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*Original Research Article*

# Evaluation of Seroprevalence and Factors Associated With the Portage of HBsAg in Pregnant Women in Rural Vanga and Semi-Urban Maluku

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## ABSTRACT

**Context and objective:** The diagnosis of viral hepatitis during pregnancy raises the problem of its seriousness in women but also fetal risk and mother-to-child transmission. The objective of this study was to determine the HBsAg screening rate and risk factors associated with HBs Ag transmission among pregnant women in semi-urban and rural areas of the Democratic Republic of Congo.
**Methods:** Cross-sectional study of 152 pregnant women conducted from June 29, 2017 to April 28, 2018, having consulted the Gynecology and Obstetrics service of two medical units, one in the semi-urban environment of the city of Kinshasa and the other in the middle rural, chosen in a random way. HBsAg was wanted by a rapid test. The analysis was done with SPSS 22. A multivariate logistic regression model was used to search for risk factors for HBV at the p <5% threshold.
**Results:** The mean age was 26.3 ± 7.1 years. The frequency of HBsAg was 15.8%. The risk factors associated with HBsAg were non-condom use (aOR: 2.26), transfusion (aOR: 3.49), multiple sexual partner (aOR: 2.39) and number of Risque Factor > 4 (aOR: 2.44).
**Conclusion:** The frequency of HBsAg in pregnant women in the DRC is high. The national system of management and risk prevention factors for hepatitis B in pregnant women need to be strengthened.

***Key words:*** HBsAg, Risk factors, Pregnant woman, DRC

## INTRODUCTION

Hepatitis B virus, a DNA virus belonging to the family Hepadnaviridae, is present in the only reservoir that is Man. This virus is 50 to 100 times more contaminant than HIV. [1-3] Populations of African and Asian origin are the most affected. [4]

Drug dependence, HIV infection, and / or hepatitis C virus are risk factors for HBV infection. [2] The Hepatitis B virus can be transmitted in four ways: sexual, parenteral (drug addiction etc.), horizontal (close contact with an infected person), vertical perinatal with maternal-fetal transmission. It should be noted that in utero transmission is relatively rare, with less than 2% of perinatal infections. [2] Healing is spontaneous in 90% of cases, 10% develop chronic hepatitis whose complications are

cirrhosis and hepatocarcinoma. [5] Chronic hepatitis B is one of the most notifiable conditions in the world, with 360 million people, or 5% of the world's population, with a very uneven geographic distribution. The prevalence of HBV varies widely by region: from 0.1 to 20%. [2]

Despite screening for HBsAg serology has been made mandatory since 1992, in the sixth month of pregnancy, [6-8] the prevalence and risk factors of HBsAg transmission in pregnant women, in the Democratic Republic of Congo, are not known. Hence the interest of this study.

The overall objective of this study is to determine the HBsAg screening rate and risk factors associated with HBsAg transmission among pregnant women in semi-urban and rural areas of the Democratic Republic of Congo.

## MATERIALS AND METHODS

The present cross-sectional and analytical study was conducted from June 29, 2017 to April 28, 2018, conducted among pregnant women who had consulted the Gynecology and Obstetrics service of two medical units, one of the semi-urban environment of the city of Kinshasa (Commune of Maluku) and the other from rural areas (Vanga Evangelical Hospital, Kwilu Province), chosen in a random manner. A random sample was drawn from pregnant women attending antenatal clinic services and having consented verbally or in writing to participate in the study. The serology of HBsAg was determined by the ACCURATE® rapid test.

The interview served as techniques to collect give. First, a fact sheet was given to the woman to finally explain how to collect data on socio-demographic characteristics, knowledge of hepatitis B and factors predisposing to hepatitis B. Secondly a sample was taken to allow a rapid test on HBsAg. For proper use, the tests were stored at room temperature (10-30 ° C) in the desiccated container to avoid condensation of moisture on the membrane. Any test unit was labeled with a woman identification number. The test was performed on the plasma of the subject of our study; for the collection of the sample, we proceeded:

- Collection of blood samples using a 5cc intravenous syringe in women.
- Leave the syringe standing for at least 10-15 minutes so that there is a separation between plasma and blood cells.

Analytical technique

- Recover the plasma and put it in the test tube.
- Bring the container to room temperature before opening the test strip to avoid condensation of moisture on the membrane.
- Remove the strip from its container when you are ready to take the test.
- Label each strip by the number or name of each student to avoid confusion.
- Using a pipette, draw 50µl of the plasma contained in the test tube and place it on the strip precisely on the sample deposit area. Wait at least 10 to 15 minutes to read the results.

Interpretation.

After analysis, 3 types of results were possible:

- The presence of a control line of the red color in the window -control but the absence of this line in the patient window; this result is negative.
- The presence of the two red lines one in the control window and the other line in the patient window. This result is positive.
- Absence of the red line in the control window but presence of the red line in the patient window; this result is invalid. In this case, the test must be repeated.

The data was processed using Excel 2010 and SPSS version 22.0. Descriptive statistics allowed us to calculate frequencies, averages and standard deviation. Using Student's t-test made it possible to compare the averages and the chi-square test compared the proportions. Factors associated with HBsAg transmission were investigated using uni-multivariate logistic regression; Odds ratio calculation and 95% CI were used to estimate the degree of association between HBsAg and

independent factors. p <0.05 was the threshold of statistical significance. The study respected the rules of confidentiality, justice and beneficence of pregnant women.

## RESULTS

A total of 152 pregnant women were included in the study, of whom 80 were from rural areas (52.6%) and 72 women from semi-urban areas (47.4%).

### General characteristics of women

The average age of pregnant women was 26.3 ± 7.1 years with extremes of 14 years and 42 years, 26.3% of women respectively were between 26 -30 years old and 31-42 years old. The majority of these women were pauciparous (32.9%); paucigeste (39.5%); 15.1% had a history of abortion. The gestational age was mostly between 23 - 28 SA (61.8%). The majority of women were self-employed (49.3%) and their wives were students. Only 17.8% of women had information on hepatitis B (Table 1).

### Risk Factors for Hepatitis B Transmission

The most common predisposing factors among pregnant women were hairdressing in a public salon (77%), non-condom use (71.7%); manicure / pedicure (45.4%), hospitalization and spouse's travel (38.8%, respectively). The frequency of non-condom use, hospitalization, tattooing, STIs was significantly higher among women residing in the semi-urban setting, but the frequency of getting a public salon, manicure, and incarceration were higher, high among rural women (p <0.05). The average risk factor per woman was 3.5 ± 1.5 and ranged from 1 to 7 factors. The majority of women had 3-4 risk factors (Table 2).

### Prevalence of HBsAg in pregnant women

The overall prevalence of HBsAg in women was 15.8%; it was 16.3% in rural areas and 15.3% in semi-urban areas, but without a statistically significant difference (p = 0.524) (Figure 1)

**Table 1. General characteristics of women by residence**

| Variables | Overall n=152 | Rural environment n=80 | semi-urban environment n=72 | p |
|---|---|---|---|---|
| Age | 26.3±7.1 | 26.8±7.6 | 25.7±6.5 | 0.324 |
| 13-20 years | 38(25.0) | 21(26.3) | 17(23.6) | |
| 21-25 years | 34(22.4) | 14(17.5) | 20(27.8) | |
| 26-30 years | 40(26.3) | 20(25.0) | 20(27.8) | |
| 31-42 years | 40(26.3) | 25(31.3) | 15(20.8) | |
| Parity | | | | 0.146 |
| Nulliparous | 43(28.3) | 21(26.3) | 22(30.6) | |
| Primiparous | 30(19.7) | 11(13.8) | 19(26.4) | |
| Pauciparous | 50(32.9) | 30(37.5) | 20(27.8) | |
| Multiparous | 29(19.1) | 18(22.5) | 11(15.3) | |
| Gravidity | | | | 0.435 |
| Gravida | 42(27.6) | 20(25.0) | 22(30.6) | |
| Paucigeste | 60(39.5) | 30(37.5) | 30(41.7) | |
| Multigravida | 50(32.9) | 30(37.5) | 20(27.8) | |
| Abortion | | | | 0.119 |
| No | 129(84.9) | 71(88.8) | 58(80.6) | |
| Yes | 23(15.1) | 9(11.3) | 14(19.4) | |
| Gestational | | | | 0.072 |
| 23-28 SA | 94(61.8) | 46(57.5) | 48(66.7) | |
| 29-36 SA | 49(32.2) | 26(32.5) | 23(31.9) | |
| 37-42 Sa | 9(5.9) | 8(10.0) | 1(1.4) | |
| Occupation | | | | <0.001 |
| Student | 30(19.7) | 27(33.8) | 3(4.2) | |
| Unemployed | 28(18.4) | 2(2.5) | 26(36.1) | |
| Officer | 19(12.5) | 15(18.8) | 4(5.6) | |
| Liberal | 75(49.3) | 36(45.0) | 39(54.2) | |
| Husband occupation | | | | 0.001 |
| Student | 40(26.3) | 20(25.0) | 20(27.8) | |
| Unemployed | 39(25.7) | 16(20.0) | 23(31.9) | |
| Officer | 36(23.7) | 29(36.3) | 7(9.7) | |
| Liberal | 37(24.3) | 15(18.8) | 22(30.6) | |
| Information with hepatitis | | | | 0.011 |
| Yes | 27(17.8) | 20(25.0) | 7(9.7) | |
| No | 125(82.2) | 60(75.0) | 65(90.3) | |

**Table 2. Predisposing factors for hepatitis B by residence.**

| Variables | Tous n=152 | Milieu rural n=80 | Milieu semi-urban n=72 | p |
|---|---|---|---|---|
| Hairdresser | 117(77,0) | 69(86,3) | 48(66,7) | 0,004 |
| No condom use | 109(71,7) | 48(60,0) | 61(84,7) | 0,001 |
| Manicure | 69(45,4) | 66(82,5) | 3(4,2) | <0,001 |
| Joint trip | 59(38,8) | 35(43,8) | 24(33,3) | 0,125 |
| Surgical intervention | 59(38,8) | 22(27,5) | 37(51,4) | 0,002 |
| IST | 29(19,1) | 10(12,5) | 19(26,4) | 0,024 |
| Transfusion | 24(15,8) | 15(18,8) | 9(12,5) | 0,203 |
| IV drug husband | 22(14,5) | 9(11,3) | 13(18,1) | 0,169 |
| Multiple sexual partner | 14(9,2) | 10(12,5) | 4(5,6) | 0,115 |
| Incarceration | 13(8,6) | 11(13,8) | 2(2,8) | 0,014 |
| Tattoo | 12(7,9) | 3(3,8) | 9(12,5) | 0,044 |
| IV Drug | 10(6,6) | 4(5,0) | 6(8,3) | 0,308 |
| Dental care | 9(5,9) | 7(8,8) | 2(2,8) | 0,111 |
| Nomber de PF | 3,5±1,5 | 3,7±1,4 | 3,2±1,6 | 0,074 |
| 1-2 PF | 42(27,6) | 16(20,0) | 26(36,1) | |
| 3-4 PF | 71(46,7) | 40(50,0) | 31(43,1) | |
| >4 PF | 39(25,7) | 24(30,0) | 15(20,8) | |

PF: Predisposing factors

**Table 3. Determinants of HBsAg Transmission in Pregnant Women in univariate Analysis**

| Variables | Rural environment | | semi-urban environment | | Overall | |
|---|---|---|---|---|---|---|
| | p | OR (95% CI) | p | OR (5% CI) | p | OR (IC95%) |
| Nocondom use | | | | | | |
| No | | 1 | | 1 | | 1 |
| Yes | 0,012 | 2,88(1,84-9,75) | 0,024 | 2,48(1,54-11,37) | 0,012 | 2,54(1,04-6,23) |
| Surgical intervention | | | | | | |
| No | | 1 | | 1 | | 1 |
| Yes | 0,001 | 9,35(2,49-15,14) | 0,820 | 1,16(0,32-4,21) | 0,012 | 3,18(1,29-7,85) |
| Transfusion | | | | | | |
| No | | 1 | | 1 | | 1 |
| Yes | 0,000 | 6,88(5,39-7,11) | 0,712 | 1,66(0,07-5,90) | <0,001 | 5,82(2,18-15,55) |
| Multiple sexual partner | | | | | | |
| No | | 1 | | 1 | | 1 |
| Yes | 0,732 | 1,34(0,25-7,18) | 0,029 | 4,43(1,17-6,85) | 0,039 | 2,55(1,97-6,71) |
| Nomberof PF | | | | | | |
| 1-2 | | 1 | | 1 | | 1 |
| 3-4 | 0,998 | 1,23(0,23-2,61) | 0,631 | 0,64(0,11-3,83) | 0,025 | 3,70(1,18-11,65) |
| >4 | 0,001 | 6,08(3,14-8,23) | 0,008 | 4,03(2,17-6,42 | 0,002 | 5,42(1,86-15,78) |

**Table 4. Determinants of HBsAg Transmission in Pregnant Women in Multivariate Analysis**

| Variables | Rural environment | | semi-urban environment | | Overall | |
|---|---|---|---|---|---|---|
| | p | aOR (95%CI) | p | aOR (95%CI) | p | aOR (95%CI) |
| No condom use | | | | | | |
| No | | 1 | | 1 | | 1 |
| Yes | 0,032 | 9,51(1,21-14,76) | 0,015 | 3,50(1,63-9,45) | 0,010 | 2,26(1,85-6,04) |
| Surgical intervention | | | | | | |
| No | | 1 | | 1 | | 1 |
| Yes | 0,807 | 1,78(0,11-5,52) | 0,165 | 4,11(0,56-8,21) | 0,363 | 1,74(0,53-5,69) |
| Transfusion | | | | | | |
| No | | 1 | | 1 | | 1 |
| Yes | 0,020 | 10,64(1,46-7,72) | 0,445 | 1,38(0,03-4,62) | 0,001 | 3,49(1,05-11,61) |
| Multiple sexual partner | | | | | | |
| No | | 1 | | 1 | | 1 |
| Yes | 0,212 | 0,22(0,02-2,37) | 0,016 | 6,95(1,45-9,45) | 0,012 | 2,39(1,81-7,11) |
| Nomber of PF | | | | | | |
| 1-2 | | 1 | | 1 | | 1 |
| 3-4 | 0,998 | 1,23(0,23-2,36) | 0,222 | 0,20(0,02-2,65) | 0,724 | 1,31(0,29-5,76) |
| >4 | 0,026 | 3,18(1,61-7,65) | 0,017 | 2,55(1,07-4,65) | 0,016 | 2,44(1,40-8,45) |

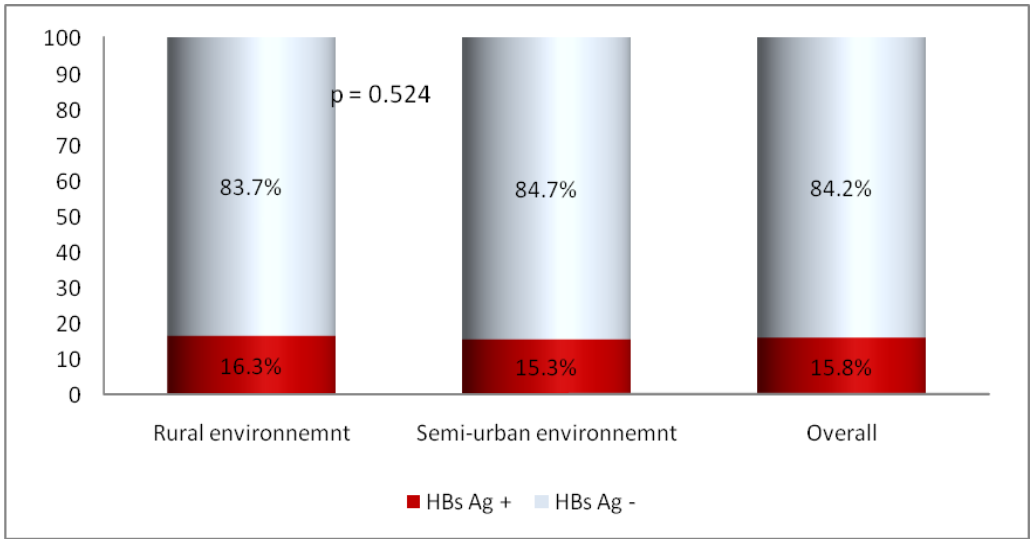


**Figure 1. Prevalence of HBs Ag in pregnant women by residence**

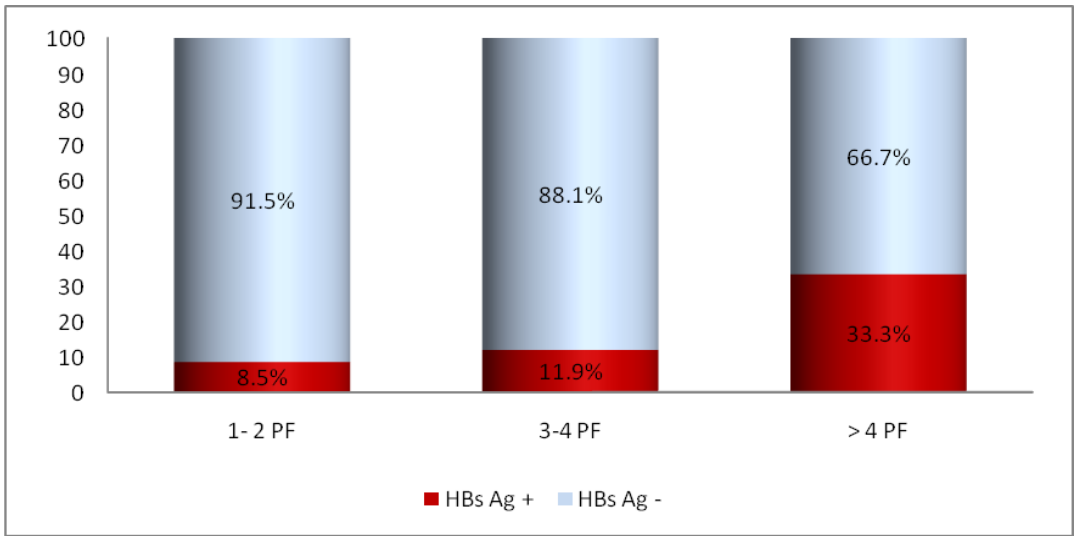


**Figure 2. Prevalence of HBsAg by number of Predisposing factors (PF) in women**

**Prevalence of HBsAg by Number of Risk Factors**

This figure indicates that the prevalence of HBsAg increased significantly with the increase in risk factors (p = 0.004) (Figure 2).

**Determinants of HBsAg Transmission in Pregnant Women**

**Univariate analysis**

Risk factors associated with transmission of HBsAg in pregnant women from both univariate backgrounds were condom non-use, surgery, blood transfusion, multiple sexual partner, and number of factors high risk. In rural settings, non-condom use, surgical intervention, transfusion and the number of risk factors> 4 were found to be the factors associated with HBsAg transmission. In contrast, in a semi-urban environment; it was soon non-condom use, the multiple sexual partner, and the number of RFs that had emerged as factors associated with HBsAg transmission (Table 3).

**Multivariate analysis**

After adjustment in multivariate analysis, in all pregnant women, non-condom use (ORa: 2.26, 95% CI: 1.85-6.04, p = 0.010), transfusion (ORa: 3.49 95% CI: 1.05-11.61, p = 0.001), multiple sexual partner (ORa: 2.39, 95% CI: 1.81-7.11, p = 0.012), and the number of RF> 4 (ORa: 2.44, 95% CI: 1.40-8.45, p = 0.016) had emerged as major factors and independently associated with HBsAg transmission in pregnant women. In rural areas the major

factors associated with the transmission of HBsAg were condom non-use, transfusion and the number of RF> 4; however, in semi-urban settings, we found major factors associated with HBsAg transmission, non-condom use, multiple sexual partner, and number of predisposing factors greater than 4 (Table 4).

## DISCUSSION

This work evaluated the seroprevalence and risk factors associated with hepatitis B in pregnant women in semi-urban and rural areas of the Democratic Republic of Congo. Its objectives are to determine the prevalence of HBsAg and to identify the risk factors associated with the seroprevalence of hepatitis B in pregnant women in the DRC.

Seroprevalence of HbsAg

Early detection of HBV infection in pregnant women is very important in order to allow early treatment. Since most pregnant women are unaware of their HBV status, they can be an important reservoir of transmission of HBV. [9, 10]

The prevalence of HBsAg carriage in pregnant women in our series is 16.3%. This prevalence in this study was close to that found in Cameroon (10.2%), [11] Yemen (10.8%) [12] and northern Uganda (11.8%). [13] However, the prevalence of HBsAg carriage in this study is significantly higher than that reported in the Ethiopian studies, which ranged from 6.1% to 7.8% [9, 14] and those in pregnant women in Cameroon (7.7%) and Nigeria (6.7-8.3%). [15, 16] This difference could for certain be related to the climate, but more likely to local epidemiology and especially to a very early contamination in life and the methodology used seems to be the point of divergence between the different studies.

The carriage rate of HBsAg in pregnant women in this study is of concern, as it is known that any HBsAg-positive woman can transmit HBV to her child. [17] The actual appreciation of this risk would have been easier if, in this work, the anti-HBc antibody and especially the HBe antigen had been assayed.

**Risk factors for carriage of HbsAg**

The factors predisposing to hepatitis B in pregnant women were numerous in our study and varied in the same woman between 1 and 7 factors. Risk factors for hepatitis B in pregnant women were reported in the African study by several authors. [18,19] In our study, the frequency of manicure was 45.4%, that of hairdressing in a public salon was 77%, that of the people operated on was 38.8%, and that of transfusion was 15.8%. These results follow the profile of most studies in pregnant women on hepatitis B. [15-19] In another study conducted in Cameroon by Bigna et al, [20] it was shown that transfusion in 63% was a predisposing factor for hepatitis B in pregnant women with the risk multiplied by 5. The Sekkat study Meryem had reported that 39.1% dental, 39.7% parental drug injection, previous hospitalization / surgery (37.8%), 25.1% tattoo / piercing, multiple partner (2, 6%) were the predisposing factors for hepatitis B in pregnant women. [21] We say that the results of this study, like those of other African studies on factors predisposing to hepatitis B in pregnant women, can be explained by the fact that these traditional practices are widespread in our society and are influenced by by ignorance about hepatitis B in our society is that in this study, 82.2% of pregnant women have never been informed about hepatitis B in life.

**Independent determinants of HbsAg**

In this study, socio-demographic variables such as age, marital and school status, residence and occupation of participants, as well as reproductive variables, such as gestational age and pregnancy, were not significantly associated with the risk of HBV infection. This finding is consistent with the study conducted in Ethiopia [22] and Nigeria. [23] However, it contrasts with a previous study that showed that pregnant women without formal

education had a higher probability of HBV infection. [24]

In the present study, pregnant women with multiple sexual partners were almost three times more likely to be at risk of HBV infection than their counterparts, this finding was most notable in a semi-urban setting where the multiple partners exposed 7 times to the risk of HBsAg carriage. This is consistent with findings from other parts of Africa. [22-24] This shows that further health education is needed to protect pregnant women from the multiple sexual partner that causes infection and to end the sexual transmission of HBV by modifying sexual practices and changing behavior.

Transfusion in the past resulted in a 3-fold risk of carrying HbsAg. [25] This finding is consistent with data from Bigna et al. which shows that the presence of an antecedent of blood transfusion multiplied the risk of transmission of HBsAg of 13. [20] Blood transfusion revealed a risk factor for the carriage of HBsAg through unsafe transfusion and also by the serological window during blood transfusion testing.

The absence of condom use increased the risk of carrying HBsAg by 2. This finding is consistent with data from the 2014 DHS. [26] Non-use is known to be an important factor in HBV transmission through direct contact between biological fluids of partners with high virus concentrations. On the other hand, the risk of having more than 4 factors is associated with the sharing of HBsAg by the effect of cumulative factors, as has been demonstrated in several African studies. [27-29]

The determination of the prevalence of HBsAg in pregnant women may be biased given the results concerned only the rapid test without Elisa. The prevalence of predisposing factors could also be biased by the cross-sectional nature of the study. To circumvent all these biases, it is necessary to realize a large-scale study, of randomized cohort and on a large sample. Apart from this bias, this has shown the prevalence of HBsAg and the predisposing factors for hepatitis B in pregnant women in Congolese environment.

## CONCLUSION

We found a high prevalence of HBV infection, with blood transfusion, multiple risk factors, non-condom use and multiple sexual partners as risk factors.Given the high prevalence of HBV infection in pregnant women, it is necessary to put in place measures to facilitate detection of HBV infection in these women. This involves the implementation of an awareness of pregnant women, a secure blood transfusion plan. Several other studies are needed to better estimate the risk of transmission of HBV from mother to child in this environment.

**Conflict of interest**

The authors declare no conflict of interest.

**Contribution of the authors**

Charles Mbendi and Aliocha Nkodila conceived and wrote the article. Marcel Kamba and Miclaire Mbombo carried out the investigation. Aliocha Nkodila analyzed the data; Benjamin Longo, Moustapha Moulay and Sébastien Mbendi coordinated the study. All authors approved the final version and revised the manuscript.

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