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Frequency of Immunogical Markers and Hepatitis B Immunization of Health Personnel and Health Science Students in Conakry, Guinea

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Abstract

Introduction: The hepatitis B virus (HBV) is a DNA virus responsible for inflammation of the liver. It is transmitted by unprotected sexual intercourse with an infected person, by contact with infected blood, and vertically from mother to child. The risk of contagion is very high in healthcare environments, especially for under-equipped and less experienced staff.

Objective: The aim of this study was to determine seroprevalence and risk factors for HBV transmission among health science students and health care staff in Conakry.

Methods: This was a prospective cohort involving staff from Conakry's three hospitals and medical centers, as well as health science students from Conakry's public and private universities and health schools, i.e. 24 facilities. The data collected concerned socio-demographic information, vaccination status and 2ml of blood in a tube without anticoagulant, on which the AgHBs was tested and the rest transported to the immuno-serology laboratory of the Institut National de Santé for further testing. Statistical analyses were performed using SPSS software. The p-value was calculated to determine the existence of a statistically significant relationship between the study variables.

Results: A total of 3041 staff and students in the health sciences participated in the study, of whom 257 were HBsAg positive (8.5%). All these AgHBs-positive participants also carried total anti-HBc antibodies and 2.3% were HBeAg carriers.

Conclusion: Hepatitis B is a public health problem in universities and health facilities in Conakry. A study extended to other regions of the country would provide a better picture of the extent of hepatitis B in Guinea.

Keywords: Hepatitis B; Health science student; Health workers; Conakry; Guinea

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Introduction

Despite enormous progress in infection prevention and control, hepatitis B remains a major health problem worldwide, especially for healthcare workers who handle blood in their daily practice. This problem is even more serious in developing countries, where they are more exposed to contaminated sharps, with around 50% of occupational infections thought to be due to hepatitis B virus through wounds [1-3].

One study reported that around 2 million healthcare workers are exposed to hepatitis B and have a tenfold increased risk of contracting the disease due to occupational exposure [4]. Other studies have also reported 14.4% and 1.4% prevalence of HBV and HCV among healthcare workers,

with the highest proportions observed among dentists, nurses, dialysis unit staff, laboratory staff or doctors [5,6]. Student healthcare professionals, who also perform these procedures, are at greater risk than supervisors, due to their lack of experience in administering care or handling blood [7].

According to the World Health Organization (WHO), the average number of occupational accidents per healthcare worker varies from region to region (0.2 to 4.7 accidents each year), as does the proportion of healthcare workers in the general population (0.2 to 2.5%) [8,9].

Few data are available on the extent of hepatitis B among healthcare professionals in Africa, although its magnitude could be significant in view of the frequency of blood and body fluid exposure accidents reported among caregivers [10-12].

In Guinea, some recent data on the hepatitis B virus have been found in the literature. Among them, that carried out by Camara A. et al in 2024 on blood donors in N'Zérékoré which reported 13.4% [13]; Souaré et al. in 2024 on a review of studies from 2000 to 2002 with a reported prevalence varying from 7.54% to 21.665% in different groups [14] and that of Kaba D. et al. in 2020 (9.17%) [15]. All these studies show very high hepatitis B prevalence.

However, no study has been found in the literature on the hepatitis B virus, either among health-care workers or among students of health sciences in Guinea.

The aim of this study is to estimate the HBsAg carriage rate among health-care workers and students in the city of Conakry, with a view to setting up an immunization program for participants not infected with this pathogen.

Setting and methods

This was a prospective cohort involving health science students from public universities (Medicine, Pharmacy, Odontology, Laboratory Technology) and private universities (Source, Koffi Annan), Conakry health schools (Nelson Mandela, Roi Hassane II, Institut professionnel de formation des agents de santé Dabompa), health personnel from the three national hospitals and the Communal Medical Centers of Conakry. The study population was made up of all students and health personnel present in the targeted structures (i.e. 24 sites at the time of our visit). The study population consisted of all students and health personnel present in the target structures (24 sites) at the time of our visit.

Data collection consisted in administering a questionnaire containing the sociodemographic characteristics of the participants, after which a capillary blood sample was taken for HBV surface antigen testing using a rapid test. A volume of at least 2 ml of whole blood was then collected in a dry tube and transported to the laboratory of the National Institute of public Health for storage at -30°C after centrifugation and decantation, followed by a biological analysis after one month. Confirmations were made by chemiluminescence using the Architect 1000 i SR (Abbott industry). Statistical analyses were performed using SPSS software. The p-value was determined with an error of 0.005% to determine the existence of a statistically significant relationship between the study variables [16].

Methods

Types and setting of study

This was a 6-month prospective descriptive study of health science students and health personnel in Conakry's hospitals, community medical centers, universities and health schools.

Data collection

we prospectively collected socio-demographic and epidemiological data from all participants (gender, age, education level, occupation, residence and vaccination status). We then took a venous sample of 2ml of blood in a dry tube. Immediately afterwards, HBsAg was detected using a rapid immuno-chromatographic diagnostic test. All participants who tested negative by RDT received three injections of hepatitis vaccine, in line with the vaccination strategy for this infection in Guinea. Samples were transported to the INSP immunoserology laboratory and decanted for storage at -30°C until biological analysis.

Biological analysis

Samples were removed from the freezer and left to thaw at room temperature for 2 hours. They were then centrifuged at 2000 rpm for 10 min. All samples were subjected to analysis on the Architect i1000SR chemiluminescence analyzer (CMIA), the principle of which involves labeling antibodies with chemiluminescent compounds capable, in the presence of acridinium carboxamide, of producing light in proportion to antigen concentration. In practice, monoclonal antibodies directed against HBsAg are attached to magnetic microparticles and incubated with patient serum. Monoclonal antibodies to HBsAg labelled with acridinium carboxamide are added to the reaction medium. The microplate wells are exposed to a magnetic field, which separates the microparticles from the antibodies. The solution is then alkalinized, inducing the chemiluminescent compound to emit light. The light measured is proportional to the concentration of HBsAg in the solution.

The test calculates the result on the basis of the E/VS ratio. E/VS = URL (Reduced Light Unit) of the sample / Threshold URL value. Samples with an E/VS value below 1.00 are considered negative. Samples with an E/VS value greater than or equal to 1.00 are considered reactive and must be reanalyzed in duplicate.

Ethical aspects

The protocol was approved by the scientific committee of the Gamal Abdel Nasser University of Conakry. Data were collected anonymously and will only be used within the framework of the study, while respecting confidentiality. Informed consent was obtained from all participants prior to enrolment. The principle complied with the Declaration of Helsinki.

Statistical analysis

Our collected data were entered and exported to SPSS software for analysis. The p-value was calculated to determine the existence of a statistically significant relationship between the study variables.

Results

Description of participant's socio-demographic characteristics

A total of 3041 participants were enrolled in the study. HBsAg surface markers were detected in 257 participants (8.5%). Anti-HBc antibodies (IgM and IgG) were also detected in 257 participants, or 8.5%. HBeAg was found in 6/257 positive participants, i.e. 2.33%.

The distribution of participants by socio-demographic characteristics showed a predominance of women (59.2%), mostly nurses (39.0%), over half of whom were from Ratoma commune

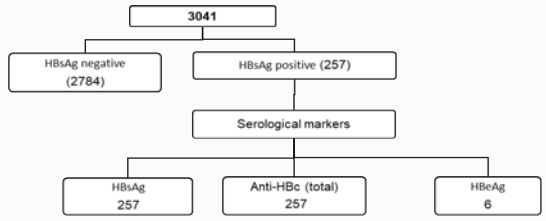

Figure 1: Serological status of health workers, students and trainees in Conakry, Guinea.

(50.8%). Of these, 120 were HBsAg positive, representing a seroprevalence of 6.7%.

The majority of participants had a mean age of 31.03, with a standard deviation of 9.74. HBsAg was reported in 257 (8.5%), of whom 24.87% were HBeAg positive. Transaminase assays showed 20.23% GOT-ASAT versus 9.84 GPT-ALAT (Figure 1).

The distribution of participants by socio-demographic characteristics showed a predominance of women (59.2%), mostly nurses (39.0%), over half of whom were from Ratoma commune (50.8%). A prevalence of 257 participants were HBsAg-positive, representing a seroprevalence of 8.5% (Table 1).

The majority of participants had a mean age of 31.03 with a standard deviation of 9.74. HBsAg was reported in 257 (8.57%) of whom 24.87% were HBeAg positive. Transaminase assays showed 20.23% GOT-ASAT versus 9.84 GPT-ALAT (Table 2 and 3).

Discussion

We carried out a prospective analytical study on the detection of immunoserological markers of hepatitis B in health-care personnel and health-science students in the city of Conakry. The aim of the study was to estimate the HBsAg carriage rate among health-care workers and students in the city of Conakry, with a view to setting up an immunization program for participants not infected with this pathogen.

A total of 3041 volunteer participants were included, who had been tested for HBV and/or immunized against hepatitis.

Participants were predominantly female (59.2%) and married (50.0%), with a predominance of nurses (39.0%), and resided mainly in the Ratoma commune (50.0%). Similar results have been reported from Mozambique, where a cohort of 315 health care workers were predominantly nurses [17]. This supports the view that women are in the majority in paramedical disciplines.

This study reported a seroprevalence of 8.5% of HBsAg and anti-HBc carriers among participants. According to the World Health Organization, Guinea is in a high-prevalence zone varying between

Table 2: Distribution of participants according to biological parameters analysed.

	Total	Minimum	Maximum	Average	Ecart-type
Age	3041	18	65	31.03	9.74
HBsAg	257	0.74	735.44	8.57	64.5
HbeAg	257	0.23	1096.2	24.87	159.2
Anti-Hbc antibodies	257	3.27	9.84	8.62	0.93
GOT_ASAT	257	10	59	20.23	5.74
GPT_ALAT	257	4	40	9.84	3.56
Total	257				

Table 1: Distribution of participants by socio-demographic characteristics.

Variables	Terms and conditions	Frequency	(%)	(%) valid	(%) cumulative
Gender	Female	1799	59.2	59.2	59.2
	Male	1242	40.8	40.8	100
Profession	*Biologist	317	10.4	10.4	10.4
	Student	663	21.8	21.8	32.2
	Nurse	1185	39	39	71.2
	Doctor	830	27.3	27.3	98.5
	Pharmacist	46	1.5	1.5	100
Marital status	Single	1520	50	50	50
	Divorce	3	0.1	0.1	50.1
	Married	1502	49.4	49.4	99.5
	Widow/Widowers	16	0.5	0.5	100
Residence	Coyah	97	3.2	3.2	3.2
	Dixinn	240	7.9	7.9	11.1
	Dubreka	111	3.7	3.7	14.7
	Kaloum	115	3.8	3.8	18.5
	Matam	132	4.3	4.3	22.9
	Matoto	802	26.4	26.4	49.2
	Ratoma	1544	50.8	50.8	100
Serological	Negative	2784	91.5	91.5	91.5
	Positive	257	8.5	8.5	100
	TOTAL	3041	100	100	

*Biologist= laboratory staff with a master's or bachelor's degree

Table 3: Univariate analysis of the distribution of participants according to socio-demographic characteristics.

Serological Status					
		Negative	Positive	Total	P-value
Gender	Female	1679	120	1799	Chi 2 <0.001
	Male	1105	137	1242	
Profession	Biologist	297	20	317	Fisher exact <0.050
	Student	595	68	663	
	Nurse	1082	103	1185	
	Doctor	771	59	830	
	Pharmacist	39	7	46	
Marital Status	Single	1373	147	1520	Fisher exact 0.024
	Divorced	3	0	3	
	Married	1395	107	1502	
	Widower/Widow	13	3	16	
Residence	Coyah	88	9	97	NS
	Dixinn	220	20	240	
	Dubreka	104	7	111	
	Kaloum	106	9	115	
	Matam	118	14	132	
	Matoto	733	69	802	
	Ratoma	1415	129	1544	
Total		2784	257	3041	

8% and 20% [18]. Several authors have reported lower results in a review of 25 studies carried out in Africa and Asia covering more than 10,000 healthcare workers in 11 countries, with an overall prevalence of 5.0% for Africa slightly higher than for Asia [19].

Further superior results were reported in 2010 by the Society of Health Professionals in Epidemiology in the USA, which revealed a seroprevalence of hepatitis B among healthcare workers two to four times higher than that of blood donor controls [20]. In Burkina Faso, a study carried out on a sample of 157 healthcare workers in 2008 noted a seroprevalence of 12.1% for HBsAg and 63.7% for at least one of the HBV markers [21]. A recent study by A Camara et al of blood donors in the N'Zérékoré region reported a 13.4% prevalence of HBsAg carriage [22]. Although this result is higher than ours, it corroborates most of the data in the literature.

The transaminase assay showed that 20.23% of participants had elevated GOT-ASAT versus 9.84% GPT-ALAT. Transaminase elevations are often correlated with HBV genome reduction, HBeAg seroconversion and ccDNA inhibition/reduction, characterizing the degree of liver function impairment and appear to be a marker for the establishment of functional recovery.

This study has the limitation of focusing on the situation of staff in Conakry, and should be extended to the whole country in order to correctly measure the extent of hepatitis B among health care staff and students in Guinea. Continuous training on infection prevention and control procedures and compulsory vaccination should be organized by the authorities to reduce the impact of infection.

Conclusion

Although the healthcare setting is a favorable environment for the risk of infection for staff and student healthcare professionals. Our study shows proportions similar to those of the country's general population. This would indicate the progress made by the country's health authorities in raising staff awareness and providing them with ongoing training over the past few years, which must continue in order to maintain the health of staff already tested by the Ebola virus disease. The study also made it possible to administer three doses of hepatitis B vaccine to participants who tested negative.

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Authors' Contributions

Study design: ASB, AC, MC and AT; Biological analysis of samples: ASB, AC, AK, ATT, NT, AHD, MCD; Analysis of results and drafting of manuscript: ASB, AC, KK, TID, FAT and AT Contribution to the editing of the manuscript: all authors participated in the editing and improvement of the manuscript.

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