Research Article
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Hepatitis B and C in healthcare professionals at the CNHU-HKM in Cotonou: epidemiological and diagnostic aspects

Abstract

Background: Infection with hepatitis B virus (HBV) and hepatitis C virus (HCV) is a major public health problem worldwide. The aim of this study was to investigate the epidemiological and diagnostic aspects of HBV and/or HCV infection among healthcare professionals at the CNHU-HKM in Cotonou.

Methods: This was a descriptive and analytical cross-sectional study. Data collection was prospective and lasted 2 months, from July 2022 to September 2022 at the university occupational health clinic, then at the university hepato-gastroenterology clinic of the CNHU-HKM in Cotonou.

Results: A total of 806 people were included, with a mean age of 43.1 ± 1.9 years and a sex ratio of 1.1. Nurses were in the majority (259; 32.1%), followed by orderlies (185; 23%) and administrative staff (122; 15.1%). HBsAg was positive in 51 subjects, for a prevalence of 6.3%, and anti-HCV antibody in 6 subjects, for a prevalence of 0.7%. Of these positive cases, 23 returned for further investigations, 78.2% of them asymptomatic. Among HBsAg carriers, 13 were chronically HBeAg-negative (59.1%). None of the subjects had cirrhosis or hepatocarcinoma. There were no factors significantly associated with the presence of HBsAg in healthcare professionals.

Conclusion: This study shows that hepatitis B and C are common among all health professionals at this hospital, and are usually asymptomatic. Systematic screening (at the time of hiring) is therefore desirable, in order to ensure adequate care and contribute to the eradication of these scourges in Benin.

Keywords: Hepatitis B, hepatitis C, healthcare professionals, CNHU-HKM, Cotonou

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Introduction

HBV and HCV infection is a major public health problem worldwide. According to the latest figures from the World Health Organization (WHO) in 2019, 296 million people were living with chronic hepatitis B, with 1.5 million new infections each year. As for HCV infection, 58 million individuals are chronic carriers worldwide, also with 1.5 million new infections each year.[1] Africa represents a zone of high hepatitis B and C endemicity, with 81 million people chronically infected with HBV and 9 million with HCV.[1]

In Benin, the prevalence of hepatitis B is estimated at 6% in 2019 according to a general population study by Kpossou et al.[2] and 1.5% for hepatitis C in 2016 in another general population study.[3] A key event in the natural history of chronic hepatitis B and C is the development of cirrhosis.[4] The complications associated with cirrhosis are largely responsible for the morbidity and mortality associated with this condition.[4] These complications include ascites, hepatic encephalopathy, jaundice, hepatorenal syndrome, digestive haemorrhage from ruptured oeso-gastric varices and hepatocellular carcinoma (HCC). The onset of these complications involves factors linked to the virus, the environment and the patient's condition. As far as terrain is concerned, apart from age and sex, co-morbidities play an important role.

Among those at high risk of contracting hepatitis B or C are healthcare workers. Healthcare workers are those who handle biomedical products, in this case labile blood products and sharps used in patient care, which presents a high risk for this profession. A study carried out in Libya in 2009 to assess the status of healthcare staff in the country's 5 major hospitals found a prevalence of 1.8% for hepatitis B and 2% for hepatitis C in a sample of 601 healthcare workers.[5] Fayomi et al.[6] reported in 2011 a prevalence of 31.3% for HBV and 12.5% for HCV among healthcare professionals in the Parakou-N'dali health zone.

However, to the best of our knowledge, no recent study had been carried out in Benin on hepatitis B and C infections among healthcare workers. The aim of this study was to investigate the epidemiological and diagnostic aspects of HBV and/or HCV infection among healthcare professionals at the CNHU-HKM in Cotonou.

Methods

The study took place in Cotonou at the CNHU-HKM at the Clinique Universitaire d'Hépato-Gastroentérologie and at the Clinique Universitaire de Santé au Travail. It was a cross-sectional study with descriptive and analytical aims, covering the period from 07/14/2022 to 09/09/2022. Data collection was prospective. The study population consisted of CNHU-HKM healthcare professionals still in service. CNHU-HKM healthcare professionals who had given their consent to participate in the study were included. As for non-inclusion criteria, they were retired CNHU-HKM healthcare professionals. Data were collected using an electronic survey form designed on the basis of different variables. The dependent variable was the presence of HBsAg and/or anti-HCV antibody in the blood. The variables related to HBV infection (HBe antigen, anti-HBe antibody, HBV DNA PCR) and those related to HCV infection

(ELISA-positive anti-HCV antibody, HCV RNA PCR). The following independent variables were studied: socio-demographic variables (age, sex, nationality, department, marital status, religion, city of residence, qualification, current department of practice, number of years in the profession); antecedents and risk factors (previous HBV screening, HBV vaccination, previous HCV screening, hemodialysis, previous transfusion, sickle cell disease, hemophilia, medicalized circumcision, presence of scarification, dental care (avulsion, scaling), surgery, tattoos, multiple sexual partners, spouse's HBV/HCV serological status, alcohol consumption, tobacco consumption, injection drug use); comorbidities (hypertension, diabetes, dyslipidemia, HIV/AIDS, renal failure, metabolic syndrome); clinical data: (anorexia, asthenia, weight loss, dyspepsia (nausea, vomiting, high digestive discomfort, belching, feeling of early satiety, post prandial bloating...), diarrhea, constipation, arthralgia/myalgia, abdominal pain (right hypochondrium, epigastrium, right flank,...), fever, BMI, extradigestive manifestations. Hepatomegaly, jaundice, ascites, splenomegaly, collateral venous circulation; paraclinical data (transaminases (ASAT, ALAT), TP, alkaline phosphatases, Gamma GT, total and conjugated bilirubin, serum protein electrophoresis (albumin, gamma globulin), AFP, platelet count, liver fibrosis investigation (APRI score, Fibrotest/Actitest, Fibroscan), abdominal ultrasound, upper GI endoscopy. HIV/AIDS, anti-VHD antibodies). We collected data in several stages.

Initially, CNHU-HKM staff were received in the personnel medicine department, where we collected their general information and issued the examination voucher for the HBV/HCV test, which was carried out in the department's consultation room. After the doctor had explained the study (its aim, objectives and stages) to the patients and obtained their informed consent, we proceeded to interview them for the rest of the data collection. The data collected in this way were entered into the questionnaire.

In a second phase, we consulted the hepato-gastroenterology department of those who were positive, for further information and tests. The test used was the OnSite Rapid Test for antigenic detection of HBV and anti-HCV antibodies, manufactured by ctkbiotech in the USA.

At the end of data collection, we entered and analyzed the data using a database designed with Epi-info software version 7.2.6. The results were presented mainly in the form of tables and graphs. Of the 825 CNHU-HKM personnel seen at the Clinique Universitaire de Santé au Travail, 806 were included in the study, i.e. a representativeness rate of 97%. Prior authorization was obtained from the authorities of the various departments where the study was carried out. We interviewed each patient to obtain free, individual and informed oral consent. The anonymity of each subject was respected. All results of examinations carried out as part of the study were forwarded to the attending physician.

Results

Socio-demographic characteristics of the study population

A total of 806 people meeting the inclusion criteria were surveyed. There was a male predominance (430; 53.3%), with a sex ratio of 1.1. The median age was 43.1 ± 1.9 years, with extremes ranging from 20 to 66 years (Table 1). Christianity predominated (726; 90.2%). The majority of respondents lived in Abomey-Calavi (398; 49.4%). The distribution of workers by department of origin was as follows: administrative department (103; 12.8%), pediatrics (66; 08.2%), emergency (61; 07.6%) and gynecology-obstetrics (52; 06.5%) (Table 2). Married patients were more represented (589; 73.1%).

Table 1 Age distribution (in years) of CNHU-HKM staff screened for HBV/HCV in 2022 (N=806)

	Work force	Percentage (%)
20 - 30	115	14.3
30 - 40	182	22.6
40 - 50	329	40.8
50 - 60	170	21.1
> 60	10	1.2
Total	806	100

Table 2 Distribution by qualification of CNHU-HKM staff screened for HBV/HCV in 2022 (N=806)

	Work force	Percentage (%)
Nurse	259	32.1
Care assistant	185	23
Administrative staff	122	15.1
Biological technician	36	4.5
Midwife	16	0.2
Cardiologist	14	1.7
Intensive care anesthetist	11	1.4
Radiologist	11	1.4
Physical and rehabilitation physician	5	0.6
Rheumatologist	3	0.4
Pediatrician	3	0.4
Surgeon	2	0.3
Hepato-gastroenterologist	1	0.1
Other	138	17.1
Total	806	100

Epidemiological characteristics

Of the 806 subjects, 51 had a positive HBsAg rapid test, for a prevalence of 6.3%, and 6 had a positive HCV rapid test, for a prevalence of 0.7%. Risk factors for viral contamination were dominated by non-medical circumcision (310; 38.4%), dental care by scaling and avulsion (31.0% and 27.3% respectively), previous surgery (238; 29.5%) and scarification (222; 27.5%) (Table 3). 126 people (17.9%) had once had a blood exposure accident. The serological status of the spouses was mostly unknown, in relation to hepatitis B (413; 55.7%) and hepatitis C (428; 58.1%). With regard to associated factors, we were only able to study those associated with hepatitis B. Factors associated with hepatitis C could not be studied, as only one case of hepatitis C was reviewed to complete the data. There was no statistically significant association between hepatitis B and the socio-demographic variables studied (Table 4).

Table 3 Distribution according to viral contamination risk factors of CNHU-HKM staff screened for HBV/HCV in 2022 (N=806)

	Work force	Percentage (%)
Non-medical circumcision	310	38.4
Descaling	250	31
Surgical procedure	238	29.5
Presence of scarification	222	27.5
Dental care, avulsion	220	27.3
Multiple sexual partners	53	6.6
Blood exposure accident	126	17.9
Previous transfusion	42	5.2
Tattoo	17	2.1
Drug use	1	0.1

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Table 4A Factors associated with HBV carriage among CNHU-HKM Cotonou staff screened for HBV in 2022 in univariate analysis

	Hepatitis B		p-value	OR	IC95% [OR]
	Yes	No			
Gender					
Male	33	402	0.81	1	
Female	18	353		0.93	0.52 – 1.65
Age (year)					
20 - 30	12	103		1	
30 - 40	10	172		0.5	0.2 – 1.2
40 - 50	20	309	0.29	0.56	0.26 – 1.17
50 - 60	9	161		0.47	0.19 – 1.17
> 60	0	10		0.38	0.12 – 3.4
Place of origin					
Cotonou	26	271		1	
Abomey-Calavi	20	378		0.55	0.3 – 1.008
Porto-Novo	2	51	0.332	0.4	0.09 – 1.77
Ouidah	1	31		0.34	0.04 – 2.56
Other	2	24		0.87	0.19 – 3.88
Professional experience (n= 780)					
< 5 years	14	144		1	
5 - 10 years	8	148	0.31	0.55	0.22 – 1.36
> 10 years	27	439		0,63	0.32 – 1.24
Marital status					
Married	34	555		1	
Single	10	116		1.61	0.69 – 3.01
Concubinage	6	75	0.52	1.29	0.52 – 3.19
Divorced	0	5		1.05	0.73 – 1.51
Widowed	1	4		4.05	0.44 – 37.31
Religion					
Christian	46	681		1	
Muslim	2	42	0.84	0.7	0.16 – 3.004
Animist	1	15		0.98	0.12 – 7.63
Other	2	17		1.74	0.39 – 7.76

Prior to the survey, five hundred and five people (62.7%) had been screened for hepatitis B once. The result was positive for 27 (5.3%) and 299 (37.1%) workers had been vaccinated against hepatitis B. Four hundred and twenty-one workers (52.2%) had been screened for hepatitis C once in the past. The result was positive for 4 (1%). Of the total, 3% (24) had sickle cell disease and 75.6% (609) consumed alcohol, mostly occasionally (565; 07.2%). Hypertension was the most common comorbidity (129; 16%).

Clinical features

We were able to examine 23 people (22 for HBV and 1 for HCV) during the study, out of the 57 positive (51 for HBs antigen and 6 for HCV antibody). Of those examined, one presented with dyspepsia, one with signs of gastro-oesophageal reflux (regurgitation and pyrosis) and 3 with asthenia. All patients were in good general condition. One patient showed epigastric tenderness and another abdominal tympany on physical examination. The rest had a normal physical examination. Of the 23 subjects, 18 (78.2%) were totally asymptomatic. The majority of patients (10; 43.5%) had a normal BMI. All 23 patients were in good general condition, with a WHO performance index of 0.

Table 4B Factors associated with the occurrence of hepatitis B among agents of the CNHU-HKM of Cotonou screened for HBV in 2022 in univariate analysis. (Continued)

	Hepatitis B		p-value	OR	IC95% [OR]
	Yes	No			
Previous transfusion					
No	45	719	0.11	1	0.8 – 5.76
Yes	6	36		2.15	
Non-medical circumcision					
No	11	109	0.12	1	0.83 – 3.91
Yes	40	270		1.8	
Avulsion dental care					
No	33	553	0.2	1	0.82 – 2.9
Yes	18	202		1.51	
Descaling					
No	30	526	0.08	1	0.82 – 2.76
Yes	21	229		1.82	
Drug injection					
No	51	754	0.79	1	0.2 – 5.23
Yes	0	1		1.36	
Multiple sexual partners					
No	46	707	0.37	1	0.59 – 4.1
Yes	5	48		1.58	
Spouse's serological status					
Positive	1	18	0.65	1	0.15 – 9.33
Negative/unknown	50	737		1.22	
Tattoo					
No	50	739	0.95	1	0.12 – 7.25
Yes	1	16		0.94	
Presence of scarification					
No	37	547	0.46	1	0.54 – 1.93
Yes	14	208		1.02	
Alcohol consumption					
No	13	184	0.7	1	0.49 – 1.8
Yes	38	571		0.94	
HBV vaccination					
No	36	471	0.28	1	0.38 – 1.32
Yes	15	284		0.71	
Arterial hypertension					
No	47	634	0.12	1	0.16 – 1.29
Yes	4	121		0.45	
Blood exposure accident					
No	49	631	0.71	1	0.54 – 2.25
Yes	10	116		1.11	

Paraclinical characteristics

Most patients had not tested for anti-HBs (21; 95.5%) and anti-HBc IgM (17; 77.3%). HBeAg was negative in the majority (17; 77.3%) and anti-HBeAg positive in 81.8% (18). B viral DNA PCR was performed and detectable in 77.3%. The mean viral load was 11,214,142.2 ± 46212.782 IU/mL, with extremes of 32 and 190,546,072 IU/mL. It was below 2000 IU/mL in 13 of the 17 subjects (59.1%) (Table 5). The mean ALT value was 30.4, with extremes of 16 and 90 IU/L. The standard deviation was 16.7. No patient had an ALT value greater than 5 times normal, allowing us to calculate the APRI score. The majority of HBsAg- and HCV-positive CNHU-HKM staff did not have clinically significant fibrosis (17; 73.9%). The majority of patients had chronic HBeAg infection (13; 59.1%) (Table 6).

Table 5 Distribution by HBV DNA quantitative PCR value of CNHU-HKM Cotonou staff testing positive for HBsAg in 2022 (N=22)

HBV DNA (IU/ML)	Workforce (n)	Percentage (%)
<2000	13	59.1
>2000	4	18.2
Inconnu	5	22.7

Table 6 Distribution according to HBV evolutionary profile of CNHU-HKM Cotonou staff testing positive for HBs antigen (N=22)

	Workforce	Percentage (%)
Chronic HBeAg+ infection (HBeAg+; DNA> 107 IU/ML; ALT normal)	1	4.5
Chronic HBeAg infection (HBeAg; DNA<2000 IU/ML; ALT normal)	13	59.1
HBeAg+ chronic hepatitis (HBeAg+; DNA between 104 _ 107 IU/ML; elevated ALT)	0	0
HBeAg chronic hepatitis - (HBeAg; DNA>2000 IU/ml; elevated ALT)	1	4.5
Latent phase (HBsAg; DNA<2000 IU/ml; ALAT normal)	0	0
Unknown	7	31.8

Abdominal ultrasound was performed in 19 HBsAg-positive patients. It was normal in 9 (47.3%) and abnormal in 10 (52.6%). The abnormalities found were : discrete homogeneous non-dysmorphic hepatomegaly (3; 15.8%), homogeneous dysmorphic hepatomegaly (1; 5.3%), heterogeneous hepatomegaly (1; 5.3%), uncomplicated vesicular lithiasis (1; 5.3%), biliary cyst (1; 5.3%), diffuse hepatic steatosis (2; 10.5%) and aerocolia (1; 5.3%).

Treatment and progress

No complications were observed in this study, notably no cases of cirrhosis or hepatocellular carcinoma in any of the patients. According to the evolutionary profile of HBsAg-positive patients, only 1 patient should be put on treatment because of hepatitis, but 15 patients (68.2%) were put on treatment with Tenofovir because they were healthcare workers performing invasive procedures. The efficacy and tolerability of the treatment will be assessed 6 months after the start of treatment by measuring transaminases and B viral DNA.

Discussion

General description of the population

The frequency of HBV infection was 6.3% and that of HCV 0.7% among healthcare professionals at the CNHU-HKM in Cotonou in 2022. The HBV prevalence found in our study is similar to the 6% found by Kpossou et al in a general population in Benin in 2019[2] and that of HCV lower than the 1.5% found by Kpossou et al in a general population in Benin in 2016.[3] The HBV and HCV prevalences found in our study are therefore no higher than those in the general population. The interest of prevalence is to have an idea about the frequency of infection among healthcare personnel in order to take adequate measures to avoid transmission to patients. The mean age of healthcare professionals at Cotonou's CNHU-HKM screened for HBsAg and HCV antibody in 2022 was 43.1 ±1.9 years, with extremes of 20 and 66 years. This average is similar to that reported by Elzouki et al.[5] in Libya, which was 32 ± 8.85 years. The study population was predominantly male (53.4%). The sex ratio was 1.1.

Mohamed et al.[7] reported an almost similar sex ratio of 1.6. Nurses (32.1%), orderlies (23%) and administrative staff (15.1%) were the most represented. Kateera et al [8] found similar results to ours in Rwanda, with a majority of nurses (32.5%). Administrative department workers were the most represented (103; 12.8%), followed by pediatrics (66; 8.2%) and emergency (61; 7.6%) in our study. In a study in Rwanda, Kateera et al [8] found the surgical department to be the most frequent (52; 13.9%), followed by medicine (47; 12.4%) and pediatrics (47; 12.4%). No factor was significantly associated with the occurrence of hepatitis B among staff. The proportion of blood exposure accidents was 17.9%.

Clinical and paraclinical characteristics

HBeAg was negative in the majority (17; 77.3%) and HBeAb positive in 18 subjects (81.8%). The aim was to determine the risk of HBV transmission in these patients, and to assess whether they had recently been infected.

B viral DNA PCR was performed and detectable in 77.3% (17 subjects), and was below 2000 IU/ml in 13 of the 17 subjects (59.1%). The majority of HBV-positive healthcare professionals therefore have a moderate level of B viral DNA replication, and therefore a low risk of transmission. We conclude from our study that the majority of HBV-positive healthcare workers at CNHU-HKM have a low risk of HBV transmission. The risk of transmission of HBV from healthcare workers to patients through blood exposure accidents during the administration of care is therefore low.

The main purpose of the viral load is to confirm the presence of the virus, but also to give an idea of the level of replication, and therefore of the risk of transmission. It is also useful for monitoring treatment and progression. In our study, we found a mean ALT value of 30.4, with extremes of 16 and 90 IU/L. Masayuki lkeda et al.[9] found in a 1998 study a lower mean ALT of 8.4 ±1.6. The majority of HBV- and HCV-positive healthcare workers at CNHU-HKM in 2022 therefore had no liver biochemical activity.

The majority of CNHU-HKM staff testing positive for HBsAg and HCV antibody did not have clinically significant fibrosis (17; 73.9%). Fibrotest, Actitest and Fibroscan were not performed. Our interest in assessing hepatic fibrosis was to see the level at which positive subjects were in liver disease, and to detect complications such as cirrhosis of the liver. Abdominal ultrasound was performed in 19 patients. It was normal in 13 (68.4%) and abnormal in 6 (31.6%). Discrete homogeneous non-dysmorphic hepatomegaly was the most common abnormality (3; 15.8%). These results show that the majority of patients had no serious liver damage and were not yet at the stage of complication.

The majority of patients had chronic HBeAg infection (13; 59.1%). The majority of patients were therefore inactive carriers with a low risk of contagiousness. The significance of this is that carriers of HBeAg chronic HBV infection, because of the immunological control of the infection, have an excellent long-term prognosis, with low necrotico-inflammatory activity, little progression of fibrosis, low risk of cirrhosis and hepatocellular carcinoma, and a high rate of HBsAg loss.[10-14]

The strong points of our study were that the CNHU-HKM staff included in the study were indeed those expected, having met the inclusion criteria. The variables were measured in compliance with scientific standards. The Rapid HBsAG/HCV Ab OnSite® test was used to detect HBsAg and HCV antibody. The conditions for antigen testing were met: capillary blood was drawn with a lancet and deposited in the part of the test reserved for blood, with diluent applied. The 15-minute time limit for reading the results was respected. But we

were also confronted with difficulties: the participation of only half of all the agents on duty at the CNHU-HKM Cotonou in the screening campaign, despite the numerous communications and awareness-raising campaigns concerning screening; the non-participation of more than half of the agents who were positive in the follow-up in the Hepato-gastroenterology department of the CNHU-HKM Cotonou; which meant that we did not have the clinical and paraclinical data concerning them. The failure of some of those who returned for further tests to complete all the investigations.

Conclusion

At the end of this study of healthcare professionals at the CNHU-HKM in Cotonou in 2022, we found that the frequency of HBV infection was high and that of anti-HCV antibodies relatively low, but similar to the frequencies in the general population in Benin. No factors were associated with HBV infection. Free systematic screening (at the time of hiring) is therefore desirable, to ensure adequate care and contribute to the eradication of these scourges in Benin.

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