

HIV infection and hepatitis B seroprevalence among antenatal clinic attendees in Niger, West Africa

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Abstract: This transversal study was suggested in order to estimate the nationwide seroprevalences of HIV infection and hepatitis B among 495 pregnant women in Niger in 2008. The study detected anti-HIV antibodies with Genscreen® Plus HIV Ag/Ab Ultra Kit (Bio-Rad; Hercules, CA), Vironostika® HIV Uni-Form II Ag/Ab (bioMérieux; Marcy-l'Etoile, France), and ImmunoComb® II HIV 1 and 2 BiSpot (Orgenics; Yavne, Israel). HBsAg was detected by Monolisa® HBsAg Ultra (Bio-Rad) and ImmunoComb® II HBsAg (Orgenics). The rates obtained were 2.02% (95% confidence intervals (CI): 1.03%–3.81%) and 16.16% (95% CI: 13.09%–19.77%), respectively. There were no significant variations according to environment, region, age, marital status, educational level, antecedent of surgery and transfusion. But these data need a large sample, and periodic updates for a better planning of activities in the framework of a national reproductive health program, including prevention of mother-to-child HIV transmission.

Keywords: HIV, HBV, seroprevalence, pregnant women, Niger

Introduction

Human immunodeficiency virus (HIV) infection and hepatitis are common vertically communicable diseases, with relatively high prevalence in sub-Saharan Africa. The Joint United Nations Programme on HIV/AIDS (UNAIDS) reported 22.4 million infected persons in this area, representing 67% of the total global cases in 2008.¹ Over 2 billion people have evidence of previous hepatitis B virus (HBV) infection and 350 million have become chronic carriers of the virus with 60 million of them residing in Africa.² The correlation between chronic HBV infection and hepatocellular carcinoma (HCC) has been proven both experimentally and epidemiologically.^{3,4}

For the two diseases, few reported data are available from Niger, a country located between Algeria and Nigeria, with 1.267 million square kilometers for only 15 million inhabitants. The main objective of this study was to generate nationwide data to aid the planning of appropriate activities for the prevention of mother-to-child HIV transmission, and national reproductive health programs.

Material and methods

Sampling method

The size of the representative sample was estimated in agreement with statistical constraints, and taking account with eventual refusal cases, insufficiently impregnated filter paper, and those with missing information. Pregnant women attending antenatal clinics were sourced from mother and infant health services, chosen for their

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high frequentation, in each region. Those who declined to participate in the study were not replaced.

Data collection

Every eligible woman was asked to answer questions about demographic data, education level, and antecedent of surgery or blood transfusion. Standardized questionnaires were filled in by the investigators (midwives). A code number was used to identify study participants. After finger pricking with sterile disposable safety lancets, blood was collected on calibrated spots of filter paper (Serobuvar[®] LDA22; Ploufragan, France). The blood spots were left to dry at ambient temperature; then the dried blood spots (DBS) were placed in paper envelopes for transport to a laboratory by the supervisors of the survey.

Laboratory method

Briefly, after overnight incubation of the DBS, the eluates were used for the screening of the different markers. For HIV infection, the study used Genscreen[®] Plus HIV Ag/Ab Ultra Kit (Bio-Rad; Hercules, CA) first. Negative specimens were then definitely considered as corresponding to noninfected individuals. Positive specimens were tested with Vironostika[®] HIV Uni-Form II Ag/Ab (bioMérieux; Marcy-l'Etoile, France); negative results were considered as definitive while positive results were later tested with ImmunoComb[®] II HIV 1 and 2 BiSpot (Orgenics; Yavne, Israel) to discriminate HIV-1 and HIV-2. HBsAg was detected by Monolisa[®] HBsAg Ultra (Bio-Rad) and ImmunoComb[®] II HBsAg (Orgenics).

Data analysis

Data analysis was performed with Epi Info[™] 6 software (Centers for Disease Control and Prevention (CDC); Atlanta, GA). Confidence intervals (CI) were calculated by using the Fleiss quadratic method.⁵ Pearson's X^2 and Fisher's exact tests were used whenever appropriate (a P -value <0.05 was considered significant).

Ethical aspects

Informed oral consent was obtained from study participants after an explanation of the aims and methods of the survey that included unequivocal reference to HIV testing and the assurance that no individual results could be generated by the study design. Collected data were anonymous and unlinked. Women were strongly encouraged to accept the routine antenatal HIV infection and syphilis screening.

Results

Five hundred and eight pregnant women were asked to participate, of which, 506 accepted and were tested; the refusal rate was 0.39%. Eleven women were not tested because of insufficiently impregnated filter papers and/or missing information. The final size of the sample was 495 women.

The overall seroprevalence was 2.02% (95% CI: 1.03%–3.81%) for HIV and 16.16% (95% CI: 13.09%–19.77%) for hepatitis B. Three cases of coinfection HIV–HBV were found. All HIV strains were type 1.

As presented in Tables 1 and 2, there were no significant variations of HIV infection rate according to environment ($P = 0.814$); region ($P = 0.619$); age ($P = 0.907$); marital status ($P = 0.780$); or educational level ($P = 0.738$). Also, variations were not significant for HBV according to environment ($P = 0.616$); region ($P = 0.999$); age ($P = 0.997$); marital status ($P = 0.618$); educational level ($P = 0.584$); history surgery ($P = 0.703$); or blood transfusion ($P = 0.953$).

Discussion

HIV seroprevalence in the general population of Niger was 0.9% in 2002 and 0.7% in 2006.^{6,7} Two previous HIV serosurveys among pregnant women were conducted the same

Table 1 Seroprevalence of the two markers according to environment, region, and age of 495 pregnant women

| Feature | Number | HIV | | HBsAg | |
|--------------------|--------|-------|------------|-------|------------|
| | | + | Prevalence | + | Prevalence |
| Environment | | | | | |
| Urban | 241 | 5 | 2.07% | 42 | 17.01% |
| Rural | 254 | 5 | 1.97% | 38 | 15.35% |
| <i>P</i> value | | 0.814 | | 0.616 | |
| Region | | | | | |
| Agadez | 68 | 1 | 1.47% | 11 | 16.17% |
| Diffa | 26 | 0 | 0% | 4 | 15.38% |
| Dosso | 67 | 2 | 2.98% | 10 | 14.93% |
| Maradi | 61 | 1 | 1.64% | 9 | 14.75% |
| Niamey | 73 | 0 | 0% | 12 | 16.43% |
| Tahoua | 68 | 2 | 2.94% | 12 | 17.65% |
| Tillaberi | 61 | 0 | 0% | 10 | 16.39% |
| Zinder | 71 | 4 | 5.63% | 12 | 16.90% |
| <i>P</i> value | | 0.619 | | 0.999 | |
| Age (years) | | | | | |
| 15–19 | 84 | 3 | 3.57% | 13 | 15.48% |
| 20–24 | 147 | 3 | 2.04% | 24 | 16.33% |
| 25–29 | 125 | 3 | 2.4% | 20 | 16% |
| 30–34 | 54 | 1 | 1.85% | 8 | 14.81% |
| 35–39 | 39 | 0 | 0% | 7 | 17.95% |
| 40–44 | 44 | 0 | 0% | 8 | 18.18% |
| 45–49 | 2 | 0 | 0% | 0 | 0% |
| <i>P</i> value | | 0.907 | | 0.997 | |

Table 2 Seroprevalence of the two markers according to marital status, educational level, antecedent of surgery and blood transfusion for 495 pregnant women

| Feature | Number | HIV | | HBsAg | |
|-------------------------------|--------|-------|------------|-------|------------|
| | | + | Prevalence | + | Prevalence |
| Marital status | | | | | |
| Monogamous | 297 | 6 | 2.02% | 46 | 15.49% |
| Polygamous | 192 | 4 | 2.08% | 33 | 17.19% |
| Divorced | 6 | 0 | 0% | 1 | 16.67% |
| P value | | 0.780 | | 0.618 | |
| Education level | | | | | |
| None | 312 | 7 | 2.24% | 49 | 15.70% |
| Primary/ Koranic school | 135 | 3 | 2.22% | 25 | 18.52% |
| Secondary/ High school | 48 | 0 | 0% | 6 | 12.25% |
| P value | | 0.738 | | 0.584 | |
| Surgery | | | | | |
| Yes | 7 | 0 | 0% | 1 | 14.29% |
| No | 488 | 10 | 2.05% | 79 | 16.19% |
| P value | | – | | 0.703 | |
| Blood transfusion | | | | | |
| Yes | 16 | 0 | 0% | 2 | 12.50% |
| No | 479 | 10 | 2.09% | 78 | 16.28% |
| P value | | – | | 0.953 | |

years, in three administrative regions within the UNFPA program, and one site by region. The overall rates reported were 0.96% (95% CI: 0.5%–1.7%) and 1.2% (95% CI: 0.7%–2.1%), respectively.⁸ The present study used a sub-sample from all eight regions of Niger for a better estimation of HIV seroprevalence among pregnant women in 2008. The rate of 2.02% (95% CI: 1.03%–3.81%) was not significantly different from the 2002 and 2006 rates ($P=0.196$). HIV-1 was responsible for all cases of HIV infection in this study; these data are in agreement with the general decreasing of HIV-2 prevalences in Niger and other West African countries.^{9,10} These updated data provided by the study made a useful contribution to the planning of HIV-vertical transmission prevention in the recent HIV/AIDS proposition to the Round 10 Global Fund Against AIDS, Tuberculosis and Malaria. However, the sample size of this study was relatively small for testing factors potentially relevant to HIV infection among antenatal clinic attendees in Niger.

For hepatitis B screening, HBsAg is still the main marker, despite some false–negative results caused by the rare variation in the antigenic determinant a, observed in occult hepatitis.^{11,12} The relatively high rate of HBsAg carriage among pregnant women is in agreement with the

well-established hyperendemicity of HBV in sub-Saharan Africa. Previous studies reported similar levels of this marker in various groups in Niger: 17.6% among students in 1985 and HIV positive people in 2007; 14.46% among blood donors in 2007.^{13–15} Nevertheless, no concrete measure of control has been undertaken for this vaccine-preventable disease, until September 2008 when hepatitis B vaccine was used in a routine vaccination program. Also, HBsAg detection is required in the package of antenatal biological screenings. HBV vertical transmission can be avoided by vaccinating newborns as early as possible, preferably before departure from the maternity hospital.

In conclusion, this study demonstrated that the HIV prevalence rate was enough to declare a HIV generalized epidemic in Niger, but a large scale study for data confirmation and for testing factors relevant to HIV infection among pregnant women is needed. For hepatitis B, these data clearly showed the pertinence and the necessity of considering HBsAg systematic screening as an important disease control strategy. This is a challenge for the national reproductive health program.

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Disclosure

The authors report no conflicts of interest in this work.

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