

Socio-Demographic and Occupational Aspects of HIV-HBV Co-Infection in Bangui, Central African Republic (CAR): Hospital-Based Cross-Sectional Study

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Abstract

Objective: HIV-HBV co-infection is a major public health problem that has not been sufficiently explored in the Central African workplace. The aim of this study was to assess the frequency of HIV-HBV co-infection among people who living with HIV (PLHIV) in the infectious and tropical diseases department of the *Centre Hospitalier Universitaire de l'Amitié Sino-Centrafricaine* in Bangui. **Methods:** A retrospective study was carried out from January 1, 2010 to December 31, 2021 in the Infectious and Tropical Diseases Department at the Amitié Sino-Centrafricaine University Hospital. It included the files of all PLHIV, which included the results of HBV serology. A standardized form was used to collect socio-demographic and professional data by documentary review. Data was analysed using Epi-Info 7 software. Means, proportions were calculated as well as Chi square witch was significant if p-value was below 0.05. **Results:** The study included 265 patients, 188 were women (70.1%) and 77 men (29.1%), giving a sex ratio of 0.45. Mean age was 35.8 years, higher in men (40 years) than in women (35.8 years) ($p < 0.0001$). The age groups 25 to 34 (37.7%) and 35 to 44 (33.6%) were in the majority (71.3%). The majority of PLHIV were unemployed (57.1%), including housewives (43.0%). HBV prevalence was 14.3%, including 7.2% among the unemployed, who account for half of all co-infections. The search for associations between HIV-HBV co-infection and all socio-demographic characteristics (age, sex, marital status) and socio-professional categories showed

no significant difference ($p \geq 0.05$). **Conclusion:** PLHIV were predominantly young adults, female, and unemployed; no occupation was significantly associated with co-infection. The vast majority of co-infected people were not covered by the occupational health system (unemployed or informal sector). Urgent action is needed to improve workers' access to occupational medicine in CAR.

Keywords

People Living with HIV, HIV-HBV Co-Infection, Occupation, Informal Sector

1. Introduction

Human immunodeficiency virus (HIV) and hepatitis B virus (HBV) infections are currently major public health problems due to their frequency, complications and socio-economic consequences [1]. According to the UNAIDS report in 2022, there were 38 million people living with HIV (PLHIV), including 1.7 million new cases [2]. Infection with the hepatitis B virus is also a major problem worldwide. Indeed, the number of chronic HBsAg carriers is estimated at 350 million people worldwide [3].

These infections share the same modes of transmission, notably parenteral, sexual and maternal-fetal, suggesting the high risk of co-infection with the 2 viruses in the same patient [4]. Co-infection with hepatitis B virus is observed in around 7% - 10% of HIV-infected patients [5]. Furthermore, 70% - 90% of HIV-infected patients have markers of previous exposure to HBV (anti-HBc and or anti-HBs antibodies) [6]. Thus, according to the WHO, 2 to 4 million people are co-infected with HIV and HBV worldwide, with a prevalence of 5% to 10% in Western Europe and 20% to 30% in Africa [7].

In addition, HIV-HBV co-infection increases morbidity and mortality beyond the cause of mono-infection with either of these viruses. Patients infected with HIV and HBV have higher levels of HBV viremia, a progression to chronic hepatitis B approximately 5 times faster than in those infected with HBV alone, and a higher risk of cirrhosis and hepatocellular carcinoma [8]. Sub-Saharan Africa is the epicenter of many infectious diseases, including HIV and HBV, with high prevalence [7] [9].

The Central African Republic (CAR) is no exception to this African reality; HIV infection is a generalized epidemic, with a relatively high prevalence of 3.4% [10]. As for HBV, a few studies have been carried out on its prevalence in Bangui [11] [12]. A most recent study carried out in 2023 revealed that out of 4317 samples tested for HBV, the prevalence among participants was 12.86% [13]. Very few studies have been carried out on HIV-HBV co-infection. In rural Central Africa, Longo reported an 18% prevalence of HBV infection among people living with HIV [14]. In 2022, Packo found a 6.47% prevalence of

HIV-HBV co-infection among blood donors in Bangui [15]. Similarly, the professional aspect is not sufficiently addressed. In view of the magnitude of the situation, we felt it important to carry out this study in the Infectious and Tropical Diseases Department of the *Centre Hospitalier Universitaire de l'Amitié Sino-Centrafricaine* in Bangui to describe the frequency of HIV-HBV co-infection according to socio-professional categories. The results of this study could contribute to the improvement of care for people who living with HIV (PLHIV) in addition infected with HBV, by highlighting the contribution of occupational medicine in the management of patients co-infected by the 2 viruses.

2. Methods

Study site: This was a retrospective descriptive and analytical study covering the period from January 1, 2010 to December 31, 2021, *i.e.* a duration of 12 years. The study was carried out in Bangui at the Infectious and Tropical Diseases Department of the *Centre Hospitalier Universitaire de l'Amitié Sino-Centrafricaine*, in collaboration with the Occupational Medicine Department. The 2 departments are the benchmark in their respective fields (management of infectious diseases, and coordinating the therapeutic management of HIV patients; safety and security at work). With HIV and HBV prevalences of 3.5% and 15,0% respectively [5] [11] [16] [17], a significant proportion of the department's patients are infected with one or the other virus, or even co-infected with both.

Study population: The study population consisted of all patients followed in the infectious diseases department during the study period. All PLHIV who had undergone HBV serology and whose results were recorded in the medical record were included in our study. PLHIV under 15 years of age and patients with missing variables of interest were not included in the study. The sample size, calculated according to Schwartz's formula [18] for estimating frequency in an observational study, using Hepatitis B infection prevalence (15%) was 146 patients. Sampling was exhaustive, with systematic inclusion of all PLHIV who met the inclusion criteria.

Data collection: Data were collected by documentary review from each patient's medical record and hospitalization register, using a pre-established anonymous form. Simple sociodemographic variables (age, sex, marital status) and professional variables (professional categories) were collected, entered and analyzed using Epi-info 7 software. Means of quantitative variables and proportions of categorical variables were determined. Pearson's Chi-square test and *t* Student test were used respectively to look for associations between categorical variables and to compare means of quantitative variables with a significance level of 5%.

Ethical considerations: As the study was retrospective, the Ethical and Scientific Committee of the Faculty of Health Sciences and the *Institut Pasteur de Bangui* did not consider it necessary to issue an ethical clearance. However, the data were collected anonymously, stored and processed in strict compliance with

confidentiality, in accordance with the Declaration of Helsinki.

3. Results

During the study period, a total of 265 PLHIV were recorded in our files. By sex, these PLHIV were divided into 188 women (70.1%) and 77 men (29.1%). The sex ratio (M/F) was 0.45. The mean age of the patients was 37 ± 9.94 years; the median was 35 years [17 and 68 years]. The mean age was higher in men (40 ± 9.92 years) than in women (35.8 ± 9.98 years) with significant difference ($p < 0.0001$). The 25 - 34 age group was the most dominant (37.7%), followed by the 35 - 44 age group (33.6%). Taken together these 2 age ranges constituted more than 2/3 of patients with a number of 189 and a proportion of 71.3% (Table 1).

In this study, 126 (47.6%) were married followed by 92 (34.7%) single. Divorcees and widowers made up 9.4% (25) and 8.3% (22) of patients respectively. Patients living alone (single, divorced and widowed) totalled 139, or 52.5% (Figure 1).

Table 1. Patients distribution by age group and gender.

Age group (years)	Sex				Total	
	Men		Women		Number	%
	Number	%	Number	%		
<25...	3	1.1	20	7.6	23	8.7
25 - 34	21	7.9	79	29.8	100	37.7
35 - 44	29	10.9	60	22.6	89	33.6
45 - 54	19	7.2	17	6.4	36	13.6
55 - 64	4	1.5	10	3.8	14	5.3
≥65	1	0.4	2	0.7	3	1.1
Total	77	29.1	188	70.9	265	100.0

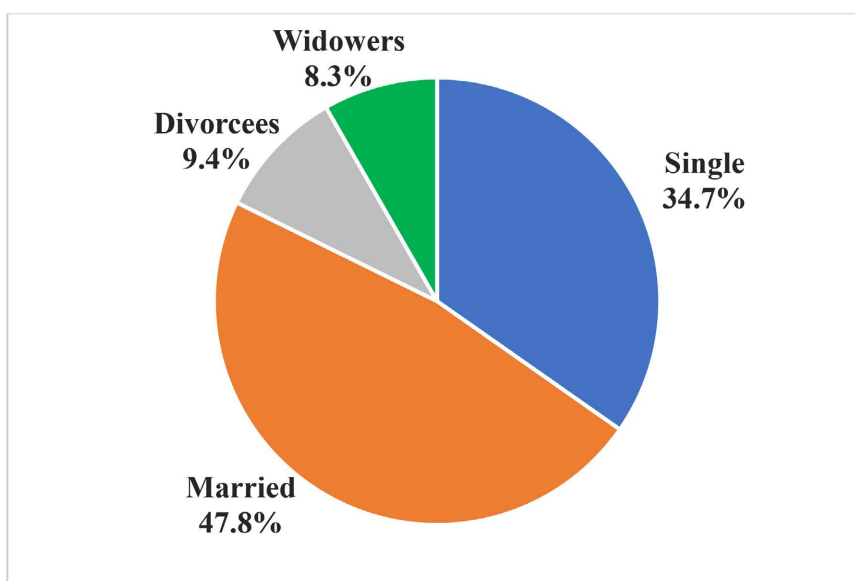


Figure 1. Distribution of participants by marital status.

Unemployed patients accounted for more than half the sample, with 137 (51.7%), including 114 housewives (43.0%). The following occupational categories each accounted for less than 20%: civil servants 40 (15.1%), merchants 32 (12.1%) and manual workers 30 (11.3%). The last 2 socio-professional categories each represent less than 10%, with 22 pupils and students (8.3%) and 14 farmers (1.5%) respectively. Apart from civil servants (15.1%) and blue-collar workers (11.3%), who together make up 26.4%, all the other socio-professional categories (73.6%) belonged to the informal and assimilated sectors (**Table 2**).

HBV prevalence was 14.3%, including 7.2% among unemployed PLHIV, the socio-professional category relatively most affected. Among unemployed PLHIV, housewives were co-infected at 5.7%, very close to that of other socio-professional categories combined (6.8%), notably civil servants (2.3%), merchants (1.9%) and blue-collar workers (1.5%); pupils and students were as co-infected as farmers, at 0.8% (**Table 2**).

Table 2. Distribution of patients according to socio-professional status and HBV infection.

Occupation	HBV Infected		Total	
	Number	%	Number	%
Unemployed	20	7.2	137	51.7
Civil servant	6	2.3	40	15.1
Merchant	5	1.9	32	12.1
blue-collar Worker	3	1.5	30	11.3
Pupil/student	2	0.8	22	8.3
Farm	2	0.8	4	1.5
Total	38	14.3	265	100.0

Table 3. Search for associations between socio-demographic and occupational characteristics and HIV-HBV co-infection.

Détermining factors	HBV Serology				OR [95% IC]	P
	Positive		Négative			
	Number	%	Number	%		
Sex						
Men	15	5.7	62	23.4	1	0.126
Women	23	8.7	165	62.3	0.74 [0.85 - 3.54]	
Marital status						
Living alone	17	6.4	122	46.0	1	0.303
Living in couple	21	7.9	105	39.6	0.70 [0.35 - 1.39]	
Age in years						
25-44	28	10.6	161	60.8	1	0.728
Other year groups	10	3.8	66	24.9	1.15 [0.53 - 2.50]	
Socioprofessionnal categories						
Unemployed	20	7.5	118	44.5	1	0.941
Others*	18	6.8	109	41.1	1.03 [0.52 - 2.04]	

*Other professional categories included civil servants, shopkeepers, workers, farmers, pupils and students.

Patients aged between 25 and 44 accounted for more than 2/3 (71.3%), of whom 28 (10.6%) were co-infected with HIV and HBV. Comparison of this age group with the general population showed no significant difference ($p = 0.728$). The same was true of women (70.9%), but they were significantly more co-infected than men ($p = 0.126$). Patients living alone (single, divorced, widowed) accounted for more than half (52.5%); they were less affected by HIV-HBV co-infection than married women, with no significant difference ($p = 0.303$). Unemployed people accounted for half (51.7%) of the total population, while the proportion of those with HIV-HBV co-infection was 7.5% (Table 3).

4. Discussion

The aim of this retrospective study was to assess the frequency of HIV-HBV co-infection among PLHIV in the infectious and tropical diseases department of the *Centre Hospitalier Universitaire de l'Amitié Sino-Centrafricaine* in Bangui. The study included 265 patients, 188 of whom were women (70.1%) and 77 men (29.1%). The sex ratio (M/F) was 0.45. Mean age was 35.8 years, higher in men than in women ($p < 0.0001$). The age groups 15 to 34 (37.7%) and 35 to 44 (33.6%) taken together were in the majority (71.3%). The majority of PLHIV were unemployed (57.1%), with housewives accounting for the largest proportion (43.0%). The search for associations between HIV-HBV co-infection and all socio-demographic characteristics (age, sex, marital status) and socio-professional profiles showed no significant difference ($p \geq 0.05$).

The results obtained in this study deserve to be discussed, bearing in mind certain limitations. These are firstly linked to the retrospective collection of data, which raises the issue of standardization with data missing from certain patient files. The exclusion of PLHIV whose file did not contain the result of HBV serology introduces a selection bias in the results, linked to the fact that HBV screening was not systematically carried out among PLHIV, due to a lack of financial resources. The HBV marker sought was limited to HBsAg, so cases of occult HBV infection would not be taken into account. The anti-HBc antibody test and viral HBV DNA load measurement, if performed, would have enabled us to diagnose occult HBV infection and get an accurate idea of the proportion of PLWH co-infected with HBV. The frequency of HBV infection is therefore underestimated. Moreover, the prohibitive cost of testing, particularly for HBV viral load in CAR, which has not yet introduced universal medical coverage, is a major obstacle to access to this test. What's more, the study carried out only in the Infectious and Tropical Diseases department could not reflect the situation throughout the country. However, it was not possible to include PLHIV from all parts of the country in the study, due to security inaccessibility, linked to military-political unrest in some parts of the country. Nevertheless, the study provided data on HIV-HBV co-infection and occupation.

In our study, patients were mostly young adults, with an average age of 37. This result is identical to that reported by Mankanera in Guinea [19]. It is close to

those of Mandiwana and Tshinge in Botswana [20], Donovan in Benin [21] who found 35 and 35.5 years respectively. On the other hand, the mean age of our series is lower than that of Kye-Duodu in Ghana [22] and Ozturk in Turkey [23], who found 40 and 41 years respectively. This average age is higher than that of Packo's series in the Central African Republic, which was 25.1 years [15]. This difference can be explained by the higher standard of living in Ghana and Turkey, and by a different study population; Packo worked on a population of blood donors. The predominance of young adults can probably be explained by the younger of population and the precocity of sexual intercourse in CAR [24]. This would be explained by the epidemiology of HIV in the CAR and throughout sub-Saharan Africa, where the epidemic mainly affects the working population [25].

The second socio-demographic characteristic studied in our series was gender. There was a predominance of females (69%), with a sex ratio of 0.41. These results confirm those of Mossoro-Kpinde in 2016 [5] and the 2018-2019 MICS survey in CAR, which reported a female predominance [26]. These results are close to those of Donovan (74.6%) [21] and Makanera (72.9%) [19]. This predominance corroborates the feminization of HIV infection in sub-Saharan Africa [9]. In contrast, Packo [15], Majid in Iran in 2017 [27], and Weitzel in Chile in 2020 [28] found a male predominance. This difference would be due to Packo's and Majid's study populations: both studies were carried out among blood donors. Moreover, among blood donors, men generally outnumber women. Women were particularly predominant in one socio-professional category.

In our study, unemployed people made up more than half the workforce (51.7%), with a predominance of women (43.0% of the total workforce). This result is similar to that of Mossoro-Kpinde in 2016 [5] and Nkuxi in Angola [29]. It is thought to be linked to the feminization of HIV infection in sub-Saharan Africa [27] and to the higher school dropout rate for girls in CAR. This wastage is at the root of women's low level of education, as noted by the 2019 MICS6 survey [26]. However, Packo noted an even higher proportion of the unemployed (61.1%) [15]. The latter are more interested in blood donation in the CAR, probably because of the favors granted to them. The predominance of the unemployed is certainly linked to CAR's socio-economic situation: the multiple military-political disorders that the country has experienced over the last few decades have considerably destroyed its economy, and sent a considerable proportion of the workforce into unemployment. This would explain the high number of unemployed in this study of HBV serology.

Hepatitis B surface antigen (HBsAg) was found in 38 out of 265 patients, for a seroprevalence of 14.3%. Detection of HBsAg alone carries a risk of minimizing the prevalence of HBV infection, due to occult HBV infections, the prevalence of which in PLHIV is estimated at 5% [30]. Molecular biology quantification DNA viral load of HBV would have been the best option for accounting for occult HBV infections. But, although probably underestimated, the observed preva-

lence remains high according to WHO classification criteria. Indeed, the WHO considers as high for values above 8% [1] [31]. CAR, with HBV prevalence of 14.3%, is a hyperendemic area for HBV infection. This frequency of HBV in our study was similar to those reported in previous studies in the CAR, where they were 15% respectively [11] [12]. The frequency of HIV-HBV co-infection is high and confirms, those of series by other Central African authors: 11.7% in 2012, 19.8% in 2013 and 21% in 2015 [5] [32] [33], as well as that reported by Longo in 2020 [14]. This is comparable to the prevalence found by Donovan in Benin (16.9%) [21] and to most estimates in sub-Saharan Africa [34]. The frequency of HBV in our series is higher than that reported in Botswana by Mandiwana (5.1%) and in Guinea by Mkanera (2.3%). This frequency is also higher than that found in North Africa and other continents (4.2% to 10.4%) [20]. This difference may be explained by the patient selection criteria used in these studies, which differed from our own. Indeed, our study focused exclusively on PLHIV. The high frequency of HBV in our study can be explained by the fact that CAR has experienced recurrent military-political crises for several decades, which have destabilized the healthcare system. In addition, nationwide preventive vaccination (against hepatitis B) was only recently introduced in 2008 for children aged 0 - 11 months, and more recently for pregnant women, and has not yet had sufficient follow-up to be sufficiently observed in the adult population. As a result, a large proportion of the population has not been vaccinated. The positivity of HBV serology was diversely distributed according to socio-demographic and professional characteristics.

Although the search for risk factors for co-infection showed that the frequency of co-infection was higher among PLHIV aged between 25 and 44 (10.6%), females (8.7%), married (7.9%) and unemployed (7.5%), including housewives (5.7%), the difference was not significant compared with other socio-demographic and occupational categories. However, the majority of sample study, who are unemployed people (51.7%) could not benefit from HIV and HBV transmission prevention activities provided by the Occupational Health Department. The same applies to 73.6% of the workforce, who were unable to benefit from HBV prevention at work because they belonged to the informal sector or similar. Urgent action must be taken to promote and improve workers' access to occupational medicine in order to help reduce the prevalence of HBV in the workplace and therefore among the CAR population globally.

5. Conclusion

HIV-HBV co-infection is common in CAR, with no significant association with socio-demographic or occupational characteristics. However, the vast majority of the sample were unemployed or worked in the informal sector; They did not have access to occupational medicine, which could have contributed to the implementation of prevention strategies in the workplace in addition to those aimed at the general population. A study with prospective data collection among

workers in occupational medicine department would enable a much finer-grained analysis of this association, including other occupation-related variables.

Conflicts of Interest

The authors declare that they have no competing interests.

Autors' Contributions

GT supervised the field activities, participated in collecting data, analysed and interpreted the data and wrote the manuscript.

HDMK analysed and interpreted the data and wrote the manuscript.

JGN participated in collecting data and contributed to writing the manuscript.

GK participated in collecting data and contributed to writing the manuscript.

SCHD participated in analysing and interpreting data.

All the authors approved the final version of the manuscript for publication.

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