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HYPOTHESIS

Evidence of iatrogenic HIV transmission in children in South Africa

In December 2002, the Human Sciences Research Council (HSRC) of South Africa published results from a national census-derived random sample survey of HIV prevalence and selected risk factors in South Africans aged two years and older (a total of 8840 persons provided interview data and a specimen for the HIV test: OraSure HIV-1 oral specimen collection device was used with the Vironostika HIV Uni-Form Ii Plus O testing kit)[1]. The survey revealed a prevalence of 5.6% (131/2348) among 2–14 year olds, comparable to the 4.2% reported in Rwandan urban children in 1986 in the last national HIV serosurvey in Africa that included children[2]. Only 6.1% of the HIV-infected South African children had a dead parent, whether due to AIDS or any other cause.

A small subgroup of 20 children (aged 2–11) was matchable to a biological parent with a known HIV test result, and only 5 of these infected children had an HIV-positive parent. This would support the hypothesis that up to three-quarters of HIV-infected 2–11 year olds may have been infected from a source other than their mother. Although the numbers are small and, therefore, results should be interpreted with caution, the observation in the same survey[1] that white children had an HIV prevalence of 11% (16/145), while white adults had one of 5.7%, also points to an important role for non-vertical HIV transmission. Surprised by such findings, HSRC investigators recommend epidemiologic investigation focussing on possible childhood sexual and/or iatrogenic exposure. As in any sample, there is the possibility of sampling bias, but this might have been less of a problem in this large survey than in other smaller ones.

Neither the lay nor medical media seem to appreciate the HSRC report's implications: 5.6% of 2–14 year olds in South Africa would translate into an estimated 670,000 HIV-infected children, an inference not explicitly drawn in the report. This is 2.7 times larger than conventional estimates for vertically infected children between 0 and 15 years old, only about half of which would be 2 years or older. The conventional estimates are based on the proportion of women in antenatal sentinel surveys with HIV, on assumptions about mother-to-child transmission and neonatal survival and on presumed negligible HIV transmission through other routes[3].

For hundreds of thousands of South African children to have acquired HIV sexually, inordinately high levels of childhood sexual exposure would be required, a phenomenon unlikely to have been overlooked by paediatricians. Recent reports from South Africa discourage this hypothesis. For example, in a large survey of women in South Africa, only 1.6% reported having been raped before age 15[4]; and despite extensive media coverage of infected men seeking virgin girls as a 'cure' for their HIV infection, few cases have been documented[5]. In another South African investigation, the rate of HIV seroconversion following child rape was 1% only, which, along with previous reports, argues against high transmission efficiency even under such circumstances[6,7]. American experience[6] points to a female-to-male ratio in child rape cases of about 5.5:1, whereas HSRC investigators report virtual sex parity in their sample's HIV-infected children. Only 1.4% of 12–14 year olds in the HSRC sample reported being sexually experienced, a rate lower than in other surveys of similarly aged South Africans[8]. Rates of partner accumulation and of sexual activity among sexually experienced youth respondents were also modest. Even assuming substantial under-reporting of sexual behaviours, the preponderance of HIV infections in children in the South African HSRC sample remains unexplained.

These data are also consistent with many other African studies reporting HIV-positive children with HIV-negative mothers[9]. HIV infection of children in the South African sample through non-sterile medical procedures is a more reasonable hypothesis than the sexual one and is supported by much other evidence. For example, a large study of sexual risk factors for HIV infection in four African cities — two with high and two with low prevalence — found that rate of partner change, sex with prostitutes, concurrent partnerships and lack of condom use were not more common in high prevalence cities[10,11]. The authors concluded that sampling bias, shifts in sexual behaviour over time or misreporting by respondents did not explain their observations[12]. Failure to find an association of sexual behaviour with community HIV disease burdens suggests that non-sexual means of transmission may be contributing substantially.

In a previous paper[9], we reported unexplained high rates of HIV incidence in African women during antenatal care and postpartum: In five studies of incidence in HIV-negative cohorts — in Kenya, Malawi, Rwanda, South Africa and Zimbabwe — from first antenatal visit to delivery and in the months after delivery, HIV incidence ranged from 6.2 to 21 per 100 person years[13–18] After allowing for possible sexual transmission [assuming (a) the proportion

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of women with HIV-positive partners is equal to the percentage of women who were HIV-positive in the sample from which the cohort was drawn and (b) HIV transmission from seropositive partners of 10 per 100 person years, which is the average from five studies of African women with HIV-positive partners continuing unprotected sex], these studies show unexplained incidence of 4–19 per 100 person years[9]. In Malawi, HIV incidence during the antenatal and postpartum periods combined fell from 21 per 100 person years in 1990 to 1.1 per 100 in 1994–1995, while HIV prevalence — and presumably risk for sexual transmission — increased. Evidence points to health care risks during antenatal care, including the drawing of blood, tetanus immunisation and other procedures.

The rates of unexplained incidence in these five studies are similar to the mortality rates of 6–16% from puerperal fever reported by Semmelweis in Vienna in 1841–1946[19]. All obstetricians will be well aware that that was eventually attributed to the effect of the physicians' unclean hands. It is possible therefore that even some of the childhood cases attributable to vertical transmission may also ultimately be due to iatrogenic causes.

We recently reported a discordance between rapid HIV transmission levels in the context of decreasing sexually transmitted disease diagnoses and increasing condom use, in Zimbabwe[20]. Other clues to inadvertent health care transmission include the fact that injections for treatment of sexually transmitted infections are more strongly associated with HIV infections than are sexually transmitted infections themselves and that higher health care access and use are associated with increased HIV/AIDS risk[9,21].

There is mounting evidence that rapid HIV transmission is fuelled by parenteral exposures in health care settings, especially medical injections but also including transfusion of untested blood and others[9,21]. Not only are injections popular among African patients, administered at an estimated 90% of medical visits, but also often unnecessary[22], and injection equipment is often reused without sterilisation[22,23]. Investigation of iatrogenic outbreaks in Russia, Romania and Libya has demonstrated both that medical injections are efficient vectors for HIV transmission and that rigorous application of safe injection procedures can virtually eliminate transmission[24].

We are preparing a research agenda detailing methods to investigate further the details of the role of iatrogenesis in African HIV transmission. One method is to conduct widespread testing of 5–11 year old children and then test the mothers of the seropositive children, looking for seronegative mothers from whom extensive histories of their child's health care exposures would be obtained.

Conclusion

The common belief that 90% of HIV transmission in Africa is driven by heterosexual exposure is no longer tenable. Evidence supporting a much larger role for parenteral HIV transmission in medical settings in Africa has recently been painstakingly detailed[9,21].The HSRC report, if confirmed, adds to this evidence. The lessons for all doctors, including obstetricians and gynaecologists are clear: They must educate their patients in the dangers of non-sterile injections and ensure that their own practice is beyond reproach. Patients could be shown the package of a new needle (or bring their own) and single-dose vials used for injections. Similar improvements in the sterility of injections in the informal sector also need to be made. We must protect patients from their own medical care system in all countries with similar epidemiological characteristics.

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