



PREVALENCE OF HEPATITIS B IN BLOOD DONORS AT THE COORDINATING BLOOD CENTER OF THE STATE OF PIAUÍ, BRAZIL

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ABSTRACT

Infection Hepatitis B virus is one of the world's biggest public health problems due to its magnitude and because it is related to chronic manifestations such as cirrhosis and primary liver cancer. The objective of this study was to analyze the epidemiological profile of donors infected with Hepatitis B virus and characterize them according to the following variables: sex, origin, age, skin color, level of education, marital status and year of donation, as also verify if sex acts as a risk factor for contamination. This is a quantitative, retrospective, analytical and descriptive field research based on information retrieved from the database of the Blood center of PiauÍ on a total of 233,927 individuals who made donations from January 2008 to December 2013. Of this total sample, 562 individuals had a positive result (case group), 233,365 had a negative result (control group). The Chi-square test was used to analyze data in the Statistical Package for Social Science. The present study showed that the seroprevalent epidemiological profile is of individuals residing in Teresina (68.6%), between the ages of 18 and 29 (45.7%, $p = 0.07$), mestizo ($p = 0.11$), with complete secondary education ($p = 0.01$), single (56.8%, $p = 0.02$), and with the highest number of seropositive cases in 2008 ($p = 0.00$). We also concluded that males showed greater seropositivity for hepatitis B infection, with 66.7% ($p = 0.024$) of the cases.

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INTRODUCTION

Viral hepatitis are diseases caused by different etiological agents with tropism for primary human hepatocytes, which present similar epidemiological, clinical and laboratory characteristics, but with important peculiarities. Infection with hepatitis B virus (HBV) is one of the world's biggest public

health problems due to its magnitude and because it is related to chronic forms such as cirrhosis and primary liver cancer. Most infected individuals are asymptomatic and unaware of their carrier status, further aggravating the disease transmission chain (CARVALHO and ARAÚJO, 2008). The etiologic agent of hepatitis B is an enveloped DNA virus belonging to the family *Hepadnaviridae* genus (*Orthohepadnavirus*). As for morphology, it has an internal icosahedral capsid composed of the central antigen (HBcAg), the "e" antigen (HBsAg) and viral DNA. The viral envelope is composed of surface antigen (HBsAg). Besides the complete viral particle, numerous

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incomplete nucleic acid particles consisting only of the surface antigen (ATTILIO *et al.*, 2010) are excessively produced during viral replication. The discovery of the hepatitis B virus was based on the identification by Baruch Blumberg of an antigen in the serum of an Australian aboriginal person that reacted with serum of hemophiliac people who had received multiple blood transfusions, initially termed as Australia antigen. Alfred Prince later related this antigen with hepatitis, calling it SH antigen (serum hepatitis). Two forms of this antigen were identified by electron microscopy by Bayer and his colleagues: spherical particles 22 nm in diameter and tubular particles 22 nm wide and 150 nm in length (Figure 01). In 1970, Dane and other researchers detected a third particle, approximately 42 nm in diameter, in positive sera for the Australia antigen, thus identifying the complete particle of hepatitis B virus (BERGAMASCHI, 2013).

The transmission of HBV happens vertically, parent rally, and through the sexual route, thus causing a sexually transmitted disease. Thus, there are groups at higher risk of acquiring HBV infection, such as: post-transfusion patients, children born to mothers infected with the virus, people living with chronic hepatitis B, and users of illicit drugs. Also included in this group are individuals who have multiple sexual partners and practice unprotected sex (SOUSA *et al.*, 2010). The World Health Organization (WHO) estimates that 2 billion people have been infected with HBV worldwide and of these, 300 million people are chronic carriers. It also estimates that 2 million people die every year from HBV infection (MIYAMOTO and BERTOLINI, 2008; CARVALHO and ARAÚJO, 2008). According to WHO, another figure that calls attention to the seriousness of the problem is that approximately 400,000 new hepatitis B infections are believed to occur in Latin America and the Caribbean every year (SILVA *et al.*, 2006). In Brazil, the Ministry of Health estimates that 15% of the population have already been exposed to the hepatitis B virus, and 1% suffer from chronic hepatitis B. A high percentage of people who chronically carry this pathogen do not present active liver disease, but persistent infection may also result in cirrhosis, hepatic failure and hepatocellular carcinoma (CARVALHO and ARAÚJO, 2008). The virus is highly infectious and it is known that a single virus particle is capable of infecting the human being. This viral agent circulates primarily in the blood and replicates in hepatocytes. HBV circulates in high concentrations in blood and low titers in other organic fluids, being approximately 100 times more infectious than HIV and 10 times more than hepatitis C virus (HCV).

Therefore, special attention should be given to chronic carriers, who may remain infectious throughout their lives (ROCHA-FILHO, 2011). Donating blood is an act of solidarity, altruism and love for life. It is also an act of citizenship. It is a procedure that starts from a voluntary donor, whose blood is collected for storage in a blood bank, to be used when necessary in a blood transfusion. Donation campaigns are numerous and increasingly touching; however, no matter how noble this act can be, precautions should be taken as to the risk of transmission of pathogens through blood transfusion (GOMES and JOSÉ JUNIOR, 2011). In view of the scenario of risk of HBV infection for the population and the lack of knowledge of the prevalence of HBV in blood donors in the population of Piauí, we considered important to carry out this study of epidemiological profile, aimed at identifying this risk group according to the following variables: sex, schooling, age

group, origin and marital status. The results of this study are intended to contribute with the population in the sense of arousing special attention to their health, thus promoting greater prevention against HBV. The objective of this study was to characterize the prevalence and analyze the epidemiological profile of blood donors infected with hepatitis B virus in the Hemodynamic Center of Piauí, according to the following variables: sex, origin, age, skin color, schooling, marital status, year of donation and profession.

MATERIALS AND METHODS

This is a field research of quantitative, retrospective, analytical and descriptive character. It was carried out based on information retrieved from the database of the coordinating Blood center of Piauí about individuals who donated blood in the years from 2008 to 2013, without distinction of ethnicity, sex, age, schooling, economic class and marital status. The study analyzed two groups of individuals. One group of donors whose test was positive for HBV, and another group of donors with a negative result, which represents the control group. Then, it was retrospectively assessed whether the donors of each of the groups had been exposed or not to a given condition. The serological marker used in the study was HBsAg (hepatitis B virus surface antigen). This is a marker that appears around 30 to 45 days after infection and can remain detectable for up to 120 days in cases of acute hepatitis. It is the first serological marker to appear in acute infections and, if persistent for more than 180 days, its presence characterizes chronic HBV infection (OLOSSON, 2011). This marker was also used to calculate the prevalence in the donor population. Data processing was performed using the Statistical Package for Social Science (SPSS) version 19.1. In order to quantitatively evaluate the relationship between the outcome of the experiment and the expected distribution for the phenomenon in question, comparing the risk factors between carriers and non-carriers of the disease, we used the Chi-square test (χ^2) and a significance $<5\%$ ($p < 0.05$), with 95% confidence intervals (95% CI). The research project was approved by the ethics committee in research involving human beings of the Santo Agostinho University Center through CAAE 42785015.2.0000.5602, and met the requirements described by Resolution 466/12 of the National Health Council that outlines the guidelines and regulatory norms of research involving human beings (BRASIL, 2013).

RESULTS

According to the data collected in the database of the Blood center of the state of Piauí, a population of 233,927 blood donors who made donations from January 2008 to December 2013 were analyzed. From these, 562 seropositive donors for hepatitis B (0.24%) were found and 233,365 donors had a negative result for HBV infection. During the analysis, the serological profile of the donors was studied taking into account the following variables: origin, age, skin color, schooling, marital status, year of donation and sex. Regarding the origin, according to the studies carried out, the prevalent seropositivity predominated in the urban area, specifically in Teresina, with 304 cases, corresponding to 68.6% of the total positive cases, as shown in the table below (Table 01). After Teresina, other large cities of the state also appeared, as is the case of Parnaíba, which had the second largest number of cases of HBV infection. This finding is in agreement with

other studies. According to Moscheta and Peres (2008), in a study on the epidemiological profile of the municipality of Chapecó - SC, there was a similar result, with a predominance of 90.6% cases of HBV infection in the urban region.

Table 1. Ten main original places of cases of HBV seropositivity

MUNICIPALITY	Positive	Negative	% Positive	Total
Teresina	304	1,44,539	68.6	1,44,843
Parnaíba	47	16,347	10.6	16,394
Timon	31	11,829	7	11,860
Florianópolis	20	6,145	4.5	6,165
Picos	17	5,599	3.8	5,616
Valência do Piauí	6	956	1.5	962
Barras	5	1,217	1.1	1,222
Campo Maior	5	2,867	1.1	2,892
São José	4	240	0.9	244
União	4	1,111	0.9	1,115
Total	443	1,90,850	100	1,91,313

Source: Blood center Database, Teresina-PI (2015)

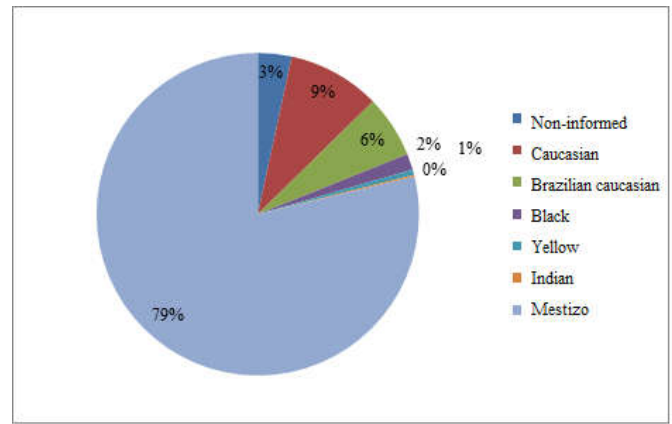
Regarding the age group, this study made a division of donors into five groups, according to their age range: less than 17 years, 18-29 years, 30-39 years, 40-49 years and over 50 years. The analysis (Table 02) showed that the first (<17) and the last (> 50) groups presented 0.5% and 10.8% of the total seropositive cases, respectively, thus presenting the lowest indices. As for the first age group, the possible explanation is that, because they are underage individuals, they are not allowed to make donations. Regarding the second group, this result can be attributed to the fact that there are usually few donors in this age group (61 cases), in which the an initial decline of sexual life is already observed (OLIVEIRA, 2015).

Table 2. Distribution of HBV seropositivity per age group

AGE	Positive	Negative	% Positive	Total
Under 17	3	905		907
18 - 29	257	1,12,626		1,12,883
30 - 39	142	64,155		64,297
40 - 49	99	36,835		36,934
Over 50	61	18,845		18,906
Total	562	2,33,365	100	2,33,927

Source: Blood center Database. Teresina-PI, 2015 ($p = 0.07$).

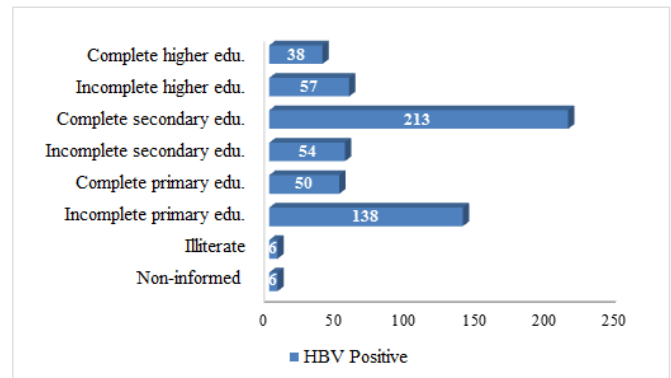
The present study analyzed HBV seropositivity according to skin color. Individuals were divided into six groups of skin color: Group 1 - Caucasian, Group 2 - Brazilian Caucasian, Group 3 - Black; Group 4 - Yellow; Group 5 – Indian, and Group 6 –Mestizo. The latter group was the one that presented greater seropositivity, with 441 infected cases, corresponding to a percentage of 79% (Graph 01). This statistical significance is due to the fact that mestizos (brown skin color) are the most prevalent in the population of Piauí, which is confirmed by the Brazilian Institute of Geography and Statistics (IBGE) (2010). Another relevant fact, according to Monte *et al* (2004), is that the city of Teresina has a population composed of 72% of mestizos. From the 562 HBV seropositive donors, 304 resided in the capital. Another reason that statistically justifies the results is that mestizos were the ones that made most blood donations during the period from 2008 to 2013; out of 233,927 donors, 185,969 were mestizos, representing 79.5% of the donors. As for schooling, the graph below (Chart 02) shows that among the 562 HBV seropositive cases, there was a higher prevalence of individuals with complete secondary education, 37.9% (213).



Source: Blood center Database. Teresina-PI, 2015 ($p = 0.01$).

Graph 1. Distribution of HBV seropositivity (n = 562) according to skin color

In second place, with 24.5% of the cases, were the individuals with incomplete primary education. In the variable schooling, a quite significant p -value (below 0.05) was observed.



Source: Blood center Database. Teresina-PI, 2015 ($p = 0.01$).

Graph 2. Distribution of HBV seropositivity (n = 562) according to level of education

Among the 562 seropositive donors, regardless of sex, 319 (56.8%) were single and 220 (39.1%) were married (Table 03). Statistical analysis of data from HBV seropositive donors showed the single people had the highest prevalence rates (56.8%), a significant difference compared to the others. The married marital status came in second place, a result similar to the study by Castro and Mousquer (2009).

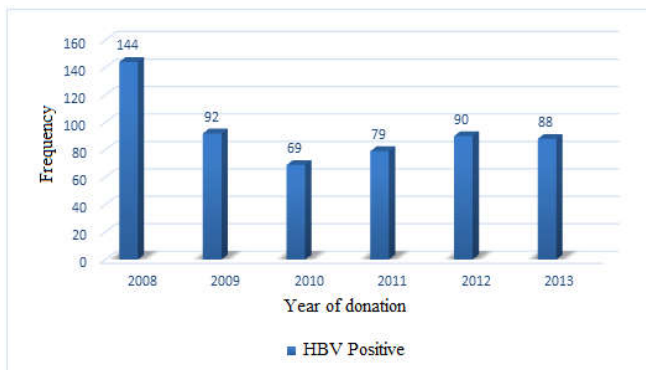
Table 3. Distribution of HBV seropositivity according to marital status

Marital Status	Positive	Negative	% Positive	Total
Non-informed	2	1,094	0.4	1,096
Single	319	1,36,951	56.8	1,37,270
Married	220	89,265	39.1	89,485
Widower	3	1,425	0.5	1,428
Judiciously separated	4	326	0.7	330
Divorced	9	2,100	1.6	2,109
Separated	1	982	0.2	983
Others	4	1,222	0.6	1,226
Total	562	2,33,365	100	2,33,927

Source: Blood center Database, Teresina-PI. 2015 ($p = 0.02$)

During the six years of donation, between January 2008 and December 2013, there was a total of 233,927 donors. A very significant result ($p = 0.00$) was observed in this variable

(Graph 03). As for the year of higher prevalence of seropositivity for Hepatitis B virus, there was a marked predominance in 2008, with 25.6% (144) of seropositive cases, corresponding to 15.5% (32,213) of the total donors. This result may be due to the influence of donation campaigns that may have affected its target audience.



Source: Blood center Database, Teresina-PI.. 2014 ($p = 0.00$)

Graph 3. Distribution of HBV seropositivity per year of donation

An important variable that was studied regarding the risk of contamination was sex. Among 562 seropositive donors, 375 (66.7%) were males, 187 (33.3%) females (Table 04). Thus, we found that males presented a higher HBV seropositivity. However, this result does not place the male sex as a risk factor for contamination, since according to the calculations, the difference was not statistically relevant. One of the possible justifications for this high seropositivity of males is the prevalence of this group in the blood donation process.

Table 4. Distribution of HBV seropositivity according to sex

AGE	Positive	Negative	% Positive	Total
Female	187	85,615	33.3	85,802
Male	375	1,47,749	66.7	1,48,124
Total	562	2,33,365	100	2,33,927

Source: Blood center Database. Teresina-PI, 2015 ($p = 0.24$)

The analysis of the Table 5 presents the population of donors infected with HBV. The total sample was 233, 927 donors, of which 562 were seropositive, presenting the following epidemiological profile as to prevalence: male, originally from Teresina, aged 18 to 29 years, mestizos, with complete secondary education, single, and the year 2008 as the year with the highest number of HBs Agreagent Donors.

Table 5. Description of the prevalent profile of donors contaminated with HBV

PROFILE	Positive	%	p
Sex: Male	375	63.3	0.24
Origin: Teresina	304	68.6	-
Age group 18 – 29 years	257	45.7	0.07
Skin color: Mestizo	441	78.5	0.07
Level of education: Complete secondary education	213	37.9	0.07
Marital status: Single	319	56.8	0.02
Year of donation: 2008	144	25.6	0

Source: Blood center Database, Teresina-PI. 2015

DISCUSSION

The prevalence of hepatitis B (HBsAg) of 0.24% is relatively low in relation to that reported by Delmondes *et al.* (2014) of

3.4% in Mato Grosso, and by Baião (2008) of 11% in Angola. The analysis of the results presented in the Table 01, which show donors originating from the most important cities of the state of Piauí, indicates that this distribution is due to the fact that the largest number of inhabitants lies in the capital Teresina and, consequently, the largest number of donors. In addition, in the capital of Piauí, campaigns to encourage donations are more frequently carried out in schools, colleges, churches and other places. There is also the fact that the blood collection center (HEMOPI) is located in Teresina, and in the main hospitals and clinics nearby, which further favors the donation. It was also seen that prevalent seropositivity predominated in the age group from 18 to 29 years. Other studies also confirm this finding, as is the case of the study of the epidemiological profile of hepatitis B carriers in the municipality of Chapecó - SC: "It is observed that the predominant age group was 20 to 34 years, corresponding to 53.1% of the sample" (MOSCHETA and PERES, 2008). In the study by Aquino *et al.* (2008) in Pará, the age group with the highest prevalence of HBsAg was 20 to 29 years, with 29.8% of the individuals. Studies show that there is a higher prevalence of markers of hepatitis B infection from age 15 onwards, with an increase in the 2nd and 3rd decades of life (SILVA *et al.*, 2013). The fact that young people in this age group are at the peak of sexual life and most of them do not have stable partners justifies this finding. Moreover, this is an age group where there is still little maturity. Most blood donors are in this group - 112,626 donors -, as shown in the Table 2. "However, the increased incidence of hepatitis B infection from 15 years of age onwards is likely to be associated with lifestyle and high risk behaviors, such as the use of injecting drugs and sexual intercourse without the use of condoms" (SILVA *et al.* 2013). The skin color presented statistical significance, and the mestizos (brown skin color) were the most prevalent in the population of Piauí, also confirmed by the Brazilian Institute of Geography and Statistics-IBGE (2010). Another relevant fact, according to Monte *et al* (2004) is that 72% of the population of the city of Teresina is composed by mestizos. From the 562 HBV seropositive donors, 304 resided in the capital. Another reason statistically justifying this result is that mestizos were the ones that most donated blood during the period 2008 to 2013. Of the 233,927 donors, 185,969 were mestizos, representing 79.5% of the donors.

The marked prevalence of seropositivity in individuals with complete secondary education is also confirmed in the Epidemiological Bulletin of Viral Hepatitis (2012), which informs that in 2012, in the Northeast region, most cases reported to have completed secondary education and between the 5th grade and primary education. The inclusion of a large number of young people who initiated or are initiating sexual practices in this modality possibly justifies this prevalence. Besides having more sexual activity, their habits and behaviors are more liberal and generally characterized by unstable relationships, thus increasing the chances of contact with the virus, either through sexual experience or through the use of illicit drugs. The results found are close to the studies conducted in Teresina by Araújo (2012) and his colleagues, in which adolescents are among the groups with higher susceptibility to infection by hepatitis B virus in view of the adoption of risk behaviors. According to the authors Dias (2011) and Araújo and collaborators (2012), single people are more vulnerable to contracting certain types of diseases transmitted during unprotected sex. Transmission of hepatitis

B virus takes place mainly by the sexual route, and the congenital infection is easy due to its high infective power. According to Pereira (2009), however, it is observed that despite high numbers of seropositivity for STDs among married couples, the conjugal bond works as a protection factor against infection because stable relationships presuppose a lower number of partners and less exposure when compared to single people. On the other hand, single people present a higher risk of infection because they are generally not stable, have multiple partners, and have a more active sexual life, exposing themselves to more risks. Another explanation for the fact that single people are majority in HBV seropositive cases is that there was a notable predominance of this variable in the blood donation process between January 2008 and December 2013; among the 233,927 donors, 137,270 (58.7%) were unmarried individuals. Out of a total of 233,927 donors, 148,124 (63.3%) were males and 85,802 (36.7%) were females. The profile of Brazilian donors (PEREIRA, 2009) was confirmed by data from the Blood center of the state of Piauí, which showed a higher frequency of men in the blood donation process (OLIVEIRA, 2015). The other plausible justification for such large numbers of male donors contaminated with HBV is that they are more vulnerable to contracting diseases through unprotected sex. According to the Epidemiological Bulletin of Viral Hepatitis (2012), sexuality is one of the main factors predisposing to the spreading of hepatitis B. According to Dias (2011), men begin their sexual life earlier, have more sexual partners, have more partners of the same sex and have more casual relationships than women, which makes them a risk group for HBV infection and other STDs. The data found in this study, with strong predominance of this variable, were similar to those found in other researches such as that of Deon *et al.* (2012), performed in Passo Fundo, Sousa and collaborators (2010) in Redenção, Pará, Araújo (2004) in Manaus, and Silva *et al.* (2013) in Florianópolis - SC.

Conclusion

The present study showed a prevalence of HBsAg of 0.24%, relatively low when compared with other epidemiological studies involving blood donors. In relation to the epidemiological profile of the donors we have: male individuals, residing in Teresina, in the age group of 18 to 29 years, mestizos, with complete secondary education and single individuals. In view of several questions raised about the risk factors for HBV infection, the present study presented the male sex with the highest number of cases in relation to the other variables studied. However, this result did not present statistical significance, leading us to the conclusion that sex cannot be considered the main risk factor for HBV contamination among the other variables. However, it was evident that males were more likely to have viral contamination than females. The identification of the most prevalent variables in the state associated to the risk factor for contamination is an essential tool for the development of prevention and control strategies. Thus, the results of this research contributed to the establishment of public funding policies and for a greater incentive to use condoms in all sexual practices, as well as other forms of prevention.

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