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Problems of Interpreting Serological Markers of Viral Hepatitis B at the Mali Hospital from January to May 2023

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Abstract **Original Research Article**

Introduction*:** Viral hepatitis is a systemic infection of viral origin preferentially affecting the liver and causing inflammatory lesions and hepatocyte alterations that can lead to fibrosis, cirrhosis and liver cancer. ***Objective: To assess the knowledge levels of healthcare staff on the interpretation of serological markers of viral hepatitis B at the Mali hospital. ***Methods*:** This was a cross-sectional study with a descriptive aim and collected 53 healthcare staff (Physicians and Biologists) from the Mali hospital including 47 doctors and 6 biologists, from January to May 2023. Consenting healthcare staff were included. A questionnaire was administered to collect information. ***Results*:** The study population represented 69.7% (53/76) of the hospital's healthcare staff. Males represented 81.1%. More than 50% of healthcare staff did not consider serological markers before proposing vaccination and 32.1% confused a cured person with a vaccinated person. ***Conclusion*:** This study generally shows an insufficient level of staff knowledge on the interpretation of serological markers of viral hepatitis B. This can lead to harmful practices in patient care. Continuous training of staff is necessary to promote good preventive, diagnostic and curative practices.

Keywords: Serological Markers, Healthcare Personnel, HBsAg.

INTRODUCTION

Viral hepatitis B is an infection of viral origin (the hepatitis B virus) preferentially affecting the liver and causing inflammatory lesions and hepatocyte alterations that can lead to fibrosis, cirrhosis and/or primary liver cancer (Zahi, 2023).

Hepatitis B virus (HBV) belongs to the *Hepadnaviridae family and the Orthohepadnavirus* genus. It is an enveloped virus with partially circular double-stranded DNA. It is transmitted through contact with blood or other bodily fluids (semen, vaginal secretions, saliva, etc.) from an infected person to other people (Ahmad *et al.*, 2015). During hepatitis B virus infection, 85% of infected individuals can become chronic carriers and 15% can recover spontaneously without treatment. (Benazzoz M, 2022). Viral hepatitis is a major cause of morbidity and mortality, ranking as the seventh leading cause of death worldwide. Hepatitis B virus infection accounts for 70% of hepatitis mortality (Khadidjatou S. A, 2019).

Thanks to national vaccination efforts in Burundi, the prevalence among children under 5 years old had fallen from 4.7% in 2000 to 1.3% in 2017 (Ndikumana *et al.*, 2018).

Worldwide in 2017, the prevalence of HBV was 3.5% or 257 million cases (WHO, 2017). In France, the prevalence of chronic hepatitis B was 0.30% or 135,706 individuals in 2016 (Carmen H, 2021).

In Africa, it was 6.1% or 60 million cases (WHO, 2017) and sub-Saharan Africa was in a zone of high endemicity with a prevalence of 5.81% in 2016 (Servais A, 2013).

In Mali, 2.6 million people, or 18% of the general population, carry the hepatitis B virus surface

antigen (HBsAg), particularly one in two young people between 18 and 25 years old (Sidibé S, 2013) with a national seroprevalence of 14.7% in 2014 (Bougoudogo F *et al.*, 2014). The pathology ranked 19th worldwide for HBV-related mortality according to the WHO in 2024 (WHO, 2014).

The diagnosis of viral hepatitis B is based on the search for virological and/or serological markers.

Healthcare staff in healthcare facilities play a role in the management of this condition, particularly in understanding and interpreting the markers of the virus in question.

It is in this context that this study was initiated with the aim of evaluating their knowledge on the interpretation of serological markers of the hepatitis B virus.

METHODOLOGY

Framework of the Study

The Mali Hospital, located on the right bank of the Niger River in Missabougou in commune VI of the Bamako district, is a gift from the People's Republic of China to the Republic of Mali. This 3rd ^{level} reference hospital was inaugurated in 2010 and equipped largely for the first time by the Chinese partner. It has a capacity of 257 beds with 62 doctors of all specialties. In addition to strengthening the diagnostic and treatment capacities of existing establishments of the same level, the activities of the Mali Hospital also aim to reduce medical evacuations outside the country through the improvement of the technical platform and the creation of new medical-surgical services.

Type and Period of Study

This was a cross-sectional study with a descriptive aim and prospective data collection which took place over a period of 5 months from January to May 2023.

Source Population

The doctors of the consultation boxes of various specialties including endocrinology -diabetology, cardiology, infectious diseases, internal medicine, neurology, pediatrics, gynecology-obstetrics, thoracic surgery, traumatology, and neurosurgery and the biologists (physician, pharmacist and engineer) working in this hospital constituted the study population due to their proximity to the patients. The choice of the site is justified by a desire to explore the epidemiology of the pathology, the structure being the most recent university hospital in the country.

Inclusion and Non-Inclusion Criteria

All doctors in the boxes and laboratory biologists working at the Mali hospital, regardless of age, sex, or specialty, who gave their written informed consent to participate in the study, were included.

Data Collection Technique

The study was conducted in the form of a direct, oral, and confidential interview. The questionnaire was administered by the principal investigator. Staff were interviewed during break times.

Data Collection Support

An anonymous survey form was developed. The questions were divided into several sections, including the socio-professional characteristics of the staff surveyed, an identification number, and the various markers of the hepatitis B virus to be interpreted according to the following situations (combinations of markers):

Situation I: HBs Ag negative, anti -HBc Ac Ig G positive, anti -HBc Ac Ig M negative, anti -HBs Ac positive

Situation II: HBs Ag negative, anti -HBc Ac Ig G negative, anti -HBc Ac Ig M negative, anti -HBs Ac positive)

Situation III: HBsAg positive for more than 6 months, HBeAg positive, viral HBV DNA > 10^{7} IU/ml, ALAT normal

Situation IV: Can Hepatitis Delta (D) exist without co-infection with hepatitis B?

Situation V: HBsAg negative, anti -HBc Ac Ig G negative, anti -HBc Ac Ig M negative and anti- HBs Ac negative

The Correct Answers to Different Situations

Situation I: Recovery from viral hepatitis B
Situation II: Vaccination against viral hepatitis B
Situation III: Immune tolerance (chronic form)
Situation IV: No
Situation V: Negative

Ethical Aspects

Before the start of the study, a letter of information and authorization was sent to the Hospital Medical Committee. Written approval was obtained from each department head. In accordance with the 1975 Declaration of Helsinki, revised in 2013, participants gave their written consent.

Data Entry and Analysis

Data entry was done using Microsoft Excel office 2013, data analysis was done with SPSS software (version 26).

Ethical Approval

The study protocol was approved by the ethics committee of the University of Sciences, Techniques and Technologies of Bamako (USTTB) under number 2024/288/CE/USTTB of November 29, 2024.

RESULTS

A total of 53 agents were enrolled in the present study for a total of 76 the number of hospital staff or (69.7%) participation of the staff of said hospital including 47/53 (88.7%) doctors and 6/53 (11.3%)

biologists. Table I indicates the characteristics of the participants.

Table I: Distribution of healthcare personnel according to profession and socio-demographic characteristics

Features N=53		Doctors N=47	Frequency %	Biologists N=6	Frequency %
Age group	20-29	7	13.2	1	1.9
	30-39	25	47.2	1	1.9
	40-49	12	22.6	3	5.7
	50-59	3	5.7	1	1.9
Sex	Male	43	81.1	0	11.3
	Female	4	7.5	6	0.0

Male doctors and staff in the 30-39 age group were the most represented. The average age was 37.33 years.

The distribution of healthcare staff according to the responses to situations (I, II, III) is found in Table II below:

Table II: Distribution of responses according to situations I, II and III

Variables	Results	Effective	Frequency %
Status I	Hepatitis acute	4	7.5
	Hepatitis chronic	9	17.0
	Patient vaccinated	17	32.1
	Hepatitis B cured	**14**	**26.4**
	Healing in course	6	11.3
	Referred	3	5.7
	Total	53	100.0
Status II	Hepatitis acute	3	5.7
	Hepatitis chronic	1	1.9
	Patient vaccinated	30	56.6
	Hepatitis B cured	10	18.9
	Healing in course	6	11.3
	Referred	3	5.7
	Total	53	100.0
Status III	Hepatitis acute	21	39.6
	Hepatitis chronic	12	22.6
	Tolerant immune	12	22.6
	Inactive carrier	5	9.4
	Referred	3	5.7
	Total	53	100.0

Referred:

Staff who would refer the patient directly as soon as a serological marker result becomes positive (HBsAg, anti - HBc Ac Ig G, anti -HBc antibodies Ig M, anti- HBs Ac).

According to the answers given by practitioners in relation to situation I, only 26.4% found the correct answer and 32.1% of the results thought of vaccination. For situation II, 56.6% answered that it was a vaccinated person. Finally, regarding situation III, only 22.6% found the correct answer and 39.6% mentioned acute hepatitis.

Table III shows the distribution of healthcare personnel according to knowledge of coinfection of hepatitis Delta with hepatitis B (situation IV).

Table III: Distribution of healthcare personnel according to knowledge of co-infection of hepatitis Delta with hepatitis B

Knowledge of hepatitis Delta and B co-infection	Effective	Percentage %
Correct answer	23	43.4
Wrong answer	27	50.9
Referred	3	5.6
Total	53	100

Nearly fifty-one percent (27/53) of healthcare personnel were unaware that hepatitis delta can be co -associated with hepatitis B infection.

Table IV shows the distribution of healthcare staff according to their knowledge of the markers of Situation V.

Table IV: Knowledge of healthcare staff on vaccination markers

Serological markers N=50	Wrong answer		Correct answer	
HBs Ag Ac HBc Ig G Ac HBc Ig M Anti-HBs Ac	Effective	Percentage %	Effective	Percentage %
	29	54.7	21	39.6

NB: Situation V presents the hepatitis B vaccination profile

Nearly forty percent (21/53) of staff did not know the serological markers that needed to be known before offering vaccination.

DISCUSSIONS

Limitations of the Study

Our study only included 69.7% of the staff due to the inclusion criteria. Other specialists included in the workforce were not involved in the consultation.

This survey, conducted using questionnaires administered to healthcare and medical-technical staff at the CHU Hôpital du Mali (Bamako, Mali), allowed us to assess their knowledge of HBV. Infection caused by this virus is potentially fatal and has been declared a public health problem (WHO, 2017). A good understanding of the infection among physicians is essential. There is little data regarding the knowledge and attitudes of practitioners regarding the interpretation of hepatitis B virus results in Mali. This study therefore makes it possible to identify gaps in knowledge about HBV infection among practitioners at the Hôpital du Mali.

HBV infection is characterized by several distinct serological and immunological responses. Temporal profiles can serve as useful guides for monitoring disease progression and provide serological correlation with disease progression. Analysis of various serological profiles provides guidance for interpreting disease course and level of infectivity.

The majority of our respondents were male (81.1%). The average age was 37.33 years. This predominance of young people was also obtained during a study carried out in 2022 in Ouagadougou, Burkina Faso, with 29.28 years (Pengdewendé M, S *et al*., 2022). These results are similar to those of previous studies (Dao A *et al*., 2018). This trend was also found by Jaquet A *et al*., with 84% men (Jaquet A, 2017). On the other hand, another study carried out in 2015, still in Mali, found a predominance of the female sex at 70.6% (Ngono AMC *et al*., 2015). Our results could be explained by the predominance of male staff in the medical field in our structure. This argument is supported by the Organization for Economic Cooperation and Development (OECD) (Gaudiaut T. 2015). Physicians were in the majority with 88.7%. Unlike a study conducted in 2017 in Senegal which reported a predominance of paramedics with 76.5% (Lawson ATD *et al.*, 2017). Our results can be explained by the high number of physicians enrolled in our study.

The majority of respondents had good knowledge about hepatitis B disease and this could be related to the fact that all respondents were health workers and had residual knowledge about HBV. The majority of respondents agreed that hepatitis B is a common disease in Mali and this was also confirmed by Dao *et al*., 2015.

Overall, this study found that the level of knowledge of health workers on the interpretation of HBV infection results in Mali hospital was low to moderate (32.1% to 54.7%). This is contrary to the study carried out in Ghana by Balegha *et al*., (2021) as well as that carried out in Cameroon by Akazong *et al*., (2020). However, a study conducted in South Kivu, Democratic Republic of Congo, showed that a large number of health workers had low knowledge (Shindano *et al*., 2017). In a Sierra Leonean study, half of health workers were also found to have low knowledge about HBV transmission and prevention (Qin *et al*., 2018).

The moderate level of knowledge could be explained by the fact that most healthcare professionals have not received continuing medical education on hepatitis B infection. Thus, education on the transmission, diagnosis, treatment, and prevention of the infection is crucial and should be known in hospitals to facilitate global efforts towards its elimination. The annual celebration of World Hepatitis Day, organizing or facilitating the participation of medical personnel in university diploma courses on hepatitis could increase their enthusiasm for the disease.

Compared to the responses, an insufficient number of respondents (32.1%) were unable to recognize a cure after HBV infection, a result contrary to that of studies conducted in Ghana by Senoo-Dogbys (2022) which showed that 17% were unable to declare a cure for HBV through the results of serological markers as well as that of Isunju *et al*., (2022) only 10.8% in Uganda. This could be explained by the difference in geographical location and hospital policies in these

countries. More importantly, the difference here could also have been influenced by the different efforts to emphasize the role of medical personnel in preventing HBV infection across the world.

Furthermore, regarding immune tolerance, only a handful of them knew the correct answer. This confirms the findings of a Vietnamese study conducted by Hang-Pham *et al*., (2019). Nevertheless, the percentage of Vietnamese and Moroccan healthcare professionals who answered this question correctly was respectively higher (61.5%) and (83.0%) (Benazzoz M, 2022) compared to those in this study (22.6%). Regardless of the difference in percentages, this is still considered a misconception and may lead to increased transmission of HBV infection in case people become careless knowing that the infection is completely treatable. These results suggest that there is a great need to strengthen and regularize health education on the transmission, diagnosis, treatment and prevention of HBV infection among health professionals in Mali hospitals.

It was observed that slightly more than half of the respondents had a good perception of hepatitis B infection and vaccination, although routine HBV vaccine was not offered to healthcare workers in the study site, it is plausible that younger healthcare workers had a better uptake of the vaccine, probably due to their less access to HBV vaccine or less knowledge of the need for HBV vaccination. (Ogoina, Pondei and Adetunji 2014). The result of this study also indicated that senior health professionals with more years of work experience were more likely to complete HBV vaccination. The motivation for this may be; Access to vaccines, financial implications and risk perception are some of the variables proposed to determine vaccination completion rates by health workers. This result, however, contradicts the findings of the research carried out by (Ogoina, Pondei, Adetunji, Chima and Isichei, Gidado, 2014).

Regarding the recognition of a vaccinated person through their serological markers, 56.6% of staff did not correctly recognize this situation. These data are similar to those observed by a 2022 study from Morocco which found 52.1% of responses in favor of this situation. In the same vein, 54.7% of the healthcare staff questioned had given incorrect answers on the interpretation of serological markers (HBsAg -, Ac antiHBc -, anti HBs Ac -) which will need to be checked before proposing vaccination. The responses of our respondents are lower than those of the 2015 study in Mali (Ngono AMC *et al*., 2015) which found 97.8%. To propose a possible vaccination, all serological markers (HBs Ag, Ac HBc Ig G; Ac HBc Ig M. and anti -HBs Ac) are negative. Only the positive serological marker (anti-HBs Ac) can explain the vaccination status of a person against viral hepatitis B. The seroprotection (immunized) rate must be greater than or equal to 10 IU (International Unit) for an immunocompetent person and greater than or equal to 100 IU for an immunocompromised or hemodialyzed person. When this anti- HBs Ac rate is lower than those described above, then revaccination against the disease is carried out according to the WHO (Benazzoz M, 2022).

Regarding the knowledge of coinfection or overinfection of hepatitis Delta with hepatitis B (situation V), 50.9% of staff gave an incorrect answer. Our data are close to those obtained in 2016 in Eritrea with 61.3% (Bader F *et al*., 2016).

CONCLUSION

This study allowed us to test the level of staff knowledge about viral hepatitis B by subjecting them to several possible situations regarding hepatitis B infection. This study generally revealed an insufficient level of staff knowledge about this pathology. This can lead to harmful practices in patient care. Continuous training of staff is necessary to promote good preventive, diagnostic and curative practices.

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