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REVIEW ARTICLE

Hepatitis B virus infection in the Democratic Republic of Congo: a systematic review of prevalence studies (2000–2016)

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Abstract

Aims The Democratic Republic of Congo (DRC) is a country with a high endemicity of hepatitis B virus (HBV) even if no national survey of prevalence has been performed. Data are based on extrapolations or limited studies. This review aimed to summarize all information about HBV infection in DRC during the period 2000–2016 to provide refined estimates and contribute to a better knowledge of its epidemiology.

Subject and methods We conducted a systematic search in electronic databases of all prevalence studies published between January 1st, 2000 and September 30th, 2016. Additional data from manual search or gray literature were also considered. We included only moderate or high quality studies using the JBI' tools for qualitative evaluation of researches. HBsAg prevalence was estimated at 95% confidence interval (CI) as result of simple pooling analysis.

Results Twenty-eight studies were included with data providing from 154,926 subjects: in the majority of these studies (18 out of 28), results were obtained from blood donors. The estimated HBsAg prevalence was 4.9% (95% CI 4.2–5.0). The prevalence was estimated at 5.0% (95% CI 4.9–5.1) in blood donors and at 5.0% (95% CI 3.0–5.9) in pregnant women.

Conclusion This review suggests that DRC is a country characterized by an intermediate level of HBV infection endemicity rate. It remains however an important public health problem and efforts should continue in prevention and in policy to control this viral disease.

Keywords Hepatitis B virus · Prevalence · DRC · Review

Background

Hepatitis B virus (HBV) infection remains one of the major public health problems. According to World Health Organization (WHO) estimates, about 2 billion people have been infected worldwide and more than 350 million are chronically affected (Ott et al. 2012; Schweitzer et al. 2015; WHO 2016). Chronic evolution of HBV infection increases the risk of progressive liver disease and premature death by related complications as cirrhosis, liver failure and hepatocellular carcinoma (Ganem and Prince 2004; Lavanchy 2004).

Main routes of transmission include the sexual transmission, exposure to blood contact and the mother-to-child trans-mission. In developing countries, groups at high risk of con-tamination mainly include people requiring blood products, newborns, pregnant women and health-care workers (Kiire 1996). For the diagnosis of HBV, laboratory tests generally focus on the detection of the Hepatitis B surface Antigen (HBsAg) (WHO 2016).

Worldwide, HBV infection is characterized by an irregular distribution. Sub-Saharan Africa (SSA) belongs to high endemic areas with an HBsAg seroprevalence estimated to be between 6 and 20% even if some studies reported that nearly 80% of SSA population had serological markers related to HBV past exposure (Kiire 1996; Kramvis and Kew 2007).

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Besides this high estimated prevalence, SSA is character-ized by an elevated rate of mother-to-child and early life trans-mission. These routes of transmission are associated with an increased risk of HBV chronic evolution and further compli-cations: early onset of hepatocellular carcinoma has been more often found in SSA than in other areas of the world (Kew 2013).

The situation in the Democratic Republic of Congo (DRC) has been described to be similar to that observed in other SSA countries (Schweitzer et al. 2015). DRC is a vast country located in central Africa (2,345,000 km^2) with a population of about 80,000,000 inhabitants and according to estimations, it is classified among countries where the prevalence of HBV infection is between intermediate and high (Ott et al. 2012; WHO 2016). However, there is no reliable national survey estimating HBV seroprevalence in the DRC. The disease was neglected during a long time and up to the early 2000s when concrete measures began to be implemented. In 2002, the country adopted a universal infant HBV immunization programme which should comprehensively be applied since 2007 (PEV/RDC 2002–2006).

In 2015, Schweitzer et al. estimated the prevalence of HBV in DRC at 5.99%, taking into account only seven studies (Schweitzer et al. 2015). To the best of our knowledge, there is no other thoroughly conducted review available, specifically extending to studies published in French, knowing that the DRC is a French-speaking country. With the objective to over-come this gap, we performed a systematic review to provide refined estimates of HBV prevalence by summarizing all available studies and information on the prevalence of HBV in the DRC over the last 16 years (2000–2016).

Methodology

Search strategy

This review considered any prospective and retrospective cohort study, case control, analytical cross sectional and descriptive cross sectional study in which the HBV prevalence in a sample population from the DRC is reported. Moreover, other texts such as opinion papers and reports were also considered. The search was based on literature published using the following keywords: hepatitis B, prevalence, Democratic Republic of Congo, incidence, Hepatitis B surface antigen, and similar terms such as HBV infection, seroepidemiology of hepatitis B, HBsAg prevalence and DRC. Previous systematic reviews on the prevalence of hepatitis B were scanned for comparison.

A three-step search strategy was performed in this review (The Joanna Briggs Institute. Systematic Review Methodology 2017). An initial limited search of MEDLINE, EMBASE, Trip database, Ovid was undertaken followed by an analysis of words contained in the title and abstract of the study, and in the index terms. A second search using all identified keywords and index terms was then undertaken across all databases. A third search consisted to look at the reference list of all identified reports and articles. Studies published in French or English were considered for inclusion in this review if they were performed or published between the 1st of January 2000 and the 30th of September 2016. The last search was done on the 30th of October 2016.

The search strategy also aimed to find unpublished sources containing reports of HBV infection as well as gray literature. Gray literature included all report published outside of traditional channels like thesis and masters as well as unpublished personal data. These additional data were searched using other databases like Google Scholar, Social Sciences Citation Index, ISI Web of Science, Scopus and Africa Journals Online (AJOL). We also used manual search using data from four main faculties of medicine of the DRC: University of Kinshasa (UNIKIN), University of Lubumbashi (UNILU), Catholic University of Bukavu (UCB) and University of Kisangani (UNIKIS) to find theses or master's theses on the topic of HBV. One unpublished study containing personal data was also considered in this review as an additional gray literature source.

Selection of studies

Titles and abstracts of retrieved studies were screened, follow-ed by application of exclusion criteria: poor data quality (see the following), reviews/studies not related to the DRC and studies related to other types of viral hepatitis such as hepatitis C or A virus.

Data collection and analysis of quality

Papers selected after extraction were assessed by two independent reviewers for methodological validity prior to inclusion in the review using appraisal instruments from the Joanna Briggs Institute Meta-Analysis of Statistics Assessment and Review Instrument (JBI-MAStARI; Joanna Briggs Institute Reviewers' Manual 2014). Any disagreement between the two reviewers was resolved through discussion or, in case of consensus failure, with a third reviewer. The JBI's checklist for cohort studies included 11 items and for cross-sectional studies 9 items (Joanna Briggs Institute Reviewers' Manual 2014). A score of 1 was given for each reported item. For cohort design, studies were classified as follows: high quality (score 9–11), moderate quality (score 6–8) or poor quality (score 5 or less), respectively, whereas for cross-sectional studies: high quality is related to a score 8–9, moderate quality a score 5–7 and poor quality a score 4 or less. We only includ-ed moderate and high quality studies.

Data extraction and management

Quantitative data were extracted from papers using the standardized data extraction tool from JBI-MAStARI. When available, the data about specific details in relation with our review were taken into account such as authors, study design, year of publication, year of collection, age group, gender, setting (rural or urban), localization, sample, type of laboratory test, prevalence of hepatitis B and target group (blood donor, pregnant women, children, transfused persons, patients with sickle cell disease, diabetics, people living with HIV: PLH or general population).

Data synthesis and analysis

Extracted data were entered into Microsoft Excel by one au-thor and independently checked by another one. To estimate overall and sub-group specific prevalence (blood donors and pregnant women), we use a simple pooling analysis method (Bravata and Olkin 2001). Pooled proportions are expressed as percentage at 95% confidence interval (CI). All reported results from included studies were set at a level of statistical significance of $p < 0.05$.

Ethical approval

This study did not require an ethical approval as it was based on data retrieved from studies already available in the public domain.

Results

Search outcomes and retrieval

Identification and inclusion processes are displayed in Fig. 1. We identified a total of 373 potentially relevant publications and unpublished studies on HBV in the DRC. After exclusion of 202 duplicate publications, 171 titles were screened. Of these, 69 on basis of title analysis were excluded because they were not pertinent to the review. We have then screened 102 abstracts and 57 of them were excluded on basis of abstract review. From the 45 remaining full texts, 12 studies were excluded because of various reasons (study no related to DRC, other viral hepatitis). Thirty-three of them were selected including 28 published studies and 5 additional unpublished studies (2 master's theses, 2 theses and 1 study containing personal data) for quality evaluation.

After quality evaluation, only 28 studies were finally included in this review and all were of moderate quality. One review estimating the prevalence of HBV infection in the DRC was chosen for comparative purposes (Schweitzer et al. 2015; Table 1), while Table 2 highlights all studies included in this systematic review. They reported prevalence based on overall population and some subgroups involving a total of 159,827 persons and were done across six provinces of DRC (Kinshasa, Tshopo, South-Kivu, Maniema, Upper Katanga and Upper Lomani) including subgroups such as blood donors (18 studies), pregnant women (Batina et al. 2013), children—under 5 years (Baleka et al. 2014), transfused children (Baleka et al. 2014) and sickle cell disease (SCD) patients (Baleka et al. 2014)—HIV subjects (5, including two studies performed in children) and diabetics (Baleka et al. 2014). Four studies had cohort's design (Kabinda et al. 2014b, c; I.N. Kembo, personal communication, 2016; Namululi et al. 2013), whereas the others were cross-sectional. It should be pointed out that two of the cohort studies calcu-lated HBV prevalence by using the number of blood dona-tions as the denominator (Kabinda et al. 2014b; Namululi et al. 2013). The most frequently used screening assays for detecting HBsAg were enzyme immunoassays and immunochromatographic rapid tests (Table 2).

Overall national prevalence

Considering all the 28 studies, the prevalence rates ranged from 0.0 to 9.3% (Table 2). In nine studies ($n = 10,606$), the reported prevalence rates ranged from 0.0 to 3.4%; in 14 stud-ies, it ranged from 3.6 to 6.0% ($n = 140,243$) and in the last five studies, the rates equal or exceeded 8%. By taking into account the full sample (154,926 persons), the estimated prev-alence is 4.9% (95% CI 4.2 to 5.0).

Prevalence of HBV infection related to socio-demographic characteristics

The vast majority of studies (23/28) included adult population and only five concerned children under 16 years. Twelve studies did not specify the comparison of prevalence by age groups; however, for the 16 remaining studies, only four have shown that the prevalence varied statistically with age but without a clear trend for any specific age range (Batina et al. 2013; Kabinda et al. 2014a; Mbendi et al. 2001; Sumbu et al. 2014). The highest prevalence is noticed between 18 and 45 years ranging from 14 to 45% according to studies. Two studies concerning children under 16 years compared the prevalence by age groups but no statistical significant difference was observed. The most affected age ranges was between 12 and 24 months (11%) and over 144 months with a preva-lence of 14% (Kabinda et al. 2015a; S.K. Kasonga, personal communication, 2016). Regarding gender, 11 studies have examined the prevalence of HBV by gender and five of them found that the prevalence was statistically higher in men than in women. The rate ranged from 5.5 to 9.4% in men and between 0 and 6.8% in women (Baleka et al. 2014, 2013; Kabinda et al. 2014c, 2015b; Yuma and Kabamba 2016). In

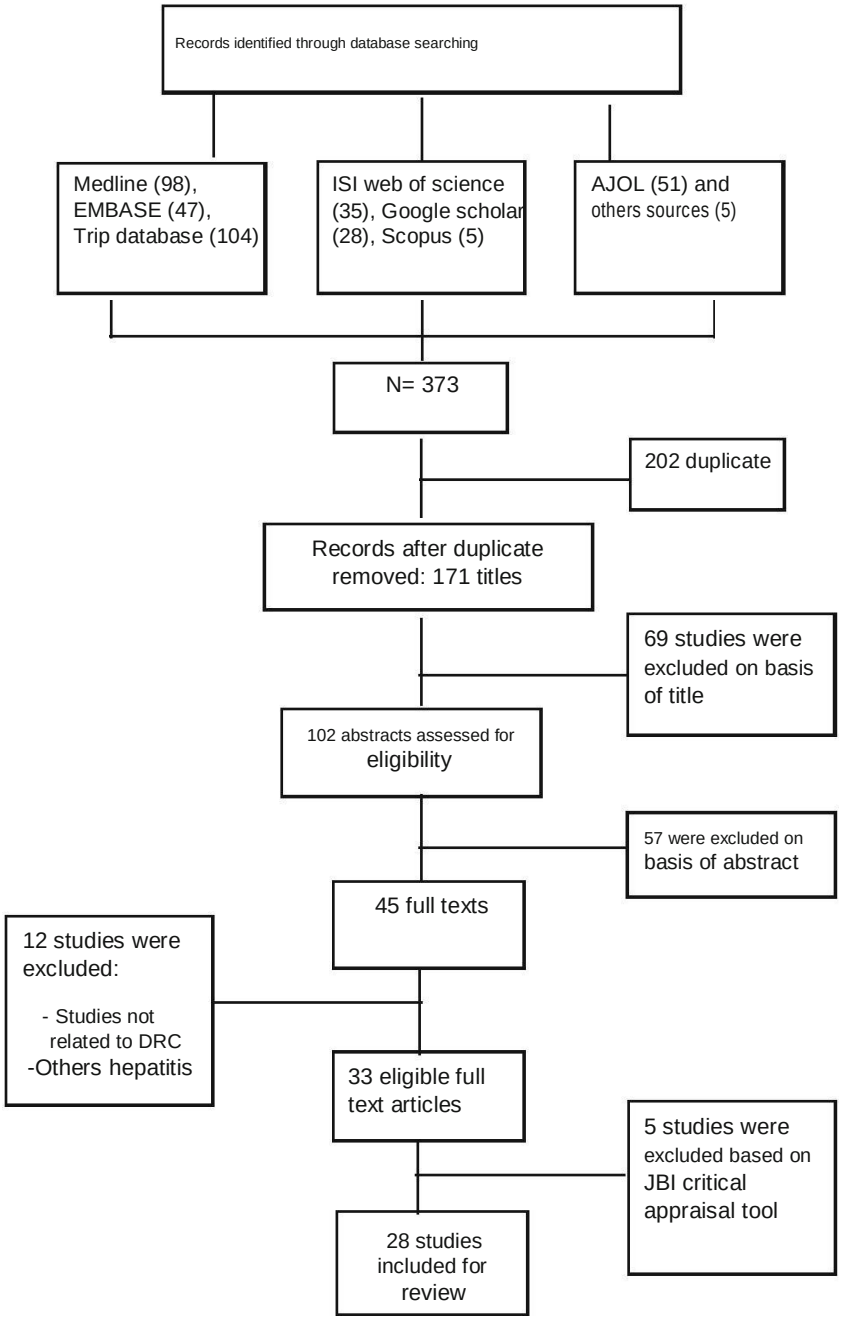

Fig. 1 Publications selection process

other remaining studies, the difference was not statistically different.—five studies reported the distribution of HBV regarding the marital status but only one showed statistically significant differences between married subjects (8.2%) and single persons (3.5%; Kabinda et al. 2014a).

HBV infection prevalence comparing rural and urban place

Four studies were conducted comparing the prevalence of HBV in two environments: rural and urban, in four types of

Table 1 Review on HBs antigen of hepatitis B in Democratic Republic of Congo

Authors, year	No. of included studies	Objective	Sample size	Prevalence of HBsAg (IC 95%)	Type of review
Schweitzer et al. 2015	1,800 overall but only 7 for DRC	Estimation of worldwide prevalence	21,559 for DRC	5.99% (5.68–6.31)	Systematic review

Table 2 General features of studies included in the review. m months

Author	Publication year	Design	Collect year	Area	Localisation	Age group	Sample	Population	HBs Ag	HBs Ag %	Method
Baleka et al.	2014	Cross-sectional	2000	Urban	Kinshasa	18–65	373	Blood donor	22	5.9	Elisa
Batina et al.	2007	Cross-sectional	2003–2004	Urban	Kisangani	18–65	3,390	Blood donor	159	4.7	Rapid test
Batina et al.	2010	Cross-sectional	2008	Urban	Kisangani	NA	127	Patients with sickle cell disease	2	1.6	Rapid test
Batina et al.	2012	Cross-sectional	2005–2006	Urban	Kisangani	18–65	1,247	Blood donor	60	4.8	Rapid test
Batina et al.	2013	Cross-sectional	2005–2008	Urban	Kisangani	18–65	6,898	Blood donor	414	6	Rapid test
Chandrasekar et al.	2016	Cross-sectional	2012–2014	Urban	Chicago	All	62	All	3	5	Elisa
Kabamba et al.	2015	Cross-sectional	2014	Urban	Lubumbashi	19–45	440	Blood donor	41	9.3	Rapid test
Kabinda and Katchunga	2010	Cross-sectional	2008	Urban	Bukavu	All	209	PLH[a]	16	8	Elisa
							211	Blood donor	16	8	Elisa
Kabinda et al.	2014a	Cross-sectional	2011	Urban	Bukavu	18–65	568	Blood donor	27	4.8	Rapid test
Kabinda et al.	2014b	Cohort[b]	2010–2012	Urban	Bukavu	18–65	5,071[c]	Blood donor	203	4	Rapid test/Elisa
Kabinda et al.	2014c	Cohort	2010	Urban/rural	Bukavu	18–60	1,079	Blood donor	45	4.2	Rapid test
Kabinda et al.	2015a	Cross-sectional	2013	Urban/rural	Kindu	Under 5	776	Children	28	3.6	Rapid test
Kabinda et al.	2015b	Cross-sectional	2013	Urban/rural	Kindu	15–48	460	Pregnant women	27	5.9	Rapid test
Kakisingi et al.	2016	Cross-sectional	2015	Urban	Lubumbashi	18–65	599	Blood donor	48	8	Rapid test
Kasonga et al.	MSc Thesis (UCB)	Cross-sectional	2016	Urban/rural	Bukavu	10 (m)–18	242	PLH	22	9	Elisa
Katabuka et al.	2013	Cross-sectional	2011	Urban	Kinshasa	18 (m)–13	371	Transfused children	NA	1.6	Rapid test
Kembo et al.	Thesis (UNILU)	Cohort	2012–2014	Urban	Lubumbashi	18–65	4,013	Blood donor	108	2.7	Rapid test/Elisa
Kitetele et al.	2014	Cross-sectional	2014	Urban	Kinshasa	0–15	176	PLH	0	0	Rapid test
Masimango et al.	2014	Cross-sectional	2012	Urban	Bukavu	18–74	235	PLH	5	1.9	Rapid test
Mbayo et al.	MSc Thesis (UCB)	Cross-sectional	2016	Urban	Bukavu	15–70	204	Blood donor	7	3.4	Rapid test
							204	Diabetics	7	3.4	Rapid test
Mbendi et al.	2001	Cross-sectional	1999	Urban	Kinshasa	18–79	7,277	Blood donor	666	9.2	Elisa
Namululi et al.	2012	Cohort	2001–2005	Urban	Bukavu	18–65	6,048[c]	Blood donor	224	3.7	Rapid test/Elisa
Ntamako et al.	2014	Cross-sectional	2010–2011	Urban	Bukavu	NA	4,061	Blood donor	81	2	Rapid test
Nzaji and Ilunga	2013	Cross-sectional	2008	Urban	Kamina	15–56	1,015	Blood donor	16	1.6	Rapid test
Shindano et al.	Unpublished data	Cross-sectional	2014	Urban	Bukavu	17–47	200	Pregnant women	6	3	Elisa
Sumbu et al.	2014	Cross-sectional	2003/2006 2008/2013	Urban	Kinshasa	18–65	26,341	Blood donor	1054	4	Rapid test/Elisa
Tu et al.	2004	Cross-sectional	NA	Urban	Bukavu	NA	9,000	PLH	540	6	Rapid test
Yuma et al.	Thesis (UNIKIN)	Cross-sectional	2014	Urban	Kinshasa	18–60	78,930	Blood donor	4,014	5.2	Rapid test/Elisa

[a] PLH people living with HIV

[b] For cohort studies, the prevalence rate is obtained from a period of follow-up

[c] Sample size refers to the number of blood donations

subgroups—pregnant women, children under 5 years, blood donors (BDs) and HIV-infected children. Three of them showed a higher prevalence in rural than in urban areas— 10.3% vs 3.6% (Kabinda et al. 2014c), 5.0% vs 0.5% (Kabinda et al. 2015a), 9.8% vs 8.5% (S.K. Kasonga et al., personal communication, 2016), respectively—while in one study conducted in pregnant women in Maniema a higher prevalence was found in urban than in rural areas (8.2% vs 5.2%; Kabinda et al. 2015b).

HBV infection prevalence in blood donors (BDs)

In 18 studies involving 142,864 subjects, the HBV prevalence rate among BDs (voluntary and replacement BDs) varied between 1.6 and 9.3%. The total estimated prevalence in all BDs was 5.0% (95% IC 4.9–5.1). Three of included studies also additionally reported an incidence rate. In the first one, Namululi et al. reported an incidence rate of 25.4 per 1,000 person-years in a 5-year follow-up study carried out in 3,292 BDs from Bukavu (Namululi et al. 2013). In the second one, there was an incidence rate of 51.7 (36.9–70.6) per 1,000 person-years in a 2-year follow-up study carried out in 2,986 BD volunteers from Bukavu (Kabinda et al. 2014b), with an HBsAg seroconversion (de novo positivity of HBsAg) detected in 37 donors. From this study, the residual risk of HBV transmission from the serologic window was estimated to be 8 per 1,000 donations (Kabinda et al. 2014b). In the third study, Kembo et al. reported a rate of 39.6 (27.4–55.3) per 1,000 person-years in a 2-year follow-up in 3,149 BDs from Lubumbashi and detected a HBsAg seroconversion in 34 donors. The residual risk of HBV transmission in this study was estimated to be 6 per 1,000 donations (I.N. Kembo, personal communication, 2016).

HBV infection prevalence in pregnant women and parturient

In two studies, HBV prevalence rates were determined among pregnant women ($n = 660$). The HBV prevalence rates from these studies were 3.0 and 5.9%, respectively (Kabinda et al. 2015b; unpublished data). The estimated prevalence was 5.0% (95% CI 3.0–5.9). Kabinda et al. found high prevalence of HBV in pregnant women who had a history of blood transfusion during pregnancy (12.5%) or tattoo during the last 12 months (24.2%; Kabinda et al. 2015b).

Prevalence studies in children

Two in-hospital studies were respectively conducted in sickle cell children and in transfused children (Batina et al. 2010; Katabuka et al. 2013). Another one was a community-based study also in children (Kabinda et al. 2015a). All these three studies evaluated the role of blood transfusion in the risk of HBV transmission. Batina et al., in a retrospective study, examined the records of 127 SCD children and found a prevalence of 1.6% (Batina et al. 2010). Katabuka et al. described a prevalence rate of HBV infection of 1.6% in a multicentric cross-sectional study of transfused children aged between 18 months and 13 years old in four hospitals in Kinshasa ($n = 371$). Frequency of transfusion events were significantly associated with HCV ($p < 0.001$) and HIV ($p < 0.05$) infections but not with HVB infection (Katabuka et al. 2013). Kabinda et al. conducted a survey in a community of 776 children (6–59 months) and found a higher HBV prevalence in children with a history of blood transfusion (6.6%) compared to those without (3.6%). They also found a rate of 5.7% in children whose mother received a blood transfusion during pregnancy compared to those whose mother were not transfused (3.9%; Kabinda et al. 2015a).

Coinfection with HIV, hepatitis C and other comorbidities

Five studies assessed HBV prevalence rates among HIV subjects and one among diabetics. In HIV subjects, the HBV prevalence in ranged from 0.0 to 9.0% (Kabinda and Katchunga 2010; S.K. Kasonga et al., personal communication, 2016; Kitetele et al. 2014; Masimango et al. 2014; Tu et al. 2004). In diabetics, the HBV prevalence was found at 3.4% (CI 1.5–6.6), while it increased to 4.3% (CI 2.1–7.9) in those with a history of tattoos (F. Mbayo et al., personal communication, 2016). Several studies ($n = 30,324$) also assessed the HBV-HCV coinfection rate which varied among studies: 1% in HIV subjects in Bukavu; 2.2, 0.4 and 0.1% among BDs in Bukavu, Kisangani and Kinshasa, respectively, while this rate was also found very low in pregnant women (0.6%) and in children under 5 years (0.2%) in two studies conduct in the province of Maniema (Batina et al. 2012; Kabinda and Katchunga 2010; Kabinda et al. 2014c, 2015a, b; Sumbu et al. 2014).

Discussion

The current review included 28 studies on HBV prevalence (between 2000 and 2016) in DRC including data of 154,926 subjects. It provides descriptive information on hepatitis B in general population (adults and children) and mainly as BDs but also in special subgroups such as pregnant women and people living with HIV. The overall HBV prevalence rate was estimated at 4.9% (95% CI 4.2–5.0). This estimation is slightly lower than that found in Schweitzer et al. review (5.99%) (Schweitzer et al. 2015) but reinforces the assertion that the DRC could be classified among countries of intermediate prevalence of HBV.

It must be outlined that studies performed before 2000 reported a higher HBV prevalence—for example in 1990,

Jager et al. reported a prevalence of 13.4% in a group of BDs (n = 2237) in Kinshasa (Jäger et al. 1990). In 1984, an investigation in healthy persons (n = 494) from a rural area found a carrier rate of HBsAg between 20 and 30% (Werner et al. 1985). Many factors can explain the observed decline in HBV prevalence during these last years: differences in methodology, in diagnostic tests, recent implementation of safe procedures in blood donation, systematic screening of blood products as well as different strategies in BD recruitment.

The estimation of seroprevalence in the DRC is also lower than those reported in neighboring countries: 10.3% in Uganda (Bwogi et al. 2009) and 13% in Angola (Valente et al. 2010). Reports of former studies published before the year 2000 also described higher rates in some of these neighboring countries: 15.6% in Burundi (de Lalla et al. 1990) and 14% in Central African Republic (Pawlotsky et al. 1995).

The majority of studies involved in our review were performed in BDs (18/28) representing 92.2% of the total population. The rate of blood transfusion is elevated in many African countries, including the DRC. Frequently, these procedures occur in pregnant women or children under 5 years and are performed in emergency. The main reason to transfuse children is related to malaria infection due to the lack of immunity at this age in a high transmission area (Kabinda et al. 2015a). This high need of blood transfusion is also associated to the use of replacement donors (punctual donor such as friend, relative or paid blood donor) who are at higher risk of HBV infection than voluntary donors even if some studies also highlight a substan-tial residual risk of HBV transmission by transfusion from blood given by voluntary donors (Kabinda et al. 2014a; I.N. Kembo, personal communication, 2016).

In 2010, WHO developed a strategic program aimed at raising mobilization of resources, policy, preventing transmission and screening, as well as treatment of HBV (WHO 2013). The DRC, as a member of the World Health Assembly, adopted these strategies but it cannot be excluded that notable gains had already been obtained before these last years with the implementation of universal vaccination for children and with the generalization of screening in all blood pockets.

Moreover, the DRC introduced HBV vaccination in babies as part of the Expanded Program of Immunization (EPI) in 2007 but the vaccine coverage remains rather low (PEV/RDC 2002–2006). In 2014, the estimation of national coverage approached 45% with disparities between regions (EDS-RDC 2013–2014). Systematic screening of pregnant women is another challenge of policy for reducing HBV in the DRC.

Improvement could be obtained by availability of more resources devoted to the screening of all pregnant women. Another possibility would be to inject the first dose of HBV vaccine within the first 24 h of delivery in infants from infected mothers as recommended by WHO. In the actual EPI schedule, a pentavalent vaccine (diphtheria, polio, tetanus, HBV and Influenza type B) is firstly given at the age of 6 weeks after birth since this type of vaccine may not be administered at birth. Strategies must also be focused on the treatment of HBV-infected pregnant women.

DRC is a vast country with large socio-demographic diversity and has been exposed to several years of politic and economic destabilization. It is also considered as a low-income country, with a national income per capita of $442 (The World Bank 2016). Epidemiological studies have shown that poor socioeconomic conditions are associated with the burden of HBV; moreover, with this low-income rate and an absence of health insurance, it appears difficult for the majority of the DRC population to access to HBV treatment.

The variation in prevalence between subgroups (setting, gender…) may be the result of differences in the risks of transmission as well as in diversity of socio-cultural, econom-ic and environmental factors across the DRC. It is also possi-ble that the regional variation of prevalence between urban and rural areas is the result of difference in socioeconomic conditions and vaccination coverage.

Many efforts are actually concentred against HIV infection. This review outlines the need to include the screening and the management of HBV in the holistic management of HIV tak-ing into account the fact that these two viruses share common ways of transmission.

Limitations

The main limit of this review is related to the lack of uniformity in the HBV screening methods used in the different studies since the accuracy of detection of active HBV infection strongly depends on the method used for detection. Moreover, very few studies have used additional markers for detection of HBV infection such as the search of HBV core antibodies or DNA testing. In addition, studies includ-ed in our review may have used different generations of AgHBs detection tests probably associated with a variabil-ity in the sensitivity and specificity of the method. The ma-jority of studies were performed with BDs and this certainly influences the estimation of the prevalence. This specific population may not be fully representative of the situation in the general population. Moreover, there is a regional im-balance in the number of studies with few studies performed in the north and the central of the DRC; thus, the overall estimated prevalence determined in our review may not be fully representative of the national prevalence. These pooled estimates might be questionable because of heterogenicity of denominators used in the calculation of prevalence in some studies (i.e blood donation), but this concern could be tempered by the large sample size associ-ated with the limited number of concerned studies.

Conclusion

Our review suggests that DRC is probably a country of intermediate HBV endemicity, according to the WHO prevalence criteria. Despite improvement in comparison to the situation observed before 2000, there are still multiple challenges such as the generalization of a universal vaccination for all children and the development of policies to prevent mother to child transmission. Efforts must be prolonged for safe blood donations procedures and by providing HBV detection tests in health facilities. Our findings illustrate the importance of implementation of new policy directive formulation to decrease HBV prevalence rate in the DRC and for organizing a national prevalence survey.

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Compliance with ethical standards

Conflict of interest Authors have no financial or any potential conflicts of interest to declare.

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