Scarification and Male Circumcision Associated with HIV Infection in Mozambican Children and Youth

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**Competing Interests:**
None
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Author(s): Brewer D D

Abstract

Background: In sub-Saharan Africa, significant numbers of children with seronegative mothers are HIV infected. Similarly, substantial proportions of African youth who have not had sex are infected with HIV. These findings imply that some African children and youth acquire HIV through blood exposures in unhygienic healthcare, cosmetic care, and rituals. In prior research, male and female Kenyan, Lesothoan, and Tanzanian adolescents and virgins who were circumcised were more likely to be infected with HIV than their uncircumcised counterparts.

Methods: I examined the association between male circumcision, scarification, and HIV infection in Mozambican children and youth with data from the 2009 Mozambique AIDS Indicator Survey. I excluded from analysis children under age 12 who had HIV seropositive biological mothers. I coded children and youth as exposed to circumcision or scarification only if it had occurred within the prior 10 years.

Results: Circumcised and scarified children and youth were two to three times more likely to be infected with HIV than children and youth who had not been circumcised or scarified, respectively. Circumcision and scarification were each associated with HIV infection for both virgins and sexually experienced youth. Males circumcised by medical doctors were almost as likely to be infected as those circumcised by traditional circumcisers. Circumcision and scarification were also independently associated with HIV infection in males.

Conclusions: To determine modes of HIV transmission with confidence, researchers must employ more rigorous research designs than have been used to date in sub-Saharan Africa. In the meantime, Mozambicans and other Africans should be warned about all risks of blood-borne HIV transmission, including scarification and medical and traditional circumcision, and informed about how these risks can be avoided.

Introduction

Since HIV was first recognized, researchers and clinicians have regularly reported significant numbers of children in sub-Saharan Africa with horizontally acquired HIV infection [1-5]. In recent national probability sample household serosurveys in Swaziland (2006-2007) and Uganda (2004-2005), 16-20% of HIV infected children had seronegative mothers [3,6-8]. Similarly, a substantial proportion as high as 5.5% in some countries of adolescent and young adult virgins in sub-Saharan Africa are infected with HIV [9-11].

Some African children and youth may be exposed to HIV and other blood-borne pathogens through circumcision and scarification [12]. In sub-Saharan Africa, traditional and medical circumcision are often conducted unhygienically, and serious complications, including death, are not uncommon [9,13-17]. In fact, male and female virgins and adolescents in Kenya, Lesotho, and Tanzania who had been circumcised (generally in puberty or later) were several times more likely to be HIV infected than their uncircumcised counterparts. Other diverse blood exposures are associated with incident and prevalent HIV infection in children and adults in sub-Saharan Africa, independent of sexual behaviors [3,11,18-22].

Data from the 2009 Mozambique AIDS Indicator Survey (AIS) [23] allow a detailed examination of the links between male circumcision, scarification, and HIV infection in children and youth. To my knowledge, scarification has not been previously studied in relation to HIV infection in children. The 2009 Mozambique AIS also has a unique combination of data on age at exposure, circumciser type, and biological mother’s serostatus.

The group nature of male circumcision and scarification has been noted for several ethnic groups in Mozambique [24-26]. Just as with circumcision, scarification in Mozambique may often be done in unhygienic circumstances and involve reused and unsterilized cutting instruments [27]. Unhygienic circumcision and scarification may lead to HIV transmission if a cutting instrument, provider’s fingers or hands, other sharps, or materials applied to wounds...
are contaminated with HIV infected blood. Traditional male circumcision in Mozambique is done as part of initiation rites, while scarification reportedly is done to express ethnic identity, signify passage into adulthood, or beautify the scarified person [28]. Thus, in Mozambique, children and youth are not circumcised or scarified in response to illness symptoms.

Methods

2009 Mozambique AIDS Indicator Survey (AIS) data
In the 2009 Mozambique AIS, the household participation rate was 99%, and 95% of eligible women and 90% of eligible men participated [23]. Ninety-three percent of respondents age 12-19 and 87% of children between ages 0 and 11 years provided dried blood spot specimens for HIV testing. HIV serostatus was determined with an enzyme linked immunosorbent assay (ELISA) test and confirmed by a different ELISA test. Specimens with discrepant ELISA results were confirmed by a further ELISA test. The 2009 Mozambique AIS data and documentation are available at http://www.measuredhs.com.

A parent or caretaker responded on behalf of their children under age 12. Adolescents and youth age 12 to 19 responded for themselves. Male respondents were asked whether they were circumcised, and parents reporting for boys were asked whether the boys were circumcised. Follow-up questions focused on the type of circumciser (medical doctor or traditional circumciser) and age at circumcision. All adolescent and adult respondents were asked whether they had received scarification or tattoos (as scarification is sometimes called in Mozambique), and parents and caretakers were asked whether their children had received scarification or tattoos. One follow-up question focused on age at scarification. All respondents age 12 and older were asked whether they had ever had sex; parents and caretakers were not asked whether their children under age 12 had ever had sex.

The very large majority of HIV infected children do not survive even 5 years after seroconversion without treatment [4]. Most infected and untreated adults also do not survive 10 years after seroconversion [29]. The questions on age at circumcision and scarification therefore provide crucial data, because potential exposures to HIV are only meaningfully assessed for periods during which some infected persons can be expected to survive. Therefore, I coded individuals as exposed to circumcision only if it had occurred within the previous 10 years. I coded exposure to scarification similarly. For some individuals, age at circumcision/scarification was coded in the AIS as during infancy/before age 5. In such cases, I treated age at circumcision/scarification as age 4 years in my calculation of time since the exposure.

Statistical analysis
I included all adolescents and youth age 12 to 19 in analysis. I also included children age 0 to 11 in analysis if their biological mothers were HIV seronegative and reported on their behalf. The inclusion criteria for children ensure that vertically-infected children were excluded. I computed cross-classifications, odds ratios, and the associated 95% confidence intervals (CI) for the relationships between circumcision, scarification, sexual experience, and HIV status. For the relationship between circumcision and scarification, I also calculated the Pearson (phi) correlation. In addition, for males, I computed the adjusted odds ratios from the multiple logistic regression with HIV status as the dependent variable and circumcision and scarification as the independent variables. For analyses involving the sexual experience variable, I coded children under age 12 as virgins. I used SPSS 7.5 (SPSS Inc., Chicago, USA), VassarStats (http://faculty.vassar.edu/lowry/VassarStats.html), RLPPlot 1.4 (rlplot.sourceforge.net), and programs I wrote in QuickBasic (Microsoft Corporation, Redmond, USA) to perform the analyses.

Results

One and one-half percent of 3,371 males age 0 to 19 were HIV positive, and 2.5% of 3,405 females age 0 to 19 were HIV positive. Eighteen (0.6%) children under age 12 who had HIV negative biological mothers were HIV infected. These horizontally-infected children comprised 31% (18/58) of all HIV infected children under age 12 whose biological mothers’ serostatuses were known.

Circumcised boys and youth were circumcised at ages ranging from infancy to their late teens. Every region is represented among circumcised males. Circumcised boys and youth were twice as likely to be infected with HIV as uncircumcised boys and youth (Table 1). This association was similar in strength for virgins and sexually experienced males, respectively. Males circumcised by medical doctors were almost as likely to be HIV infected (2.6%, 6/230) as males circumcised by traditional circumcisers (3.3%, 15/452; OR 1.28, 95% CI 0.49-3.35). There was no meaningful difference in age at circumcision by the type of
circumciser (medical doctor or traditional circumciser; data not shown). Scarified children and youth of both sexes were scarified at ages ranging from infancy to their late teens. Every region is represented among scarified females, and every region except Manica province is represented among scarified males. Scarified children and youth were about three times more likely to be HIV infected than children and youth who had not been scarified (Tables 2 and 3). This relationship was of similar strength for virgin and sexually experienced males, respectively. Scarified virgin females were as likely to be infected with HIV as sexually experienced females. However, sexually experienced females who had been scarified were more than twice as likely to be HIV infected as sexually experienced females who had not been scarified. In sexually experienced females aged 15 to 19, the odds ratio for the association between scarification and HIV infection, adjusted for number of sex partners in the last 12 months, was 2.42 (95% CI, 1.11-5.29).

Circumcision and scarification were negligibly associated in males (r = .01; OR 1.09, 95% CI 0.66-1.78). In a multiple logistic regression (n = 3,293), circumcision (AOR 2.88, 95% CI 1.62-5.11) and scarification (AOR 4.00, 95% CI 1.54-10.4) were independently associated with HIV infection. Only two HIV infected males had been both circumcised and scarified.

**Discussion**

In the 2009 Mozambique AIDS Indicator Survey, circumcised and scarified children and youth were two to three times more likely to be infected with HIV than children and youth who had not been circumcised or scarified, respectively. Circumcision and scarification were associated with HIV infection for both virgins and sexually experienced youth. Males circumcised by medical doctors were almost as likely to be infected with HIV as sexually experienced males. However, sexually experienced males who had been scarified were more than twice as likely to be HIV infected as sexually experienced males who had not been scarified. In sexually experienced males aged 15 to 19, the odds ratio for the association between scarification and HIV infection, adjusted for number of sex partners in the last 12 months, was 2.42 (95% CI, 1.11-5.29).

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of the dozens of Kenyan clinics assessed in 1999 and 2004 lacked the trained staff, supplies, and equipment (including sterilizers) for performing male circumcision safely [13,39]. Indeed, local health officials in Tanzania interviewed in 2008-9 emphasized that Tanzania lacked the medical infrastructure, including trained professionals, infection control practices, and supplies for ensuring safe and hygienic male circumcision [40].

To determine modes of HIV transmission with confidence, researchers must employ more rigorous research designs than have been used to date in sub-Saharan Africa. Such designs involve assessing blood and sexual exposures comprehensively in incident HIV cases and controls, tracing their contacts corresponding to these exposures, and sequencing infected person’s HIV isolates [41-43]. In the meantime, Mozambicans and other Africans should be warned about all risks of blood-borne HIV transmission, including scarification and medical and traditional circumcision, and informed about how these risks can be avoided [44-46].

Acknowledgments

I thank Stuart Brody, Deena Class, David Gisselquist, and John Potterat for their helpful comments on an earlier draft of this manuscript. I also thank the government of the Republic of Mozambique for making the data from the 2009 Mozambique AIDS Indicator Survey publicly available.

References


Illustrations

Illustration 1

Table 1. Association between circumcision and HIV infection in males age 0-19, Mozambique, 2009

<table>
<thead>
<tr>
<th></th>
<th>HIV negative</th>
<th>HIV positive</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All males</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not circumcised</td>
<td>98.9 (2592)</td>
<td>1.1 (29)</td>
</tr>
<tr>
<td>Circumcised</td>
<td>97.0 (671)</td>
<td>3.0 (21)</td>
</tr>
<tr>
<td><strong>OR (95% CI)</strong></td>
<td>2.80 (1.59-4.94)</td>
<td></td>
</tr>
<tr>
<td><strong>Virgin males</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not circumcised</td>
<td>99.0 (2172)</td>
<td>1.0 (23)</td>
</tr>
<tr>
<td>Circumcised</td>
<td>97.8 (406)</td>
<td>2.2 (9)</td>
</tr>
<tr>
<td><strong>OR (95% CI)</strong></td>
<td>2.09 (0.96-4.56)</td>
<td></td>
</tr>
<tr>
<td><strong>Sexually experienced males</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not circumcised</td>
<td>98.6 (420)</td>
<td>1.4 (6)</td>
</tr>
<tr>
<td>Circumcised</td>
<td>95.7 (264)</td>
<td>4.3 (12)</td>
</tr>
<tr>
<td><strong>OR (95% CI)</strong></td>
<td>3.18 (1.18-8.58)</td>
<td></td>
</tr>
</tbody>
</table>

Note: Cells show row percentages with frequencies in parentheses.

1One adolescent boy had missing data on sexual experience.
### Table 2. Association between scarification and HIV infection in males age 0-19, Mozambique, 2009

<table>
<thead>
<tr>
<th></th>
<th>HIV negative</th>
<th>HIV positive</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All males</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not scarified</td>
<td>98.6 (3203)</td>
<td>1.4 (44)</td>
</tr>
<tr>
<td>Scarified</td>
<td>94.8 (92)</td>
<td>5.2 (5)</td>
</tr>
<tr>
<td>OR (95% CI)</td>
<td></td>
<td>3.96 (1.53-10.2)</td>
</tr>
<tr>
<td><strong>Virgin males(^1)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not scarified</td>
<td>98.9 (2560)</td>
<td>1.1 (29)</td>
</tr>
<tr>
<td>Scarified</td>
<td>95.8 (46)</td>
<td>4.2 (2)</td>
</tr>
<tr>
<td>OR (95% CI)</td>
<td></td>
<td>3.84 (0.89-16.6)</td>
</tr>
<tr>
<td><strong>Sexually experienced males(^1)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not scarified</td>
<td>97.8 (642)</td>
<td>2.2 (15)</td>
</tr>
<tr>
<td>Scarified</td>
<td>93.9 (46)</td>
<td>6.1 (3)</td>
</tr>
<tr>
<td>OR (95% CI)</td>
<td></td>
<td>2.79 (0.78-9.99)</td>
</tr>
</tbody>
</table>

Note: Cells show row percentages with frequencies in parentheses.

\(^1\)One adolescent boy had missing data on sexual experience.
Illustration 3

Table 3. Association between scarification and HIV infection in females age 0-19, Mozambique, 2009

<table>
<thead>
<tr>
<th></th>
<th>HIV negative</th>
<th>HIV positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>All females</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not scarified</td>
<td>97.7 (3135)</td>
<td>2.3 (74)</td>
</tr>
<tr>
<td>Scarified</td>
<td>93.0 (147)</td>
<td>7.0 (11)</td>
</tr>
<tr>
<td>OR (95% CI)</td>
<td>3.17 (1.65-6.10)</td>
<td></td>
</tr>
<tr>
<td>Virgin females¹</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not scarified</td>
<td>98.9 (2466)</td>
<td>1.1 (27)</td>
</tr>
<tr>
<td>Scarified</td>
<td>98.9 (93)</td>
<td>1.1 (1)</td>
</tr>
<tr>
<td>OR (95% CI)</td>
<td>0.98 (0.13-7.31)</td>
<td></td>
</tr>
<tr>
<td>Sexually experienced</td>
<td></td>
<td></td>
</tr>
<tr>
<td>females¹</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not scarified</td>
<td>93.5 (658)</td>
<td>6.5 (46)</td>
</tr>
<tr>
<td>Scarified</td>
<td>84.4 (54)</td>
<td>15.6 (10)</td>
</tr>
<tr>
<td>OR (95% CI)</td>
<td>2.65 (1.27-5.54)</td>
<td></td>
</tr>
</tbody>
</table>

Note: Cells show row percentages with frequencies in parentheses.

¹Twelve adolescent girls had missing data on sexual experience.
Illustration 4

Figure 1. Higher prevalence of HIV in children and youth who have been circumcised or scarified, in four African countries (ages 15-17 for Kenya, Lesotho, and Tanzania; ages 0-19 for Mozambique)
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Reviews

Review 1

Review Title: appropriate

Posted by Dr. Paula Vaz on 29 Sep 2011 04:37:56 PM GMT

1. Is the subject of the article within the scope of the subject category? Yes
2. Are the interpretations / conclusions sound and justified by the data? Yes
3. Is this a new and original contribution? Yes
4. Does this paper exemplify an awareness of other research on the topic? Yes
5. Are structure and length satisfactory? Yes
6. Can you suggest brief additions or amendments or an introductory statement that will increase the value of this paper for an international audience? No
7. Can you suggest any reductions in the paper, or deletions of parts? No
8. Is the quality of the diction satisfactory? Yes
9. Are the illustrations and tables necessary and acceptable? Yes
10. Are the references adequate and are they all necessary? Yes
11. Are the keywords and abstract or summary informative? Yes

Rating: 7

Comment:
This is a very interesting article that raises the problematic of the horizontal transmission of HIV. I am convinced that this type of transmission is accountable for a non negligible amount of HIV contaminations in poor settings. These results are consistent with other published articles on nosocomial transmission. However there are some limitations that were not mentioned:

1. The national database was done on a cross-sectional evaluation and in this context the estimates of HIV infection are not accurate as we can’t exclude the possibility of those on the window period that were not re tested.
2. One of the premises of the author is that scarification is not done in response to illness symptoms, which is not true in our country. In Mozambique, scarification is often used as a mean to treat chronic or persistent illness and many children seen in the hospital for chronic illness present scarifications, this might work as confounder for HIV infection and change the interpretation of the results.

Competing interests: no

Invited by the author to make a review on this article? : Yes

Experience and credentials in the specific area of science:
I have a cohort of HIV positive children and adolescents born of HIV seronegative mothers, on clinical follow up for more than 10 years.

Publications in the same or a related area of science: Yes


How to cite: Vaz P. appropriate[Review of the article 'Scarification and Male Circumcision Associated with HIV Infection in Mozambican Children and Youth ' by ].WebmedCentral 1970;2(9):REVIEW_REF_NUM976
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