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Prevalence of Serological Markers of Hepatitis B Virus in Patients Admitted to the Bacteriology-Virology Laboratory Admitted to the Bacteriology-Virology Laboratory of the Fann University Hospital in Dakar between January 2021 and December 2022

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Abstract

Introduction: Hepatitis B virus (HBV) infection is a major public health problem worldwide. In Senegal, 85% of the general population has at least one HBV marker. It is in this context that this study was conducted to determine the prevalence of serological markers of HBV in patients monitored at the bacteriology-virology laboratory of the Fann University Hospital Center. **Methodology:** This is a retrospective study of 6053 patients seen between January 1, 2021, and December 31, 2022. The Abbott Architect i1000 immunoassay analyzer was used to screen for HBV serological markers, except for HBs antigen, which was screened using immunochromatography. Data was collected from laboratory records and analyzed using Excel software. **Results:** The results showed that the average age of this population was 38.49 years, ranging from 2 months to 97 years. The male-to-female ratio was 0.78. 53.43% of patients who tested positive for HBs antigen were men, compared to 46.7% who were women. Among the patients, 10.83% were carriers of HBs antigen (Ag), 7.44% carried the HBe antigen, 68.86% carried the anti-HBc antibody, and those with anti-HBs antibody levels above 10 IU/L accounted for 18.97%. **Conclusion:**

These results show that a large part of the Senegalese population is exposed to HBV. Nevertheless, systematic screening and vaccination remain the most effective strategies for improving the management of this infection.

Keywords

Hepatitis B Virus, Serological Markers, CHNU Fann, Dakar

1. Introduction

Hepatitis B, an inflammation of the liver, is caused by the hepatitis B virus, a small DNA virus with reverse transcriptase, belonging to the Hepadnaviridae family [1]. Infection with the hepatitis B virus (HBV) is a major public health problem in several regions of the world due to its frequency, complications, and socioeconomic consequences [2]. The World Health Organization (WHO) estimates that more than 2 billion people worldwide have been infected with HBV. Of these, 240 million are chronic carriers of the HBs antigen (HBsAg) [3]. In 2022, the WHO estimated that hepatitis B virus (HBV) infections caused 1.5 million deaths, most of which were attributable to complications related to chronic infections, cirrhosis, and hepatocellular carcinoma (HCC). Despite the availability of a vaccine, 296 million people were chronically infected in 2019. Africa is one of the continents most affected by this infection, with approximately 100 million people infected [4]. Sub-Saharan Africa is a highly endemic area with a prevalence of between 8% and 18% [5]. Senegal is a country where the hepatitis B virus (HBV) is endemic.

It is estimated that approximately 8% of the population is chronically infected with HBV, representing approximately 1,250,000 people [6]. According to the WHO, HBV is responsible for 80% of liver cancers, which are the most common cancers among men in Senegal [7]. Without screening and treatment, chronic HBV infection can lead to serious complications and death. Hence, the importance of good patient follow-up. The overall objective of this study is to evaluate the different serological profiles of hepatitis B obtained during screening and follow-up of patients carrying the hepatitis B virus at the Fann National University Hospital Center (CHNU).

2. Equipment and Methods

2.1. Framework of the Study

The study was conducted at the bacteriology-virology laboratory of the Fann National University Hospital Center in Dakar, Senegal. National University Hospital Center (CHNU) in Fann is a level III public health facility.

2.2. Type and Period of Study

This is a retrospective and descriptive study covering a period of two years, from January 1, 2021, to December 31, 2022.

2.3. Population Studied

Our population studied was composed of patients who were sent to the laboratory to undergo screening tests for at least one serological marker of the hepatitis B virus, as requested by the physician. This means that not all patients will have all serological markers tested (the tests performed are indicated by the clinician).

Inclusion criteria:

We included in our study all patients who visited the laboratory to undergo screening for at least one of the serological markers of VHB, regardless of their age. HBV, regardless of their age or gender.

Exclusion criteria:

Patients who were brought to the laboratory during the data collection period but had incomplete data were excluded from the study.

2.4. Equipment and Methods

HBV markers were measured in fasting patients. Blood samples were collected by venipuncture from the elbow crease under strict aseptic conditions. These samples were collected using a Vacutainer system in dry tubes or tubes containing lithium heparin. These tubes were immediately labeled and sent to the laboratory, where they were processed within four hours. In case of delay in analysis, the sample was stored in a refrigerator at 4˚C - 8˚C. The Abbott Architect i1000 immunoassay analyzer was used to test for HBV serological markers (Figure 1). For HBsAg, the immunochromatographic method was used.

Figure 1. Abbott architect i1000 automated system.

2.5. Collection and Analysis of Data

The data were collected from the laboratory's serological files. Serological records

of the laboratory. The data entry and processing were carried out using the Excel software version 2016. The parameters studied included age, sex, patient origin (outpatient or inpatient), and, for inpatients, the department of origin. The serological markers analyzed were: HBs antigen (HBsAg), anti-HBs antibodies (anti-HBsAb), HBe antigen (HBeAg), anti-HBe antibodies (anti-HBeAb), and anti-HBc antibodies (anti-HBcAb).

The anti-HBc IgM antibody assay was not included in the analysis due to the unavailability of reagents during the study period.

3. Results

3.1. Characteristics of the Population Studied

In total, 6053 patients were recruited at the laboratory between January 2021 and December 2022 to undergo testing for hepatitis B virus markers.

3.2. Distribution of the Population Studied by Age

The average age of this population was 38.49 years, ranging from 2 months to 97 years. The 20 - 30 and 30 - 40 age groups were the most represented, accounting for 17.13% and 45.28% of the sample, respectively. They were followed by the 40 - 50 and 60 - 70 age groups, with respective percentages of 11.13% and 8.36% (Table 1).

Table 1. Distribution of the population studied by age.

Age Group	Count	%
0 - 10	108	1.78
10 - 20	300	4.96
20 - 30	1037	17.13
30 - 40	2741	45.28
40 - 50	674	11.13
50 - 60	399	6.59
60 - 70	505	8.34
70 - 80	226	3.73
80 - 90	55	0.91
90 - 100	8	0.13
Total	6053	100.00

3.3. Distribution of the Population Studied by Gender

Women were in the majority, representing 55.97% of the population, while men represented 43.70%. The male-to-female ratio was 0.78 (2650 men to 3403 women) (Table 2).

Table 2. Distribution of the population studied by gender.

Sexe	Count	%
Women	3403	56.22
Men	2650	43.78
Total	6053	100.00

3.4. Distribution of the Population Studied according to Origin (Outpatients and Inpatients)

Of the 6053 patients, 5435 (89.79%) were outpatient, while 618 (10.21%) were hospitalized (Figure 2).

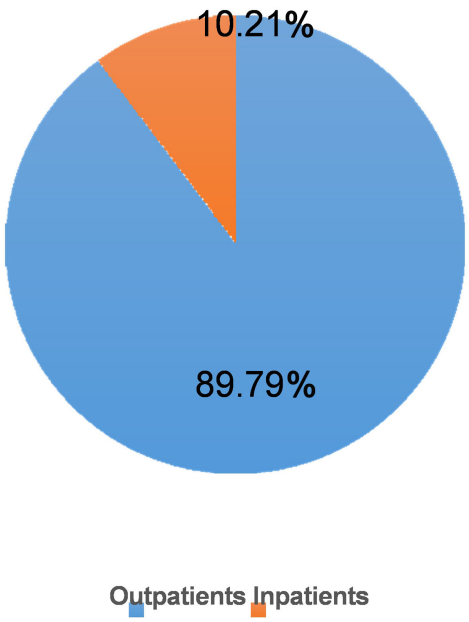

Figure 2. Distribution of the population studied according to origin.

3.5. Distribution of the Population Studied according to Hospital Departments

Hospitalized patients came mainly from infectious disease and pulmonology departments, with respective percentages of 35.11% and 20.71%, followed by the neurology department with 18.77% (Table 3).

Table 3. Distribution of the population studied according to the clinical departments.

Service of Origin	Count	%
Geriatrics	21	3.4
Cardiology	9	1.46
Neurology	116	18.77
Infectious Diseases	217	35.11
CTCV	29	4.69

Continued

Emergency	27	4.37
Pulmonology	128	20.71
Pediatric Cardiology	26	4.21
No Specified	36	5.83
Psychiatry	5	0.81
CPIAD	1	0.16
Resuscitation	2	0.32
ORL	1	0.16
Total	618	100.00

3.6. Distribution of the Population Studied in Function of Serological Markers of HBV

Of the 6053 patients studied, the tests for screening for markers of HBV had the following results and were as follows:

- The HBs antigen was positive in 597 of the 5510 patients tested, representing a rate of 10.83%.
- The test for the antigen HBe was performed on 390 patients, and the results showed that 29 (7.44%) were positive, while 361 (92.56%) were negative.
- The test for detecting anti-HBe antibodies was performed on 229 patients, with 172 positive cases (75.11%) and 57 negative cases (24.89%).
- Finally, the anti-HBc antibody screening test was performed in 411 patients, with 283 positive cases (68.86%) and 128 negative cases (31.14%) (Table 4).

Table 4. Population distribution according to markers.

Characteristics	Count	Negative (%)	Positive (%)
HBsAg	5510	4913 (89.17)	597 (10.83)
HBeAg	390	361 (92.56)	29 (7.44)
Anti-HBe	229	57 (24.89)	172 (75.11)
Anti-HBc	411	128 (31.14)	283 (68.86)

A test for screening anti-HBs antibodies was requested for 174 patients. Among them, 81.03% had levels below 10 IU/L and 18.97% had levels above the protective threshold (≥10 IU/L) (Table 5).

Table 5. Proportion of anti-HBs antibodies in patients who are negative for the HBs antigen.

Anti-HBs Antibody Titer	Count	%
Titer > 10 UI/L	33	18.97
Titer < 10 UI/I	141	81.03
Total	174	100

3.7. Serological Prevalence of Hepatitis B according to Gender

The seroprevalence of HBsAg was higher in men (319) than among women (278) (Table 6).

Table 6. Serological prevalence by gender.

HBsAg	Women (n = 3129)	Sexe M (n = 2381)	n
Negative	2851 (91%)	2062 (87%)	4913
Positive	278 (8.9%)	319 (13%)	597

3.8. Seroprevalence by Age

The highest number of positive cases was observed in the 30 - 40 age group (48.91% of all infections), reflecting the demographic predominance of this group in the study sample. However, the prevalence rate was notably high in the 20 - 30 age group (Table 7).

Table 7. Serological prevalence by age.

Age Group	Count	%
10 - 20	12	2.01
20 - 30	148	24.79
30 - 40	292	48.91
40 - 50	73	12.23
50 - 60	31	5.19
60 - 70	30	5.03
70 - 80	8	1.34
80 - 90	3	0.50
Total	597	100.00

3.9. Seroprevalence according to Origin

Of the 597 patients who were HBsAg carriers, 63 (10.55%) were hospitalized, while 534 (89.45%) were treated on an outpatient basis (Table 8).

Table 8. Serological prevalence according to origin.

HBsAg	Outpatients (n = 4919)	Hospitalized (n = 591)	n
Negative	4385 (89%)	528 (89%)	4913
Positive	534 (11%)	63 (11%)	597

3.10. Seroprevalence by Department of Origin

The seroprevalence was marked by a high presence of patients from the disease's services. From infectious and tropical diseases, pulmonology, and neurology departments, with respective rates of 30.16%, 15.87%, and 15.87% (Table 9).

Table 9. Serological prevalence by originating department.

Service of Origin	Count	%
Geriatrics	2	3.17
Cardiology	1	1.59
Neurology	10	15.87
Infectious Diseases	19	30.16
CTCV	5	7.94
Emergencies	5	7.94
Pulmonology	10	15.87
Pediatric Cardiology	1	1.59
No Specified	8	12.7
Psychiatry	2	3.17
Total	63	100

4. Discussion

HBV infection is a public health problem in a resource-limited country such as Senegal. This is due to its prevalence and high mortality rate from serious complications, including cirrhosis and primary liver cancer. The average age obtained in our study was 38.49 years, ranging from 2 months to 97 years. This figure is comparable to that of Mor Talla in Senegal (1645 patients) in 2021, which was 36.1 years, with extremes ranging from 0 to 86 years (Mor Talla, 2021). These results could be explained by the demographic structure of Senegal, which is characterized by a predominantly young population, thus influencing the average ages observed. The most represented age group was 30 to 40 years old (45.28%). This result is similar to that of a study conducted in Mali (1035 patients), where this age group reached 36.5% [8]. The age range obtained in these studies shows the predominance of this group in the working population, its more frequent participation in screening due to its professional and social responsibilities, as well as exposure factors such as risk behaviors, history of blood transfusions, or occupational exposure (caregivers, personnel in contact with biological fluids). In our study, outpatient patients had a prevalence of 89.45% compared to 10.55% for hospitalized patients. Among the latter, seroprevalence was characterized by a high proportion of patients from infectious and tropical disease, pulmonology, and neurology departments, with respective rates of 30.16%, 15.87%, and 15.87%. Our results are comparable to those of the study conducted in Bamako (Mali) in 2024 by Mamadou, which revealed a prevalence of 22.92% among outpatients in a sample of 505 patients. Internally, the infectious and tropical diseases department had the highest prevalence (20.83%), followed by the internal medicine department (14.58%) [9]. In addition, a study conducted in Algeria on 3,845 patients also showed that the majority came mainly from the infectious diseases department, with a prevalence of 41.50%, followed by the hemodialysis department with 32.07% [10]. Hepatitis B is frequently observed in the infectious diseases depart-

ment due to its specialization in diagnosis, treatment, and follow-up. Patients with hepatitis B are often referred to or admitted to this department to receive specialized care tailored to their condition. It is therefore essential to focus hepatitis B surveillance and treatment efforts in this department in order to ensure appropriate patient care and prevent the spread of the disease. We looked for markers of chronicity in HBs antigen-positive subjects, including HBe antigen, which is a marker of active viral replication, and anti-HBe antibodies. A total of 92.56% of subjects were HBe antigen negative, and 75.11% were HBe antibody negative; of the HBe negative subjects had antibodies anti-HBe. These are markers of the cessation of viral replication. Our results differ from those of Lo *et al.* (n = 466), who found a seroprevalence of 24.4% for HBe antigen and 69.2% for anti-HBe antibodies in people living with HIV (PLHIV) who were HBs antigen carriers [11].This difference could be explained by the sample size and HIV-related immunosuppression, which has an impact on the immune response and viral replication markers. Regarding anti-HBs antibodies, we were able to divide our study population into two categories: those with anti-HBs antibody titers below 10 mIU/mL and those with anti-HBs antibody titers ≥ 10 mIU/mL. The threshold of 10 mIU/mL for anti-HBs antibodies is considered the threshold for protection [12]. Individuals with insufficient anti-HBs antibody titers should be vaccinated in accordance with WHO recommendations [13]. For individuals with protective levels of anti-HBs antibodies (greater than 10 IU/L), screening for anti-HBc IgG antibodies would have allowed us to distinguish those who developed immunity after resolution of the infection. In our study, we identified 174 requests for anti-HBs antibody titration in HBsAg-negative patients. Among these requests, 141 patients (81.03%) had a titer below 10 IU/L, and 33 patients had a titer above 10 IU/L, or 18.97%. In Chkouri's study in Senegal, out of a total of 227 requests for anti-HBs antibody titration, 91 patients (40.08%) had a titer below 10 IU/L, and 136 patients had a titer above 10 IU/L, or 59.92% [14]. This difference compared to our results can be explained by a different study population, a different study period, and the patients' varied vaccination histories. This immunity could be due to vaccination or spontaneous recovery with the production of antibodies against the virus. In our study, 411 patients presented for an anti-HBc antibody screening test, the majority of whom tested positive at a rate of 68.86%. Our results are comparable to those obtained by Mor Talla in Senegal (n = 516), who found a seroprevalence of 78.5%. These observations could be explained by the fact that Senegal is a country with a high prevalence of HBV. A large proportion of the population is exposed to the virus during their lifetime, which explains the prevalence of total anti-HBc antibodies [15]. In our study, the absence of anti-HBc IgM antibody testing is a limitation, as it would have allowed us to differentiate between acute and chronic hepatitis B infections.

5. Conclusion

Hepatitis B is a serious public health problem, and Senegal is one of the countries most affected. These observations highlight the need to strengthen awareness and

vaccination campaigns, particularly among young adults and men, to promote systematic screening in high-risk services such as services for infectious diseases, and to ensure prolonged clinical follow-up in order to prevent complications.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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