HIV Epidemic in Central African Republic: High Prevalence Rates in Both Rural and Urban Areas

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INTRODUCTION

Prevalence data are vital for tracking the progress of the HIV epidemic, planning the allocation of resources for the care of AIDS patients and monitoring the impact of interventions. Ideally, these data should come from community-based serosurveys, but few of these studies have been carried out for financial or logistical reasons. Furthermore, surveys provide only occasional estimates of point prevalence. As a result, many countries rely on sentinel surveillance systems in which easily accessible populations are monitored anonymously over time [Walker et al., 2001]. The Central African Republic, located in sub-Saharan Africa bounded by Chad, Sudan, Cameroon, Congo (Brazzaville) and Democratic Republic of Congo, has had a sentinel serosurveillance system since 1989, 5 years after the notification of the first AIDS cases. Initially, blood donors, tuberculosis patients, patients with sexually transmitted infections and pregnant women were monitored in only three health facilities in Bangui, the capital city. Since 1994, the number of sentinel sites has increased to 14. These sites are located in most parts of country and targeted populations are pregnant women, patients with sexually transmitted infections and employees of private firms in Bangui. However, the National AIDS Committee has no surveillance data since 1997, when the first rebellions took place in Central African Republic. Thus, the National AIDS Committee, in part-

A sentinel serosurveillance study was conducted in Central African Republic to estimate the prevalence of HIV seropositivity in the general adult population in each province so that the public health authorities can target HIV prevention programmes to the priority areas. Blood samples were collected from women attending 48 antenatal clinics in urban and rural areas of the Central African Republic. These samples were tested for HIV antibodies in an anonymous and unlinked manner using strategy II recommended by WHO. The data were extrapolated to all women of reproductive age in Central African Republic by use of a parity-based adjustment involving the application of correction factors to the observed prevalence rates. A total of 9,305 pregnant women were recruited from November 2001 to October 2002. HIV seroprevalence was high in all age groups (12% in the less than 20 year age group to 17% in the 25–29 year age group). The median prevalence of HIV in antenatal clinics was similar for rural areas, for Bangui and for other urban areas (16.5, 15.0, and 12.5% respectively). Adjustment for parity and fertility pattern increased the prevalence of HIV in all antenatal clinics except in Bangui. This first national study of HIV prevalence in Central African Republic revealed that the HIV epidemic is continuing to spread in both urban and rural areas. Thus, efforts to reduce transmission should be made in every part of the country.


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KEY WORDS: seroprevalence; sentinel surveillance; pregnant women
MATERIALS AND METHODS

Study Population and Data Collection Methods

This sentinel serosurveillance study was carried out as recommended by UNAIDS: blood samples are collected routinely from women attending antenatal clinics for syphilis screening, thus we used these samples for anonymous unlinked HIV testing [Slutkin et al., 1988].

Two hundred and fifty women were recruited in health facilities located in urban areas and 125 in those located in rural areas, due to differences in the numbers of women attending rural and urban facilities. Urban were defined as Bangui, the capital city and other major agglomerations, rural areas corresponding to other places [Schwartlander et al., 1999]. A total of 9,000 pregnant women were expected to be recruited from 48 health facilities located throughout the country. These health facilities included the 14 existing sentinel sites plus 34 others with antenatal and laboratory facilities. Age, parity and the results of syphilis screening (RPR Slide Test, BioMerieux laboratories, Marcy l’Etoile, France) were recorded for each pregnant woman during her first visit.

Laboratory Methods

A revised version of strategy II recommended by WHO was used [WHO, 1997]. All serum samples were sent to Bangui and tested for HIV antibodies by ELISA (Genscreen® HIV 1/2, Biorad laboratories, Marne la Coquette, France). If a positive result was obtained, a second independent rapid test was used for confirmation (Determine® HIV 1/2; Abbott laboratories, Tokyo, Japan). In the case of discrepant results, specimens were further tested using VIDAS HIV Duo® (BioMerieux laboratories) and samples found to be negative were considered HIV-negative and those found to be positive were considered to be HIV-indeterminate. Only HIV-positive results were used to estimate HIV prevalence.

Data Analysis

Data were recorded using the Epi Info 6.04d.fr software [Centers for Disease Control and Prevention, Atlanta]. Univariate and multivariate analysis were carried out using STATA 7.0 software [Stata Corporation, College Station, Texas]. For each health facility, HIV prevalence was first estimated among antenatal clinics attendees and then extrapolated to the females in the general population, using an adjustment method developed by Zaba et al. [2000]. The fertility and parity data necessary for this adjustment were obtained from the 1994 to 1995 Demographic Health Survey [Central Census Office, 1995].

RESULTS

From November 2001 to October 2002, a total of 9,305 ANC attendees were recruited, 67% in urban area. The median age was 22 years with a range from 12 to 47 years. Sixty-nine percent of pregnant women were parous and the median number of children born alive was 3 (range: 1–15). A total of 1,902 (20.4%) serum samples were tested HIV positive with Genscreen®, but only 1,330 (14.3%) were confirmed as being positive with Determine®. Of the 572 samples that gave discrepant results, 548 were found to be HIV negative using HIV Duo® and 24 (0.3%) were considered as indeterminate. At the end of diagnostic process, 14.3% of pregnant women were considered to be HIV-positive, 85.4% HIV-negative and the status could not be determined for 0.3% women. Syphilis antibodies were present in 10% of women and positively associated with HIV antibodies (P < 0.05).

The median prevalence rate has been calculated for each area (national, Bangui, urban excluding Bangui and rural). In all areas, except Bangui where the median prevalence was 15% (7–21), adjustment for parity and fertility pattern increased the prevalence of HIV: in urban areas other than Bangui (from 13% [9–20] to 23% [13–29]) and in rural areas (from 17% [4–28] to 21% [5–40]).

Seroprevalence rates according to location are represented in Figure 1. It can be seen that the country is concerned by the epidemic, including both economically important areas (like Bouar, Carnot, Ngoundaye in the west) and remote areas (like Zemio or Amdafok in the east).

The seroprevalence of HIV peaked at 16.9% in the 25–29 year age group and was high among the less than 20 year age group (12%) and the more than 35 year age group (around 14%) (Table I). HIV seroprevalence decreased with parity, but only after adjustment for age (Table I). There was no association between urban or rural residence and HIV infection (Table I).

DISCUSSION

Our study, the first ever national study in Central African Republic or in the central African region, shows that HIV is highly prevalent in the entire country. As for the countries that are most affected by the HIV epidemic (e.g., southern Africa), women in rural areas were equally at risk of being infected as women in urban areas as predicted by the model described by Salomon and Murray [2001]. The prevalence of HIV among the general female population tended to be higher (>25%) in northern areas (up to the borders with Chad and Sudan) than in southern areas (down to the borders with Congo and the Democratic Republic of Congo) (15–19%).
Fig. 1. HIV prevalence among pregnant women by health facility (map 1) and after adjustment for parity and fertility pattern, among the general female population of reproductive age (map 2), Central African Republic, November 2001–October 2002.

### TABLE I. Distribution of HIV Prevalence Among Pregnant Women by Age Group, Parity and Area, and Results of Multivariate Analysis (Logistic Regression), Central African Republic, November 2001–October 2002

<table>
<thead>
<tr>
<th>Variable</th>
<th>Subjects</th>
<th>HIV-1 prevalence (%)</th>
<th>Crude OR\textsuperscript{a}</th>
<th>95% CI\textsuperscript{b}</th>
<th>$P^*$</th>
<th>Adjusted OR\textsuperscript{a}</th>
<th>95% CI\textsuperscript{b}</th>
</tr>
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<tr>
<td>Age group (years)</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>&lt;20 (Ref.)</td>
<td>3,003</td>
<td>12.3</td>
<td>1</td>
<td>0.03</td>
<td>1</td>
<td>1.48</td>
<td>[1.25–1.77]</td>
</tr>
<tr>
<td>25–29</td>
<td>1,697</td>
<td>16.9</td>
<td>1.44</td>
<td>[1.22–1.71]</td>
<td>2.03</td>
<td>[1.63–2.52]</td>
<td>2.03</td>
</tr>
<tr>
<td>30–34</td>
<td>1,103</td>
<td>14.1</td>
<td>1.17</td>
<td>[0.96–1.44]</td>
<td>1.92</td>
<td>[1.48–2.51]</td>
<td>1.92</td>
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<tr>
<td>35–39</td>
<td>634</td>
<td>13.7</td>
<td>1.14</td>
<td>[0.92–1.45]</td>
<td>2.18</td>
<td>[1.58–3.02]</td>
<td>2.18</td>
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<tr>
<td>40–44</td>
<td>165</td>
<td>14.5</td>
<td>1.22</td>
<td>[0.76–1.94]</td>
<td>2.52</td>
<td>[1.53–4.16]</td>
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<tr>
<td>45–49</td>
<td>25</td>
<td>16.0</td>
<td>1.36</td>
<td>[0.93–2.0]</td>
<td>2.58</td>
<td>[0.86–7.77]</td>
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<tr>
<td>Parity</td>
<td></td>
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<tr>
<td>0 (Ref.)</td>
<td>2,847</td>
<td>14.7</td>
<td>1</td>
<td>0.06</td>
<td>1</td>
<td>1</td>
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<tr>
<td>1–2</td>
<td>3,164</td>
<td>14.2</td>
<td>0.96</td>
<td>[0.83–1.11]</td>
<td>0.74</td>
<td>[0.63–0.88]</td>
<td>0.74</td>
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<tr>
<td>3–5</td>
<td>2,187</td>
<td>15.1</td>
<td>1.03</td>
<td>[0.88–1.21]</td>
<td>0.62</td>
<td>[0.49–0.77]</td>
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<td>6+</td>
<td>989</td>
<td>10.8</td>
<td>0.70</td>
<td>[0.56–0.88]</td>
<td>0.38</td>
<td>[0.28–0.52]</td>
<td>0.38</td>
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<tr>
<td>Area</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Rural (Ref.)</td>
<td>3,009</td>
<td>14.0</td>
<td>1</td>
<td>0.62</td>
<td>1</td>
<td>1.06</td>
<td>[0.93–1.20]</td>
</tr>
<tr>
<td>Urban</td>
<td>6,182</td>
<td>14.4</td>
<td>1.03</td>
<td>[0.91–1.17]</td>
<td>1.06</td>
<td>[0.93–1.20]</td>
<td>1.06</td>
</tr>
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\textsuperscript{a}Odds ratio.
\textsuperscript{b}Confidence interval.
\textsuperscript{*}Test for trend.
Sentinel surveillance systems among pregnant women are typically biased by the lack of representativity of the selected health centers, the fact that only women of a certain socio-economic status attend antenatal appointments, and differences in HIV risk between pregnant women and women from the general population [Strickler et al., 1995; Nicoll et al., 1998; Zaba and Gregson, 1998; Gregson et al., 1999; Jackson et al., 1999; Schwartländer et al., 1999; Kwegisabo et al., 2000; Zaba et al., 2000; Fabiani et al., 2001; Walker et al., 2001]. In our study, these biases have been minimised by selecting 48 health facilities, representing 90% of all health facilities with antenatal clinics and laboratory capacities in the country. Furthermore, it has been shown in Central African Republic that on average, 69% of pregnant women attended antenatal appointments, and this percentage reached 91% in Bangui [Central Census Office, 2001]. Finally, adjustment for parity and fertility patterns using the method developed by Zaba and Gregson [1998] increased the prevalence of HIV, as shown in most other published studies [Changalucha et al., 2002].

The results showed that Genscreen® gave a high number of false positive results: the number of positive HIV tests was 20% with Genscreen® and just 14% with Determine®. This phenomenon has been described previously and can be explained by non-specific binding of antibody in ELISA because of hypergammaglobulinemia, HLA type and cross-reactivity with unidentified retroviruses in the sera of Africans [Strickler et al., 1995]. To minimise costs, UNAIDS and the WHO recommend the implementation of strategy I e.g., the use of one assay for surveillance purposes when the HIV prevalence is over 10% [WHO, 1997]. If this strategy is to be implemented in Central African Republic, the rapid and simple Determine® assay should be used because of its better specificity (100%) [Palmer et al., 1999].

There are some limitations to our study. First, more women from each health facility should have been included. However, due to the low number of women attending these facilities, it was not possible really to include more women in most cases. Second, due to the lack of reliable data about the real male to female sex ratio, our objective, which was to estimate the HIV prevalence in the general adult population of the Central African Republic, could not be reached completely. However, this sex ratio is probably less than one, meaning that the prevalence of HIV in the general adult population is at worst equal to that observed in the general population of females of reproductive age.

Our results (national median HIV prevalence = 18%) confirmed the high prevalence of HIV in Central African Republic compared to in other sub-Saharan African and central African countries [Walker et al., 2001]. The estimated prevalence of HIV in the countries bordering the Central African Republic is less than 10% (Cameroon: 8%, Chad: 3%, Congo: 6%, Democratic Republic of Congo: 5% and Sudan: 1% in 1999). In these countries, fewer sentinel sites were used to extrapolate the national estimates and none of the sentinel sites were located near the border with the Central African Republic, even though we found that HIV was highly prevalent at border sites. The reasons for the high prevalence of HIV in Central African Republic are not straightforward and merit further studies: the Central African Republic is neither a traffic nor an economic crossroads [Amat-Roze, 1993]. Subtyping studies have shown that the HIV strains circulating in this region are highly heterogeneous, a pattern usually associated with slow rather than fast developing epidemics (e.g., Democratic Republic of Congo and Senegal) [Müller-Trutwin et al., 1999; Toure-Kane et al., 2000; Vidal et al., 2000]. Furthermore, there is no convincing evidence that differences in sexual behaviour have a major impact on the level of HIV epidemics [Auvert et al., 2001]. Data on HSV-2 prevalence and male circumcision status would be useful as these two factors are associated with more aggressive HIV epidemics [Auvert et al., 2001].

Our results should serve as a baseline for national authorities to address these questions. Second generation surveillance system, combining serosurveillance and sexual behaviour surveillance, is necessary to improve the monitoring of the HIV/AIDS epidemic in Central African Republic [UNAIDS, 2000; Asimwe-Okiror et al., 1997]. In addition, national authorities should target their preventative actions not only in areas with high economic activity, but also in remote areas, which seem to be equally as affected by the epidemic. This study will be repeated in 3 years time, at the end of the Multisectorial AIDS Programme, to evaluate the impact of control efforts in reducing transmission.

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