Original Research Article

SEROLOGICAL PROFILE OF HEPATITIS B VIRUS AT IBN ROCHD UNIVERSITY HOSPITAL CENTER (CASABLANCA, MOROCCO)

ABSTRACT

Aim: Hepatitis B virus (HBV) infection is a major public health problem with complications of progression to cirrhosis and hepatocellular carcinoma. In Morocco, the real extent of the problem related to these infections in the general population is not precisely known.

The objective of our study is to determine the serological profile of hepatitis B in patients referred to the sero-immunology laboratory of Ibn Rochd University Hospital Center in Casablanca

Study design: Retrospective study

Place and Duration of Study: Sample: Sero-immunology laboratory at Ibn Rochd University Hospital Center, between January 1st, 2020 to December 31st, 2022.

Methodology: This is a study based on the exploitation of data from the computer system including the results of serum analyses of HBs antigen (HBsAg), HBc antibody (HBcAb) and HBs antibody (HBsAb). The various assays were performed using the chemiluminescence technique on the Architect i1000 Analyser.

Results: Out of 4717 tests collected, 2487 patients (52.70%) were female and 2230 were male (47.30%). 90 persons were HBsAg positive (1.90%), 846 persons were HBcAb positive (17.91%), 1290 persons were HBsAb positive (27.22%).The distribution of the positivity and negativity of the 3 associated markers showed 3153 persons with all 3 markers negative (67%), 708 persons with only HBsAb positive (15%), 578 persons with HBs antibody as well as HBcAb positive (12.14%), 185 persons with only HBcAb positive (4%) and 90 persons with both HBsAg and HBcAb positive (1.90%).

Conclusion: The prevalence of Hepatitis B in our study population is low and 66.79% remain free of contact with the virus and require vaccination to avoid serious complications of HBV infection.

Keywords: Hepatitis B virus, HBsAg, HBsAb, HBcAb, Vaccination

1. INTRODUCTION

Hepatitis B virus (HBV) infection is a major public health problem. In 2015, World Health Organization (WHO) estimated that two billion people worldwide have been infected with HBV, of whom 350 million are chronic carriers, and with nearly one million deaths each year [1,2]. The risk of developing major complications such as cirrhosis and hepatocellular carcinoma is estimated to be between 20% and 30% in people with chronic viral hepatitis B [3]. The highest concentrations of the virus are found in blood and oozing lesions, while moderate concentrations are found in semen and vaginal secretions and the lowest concentration is found in saliva [4]. The modes of transmission of Hepatitis B virus are therefore vertical (perinatal) and horizontal (sexual, blood, non-sexual intrafamilial) [5,6].

HBV infection is widely distributed worldwide, and the incidence and prevalence of this disease are mainly related to socio-economic development. The prevalence of HBV is therefore 5.4% worldwide [7].

Based on the prevalence of HBs antigen (HBsAg), three geographical areas are delineated [8,9]. A distinction is made between:

- High endemicity areas correspond to a prevalence of HBsAg above 8%.

- Intermediate endemicity areas where HBsAg prevalence is between 2 and 8%.

- Low endemicity areas where HBsAg prevalence is less than 2%.

Thus, in HBV infection, several serological markers are expressed and have clinical relevance. These markers are also of great interest for epidemiological studies. Indeed, HBV serological markers discriminate between acute and chronic infections and are used as serological evidence to assess the immune status of the host.

The main serological markers used in the evaluation of HBV infection are:

- Hepatitis B surface antigen (HBsAg),

- Antibody to hepatitis surface antigen (HBsAb),

- Total antibodies to hepatitis B core antigen (HBcAb)

Some studies have also introduced other markers such as B "e" antigen (HBeAg) and antibodies against "e" antigen (HBeAb).

These markers, in combination, provide HBV serological profiles that could better complement clinical assessment for better management of this infection. More recently, with the introduction of molecular assays in global infectious disease surveillance, HBV infection is assessed by quantitative HBV DNA [10].

In Morocco, the epidemiology of viral hepatitis is not precisely well known. Few studies have been done to estimate the prevalence of HBV in the general Moroccan population. For this reason, the objective of our study is to evaluate the serological profile of hepatitis B in patients referred to the sero-immunology laboratory of Ibn Rochd University Hospital Center in Casablanca and to estimate the prevalence of the different serological markers for a better management of this infection and related diseases in Morocco.

2. MATERIAL AND METHODS

This is a three-year retrospective study from January 1st, 2020 to December 31st, 2022.

2.1 Study population

During this period, the sero-immunology laboratory of Ibn Rochd University Hospital Center in Casablanca received 4714 requests containing the determination of the 3 markers, namely HBsAg, HBsAb and HBcAb in outpatients coming from the reception and sampling center and hospitalised patients in order to screen them for the serological profile of

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Hepatitis B. Blood samples were collected in dry tubes and centrifuged at 4000 rpm for 15 minutes.

2.2 HBV serological tests

The HBV serological markers, namely, HBsAb and HBcAb, were detected by chemiluminescence technique on the Architect i1000 Analyser. This technique is based on the labelling of antibodies with chemiluminescent compounds, i.e. compounds capable of producing light in the presence of a given reagent. The most commonly used markers are acridinium and ruthenium esters. In practice, magnetic beads coated with the specific antigen or antibodies are incubated with the patient serum. Labelled monoclonal antibodies are then added to the reaction medium. The cups containing the reaction are then exposed to a magnetic field which will detach the magnetic beads. The solution is then alkalinised, which induces the emission of light from the chemiluminescent compound. The light measured is proportional to the concentration of the markers to be measured in the solution.

Results are expressed in international units per milliliter for HBsAb and S/CO ratio for other markers. An HBsAb level of 10 IU/L was considered protective. An S/CO ratio >=1 was considered positive.

3. RESULTS AND DISCUSSION

3.1 Results

3.1.1 Characteristics of the study population

Among the 4714 patients with the 3 markers, 47.30% were male and 52.70% were female with a M/F sex ratio of 0.89. 90 patients were found to be HBsAg positive, i.e. an overall prevalence of hepatitis B of 1.90%. 76.50% of the positive cases were inpatients and 23.50% were outpatients from the reception and sampling center.

3.1.2 Prevalence of HBsAg, HBsAb and HBcAb

Among the 4714 patients, 90 patients were HBsAg positive, i.e. 1.90% of the cases. HBsAb was detected in 1290 patients i.e. 27.22% and HBcAb in 846 patients i.e. 17.91%.
Thus, we classified our population into 5 categories: Unaffected, protected vaccinated, protected with former contact, isolated HBcAb and infection in progress (Table 1).

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Table 1. Prevalence of serostatus in all patients.

Markers			Status	Number	Prevalence
Ag HBs	**Ac HBc**	**Ac HBs**			
Negative	Negative	Negative	**Unaffected**	2961	67%
Negative	Negative	Positif	**Protected, vaccinated**	669	15,00%

Negative	Positif	Positif	**Protected, former contact**	539	12,15%
Negative	Positif	Negative	**Ac HBc isolated**	179	4,00%
Positif	Positif	Negative	**Infection in progress**	76	1,71%
Positif	Negative	Negative		6	0,13%
Positif	Positif	Positif		3	0,06%

Table 2. Prevalence of serostatus according to gender

Status			
		Male	**Female**
Unaffected	**n**	1476	1677
	%	46.80%	53.20%
Protected, vaccinated	**n**	309	399
	%	43.64%	56.36%
Protected, former contact	**n**	294	284
	%	50.85%	49.15%
Ac HBc isolated	**n**	89	96
	%	48%	52%
Infection in progress	**n**	53	26
	%	67%	33%
	n	5	2

3.2 Discussion

Despite major efforts to control HBV infection, Hepatitis remains a major health problem in Morocco.

The objective of this study is to evaluate the serological profile of Hepatitis B in patients referred to the sero-immunology laboratory of Ibn Rochd University Hospital Center in Casablanca and to estimate the prevalence of different serological markers in this population. This approach is very important because the evaluation of the prevalence of HBV makes it possible to follow the evolution of the virus on a national scale and also to delimit the propagation of the infection by the measures of hygiene and protection.

Of the 4714 serum collected, 90 were found to be positive. These results show that Morocco is a low endemic country with an estimated HBsAg prevalence of 1.90%. This prevalence, less than 2%, is consistent with that found in other previous studies conducted in Morocco on the general population and which reported a prevalence of HBV <2%: 1.66% among the active population in the study conducted by Sbai. A and al in 2012 [11], 1.81% in the cross-sectional survey as part of the large Hepatitis B and C screening program conducted by the Pasteur Institute of Morocco [12]. Other studies conducted on blood donors in Rabat in 2013 and 2016 reported a prevalence of 0.80 and 1.34%, respectively [13, 14]. It should be noted that there is a slight difference in HBsAg prevalence between our study and the study conducted at Ibn sina hospital in Rabat, which found a prevalence of 2.47% [15] which is in line with the overall prevalence estimated at 3.3% by WHO in the Eastern Mediterranean

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Region. This HBV seroprevalence supports the classification of Morocco as a medium endemic area with a prevalence between 2 and 8% [16-17]. However, this prevalence is low compared to other neighbouring countries, notably Algeria (3.6%), Tunisia (4 to 7%) [12], Mali (11.1%), and Senegal (14.2%) [18].

This low seroprevalence of Hepatitis B could be explained by the different strategies undertaken by Morocco such as information and awareness campaigns against sexually transmitted infections, as well as the improvement of sanitary and socio-economic conditions and especially the introduction of the Hepatitis B vaccine in the expanded national vaccination program. Not to mention the medical coverage system and the epidemiological surveillance system that is being set up for epidemic Hepatitis. HBV is a notifiable disease in Morocco.

The study of the prevalence of HBsAg according to sex showed a slight male predominance. These results are in agreement with the data. This male predominance is thought to be related to higher exposure to HBV risk factors in men such as risky sexual behaviour or the use of multiple-use glass needles, which are the most important transmission factors [14]. Other hormonal factors may contribute to women clearing HBV more efficiently than men [11].

Overall, only 27.22% of patients were positive for HBsAb. This antibody screening is performed to monitor the course of Hepatitis B to check HBsAg/HBsAb seroconversion status, but also to assess the effectiveness of HBV vaccination. This value remains very low considering the development achieved in Morocco in terms of vaccination coverage since 1999 [19]. As a result, a significant proportion of the patients recruited for this study are at high risk of contracting HBV because they are likely to receive massive and/or iterative transfusions (haemophiliacs, dialysis patients, renal failure patients, organ transplant candidates), in psychiatric institutions, hospitalised patients, etc. The double burden due to HBV superinfection could be fatal for these vulnerable patients. Vaccination therefore remains the cornerstone of the fight against this virus.

In Morocco, vaccination coverage of children against HBV was introduced in 1999. Vaccination coverage for children under 1 year of age rose from 33% in 2000 to 93% in 2005 [19] and according to the national seroprevalence survey of viral hepatitis 2019 conducted by the Ministry of Health, vaccination was carried out in 99.7% of cases in the public sector , 97% of participants aged between 5 and 18 years had received at least one dose of HBV vaccine and 91% had received 3 doses [20].

Currently, the vaccination coverage rate exceeds the global target of 90% and was 99% in 2021. Vaccination at birth (within the first 24 hours) against HBV was introduced in 2004 in Morocco with a coverage percentage reaching 64% in 2020 [21].

In the study population, total HBcAb were found in 17.91% of patients. These antibody compounds are IgM HBcAb and IgG HBcAb, which are widely reported as a good indicator of HBV endemic status.

In Moroccan National Seroprevalence Survey of Viral Hepatitis2019, anti HBc, was positive in 1189 patients out of a total of 11996 patients, giving an overall seroprevalence of 10.3% [20]. A lower prevalence of HBcAb was found in countries such as Iran, France and Spain (4.9%, 7.3% and 8.2%, respectively) [22-23]. In contrast, a higher prevalence was found in countries such as Nigeria, Togo and Mauritania (32%, 53.9% and 76.5%, respectively) [24-25].

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The evaluation of HBsAg, HBsAb and total HBcAb serological markers is of great interest in the management of hepatitis B, as they allow the identification of the different phases of HBV infection and the follow-up of infected patients. The other virological markers, namely IgM HBcAb, HBeAg, HBeAb and molecular quantification of HBV DNA, are widely used but depend on the initial results of the first 3 markers. In the end, and according to the results obtained, the patients had 5 distinct serological profiles: Unaffected, protected vaccinated, protected with former contact, isolated HBcAb and infection in progress.

4. CONCLUSION

This study clearly demonstrated a low prevalence of HBV in Morocco and a very low HBV vaccination coverage. HBV infection remains a public health problem and new recommendations, in accordance with WHO guidelines, should be established to promote serology testing and strengthen the vaccination protocol to limit viral dissemination and ensure better management of this disease in Morocco.

CONSENT

It is not applicable.

ETHICAL APPROVAL

the authors declare to have respected the ethical side, the patients' information is anonymous

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