

ORIGINAL ARTICLE

PREVALENCE OF HEPATITIS B ANTIBODIES IN A REGIONAL HEALTH CENTER IN PARANÁ

HIGHLIGHTS

1. Demographic and serological analysis of a regional health center.
2. During pregnancy, the immunity of pregnant women is affected.
3. Schooling interferes with the possibility of contact with HBV.
4. Commitment to vaccination and notification of hepatitis are necessary.

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ABSTRACT

Objective: To estimate the positivity rate of the Hepatitis B Surface Antigen with demographic characteristics and exposure categories among confirmed cases in the municipalities of the 17th Health Region of Paraná, Brazil. **Method:** This is a descriptive, quantitative cross-sectional study based on notified/confirmed cases in people aged ≥ 1 year and living in the area of the regional health center between 2017 and 2022. The serological marker was used as the outcome variable, and the exposure variables were categorized using absolute and relative frequencies, the Chi-square test, and Fisher's exact test. **Results:** The variables gender, age group, pregnancy, schooling, and exposure to injecting drugs showed a statistical difference between the groups with a positive rate for the reactive marker. **Conclusion:** It is important to train health professionals in the use of rapid tests and in filling out the form in full so that they know the epidemiological profile of each region and can draw up specific strategies for prevention, control, and treatment.

KEYWORDS: Hepatitis B; Immunity; Public Health Surveillance; Health Information Systems; Epidemiology.

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INTRODUCTION

The Hepatitis B Virus (HBV) is a major public health problem. According to the World Health Organization (WHO), approximately 3.5% of the world's population is chronically infected with HBV, which corresponds to 257 million people¹.

In Brazil, 15% of the population has already come into contact with the virus, with almost 1.5% of the country's inhabitants having the chronic form. Most are unaware of their diagnosis, which impacts disease control²⁻³.

Transmission can occur sexually, vertically, from mother to baby, and also through parenteral interaction. Detection takes place through the use of rapid tests and serological markers⁴⁻⁶.

Markers are used to analyze antibodies, such as Hepatitis B Virus Surface Antigen (HBsAg), which indicates active infection and is the first marker to appear, Hepatitis B Virus Core Antigen (Anti-HBc), which signals previous contact with HBV, and Hepatitis B Surface Antigen Antibody (Anti-HBs), a reagent that indicates immunity, either through vaccination or disease⁷.

As a result, 90% of adults develop spontaneous immunity after contact with HBV. However, chronic infection can occur in a smaller number of patients, in which the virus persists in the body. Early identification of HBV is, therefore, essential for successful treatment and an improvement in the quality of life of the infected person⁸⁻¹¹.

In this context, analyzing demographic factors, forms of transmission, and the Anti-HBs positivity rate of cases reported in the 17th Regional Health Center of Paraná (RS/PR) can serve as a basis for expanding HBV prevention and control policies. The epidemiological bulletins prepared annually by the Ministry of Health (MS) and the State Health Departments do not provide information on the completeness of the data on the Notifiable Diseases Information System (SINAN) form, nor do they analyze inconsistencies. No studies were found in the state that analyzed the quality of HBV case records regarding filling in the fields on the form and the follow-up bulletin.

Given the above, it is important to analyze the data on HBV in the 17th RS/PR to prevent new infections. This essentially requires knowing the epidemiological behavior of the virus, identifying risk factors, and detecting, preventing, and controlling outbreaks as soon as possible. Therefore, this study aimed to estimate the Anti-HBs positivity rate in relation to demographic characteristics and exposure categories among confirmed cases in the municipalities belonging to the 17th RS/PR – BR.

METHOD

This is an analytical and quantitative cross-sectional study. The data was obtained from secondary sources, via notification forms filled in by health professionals in the municipalities, subsequently recorded in SINAN, and finally extracted in an Excel spreadsheet by the State Epidemiological Surveillance Department.

The 17th RS/PR was chosen as the setting. It is made up of 21 municipalities, namely: Alvorada do Sul, Assaí, Bela Vista do Paraíso, Cafeara, Cambé, Centenário do Sul, Florestópolis,

Guaraci, Ibiporã, Jaguapitã, Jataizinho, Londrina, Lupionópolis, Miraselva, Pitangueiras, Porecatu, Prado Ferreira, Primeiro de Maio, Rolândia, Sertanópolis, and Tamarana, which correspond to an estimated population of approximately 1 million inhabitants¹²⁻¹³. It is worth noting that this setting was chosen because of the importance of the municipality of Londrina, the headquarters of the 17th RS/PR, which is a reference for the diagnosis, treatment, and follow-up of HV cases for the other municipalities in the region.

The sample consisted of all notified/confirmed cases in people aged one year old or older and living in the municipalities belonging to the 17th RS/PR, between January 1, 2017, and December 31, 2022. Cases with blank and/or incomplete serological results were excluded.

The Anti-HBs serological marker (reactive and non-reactive) was used as the outcome variable, and the exposure variables were categorized as gender (male or female), age group (1 to 18 years old; adult 19 to 59; elderly 60 or older); ethnicity (white and non-white); schooling (up to 9 years - elementary school; 10 years or more - secondary school and higher education); pregnancy (pregnant and non-pregnant women); and exposure categories (injectable medications, tattoos/piercing, biological material, inhalable drugs/crack, acupuncture, transfusion, injectable drugs, surgical treatment, dental treatment, three or more partners, hemodialysis, transplantation). It should be noted that the exposure variables gender, age group, ethnicity, schooling, and pregnancy may present blank data, due to incomplete fields on the notification forms.

Absolute and relative frequencies were used for the descriptive analysis. The statistical tests used were the Chi-square test and Fisher's exact test, with a significance level of 5%. All the analyses were done using the IBM Software Statistical Package for the Social Sciences (SPSS) for Windows, version 20.0^{®14}. Cases with incomplete information were considered losses.

The study was approved by the Human Research Ethics Committee of the State University of Londrina (CEP/UEL): CAAE: 21738719.9.0000.5231 and Opinion No. 3.913.333, issued on March 12, 2020.

RESULTS

Of the 1,374 HBV cases, 334 were excluded because they did not have the Anti-HBs result, totaling 1,040 cases. Table 1 shows a predominance of men, 649 (62.4%); aged 60 or older, 552 (53.1%); white, 667 (67.1%); with up to nine years of schooling, 339 (63.6%).

Exposure categories were dental treatment, 246 (36.4%); injectable medications, 290 (34.8%); surgical treatment, 260 (34.3%); three or more partners, 96 (13.3%); tattoos/piercing, 62 (8.9%); inhalable drugs/crack, 48 (6.0%); hemodialysis, 49 (5.3%); acupuncture, 33 (4.8%); transfusion, 40 (4.7%); biological material, 16 (2.0%); injectable drugs, 16 (2.0%); and transplantation, 8 (0.9%). The percentages do not add up to 100%, because each individual could mention several options.

Table 1 - Epidemiological characteristics regarding the profile of hepatitis B cases confirmed in SINAN, 17th Regional Health Center, PR. Londrina, PR, Brazil, 2023

Variable	n	%
Gender (n=1040)		
Male	649	62.4
Female	391	37.6
Pregnant (n=260)^a		
No	235	90.4
Yes	25	9.6
Ethnicity (n=994)^b		
White	667	67.1
Non-white	327	32.9
Age group (n=1040)		
60 years old or older	552	53.1
19 to 59 years old	471	45.3
1 to 18 years old	17	1.6
Schooling (n=533)^c		
Up to 9 years	339	63.6
10 years or more	194	36.4

^a131 cases missing/no information for pregnant women; ^b46 cases, ignored/system for ethnicity; ^c507 cases illiterate/blank/system for schooling.

Source: Prepared by the authors (2023).

There was a difference between the groups with reactive Anti-HBs positivity and the variables gender and age group ($p=0.01$), and pregnant women and schooling ($p = <0.001$) (Table 2).

Table 2 - Epidemiological characteristics of the Anti-HBs positivity rate (reactive and non-reactive) in relation to the demographic profile of hepatitis B cases confirmed on SINAN. 17th Regional Health Center-PR. Londrina, PR, Brazil, 2023

Demographic variables	Reactive		Non-reactive		Total	p-value*
	N	%	n	%		
Gender						
Male	360	55.5	289	44.5	649	0.01
Female	246	62.9	145	37.1	391	
Pregnant						
No	159	67.7	76	32.3	235	<0.001
Yes	10	40.0	15	60.0	25	
Ethnicity**						
White	383	57.4	284	42.6	667	0.94
Non-white	187	57.2	140	42.8	327	
Age group						

60 years old or older	345	62.5	207	37.5	552	0.01
19 to 59 years old	252	53.5	219	46.5	471	
1 to 18 years old	8	47.1	9	52.9	17	
Schooling						
Up to 9 years	201	59.3	138	40.7	339	<0.001
10 years or more	92	47.4	102	52.6	194	

* Chi-square test; **46 missing.

Source: Prepared by the authors (2023).

Regarding the exposure variables, only injectable drugs ($p= 0.02$) showed a difference between the Anti-HBs reactive positivity rate groups (Table 3).

Table 3 - Epidemiological characteristics of the Anti-HBs positivity rate (reactive and non-reactive) for the exposure categories of hepatitis B cases confirmed on SINAN. 17th Regional Health Center-PR. Londrina, PR, Brazil, 2023

Variables***	Reactive		Non-reactive		total	p-value*
	(n)	(%)	(n)	(%)		
Exposure categories						
Injectable medications	163	56.2	127	43.8	290	0.92
Tattoos/piercings	31	50.0	31	50.0	62	0.46
Biological material	9	56.3	7	43.8	16	0.99
Inhalable drugs/crack	26	54.2	22	45.8	48	0.86
Acupuncture	16	48.5	17	51.5	33	0.50
Transfusion	25	62.5	15	37.5	40	0.39
Injectable drugs	4	25.0	12	75.0	16	0.02**
Surgical treatment	141	54.2	119	45.8	260	0.49
Dental treatment	122	49.6	124	50.4	246	0.06
Three or more partners	53	55.2	43	44.8	96	0.83
Hemodialysis	31	63.3	18	36.7	49	0.39
Transplantation	4	50.0	4	50.0	8	0.73**

* Chi-square test; ** Fisher's exact test; *** the percentages do not add up to 100%, because each individual could mention several options.

Source: Prepared by the authors (2023).

DISCUSSION

The aim of this study was to estimate the positivity rate of the Hepatitis B Surface Antigen with demographic characteristics and exposure categories among confirmed cases in the municipalities of the 17th Regional Health Center of Paraná.

This study showed that women had a higher anti-HBs reactive result (62.9%). No evidence was found in the literature to explain this result, but it is worth noting that men are

more likely to be notified, due to the fact that they expose themselves to risk more often, such as having multiple partners and unprotected sex. The issue of low vaccination can also be explored, due to social prejudice in relation to male self-care¹⁵⁻¹⁶.

The majority of pregnant women did not achieve immunity (60.0%). It is known that during pregnancy, the body's defense system is compromised. As a result, changes in the reaction of T-helper 2 lymphocytes and antibody immunity, as well as a drop in the number of circulating natural killer and plasmacytoid dendritic cells, are factors that favor susceptibility to contracting viral infections and the development of critical pathologies¹⁷.

In this context, the importance of prenatal care is reinforced, as laboratory and rapid tests must be carried out at least once in each trimester of pregnancy. After testing, in non-reactive cases and where the pregnant woman has not been vaccinated, vaccination with three (3) doses is indicated. In reactive cases, a specific test and HB viral load are also necessary to start treatment¹⁸.

Therefore, if HB is confirmed in the pregnant woman and she meets the criteria established in the Clinical Protocol and Therapeutic Guidelines for the Prevention of Mother-to-Child Transmission of Human Immunodeficiency Virus (HIV), Syphilis, and Viral Hepatitis (HV) (PCDT-TV), prophylaxis with Tenofovir (TDF) may be recommended from the third trimester of pregnancy onwards¹⁸.

For babies exposed to HBV during pregnancy, HB vaccine and immunoglobulin are indicated, ideally within 24 hours of birth, reducing perinatal transmission in approximately 90% of children¹⁸.

Regarding the "age group" variable and the Anti-HBs reactive result, the highest percentage refers to individuals aged 60 years old or older (62.5%), followed by individuals 19 to 59 years old (53.5%) and, lastly, the group between 1 and 18 years old (47.1%). However, the literature indicates a link between age and decreased co-stimulatory molecule CD28 in antigen-experienced T cells. Thus, as the body ages naturally, the individual's immune system is compromised, and consequently, there is less response to infections and immune memory, constituting immune senescence. As a result, with the immune system affected, the level of anti-HBs in the blood drops¹⁹.

In addition, individuals who contract the virus in adulthood and are chronically infected may show a failure in the specific reaction of T lymphocytes. This error occurs because there has been a long activation of these cells, culminating in their extinction²⁰.

During the period analyzed, individuals with up to nine (9) years of schooling accounted for the majority of reported cases (63.6%) and those who tested anti-HBs reactive (59.3%). This can be explained by the fact that people with a lower level of education have a greater chance of infection. In this sense, education favors intellectual development and the processing of information, so a low level of education makes it difficult to understand prevention measures and access them, and leads to exposure to risk factors for contact with HBV²¹.

Another context for presenting a reactive anti-HBs test would be through vaccination. However, the literature shows that individuals with a low level of education have difficulty understanding the importance of vaccination. Thus, the lack of knowledge about the concept of a vaccine, its composition, and its mechanism of action leads to individuals refusing this form of immunization and the possibility of spreading false information on the subject. With this in mind, it is essential that health institutions provide educational and awareness-raising communication to encourage these individuals to be vaccinated.

This can be done through instructional talks and advertisements about HB on social media, for instance²².

In terms of exposure variables, the injectable drug category was not a significant factor in the Anti-HBs positivity rate, since only four (4) cases were reactive and 12 were non-reactive. The higher number of cases with non-reactive Anti-HBs tests than reactive ones in this study may be explained by the fact that other forms of transmission are more common than exposure to injectable drugs, such as the sexual route, which was highlighted as the likely main cause of infection in a study carried out at the University Hospital of the Federal University of Piauí (HU-UFPI) in 2018¹⁶.

In view of these figures, Brazil's goal regarding the Sustainable Development Goals (SDGs) is to end HV epidemics by 2030. This will require increasing the availability and use of rapid tests, increasing the number of infected patients undergoing treatment, decentralizing care, improving access to the primary health care network, building more referral clinics and hospital units, and training more health professionals to deal with cases²³.

Thus, it is important to formulate strategies that bring users closer to primary health care, through vaccination campaigns, rapid tests, and health education activities in the community.

It is also necessary to define a municipal management plan specific to the epidemiological scenario of each region, especially with regard to early detection, since this measure helps to achieve a satisfactory response at the end of treatment and provides the patient with a better quality of life.

Limitations include the lack of specific studies on the Anti-HBs marker, which seek to understand why certain individuals develop immunity and others do not.

Health information systems are important tools for contextual and surveillance research. However, underreporting, information bias, and memory bias can occur because they use secondary data. It is worth pointing out that, even with these limitations, this research has helped to enrich the information on HB in the 17th RS/PR and on serological markers. In addition, official information systems are the best regular source of data available for the Brazilian territory, and their extensive use is an important strategy for qualifying their records.

This study is the first to estimate the anti-HBs positivity rate with demographic characteristics and exposure categories among confirmed cases in the municipalities belonging to the 17th RS/PR, derived from SINAN records. The results discussed open up a field of study to address new research questions and provide elements to argue in favor of the relevance of testing the serological scar in all individuals after receiving the HB vaccine.

CONCLUSION

This study made it possible to analyze the epidemiological profile of the 17th RS/PR, which had 1040 notified/confirmed cases of HB with the anti-HBs test carried out over the six-year period of analysis.

A higher prevalence of HBV was found among men, non-pregnant women, those aged 60 years old or older, white people, and individuals with up to nine (9) years of schooling. As for risk factors, the risk situations most cited by patients were injectable medications, surgical treatment, and dental treatment.

The Anti-HBs test analyzes the production of antibodies against the HBV surface protein, HBsAg. The expression of this antibody is expected after vaccination or infection with the virus. The statistical differences found with the Anti-HBs positivity rate were female gender, non-pregnant, age group, low schooling, and category of exposure to injecting drugs.

In addition, it is important to train health workers to carry out the tests correctly, fill in the SINAN form completely, and publicize the tests available in the public service. This will allow to know the sociodemographic and epidemiological profile of each region, with the aim of controlling HB.

Finally, health professionals should be made aware of the benefits of HB vaccination and users should be informed. Managers should look for ways to increase vaccination coverage levels, given that the vaccine is universal and available in all maternity wards and primary health care units, with no age restriction.

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