the adolescents that did not take the hepatitis B vaccine, besides the lack of orientation, some said they did not consider the vaccine necessary. Forgetting was also a frequently mentioned reason. Adolescents, who are in a typical phase of biopsychosocial development, may acquire behaviors that put them at particular risk for contracting the disease<sup>4,28,30</sup>. One could highlight the progressively earlier beginning of sexual activity<sup>27,28</sup> with multiple partners, use of injectable drugs, lack of knowledge of the possibility of infection through sex<sup>4,25,30</sup> — 60% of adolescents do not know the source of their infection, compared to 30% of infected adults<sup>16</sup>.

According to the Counseling Guide prepared by the National Viral Hepatitis Program (PNHV) “the development of the educational component is an intrinsic part of both the collective and individual counseling” and “the information/orientation, although in itself does not favor the change in behavior, represents unquestionably the first step of the process, sensitizing the individual to the need for change”<sup>31</sup>. For the professional to promote this action properly, the knowledge of epidemiological aspects of the disease is necessary. A study carried out in the Federal District of Brazil found that most professionals were not up to date with the hepatitis B vaccination schedule (despite the recommendation) and that many of them do not suggest the vaccination

and have not undergone training in the area in the last five years<sup>32</sup>. These results reveal the need for investment in the training of professionals that are in the “gateways” of health services, given their importance in the implementation of preventive practices.

The potential evolution of hepatitis B to liver cirrhosis and hepatocellular carcinoma, the great infectivity of the virus and the role of the chronic carrier of the virus in the spread of the disease<sup>3,4,6</sup> are some relevant information that need to be disclosed in a meaningful and comprehensive way, so that there can be a greater appreciation of this preventive practice by the adolescents and young adults.

## CONCLUSION

This study revealed the extent and reach of the immunization against hepatitis B in adolescents living in Campinas, São Paulo, Brazil, but still with low coverage. The orientation of a health professional was positively and strongly associated with vaccination. In this sense, health education programs aimed at this age group, addressing the importance of immunization to prevent the disease, strategies for an active search of those who did not complete the schedule, as well as information on the disease and orientation from health professionals about the benefits of vaccination to adolescents, parents and caretakers can improve the vaccination coverage in this population. Besides, specific actions, such as stimulating the use of condoms in sexual practices, should be directed to all the adolescents and, particularly, to those who are more vulnerable to the infection.

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