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# Predictive Factors for Viral B and C Infection in Health Workers in a University Hospital in Ivory Cost

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## Abstract

**Purpose:** To evaluate the serological status of hepatitis B and C and to identify the risk factors for viral B and C infection in health workers at the university hospital. **Material and Method:** Mono-centric cross-sectional study carried out at Bouaké University Hospital from March 2nd to May 16th, 2016, concerning the health staff of the Bouaké University Hospital. Cross-sectional study mono-centric concerning the serological status of viral hepatitis B and C from the period from March 2nd to May 16th, 2016 of the health staff of the University Hospital of Bouaké. It has benefited from data from PNLHVi (national program against viral hepatitis) as part of its awareness campaign. The data were analyzed by SPSS software version 20.0. **Results:** Of the 1107 health workers, 632 had been included, representing a participation rate of 57.1%. The average age of the staff was 37.8 years with extremes ranging from 18 to 66 years. The sex ratio (H/F) was 0.8. Accidents with blood exposure were noted in 52.4% of cases. The maximum vaccine coverage was 16.1%. The prevalence of HBsAg was 8.4%. Contact with HBV was present in 3/4 of the staff. Anti HCV Ab was positive in 1.4% of the staff. Males, age over 50 and over 20 years of seniority were associated with HBV. Also, HBV infection was significantly higher in boys and girls (81.7%), nurses (78.3%) and nursing aides (73.8%), ($p = 0.022$). HCV infection was significantly correlated with emergency services. **Conclusion:** Age, gender, seniority, paramedic qualification, and high risk of exposure to body fluids were correlated with viral B infection while emergency department membership was a factor risk of HCV infection.

## Keywords

Prevalence, Risk Factors, Viral Hepatitis B, Viral Hepatitis C,

Health Personnel

## 1. Introduction

Viral hepatitis B (HBV) and Viral hepatitis C (HCV) pose a public health problem in the world especially in low-income countries with about 350,000 to 500,000 deaths per year [1] [2] [3]. Approximately 36 million health workers are victims each year of a work incident that exposes nearly 3 million to the risk of contamination by hepatitis B and C viruses [3]. In the course of their duties, health care workers are frequently exposed to HBV and HCV and it is estimated that approximately 75% of the overall exposure risk is transcutaneous compared to only one quarter for the cutaneous route; mucosa, with a higher risk of contamination for the transcutaneous route [1].

There are 3 degrees of contamination according to the causal link established between the medical staff and their patient:

- the transmission is confirmed when there is an epidemiological link and especially a confirmation by the presence of partial or complete sequence of similar DNA between the staff and their patient,
- the transmission is said probable if the genotype of the virus of the personnel and its patient is identical and that there is an epidemiological link between them,
- transmission is possible if there is an epidemiological link between the staff and their patient, the patient has no other risk factor for contamination and it is not possible to carry out a correspondence between pathogens [2].

Although several studies have reported the prevalence of HBV and HCV infections in different risk groups, so far there is little or no published data on the prevalence and risk factors of viral infection. B and C taking into account all health personnel in Côte d'Ivoire. Thus, this study aimed mainly at determining the seroprevalence of HBV and HCV infections and the associated risk factors among health workers at the University Hospital Center (CHU) in Bouaké, Côte d'Ivoire.

## 2. Material and Method

It is a cross-sectional mono-centric study with descriptive and analytical aims. The study took place from March 2nd to May 16th 2016 at the Bouaké University Hospital. Included in the study were health personnel (medical, paramedical) from the Bouaké University Hospital, who were present at the facility during the study period and gave their oral informed consent to the investigator. Administrative, technical and trainee staff were not selected for this study.

### 2.1. The Study Protocol

This study benefited from the work of PNLHVi (national program against viral

hepatitis) as part of its awareness campaign, which we inherited data. The study was conducted in two phases (a clinical phase and a biological phase).

*The clinical phase* was held from 02 to 16 March 2016 and consisted of a questioning of the health worker using a questionnaire that provided information on: its socio-professional characteristics (age, sex, service, qualification and seniority).

The services were classified according to the nature of the care provided in 5 groups which are:

- medical services;
- surgery services;
- the mother-child block that contained gynecology-obstetrics and pediatrics;
- medical and surgical emergencies;
- para-clinical services (radiology and laboratory).

The qualification was split into 2 groups:

- medical staff composed of doctors and surgeons;
- paramedical staff represented by nurses, midwives, caregivers, waiters, lab technicians and radiology and rehabilitation technicians.

Exposure of health workers was divided into 2 groups according to the risk of repeated and frequent contact with biological fluids:

♣ a high-risk group for exposure to body fluids consisting of surgeons, nurses, midwives, caregivers, waiters and lab technicians;

♣ a group at low risk of exposure including physicians, and radiology and rehabilitation technicians;

• his past medical history, namely the concept of previous transfusion, blood exposure accidents, and his vaccination status with respect to viral hepatitis B.

*The biological phase*; It followed the clinical phase and lasted until May 16, 2016. For each agent interviewed, a venous blood sample of 5 to 8 ml on a dry tube was made by phlebotomists made available by the department. Laboratory of the University Hospital of Bouaké. This sample is then stored in a cooler at a temperature of 15˚C to 20˚C before being sent to the biochemistry laboratory of the University Hospital of Bouaké for analysis. Once in the laboratory, the samples were centrifuged at 3000 rpm for 10 minutes, then the qualitative assay of HBsAg, HBcAb and HCV anti-Ab was carried out by the sandwich method with ECL technique using COBAS, then the samples were aliquoted for conservation (Serotec) before validation of the results by the assistants of the service.

## 2.2. Statistics

The data collected on the survey sheets were saved in an Excel file and then transferred for processing into the SPSS version 20.0 analysis software. A comparison of observed proportions was made from the KHI two tests and the p-value (significance level) was significant if it was less than 0.05.

### 2.3. Ethics

The study had obtained the agreement of the ethics committee, the heads of department and that of the Director of the University Hospital Center of Bouaké. The protocol was explained to the different CHU agents before his oral consent. The questionnaire was anonymous.

### 2.4. Results

Of the 1107 health workers of the University Hospital of Bouake, 632 were randomized to either a participation rate of 57.1%. The general characteristics of the 632 health workers are summarized in Table 1.

The average age of staff at Bouaké University Hospital was 37.8 years with extremes ranging from 18 to 66 years. Women predominated with a sex ratio (M/F) of 0.87. The services that participated massively were those of the gynecology-obstetrics/pediatrics block with 28% of participants, medicine with 27.7% of participants and surgery with 24.7% of participants. Health workers with less than 10 years of seniority accounted for 74.2% of the study population. Nursing aids and nurses with 32.6% of cases and 22.6% of cases respectively were the most numerous. Health workers at high risk of contact with body fluids were the most numerous with 75% of participants. In 3.6% of cases, health workers had a history of blood transfusion. Health workers had a blood exposure accident in 52.4% of cases. Health workers had responded be vaccinated in 46.4% of cases. Among them, 102 had made the 3 recommended doses, ie a maximum vaccination coverage of 16.1%. HBsAg was positive in 8.4% of health workers and HCV-positive anti was positive in 1.4% of health workers. Contact with HBV was 72.6% of the nearly 3 quarters of the staff. Les predictors of viral infection B and C are summarized in Table 2 and Table 3.

The HBsAg was higher in men significantly. The positivity of HBsAg was higher respectively in the para-clinical services in 13.1% of cases in emergency services in 11.1% of cases and 10.3% in medical cases not significantly. With a prevalence of 23.1%, health workers with 26 to 30 years of seniority were the most affected by HVB. Health workers are who reported being vaccinated against HBV and who had HBsAg accounted for 7.5% of cases. HBV contact was higher among health workers over 50 years of age significantly. HBV contact was higher in men than in women significantly. HBV contact was more important in surgery than in medicine in a non-significant way. Health workers most in contact with HBV were those who had a seniority of over 35 years (100%), between 31 and 35 years (90%) and between 21 and 25 years (90%). Contact HBV was significantly higher respectively in boys and girls of room in 81.7% of cases, nurses in 78.3% of patients and nursing aids in 73.8% of cases. Also contact HBV was significant higher among health workers at risk of high exposure to body fluids in 74.6% of cases. In multivariate analysis, age over 40 years, males, seniority over 25, paramedical qualification, and high risk of exposure to body fluids were significantly associated with HBV infection.

**Table 1.** General characteristics and seroprevalence of VHB_VHC infection in care staff at the Bouaké University Hospital.

| Variables | Total | HVB negative n % | HVB positive n % | HVC negative n % | HVC positive n % |
|---|---|---|---|---|---|
| Sex | | | | | |
| feminine | 338 | 107/31.7% | 231/68.3% | 334/98.8% | 4/1.2% |
| masculine | 294 | 64/21.8% | 230/78.2% | 289/98.3% | 5/1.7% |
| Ages | | | | | |
| <20 years | 1 | 0/0% | 1/100% | 1/100% | 0/0% |
| [20 - 29] years | 74 | 28/37.8% | 46/62.2% | 74/100% | 0/0% |
| [30 - 39] years | 345 | 98/28.4% | 247/71.6% | 340/98.6% | 5/1.4% |
| [40 - 68] years | 212 | 45/21.2% | 167/78.8% | 208/98.1% | 4/1.9% |
| Qualification: | | | | | |
| Nursing aids | 206 | 53/25.7% | 153/74.3% | 204/99% | 2/1% |
| Surgeons | 55 | 19/34.5% | 36/65.5% | 54/98.2% | 1/1.8% |
| Boys-girls of room | 82 | 15/18.3% | 67/81.7% | 80/97.6% | 2/2.4% |
| Nurses | 143 | 31/21.7% | 112/78.3% | 141/98.6% | 2/1.4% |
| Doctors | 63 | 26/41.3% | 37/58.7% | 62/98.4% | 1/1.6% |
| Midwives | 45 | 14/31.1% | 31/68.9% | 44/100% | 0/0% |
| Laboratory technician | 25 | 7/28% | 18/72% | 24/96% | 1/4% |
| Radiology and Rehabilitation Technician | 13 | 6/46.2% | 7/53.8% | 13/100% | 0/0% |
| Department: | | | | | |
| Surgery | 156 | 36/23.1% | 120/76.9% | 155/99.4% | 1/0.6% |
| gynecology and pediatrics | 177 | 49/27.7% | 128/72.3% | 175/98.9% | 2/1.1% |
| Medicine | 175 | 51/29.1% | 124/70.9% | 174/99.4% | 1/0.6% |
| Paraclinical | 61 | 17/27.9% | 44/72.1% | 59/96.7% | 2/3.3% |
| Emergencies | 63 | 18/28.6% | 45/71.4% | 60/95.2% | 3/4.8% |
| Transfusion: | | | | | |
| No | 609 | 167/27.4% | 442/72.6% | 600/98.5% | 9/1.5% |
| Yes | 23 | 4/17.4% | 19/82.6% | 23/9100% | 0/0% |
| Degree of exposure: | | | | | |
| High | 474 | 124/26.2% | 350/73.8% | 468/98.7% | 6/1.3% |
| Low | 158 | 47/29.7% | 111/70.3% | 155/98.1% | 3/1.9% |
| Vaccination: | | | | | |
| No | 339 | 77/22.7% | 262/77.3% | 335/98.8% | 4/1.2% |
| Yes | 293 | 94/32.1% | 199/67.9% | 288/98.3% | 5/1.7% |
| Seniority: | | | | | |
| <10 years | 469 | 134/28.6% | 335/71.4% | 464/98.9% | 5/1.1% |
| [10 - 19] years | 95 | 27/28.4% | 68/71.6% | 94/98.9% | 1/1.1% |
| [20 - 29] years | 46 | 9/19.6% | 37/80.4% | 44/95.7% | 2/4.3% |
| [30 - 39] years | 19 | 1/5.3% | 18/94.7% | 19/100% | 0/0% |
| [40 - 49] years | 3 | 0/0% | 3/100% | 2/66.7% | 1/33.3% |

**Table 2.** Correlation between factors predictive of viral infection B (contact-infection) and positivity of viral markers B.

| Variables | p | 0R | IC |
|---|---|---|---|
| **Sex: Féminine vs masculine** | **0.003** | **1.66** | **1.16 - 2.38** |
| **Age: <40 years vs ≥40 years** | **0.016** | **1.59** | **1.07 - 2.35** |
| **Qualification: Medical vs paramedical** | 0.002 | 1.22 | 1.05 - 1.42 |
| **Department** | | | |
| -Paramedical vs medical | 0.49 | 0.96 | 0.53 - 1.72 |
| -Emergencies vs hospitalization | 0.35 | 1.09 | 0.76 - 1.54 |
| **Seniority <30 years vs ≥30 years** | **0.008** | **8.11** | **1.08 - 60.79** |

**Table 3.** Correlation between factors predictive of viral infection C and positivity of viral markers C.

| Variables | p | 0R | IC |
|---|---|---|---|
| Sex: Féminine vs masculine | 0.41 | 1.45 | 0.38 - 5.43 |
| Age: <40 years vs ≥40 years | 0.35 | 1.59 | 0.42 - 6.01 |
| Qualification: Medical vs paramedical | 0.52 | 1.25 | 0.27 - 6.09 |
| Department | | | |
| -Paramedical vs medical | 0.21 | 2.73 | 0.55 - 13.45 |
| **-Emergencies vs hospitalization** | **0.007** | **8.23** | **1.35 - 50.30** |
| Seniority <30 years vs ≥30 years | 0.27 | 3.58 | 0.43 - 29.97 |

For contact with HCV, it was higher among health workers over 50 in 2.74% of cases. HCV contact was higher in men than in women. The agents most in contact with HCV were those who had more than 35 years of seniority in 10% of cases. HCV contact was higher for laboratory technicians in 4% of cases and for boys and girls in 2.4% of cases. HCV contact was greatest among health workers with low risk of exposure to body fluids. HCV infection was predominant among workers over 50 years, men in emergency departments, over 35 years of seniority, among laboratory technicians. However, there was no significant relationship between viral C infection and these variables in multivariate univariate analysis, whereas HCV infection was significantly correlated with emergency services (p = 0.007; 8.23 [1.35 - 50.30]).

## 3. Discussion

The age group of 30 to 40 years is the one found in the work in Africa and the Middle East [4] [5] [6]. The sex ratio close to 1 seems to reflect the gender parity advocated by our leaders in the employment sector [6] [7] [8]. Nurses and nursing aids made up the population at risk for exposure to body fluids as mentioned in the literature [7] [9] [10] [11]. More than half of the health workers in this study had been exposed to body fluids, Bathaix had an blood exposure accidents in 34.6% of health staff [12]. According to the World Health Organization (WHO),

the misapplication of universal measures to prevent infections in hospital settings [1]. Immunization coverage of health workers at Bouaké University Hospital was 16.1%, a low coverage, contrary to data from the literature [6] [7] [10] [13]. In Saudi Arabia, extensive vaccination campaigns undertaken by the Kingdom in the 1990s to reduce the prevalence of HBV resulted in a high proportion of health workers (84.7%) who received one vaccine dose in the 5 years before the study [6]. For African countries, it is only recently that most of these countries have systematically included HBV vaccination in their immunization program [1]. The prevalence of HBsAg of health staff at Bouaké University Hospital was 8.4%. This prevalence was close to that found in blood donors in Bouaké (12.5%) [14] and consistent with data from the literature in African countries [5] [8] [13]. Nearly three-quarters of the study population had contact with HBV as in most African countries in highly endemic areas [15]. The risk of HBV infection was significantly related to the seniority of health workers and the male sex as observed in previous work [5] [6] [8]. Indeed, several authors agree that seniority was correlated with the positivity of HBsAg. And this seniority threshold varied according to the country. In this study, it was 25 years old when in Tanzania and Uganda this threshold was 10 years old [8] [13] [16]. The increase in the prevalence of HBV with age and seniority can be explained by the combination of the risks of contact with the virus as well as in the working life. According to the WHO, the risk of viral B infection is greater in case of impaired reflexes on universal measures of infection prevention and in case of increased exposure to blood exposure accidents [1] [16]. In this study, paraclinical services and emergencies were most affected by HBV, unlike in Uganda, where HBsAg positivity was predominant in medical services. Depending on the qualification of the agents, the study identifies 3 corporations with prevalences of HBV greater than 10%. These are surgeons (10.9%), nurses (11.2%) and radiology and rehabilitation technicians (23.1%). Mueller in Tanzania found that doctors and nurses had a significantly higher prevalence of HBsAg compared to other professions [13]. In the United States [9] and Burkina Faso [8], authors have significantly demonstrated a higher prevalence of HBsAg, respectively, in nurses and surface technicians. Of all these studies, the nursing corps was regularly cited as health workers who had a high prevalence of HBsAg. There was no significant link between viral contact B and the health worker service. Due to the permanent rotations of the paramedical staff in the different services. But HBV contact was significantly higher among paramedics than nursing aids, room boys and girls and nurses ($p = 0.022$) as described by several authors [5] [8] [12] [16]. Paramedical staff being more exposed to body fluids is often a victim of blood exposure accidentsin the practice of their profession. Thus, according to Bathaix, nurses were more exposed to blood exposure accidents [12]. The high prevalence of contact among ward boys and girls and caregivers could be explained by a poor knowledge of the risks of infection by them and also by the lack of knowledge of the universal measures of infection prevention in hospital settings. Also in our context, room boys and girls

as well as nursing aids tend to perform the tasks usually reserved for nurses, exposing them a little more to HBV.

The prevalence of HCV among health workers at Bouaké University Hospital was 1.4%. This result was consistent with literature data both in the US and in Africa [9] [15] [17]. But this value is lower than the 4.4% found in blood donors in Abidjan from 1997 to 2012 [18]. The positivity of the Anti-HCV Ab was correlated with the health workers' membership of the emergency services. This high risk of exposure is explained by the fact that they are constantly engaged in repeated invasive procedures and some emergency situations bring health workers to procedural errors in the implementation of universal prevention measures infections in hospital settings [1] [16]. On the other hand, neither age, sex, seniority, qualification and high risk of contact with body fluids were correlated with HCV infection.

The limit of this study may be that when screening many agents were absent or some refused to participate. Absence of markers that can verify vaccination. But nevertheless this study provides important results.

## 4. Conclusion

The prevalence of HBsAg among health workers at Bouaké University Hospital was 8.4% and that of HCV was 1.4%. Emergency services were an important source of HCV infection. The paramedical qualification, especially the nurses, the boys and girls of rooms as well as the carers, constitutes the professional layer at risk of HBV infection because of their function on the one hand and on the other hand of their ignorance of the measures prevent against these viruses. In the control of viral hepatitis B and C in health workers, systematic screening and vaccination against HBV of naive subjects should be carried out before the exercise of the function as well as reinforcement of the preventive measures of theblood exposure accidents.

## Conflicts of Interest

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

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