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Hepatitis B and C viruses seroprevalence and risk factors among health care workers (HCWs) in referral hospitals in Brazzaville, Republic of Congo

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Abstract

Introduction. Hepatitis B and C viruses cause chronic infections leading to liver cirrhosis and hepatocellular carcinoma.

This study aimed to determine the seroprevalence of hepatitis B and C viruses and the potential risk factors which might influence the prevalence among health care workers (HCWs) in Brazzaville, Republic of Congo.

Materials and methods. We conducted a cross-sectional study from June to November 2022 among HCWs from the Talangaï and Makélékélé referral hospitals, Brazzaville. 107 HCWs were included and serological screening was carried out using rapid screening tests followed by the ELISA technique, after completing a survey questionnaire.

Results. The mean age was 36.56 ± 11.62 years with a female predominance of 1 : 0.36 sex ratio, laboratory technicians were the most represented socio-professional category. Seroprevalence of HBV was 7.48% and that of HCV was 3.74%. During their service, 40% have already been the victims of blood exposure accidents and have 7 times more risk of contracting HBV (odd ratio [OR] = 7.01 (95% Confidence interval [CI] 1.54–31.96); p = 0.01).

Conclusion. These data show that hepatitis B and C viruses are still endemic among HCWs in Republic of Congo. We can conclude that the health care sector is a high-risk profession due to infection with hepatitis B and C viruses. It is therefore necessary to improve the health and safety conditions of HCWs, implement new strategies to reduce occupational exposure to blood and body fluids, and reduce viral contamination by hepatitis B and C.

Keywords: *Hepatitis B virus; Hepatitis C virus; Seroprevalence; Health care workers, Blood exposure accident; Brazzaville; Congo*

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Conflict of interest. The authors declare no apparent or potential conflicts of interest related to the publication of this article.

Ethics approval. The study was conducted with the informed consent of the patients. The research protocol was approved by the Health Sciences Research Ethics Committee of the Ministry of Scientific Research and Technology (Protocol No. 320/MRSIT/IRSSA/CERSSA dated April 5, 2021), then received secondary authorization from the Faculty of Health Sciences of Marien NGOUABI University (reference number: 75/ UMNG.FSSAV-DOY).

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ОРИГИНАЛЬНОЕ ИССЛЕДОВАНИЕ
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Серопревалентность вирусов гепатитов B и C и факторы риска среди медицинских работников (МР) в специализированных больницах в Браззавиле, Республика Конго

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Резюме

Введение. Вирусы гепатитов B и C вызывают хронические инфекции, приводящие к циррозу печени и гепатоцеллюлярной карциноме.

Целью данного исследования было определить серопревалентность вирусов гепатитов B и C и потенциальные факторы риска, которые могут влиять на распространенность среди медицинских работников (МР) в Браззавиле, Республика Конго.

Материалы и методы. Мы провели поперечное исследование с июня по ноябрь 2022 г. среди МР в специализированных больницах Талангаи и Макелекеле в Браззавиле. В исследование было включено 107 МР. Серологический скрининг проводили с использованием экспресс-тестов, а затем с подтверждением реактивных результатов в иммуноферментном анализе после заполнения анкеты.

Результаты. Средний возраст пациентов составил 36,56 ± 11,62 года, в когорте преобладали женщины (соотношение женщин и мужчин составило 1 : 0,36). Наиболее представительной социально-профессиональной категорией были лаборанты. Серопревалентность вируса гепатита B составила 7,48%, а вируса гепатита C – 3,74%. За время работы 40% МР являлись жертвами несчастных случаев, связанных с контактом с кровью, и имели в 7 раз больший риск заражения вирусом гепатита B (коэффициент шансов [ОШ] = 7,01 (95% доверительный интервал [ДИ] 1,54–31,96); p = 0,01).

Заключение. Полученные данные свидетельствуют о том, что вирусы гепатитов B и C по-прежнему широко распространены среди МР в Республике Конго. Можно сделать вывод, что МР являются группой высокого риска инфицирования вирусами гепатитов B и C. В этой связи необходимо улучшить условия труда и безопасности МР, внедрить новые стратегии для снижения профессионального контакта с кровью и биологическими жидкостями, а также снизить уровень заражения вирусами гепатитов B и C.

Ключевые слова: *вирус гепатита B; вирус гепатита C; серопревалентность; медицинские работники; несчастные случаи, связанные с контактом с кровью; Браззавиль; Конго*

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Финансирование. Авторы заявляют об отсутствии внешнего финансирования при проведении исследования.

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Конфликт интересов. Авторы декларируют отсутствие явных и потенциальных конфликтов интересов, связанных с публикацией настоящей статьи.

Этическое утверждение. Исследование проводилось при добровольном информированном согласии участников. Протокол исследования одобрен Комитетом по этике исследований в области здравоохранения Министерства научных исследований и технологий (Протокол № 320/MRSIT/IRSSA/CERSSA от 05.04.2021), затем получил вторичное разрешение от факультета медицинских наук Университета Мариен НГУАБИ (регистрационный номер: 75/ UMNG.FSSAV-DOY).

Introduction

Viral hepatitis is caused by five different types of viruses, including hepatitis virus A, B, C, D and E. Hepatitis B virus (HBV) and Hepatitis C virus (HCV), are among the leading causes of chronic liver diseases such as cirrhosis, liver failure and hepatocellular carcinoma (HCC) [1, 2]. Viral hepatitis is a global public health problem, on a par with communicable diseases such as HIV/AIDS, tuberculosis and malaria [3]. All hepatitis viruses have hepatocyte tropism and cause inflammatory lesions leading to an acute liver infection that can progress to chronic liver disease. If left untreated, chronic infection progresses

*Эти авторы внесли равный вклад в написание статьи

insidiously towards serious complications such as cirrhosis and HCC [4]. There are an estimated 248 million people living with chronic hepatitis B, 110 million living with a positive anti-HCV antibody and 80 million with active HCV viremia [5, 6]. While each year nearly 10 to 30 million new contaminations by these viruses are recorded [7]. Viral hepatitis is now ranked as the seventh leading cause of mortality worldwide [6]. Hepatitis B virus Surface Antigen (HBsAg) and HCV seroprevalence vary according to region. There are regions with a high prevalence of HBsAg (Africa, South-East Asia), regions with an intermediate prevalence (Eastern Europe, North Africa, Greece, Japan) and low prevalence (Northern Europe and the USA), with respectively 5 to 10%, 2 to 5% and less than 2% of the general population chronically carrying HBs antigen [8]. Global HCV seroprevalence is estimated between 2 and 3%, that of sub-Saharan Africa at 2.98% [9, 10]. In Republic of Congo, HBV seroprevalence varies between 5.3 and 9.9% depending on the population studied [11–13] and HCV seroprevalence is estimated at 2.9% [14]. Health care workers (HCWs) have an increased risk of becoming infected with hepatitis B and C viruses, approximately four times more than the rest of the population, due to their direct contact with bodily fluids and substances patients such as blood, and other contaminated body fluids, as well as due to blood exposure accidents (needle stick injuries and others) [15, 16]. It should be noted that in the Republic of Congo, the national hepatitis control program raises awareness about the importance of hepatitis B vaccination. However, the HBV vaccine is not free or included in the Expanded Program on Immunization (EPI) for newborns. In addition, HBV vaccination, including for healthcare workers, is voluntary and not mandatory. Among non-immune HCWs, the risk of HBV infection after percutaneous exposure ranges from less than 6% (if HBeAg negative) to 30% (if HBeAg positive). In developing countries, 40 to 65% of HBV infections among HCWs are attributable to percutaneous occupational exposure, whereas the corresponding risk in developed countries is low, less than 10% [17]. In East Africa, the prevalence of HBsAg among health care workers is estimated between 7 and 8% [18]. Kateera et al. reported a prevalence of 2.9% of chronic hepatitis B infection, indicated by positive HBsAg, and 1.3% of HCV positivity, indicated by anti-hepatitis C virus antibodies, among tertiary hospital workers in Rwanda [19]. Ziraba et al. found chronic hepatitis B infection in 8.1% of HCWs at a Ugandan university hospital [16]. Republic of Congo is no exception, Deby Gassaye et al. (2015), report a prevalence of HBsAg among nursing staff at the University Hospital of Brazzaville (CHU-B) of 5.3%, of whom 50% were HBeAg positive; 36.3 and 11.5% had anti-HBc and HBs antibodies respectively; while the prevalence of the presence of anti-HCV antibodies was 4.4% [11]. This study aimed to determine the seroprevalence of hepatitis B and C viruses and the potential risk factors which might influence the prevalence among health care workers in Brazzaville, Republic of Congo.

Materials and methods

Study population, samples and data collection

We conducted a cross-sectional study from June to November 2022 among health care workers from the Talangaï and Makélékélé referral hospitals in Brazzaville, Republic of Congo. In total, 107 apparently healthy HCWs who had direct or indirect contact (biological fluids, soiled objects, etc.) with patients were included. Administrative staff were not included in our study. After collecting blood samples from health care workers at the two health centers included in the study, serum analyses were performed at the Serology Unit of the National Blood Transfusion Center of Brazzaville (CNTS Brazzaville). For each participant, a survey questionnaire was completed with data on sociodemographic characteristics including gender, age, marital status, profession. Clinical characteristics included risk factors for transmission of hepatitis B virus and hepatitis C virus, such as blood exposure accidents (stings, cuts, splashes) and non-professional risk factors (transfusion, drugs, scarification, piercing, tattooing, stay in a boarding school, stay in prison, nosocomial risk from surgery or dental care, risky sexual intercourse, sexual partner with HBV/HCV, multiple sexual partners, drug-addicted sex partner).

Rapid screening tests for detection of hepatitis B surface antigen and anti HCV antibodies

The NADAL HBsAg strip test (nal von minden GmbH, Moers, Germany) was used for the detection of hepatitis B surface antigen in serum. The NADAL "nal von minden" immunochromatographic tests have a sensitivity of 99.9% and a specificity of 99.9%. Concerning HCV, rapid diagnostic tests called One Step anti-HCV Rapid Screen Test (NANTONG Jiangsu Province, China) was used for the detection of anti-HCV antibodies in serum.

Enzyme linked immunosorbent assay (ELISA) for detection of hepatitis B surface antigen and anti HCV antibodies

As reference, after detection of HBsAg and anti-HCV-Ab by rapid screening tests, HBsAg and anti-HCV status of all serum samples was determined by ELISA (Monolisa HBsAg ULTRA and Monolisa Anti-HCV PLUS V3, Bio-Rad, Marnes-la-Coquette, France) of the 4th generation (100% sensitivity, 99.94% specificity) following manufacturer's instructions.

Statistical analysis

Database was created using Excel 2013 (Microsoft) and the data was analysed using Epi-info software (version 7.2.2.6). The odds ratio (OR) and their 95% confidence intervals (95% CI) were calculated and the result was considered statistically significant at $p < 0.05$.

Ethical approval

This study was conducted according to recommendations of the Declaration of Helsinki. Approvals were obtained from the Health Sciences Research Ethics Committee of the Ministry of Scientific Research and Technology under reference number 320/MRSIT/IRSSA/CERSSA, the highest institution for the approval of experiments on humans in the Republic of Congo. The study then received secondary authorization from the Faculty of Health Sciences of Marien NGOUABI University (reference number: 75/ UMNG.FSSAV-DOY). HCWs participating in the study gave their written, free and informed consent and completed the survey form. The data processing was anonymous and the results confidential.

Results

Sociodemographic characteristics

A total of 107 health care workers were included in this study and women were the most represented [78/107 (72.90%)] (**Table 1**). The mean age was 36.56 ± 11.62 years and the age group most represented was 35–44 years (28.97%), with extremes of 17 and 63 years. The majority of agents were single while the most represented socio-professional category was that of laboratory technicians.

HBsAg and anti-HCV antibodies seroprevalence

We found in this study, a prevalence of 7.48% (8) and 3.74% (4) for HBsAg and anti-HCV antibodies respectively (**Table 1** and **2**). There were more women than men among the positive subjects, in particular 5 women were positive for HBsAg and 4 for anti-HCV antibodies, although not statistically significant (p = 0.5). Half of the HBsAg-positive subjects (50%) were in the 35–44 age group, while half of the anti-HCV antibodies positive subjects (50%) were over 45 years old. For both HBsAg and anti-HCV

Table 1. Distribution of HBsAg and anti-HCV antibodies according to sociodemographic characteristics
Таблица 1. Распределение HBsAg и антител к HCV по социально-демографическим характеристикам

Variables / Параметры	*n* (%)	HBsAg	Anti-HVC antibodies
		Positive / Позитивны, *n* (%)	Positive / Позитивны, *n* (%)
Gender / Пол			
Female / Женский	78 (72.9)	5 (62.5)	4 (100)
Male / Мужской	29 (27.1)	3 (37.5)	–
Age (years) / Возраст (лет)			
15–24	23 (21.5)	1 (12.5)	–
25–34	25 (23.3)	1 (12.5)	1 (25)
35–44	31 (29.0)	4 (50.0)	1 (25)
≥ 45	28 (26,1)	2 (25.0)	2 (50)
Marital status / Семейное положение			
Single / Одинокий	84 (78.5)	5 (62.5)	2 (50)
Maried / В браке	21 (19.6)	3 (37.5)	2 (50)
Divorced / Разведен	2 (1.8)	–	–
Profession / Профессия			
Lab Technician / Лаборант	31 (29.0)	6 (75.0)	3 (75)
Nurse / Медсестра	26 (24.0)	–	–
Student trainee / Студент-стажер	20 (19.0)	1 (12.5)	–
Midwife / Акушерка	16 (15.0)	1 (12.5)	1 (25)
Doctor / Врач	7 (6.0)	–	–
Biocleaning agent / Уборщик	3 (3.0)	–	–
Surgeon / Хирург	3 (3.0)	–	–
Health Assistant / Медицинский помощник	1 (1.0)	–	–
Accidents involving exposure to blood / Случаи контакта с кровью	Yes, 43 (40.2)	5 (62.5)	1 (25)
Stings / Укусы	Yes, 26 (24.3)	5 (62.5)	1 (25)
Splashes / Брызги	Yes, 11 (10.3)	–	–
Cuts / Порезы	Yes, 6 (5.6)	–	–
Non-professional risk factors	Yes, 64 (59.8)	3 (37.5)	3 (75)
Blood transfusion / Трансфузии	Yes, 4 (3.8)	1 (12.5)	–
Drugs / Лекарства	–	–	–
Scarification / Скарификация	Yes, 8 (7.5)	1 (12.5)	–
Piercing / Пирсинг	Yes, 5 (4.7)	–	1 (25.0)
Tattoo / Татуировка	Yes, 7 (6.5)	–	–
Boarding school stay / Пребывание в школе-интернате	Yes, 3 (2.8)	–	–
Prison stay / Тюремное заключение	Yes, 3 (2.8)	–	–
Nosocomial risk (surgery) / Риск больничной инфекции (хирургия)	Yes, 4 (3.8)	–	–
Nosocomial risk (dental care) / Риск больничной инфекции (стоматология)	Yes, 11 (10.2)	–	–
Risky sexual behaviour / Рискованное сексуальное поведение	Yes, 6 (5.6)	–	–
Sexual partner with VHB/VHC / Сексуальный партнер с VHB/VHC	–	–	–
Multiple sex partners / Несколько сексуальных партнеров	Yes, 12 (11.2)	1 (12.5)	2 (50.0)
Drug-addicted sexual partner / Сексуальный партнер, страдающий наркотической зависимостью	Yes, 1 (0.9)	–	–

Table 2. Distribution of HBsAg and anti-HCV antibodies according to risk factors
Таблица 2. Распределение HBsAg и антител к HCV по факторам риска

Variables	HBsAg			Anti-HCV antibodies / Антитела к HCV		
	Positive / Позитивны, *n* (%)	Odds ratio / Отношение шансов	*p*-value	Positive / Позитивны, *n* (%)	Odds ratio / Отношение шансов	*p*-value
Piercing / Пирсинг						
Yes / Да	–	–	–	1 (25)	6.53 (0.57–74.5)	0,13
No / Нет	8 (100)	1		3 (75)	1	
Multiple sex partners / Несколько сексуальных партнеров						
Yes / Да	1 (12)	0.47 (0.05–4.03)	0.493	2 (50)	3.68 (0.49–27.63)	0.205
No / Нет	7 (88)	1		2 (50)	1	
Drug-addicted sexual partner / Сексуальный партнер, страдающий наркотической зависимостью						
Yes / Да	–	–	–	–	–	–
No / Нет	8 (100)	1		4 (100)	1	
Risky sexual behaviour / Рискованное сексуальное поведение						
Yes / Да	–	–	–	4 (100)	1	–
Yes / Да	8 (100)	1		–	–	
Scarification / Скарификация						
Yes / Да	1 (12.5)	0.53 (0.06–4.55)	0.555	–	–	–
No / Нет	7 (87.5)	1		4 (100)	1	
Tattoo / Татуировка						
Yes / Да	–	–	–	–	–	–
No / Нет	8 (100)	1		4 (100)	1	
Accidents involving exposure to blood / Случаи контакта с кровью						
Yes / Да	5 (62.5)	7.01 (1.54–31.96)	0.01	1 (25)	1	
No / Нет	3 (37.5)	1		3 (75)	0.52 (0.05–5.01)	0.558

antibodies, there were more positive cases among laboratory technicians than in other professions, but differences were not statistically significant ($p > 0.05$).

Risk factors associated with HBsAg and anti-HCV seropositivity

Blood transfusion, drugs, scarification, piercing, tattoo, boarding school stay, prison stay, dental care, surgery, risky sexual behaviour, sexual partner with HBV/HCV, multiple sex partner and drug-addicted sex partner were considered as non-professional risk factors and none of them were statistically significant related to hepatitis B and C. Blood exposure accidents were the only risk factor associated with the development of hepatitis B. HCWs who were victims of blood exposure accidents were 7 times more likely to contract HBV (odd ratio [OR] = 7.01 (95% Confidence interval [CI] 1.54–31.96); $p = 0.01$). Of all these HCWs, 43 reported blood exposure accidents. Stings, cuts and splashes were cited as types of blood exposure accidents from which, stings were the most represented accounting for 37.43%.

Discussion

In Sub-Saharan Africa, infection with hepatitis B virus (HBV) or hepatitis C virus (HCV) is the main risk factor for hepatocellular carcinoma (HCC) [20]. Infection with HBV and HCV is a major public health problem in the Republic of Congo, particularly among HCWs [11]. Health care workers in our study were predominantly female. Deby et al. reported in 2015 a female predominance in Republic of Congo [11]. Many studies in some countries in Africa and around the world report similar results, Shao et al. in Tanzania with 78.5% [21] and Alqahtani et al. in Saudi Arabia with 73% [22]. This majority can be explained by the fact that the majority of staff in these two health centers are women. Although a study conducted among HCWs in Burkina Faso by Pietra et al., revealed a majority of men [23]. The age group most represented in our study was 35–44 years; similar to the results reported among HCWs in South-Eastern Nigeria (31–40 years) [24]. About age, Ugandan studies also reported a mean age of 36 years [16, 25]. We found a seroprevalence of 7.48% (8/107) for the HBV and 3.74% (4/107) for HCV among HCWs of the two reference hospitals. Our results on seroprevalence of HBsAg is close to the 7% reported by Muller et al. among HCWs in Tanzania [26] but slightly higher than that obtained by Deby et al. on the HCWs of the Brazzaville University Hospital in 2015 which was 5.2% [11]. Some Sub-Saharan African countries have reported lower HBV prevalence rates; 2.6% among HCWs and medical waste handlers in Ethiopia [27], 2.3% in HCWs of an urban referral hospital in central Sudan [28], 1.1% in

HCWs who are in regular contact with blood, body fluids and patients in Nigeria [29], 2.9% among workers at the University Teaching Hospital of Butare in Huye District, Rwanda [19], 4.5% among HCWs in Kenya [30]. On the other hand, in Cameroon and the Democratic Republic of Congo, neighboring countries of the Republic of Congo, an alarmingly high HBsAg prevalence rate of 10.6 and 18.6%, respectively, has been reported in HCWs [31, 32]. HCV seroprevalence of 3.74% found in our study population was similar to that of 3.2% obtained among HCWs in Abbottabad, Pakistan [33], and fairly close to the results reported by Deby et al. among HCWs at the Brazzaville University Hospital, which was 4.4% [11]. Cameroon, Ethiopia and Sierra Leone report even lower HCV seroprevalence rates of 1.7, 0.4 and 2.5% respectively [34–36]. These disparate HBV and HCV seroprevalences from one study to another could be explained by the number of participants. The more participants there were, the more the prevalence increased because of the power of the sampling. This finding is shared by meta-analysis studies [37]. The other reason could be differences in the routine HBV vaccination policies which in turn may influence immunity of HCWs and the lack of a policy to raise awareness of HBV and HCV risk factors [38]. In our study, although all participants (HCWs) were asked about their HBV vaccination status, none had been vaccinated. This data was deemed unusable and was therefore not included in the results. In some hospitals, no instructions are posted or given on what to do in the event of a blood exposure accident, which was the case in the facilities where we conducted our study. This highlights the reality of viral hepatitis B and C among HCWs in Central and West Africa. The seroprevalence of both viruses were higher in female HCWs; 62.5% *versus* 37.5% for HBsAg and 100% *versus* 0% for HCV. This is due to an effect of overrepresentation of women in our study because in most studies no statistically significant difference was found between female and male HCWs [21, 38–40]. In terms of profession, an increased proportion of HBV (6/31, 19.35%) and HCV (3/31, 9.67%) positives was observed among laboratory technicians, followed by the categories of midwife (1/15; 6.66% both HBsAg and HCV) and student trainee (1/20; 5% for HBsAg). Similar observations have been reported in a study with laboratory technicians in Uganda (18.18%) [16]. We see the same dynamics with HCV. Okasha et al. in Egypt (2015) report in the laboratory technician profession a prevalence of 4.8%; although half that of what we found [41]. This suggests that variations between different HCW cadres could reflect different levels of exposure risk. It is therefore possible that the risk of infection differs according to health care professions. Laboratory technicians were not only the most represented professional category in our study, but they also perform blood sampling and are constantly exposed when performing medical tests. It should be noted that in the Republic of Congo, in almost all hospitals, blood sampling of patients is carried out by laboratory technicians. This explains why our results are different from other studies that have reported high prevalence of hepatitis B and C among nurses and doctors [27, 29]. However, HBsAg and anti-HCV antibodies positivity according to occupation did not give any statistically significant difference ($p > 0.05$). Exposure to fluids from potentially infected patients is quite high. We found a considerably high proportion of HCWs exposed to blood exposure accidents (43; 40%). 63% (5) of HCWs with needle sting injuries tested positive for HBsAg and 25% (1) for anti-HCV antibodies, yet only 7.5% (8) had been vaccinated against hepatitis B, with barely one HCW having received the recommended three doses; no immunity tests for anti-HBs antibodies were performed. These results seem similar to those obtained by Okasha et al. in Egypt and by Deby et al. in Republic of Congo, where blood and needles were the main sources of contamination [11,41]. Thus, HCWs who are victims of blood exposure accidents have 7 times more risk of contracting HBV. This result is different from that obtained by Yizengaw et al. in Ethiopia [27] and Shao et al. [21] who had respectively obtained contact with a positive case of hepatitis and blood transfusion as main risk factors. Concerning HCV, the most important risk factor appears to be unsafe sex. However, we did not observe any statistically significant difference. In contrast, Okasha et al. in Egypt reported that the most important risk factor was accidental needlestick injuries [41]. This may be explained by the daily use of needles by health personnel.

Our study may have some limitations: (i) Due to insufficient technical facilities, we were unable to search during this study for other serological markers of HBV, namely anti-HBs Ab; HBeAg; anti-HBe Ab; anti-HBc Ab as well as the viral load of HBV and HCV. This could have informed us about the different stages of carriage of these viruses. (ii) HCWs in services with a high risk of occupational exposure, such as surgical emergencies and blood banks, were not included in our study because they were overwhelmed by the workload and were reluctant to participate in our study. (iii) We were unable to establish a strong causal link between the risk factors described and hepatitis B and C virus positivity. It may be that the participants were infected before entering the workplace.

Conclusion

This high prevalence shows that hepatitis B and C are still endemic among HCWs in Republic of Congo. Furthermore, we can state that the health profession constitutes a profession at risk due to infection with hepatitis B and C viruses. To reduce the prevalence of HBV and HCV among HCWs it needs a new strategy that reduces occupational exposure to blood and body fluids. There is need for increasing the awareness and prevention of contracting and transmitting HBV and HCV infections among HCWs, to integrate HBsAg screening and HBV vaccination during recruitment sessions for public and private sector health workers in order to help protect health workers in the sector and control the spread of the virus. Vaccination against hepatitis B virus infection could also be made mandatory for preclinical medical and nursing students. The Ministry of Health could consider offering subsidized or free Hepatitis B vaccination to HCW. In addition, in Congolese hospitals, occupational medicine or the Ministry of Health must play the role of providing ongoing training for all health professionals in infection prevention, and of displaying procedures to be followed in the event of exposure accidents in work areas at risk of exposure.

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