Disentangling the complex association between female genital cutting and HIV among Kenyan women: a multilevel analysis

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Abstract

Female genital cutting (FGC) is a widespread cultural practice in Africa, with a number of potential adverse health consequences for women. International organisations, national governments together with NGOs, community-based and grass-root organisations are trying to reduce the prevalence of FGC. Despite these efforts, female genital cutting is still a widespread phenomenon. It was hypothesised by Kun (1997) that FGC increases the risk of HIV transmission through a number of different mechanisms. Yount and Abraham (2007) in their detailed analysis of 2003 Kenyan Demographic and Health Survey reported that FGC is not directly associated with HIV but indirectly through several pathways. We applied multilevel analysis on the same dataset to demonstrate that there is a significant direct and positive association between FGC and HIV after controlling for hierarchical structure of the data, potential confounding factors, and interaction effects. FGC increases the odds of being HIV positive by the factor of 4.17 when compared to women without FGC. Furthermore, the results show that women who had FGC and older first union partners have higher odds of being HIV positive than their counterparts (odds further changes by the factor of 1.66); the odds of being HIV positive increase further by the factor of 2.27 if women reported having a genital ulcer. These results suggest the underlying complex interplay of bio-behavioural and social variables in disentangling the association between FGC and HIV.

Introduction

In June 2007 issue of the Studies in Family Planning Yount and Abraham published their study on female genital cutting and HIV/AIDS in Kenya. In their detailed analysis of 2003 Kenyan Demographic and Health Survey they reported that FGC is not directly associated with HIV/AIDS. Our study builds upon the results from their analysis.

According to UNAIDS the HIV/AIDS epidemic is generalised in Kenya with the prevalence of 6.1% in 2006 and with the main route of HIV transmission being heterosexual transmission. A number of studies (Bongaarts 2007, Auvert *et al*. 2001, Shapiro 2002, Caldwell 2000, Clark 2004 and others) investigated different risk factors which are associated with

HIV/AIDS in Africa. Auvert *et al*. (2001) suggested that the risk factors associated with HIV/AIDS can be divided into the two main groups: behavioural factors such as commercial sex, lack of condom use, young age at first sexual intercourse, multiple sexual partners, difference in age of partners, and biological factors, which can increase susceptibility to HIV infection, such as untreated STIs, high viral load of infected partners, lack of male circumcision.

It was hypothesised by Kun (1997) that FGC increases the risk of HIV transmission through a number of different mechanisms, for example through unsterilised instruments used during the procedure, through increased risk of blood transfusion, through risk of infections caused by FGC, or through increased frequency of anal intercourse (for more details see Kun 1997).

The prevalence of FGC is declining in Kenya; in the 1998 KDHS the prevalence was 37.6%, whereas in the 2003 KDHS the FGC prevalence was estimated to be 32% (Skaine 2005, CBS *et al.* 2004a). However despite the visible reduction, the prevalence is still quite high. According to UNICEF 2005, FGC is a "fundamental violation of human rights", it also might bring health risk and life-threatening consequences to women. This all suggest that more research should be done in order to understand potential consequences of FGC better, more efforts should also be made to eradicate this potentially harmful cultural practice.

The current study will examine an association between FGC and HIV/AIDS in the Kenyan context.

Results from other studies

Not many studies have investigated the potential association between female genital cutting and HIV/AIDS. A number of different short- and long-term negative health outcomes were attributed to FGC by researchers such as infections, gynaecological and obstetric problems, hemorrhage, pain, keloid scars, genitor-urinary problems, reproductive tract infections and others (Yount and Abraham 2007, Shell-Duncan 2001, Jones *et al*. 1999, Okonofua *et al*. 2002).

Morison *et al*. (2001) found an association between FGC and bacterial vaginosis (BV) and between FGC and herpes simplex virus 2 (HSV-2) in rural Gambia. They hypothesised that the high prevalence of HSV-2 among women with FGC may suggest that they are more vulnerable towards HIV infection (Morison *et al*. 2001).

Caldwell *et al*. (1997) looked at potential negative association between FGC and HIV/AIDS (the motivation for this study came from the well established negative association between male circumcision and HIV) and the association was not established.

Brewer *et al*. (2007) and Pépin *et al*. (2006) found a direct positive association between FGC and HIV/AIDS (the first study was looking at virgins and adolescents in Kenya, Lesotho

and Tanzania, the second study examined the parenteral transmission of HIV through the communal FGC among some ethnic groups in Guinea-Bissau). Both studies suggest that the most plausible mechanism of HIV transmission was through using the same ceremonial knife during the FGC procedure, which was performed on a number of girls and at least one of the girls was infected with HIV occupationally, parenterally or vertically prior to the FGC procedure.

Other studies which investigated the link between FGC and HIV, have found no significant direct association between the two: Msuya *et al*. (2002), Klouman *et al*. (2005), Yount and Abraham (2007).

The first study which used nationally representative sample for the analysis (Yount and Abraham 2007) found no direct association between HIV and FGC but indirect association through a number of different pathways (Yount and Abraham 2007).

Plausible mechanisms of association between FGC and HIV

All mechanisms of association between FGC and HIV can be divided into the two main groups: non-sexual mechanisms and sexual mechanisms. Non-sexual mechanisms are the parenteral transmission of HIV through septic instruments either during FGC procedure or during medical interventions. Studies by Brewer *et al*. (2007) and Pépin *et al*. (2006) were predominantly interested in this mechanism of association. However, according to Adams *et al.* (2007) in their letter in response to the Brewer *et al*. (2007) study they suggested that when sexual behaviour is self-reported in a survey the results in relation to non-sexual mechanism of transmission could be seriously biased.

Yount and Abraham (2007) reported three plausible pathways of the association and all those pathways belong to sexual mechanisms. These pathways include first sexual experience before the age of 20, first union with an older partner, and widowhood or divorce. Women who went through FGC have higher odds of being widowed or divorced, of being in a first union with an older partner, or of having first sexual intercourse before the age of 20 than women without FGC. Women who are widowed or divorced, who were in a first union with an older partner, or who had the first sexual intercourse at the age younger than 20 have higher odds of being HIV positive (Yount and Abraham 2007).

The current study will concentrate mainly on the sexual mechanisms of association between FGC and HIV/AIDS. These mechanisms of association are of the major interest as the main route of HIV transmission in Sub-Saharan Africa is through heterosexual intercourse.

Data and sample

The Kenyan Demographic and Health Survey 2003 (KDHS 2003) provides the unique opportunity to look at the association between FGC and HIV as it allows the linking of HIV prevalence data, i.e. results of HIV tests, with a large number of demographic, social, economic and behavioural characteristics of women, including women's FGC status.

The KDHS 2003 has a two-stage sample design. At the first stage 400 clusters were samples. During the second stage households were systematically selected, and 8,889 households were eligible for interviews. All women age 15-49 years in these households were eligible to be interviewed for the survey. In addition, in every second household selected for the survey, all women who were eligible for the interview were also asked to voluntary give a few drops of blood for HIV testing. 4,043 women were eligible for HIV testing, 3,273 of these women were tested for HIV (CBS *et al*. 2004b). For more details about the data see CBS *et al*. 2004b.

As the main research question is concerned with the association between HIV and FGC, only women who reported their FGC status and who were tested for HIV and the results were not questionable (not indeterminate) were included into the dataset for the analysis. A total number of women whose HIV status and FGC status were available was 3,266.

During the descriptive analysis stage it was established that in the North Eastern province 100% of the women (152) went through an FGC procedure, however none of the 152 cases was HIV positive. The North Eastern province is a very distinctive part of the country in many respects. In Kenya, the HIV epidemic is generalised, but in the North Eastern province "no respondent tested positive"[1], which means that the rate is very low in the province (CBS *et al.* 2004b, p.222). On the other hand the North Eastern province has the highest rate of FGC in the country – 99% (CBS *et al.* 2004a). The province is quite remote and sparsely populated, the majority of population are ethnic Somalis. Mobility across the region and migration between regions, which can contribute to the spread of HIV infection, is still quite low and can help to explain the low level of HIV infection in the province. The response variable used for the analysis is HIV status, due to the fact that none of respondents from the province is HIV positive, and therefore the population of interest does not exist there, the decision to exclude the province from the analysis was taken. The final dataset used for analysis contains observations for 3,114 women of reproductive age in Kenya nested within 2,372 households nested within 373 communities.

[1] Non-response in the North Eastern province is similar to the non-response in the other parts of the country, therefore the low HIV prevalence cannot be attributed to the issue of non-response.

Methodology

Multilevel modelling is required when observations are not independent because data have structure either due to the data collection process or due to the natural structure which might exist within the population. If this hierarchical structure is not accounted for, standard errors will be underestimated. And this can bring the misleading results of analysis, e.g. misleading significance status of parameter estimates. Due to the survey's sample design there is a need to account for the hierarchical structure. The statistical package MLwiN version 2.02 was used for the multilevel modelling.

Forward selection procedure was used for the multilevel logistic model selection processes. The Wald test: $\frac{\hat{\beta}_m^2}{Var(\hat{\beta}_{m)}} \sim \chi_1^2$ informs the decision about inclusion of terms, interactions, random intercepts and random slopes. This test has an advantage of being able to test the overall significance of a categorical variable with several categories. It is rather difficult to estimate the random variance in a logistic multilevel analysis. Twisk argues that "a second order PQL (Penalised Quasi-Likelihood) estimation procedure is thought to be the most appropriate method" (2006, p.44).

Results

The results from the multilevel logistic regression when only main effects were included into the final model confirm the results from Yount and Abraham (2007) in relation to the association between HIV and FGC. After controlling for the hierarchical structure of the data and for potential confounding factors, the direct association between HIV and FGC does not exist. The results of the multilevel logistic regression model *without* interactions can be found in Tables 1.

Table 1: Coefficients, standard errors, odds ratio, 95% confidence intervals (multilevel logistic regression *without* interactions)

Variable	Number of women	Percent of HIV positive	Coefficient	Standard Error	Odds Ratio	95% Confidence Interval
Intercept			-3.980	0.420	0.019	
FGC status						
No (r)	2152	9.9	0.000		1.000	
Yes	962	6.6	-0.163	0.214	0.850	(0.558, 1.292)
Marital status						
Married–monogamous (r)			0.000		1.000	
Never married and never had sex	524	1.7	-0.468	0.467	0.62625	(0.251, 1.564)
Married-polygamous	353	11	0.416	0.217	1.51589	(0.991, 2.319)
Widowed	130	31.5	2.235***	0.265	9.34648	(5.560, 15712)

Divorced	43	14	0.699	0.484	2.01174	(0.779, 5.195)
Never married but had sex	401	8.2	0.634	0.336	1.88514	(0.976, 3.642)
Not living together	164	19.5	1.028***	0.241	2.79547	(1.743, 4.483)
Age centred			0.021	0.012	1.021	(0.997, 1.045)
Age centred squared			-0.006***	0.001	0.994	(0.992, 0.996)
Region						
Coast (r)	381	6.8	0.000		1.000	
Central	522	7.5	0.391	0.337	1.478	(0.764, 2.862)
Eastern	382	6.3	0.403	0.366	1.496	(0.730, 3.066)
Nairobi	353	11	0.368	0.316	1.445	(0.778, 2.684)
Nyanza	465	17.2	1.379***	0.287	3.971	(2.262, 6.969)
Rift Valley	567	6.3	0.274	0.315	1.315	(0.709, 2.438)
Western	444	7	0.097	0.321	1.102	(0.587, 2.067)
Wealth						
Poorest (r)	459	4.1	0.000		1.000	
Poorer	567	7.9	0.717*	0.311	2.048	(1.113, 3.768)
Middle	579	7.3	0.927**	0.316	2.527	(1.360, 4.694)
Richer	625	10.2	1.222***	0.303	3.394	(1.874, 6.146)
Richest	884	11.9	1.371***	0.304	3.939	(2.171, 7.148)
Ulcer						
No (r)	2052	8.5	0.000		1.000	
Yes	62	24.2	1.016**	0.341	2.762	(1.416, 5.389)
Ethnic group						
0-29% (r)	1189	12.6	0.000		1.000	
30-69%	1580	6.8	-0.488*	0.230	0.614	(0.391, 0.963)
70-100%	345	5.2	-1.104**	0.355	0.331	(0.165, 0.665)
First union partner's age						
Never in a union, younger or the same age (r)	1288	4.8	0.000		1.000	
Older	1826	11.7	0.705**	0.260	2.024	(1.216, 3.369)

***p<0.001; **p<0.01; *p<0.05; r – reference category

However, the inclusion of the significant interactions[2] into the final model, changes the results of the modelling substantially. The results of the *final* multilevel logistic regression model *with* significant interactions can be found in Tables 2. The results of the analysis suggest that direct positive association between FGC status and HIV status does exist after controlling for a number of potential confounding factors, interaction effects and for hierarchical structure of the data. These results suggest that FGC increases the risk of HIV transmission in the Kenyan context.

[2] As the main variable of interest was an FGC status of women, interactions of this variable with other variables were tested for significance despite the fact that the variable was not found to be significant on its own.

Table 2: Results of the final multilevel logistic regression model (fixed effects)

Variable	Coefficient	Standard Error	Odds Ratio	95% Confidence Interval
Intercept	-4.348	0.447	0.013	
FGC status				
No (r)	0.000		1.000	
Yes	1.428**	0.498	4.170	(1.571, 11.068)
Marital status				
Married – monogamous (r)	0.000		1.000	
Never married and never had sex	-0.306	0.473	0.736	(0.291, 1.861)
Divorced	0.718	0.489	2.050	(0.786, 5.346)
Married-polygamous	0.405	0.220	1.499	(0.974, 2.307)
Never married but had sex	0.809*	0.343	2.246	(1.146, 4.398)
Not living together	1.057***	0.242	2.878	(1.791, 4.624)
Widowed	2.271***	0.269	9.689	(5.719, 16.416)
Age centred	0.017	0.013	1.017	(0.991, 1.043)
Age centred squared	-0.006***	0.001	0.994	(0.992, 0.996)
Region				
Coast (r)	0.000		1.000	
Central	0.430	0.338	1.537	(0.792, 2.982)
Eastern	0.383	0.368	1.467	(0.713, 3.017)
Nairobi	0.406	0.318	1.501	(0.805, 2.799)
Nyanza	1.366***	0.290	3.920	(2.220, 6.920)
Rift Valley	0.306	0.318	1.358	(0.728, 2.533)
Western	0.134	0.324	1.143	(0.606, 2.158)
Wealth				
Poorest (r)	0.000		1.000	
Poorer	0.730*	0.314	2.075	(1.121, 3.840)
Middle	0.928**	0.318	2.529	(1.356, 4.717)
Richer	1.236***	0.305	3.442	(1.893, 6.258)
Richest	1.378***	0.307	3.967	(2.173, 7.240)
Ulcer				
No (r)	0.000		1.000	
Yes	0.723	0.401	2.061	(0.939, 4.522)
Ethnic group				
0-29% (r)	0.000		1.000	
30-69%	-0.476*	0.232	0.621	(0.394, 0.979)
70-100%	-1.151**	0.359	0.316	(0.156, 0.639)
First union partner's age				
Never in a union, younger or the same age (r)	0.000		1.000	
Older	1.140***	0.301	3.127	(1.733, 5.640)
Interactions				
FGC and first union partner's age	-0.632***	0.184	0.531	(0.370, 0.762)
Age centred with genital ulcer	0.098*	0.043	1.103	(1.014, 1.200)

***p<0.001; **p<0.01; *p<0.05; r – reference category

Main Results

The interaction between FGC status and the first union partner's age was found to be significant. Figure 1 shows predicted probabilities of being HIV positive for women with and without FGC by different groups of the first union partner's age. Both groups of women with FGC have higher probabilities of being HIV positive in comparison with the women without FGC. Having an older partner increases the probability of being HIV positive for women with and without FGC. Women with FGC and older first union partner have the highest predicted probability of being HIV positive when compared with the other three groups of women.

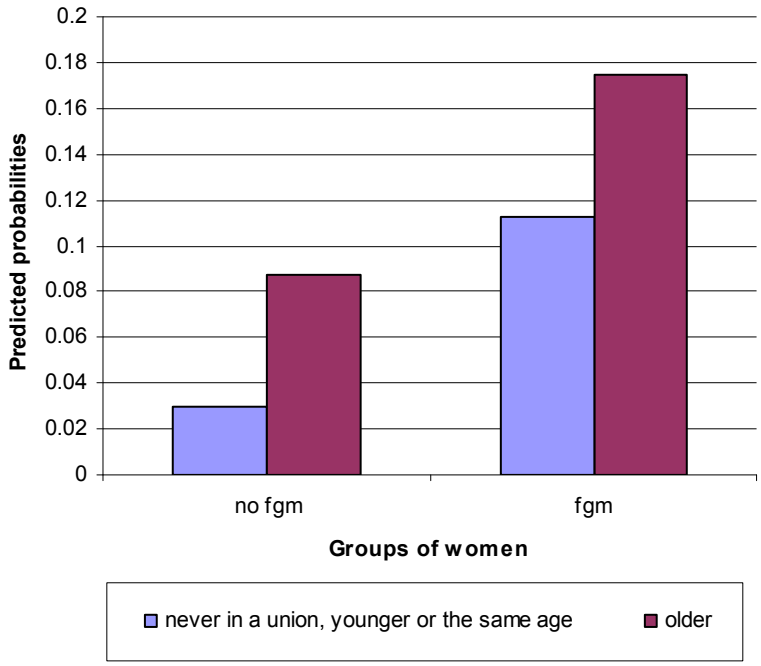

Figure 1: Predicted probability of being HIV positive for women with and without FGC and with and without an older first union partner

Note: Reference woman for this and further graphs has the following characteristics: she is 28 years old, without FGC, married in monogamous union, lives in Nairobi, belongs to middle wealth index, from an ethnic group with FGC prevalence 30-69%, and without older first union partner.

Figure 2 shows predicted probabilities of being HIV positive for four groups of women. The probability is the highest around the age of 29 years for all four groups. Figure 2 demonstrates that both groups of women with FGC have higher probabilities of being HIV positive at all ages when compared with women without FGC. Women without FGC and with "not older first union partner" have the lowest probability of being HIV positive at all ages in comparison with the other three groups of women and the probabilities do not differ much by age for this group. Women with FGC and with an older first union partner have the highest probability of being HIV

positive when compared with the other three groups, and probabilities for this group differ substantially by age.

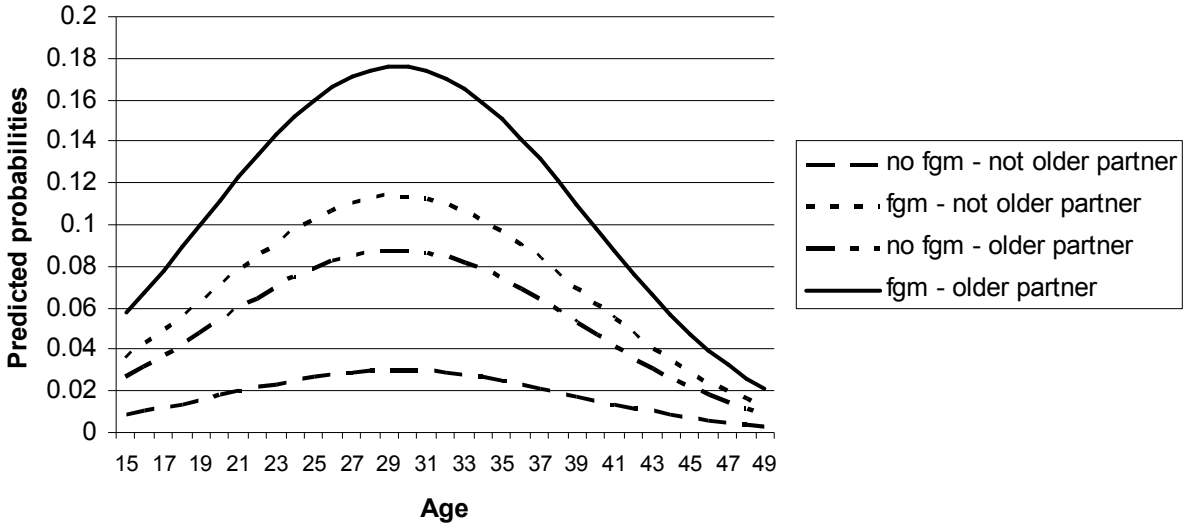

Figure 2: Predicted probabilities of being HIV positive by age for four groups of women

Figure 3 shows predicted probabilities of being HIV positive for women with and without genital ulcers. The predicted probability of being HIV positive is the highest at around the age of 29 years for all four groups of women. The probability of being HIV positive does not differ much by age for women without FGC and with "not older partner" (with or without genital ulcers), however, it does differ substantially by age for women with FGC and with an older first union partner, especially for women who reported having a genital ulcer. For women with FGC and with older first union partner (with or without genital ulcers), the predicted probabilities of being HIV positive are higher than for women in the two other groups. The predicted probabilities of being HIV positive are even higher for women who reported having genital ulcers in comparison with the same group of women but who reported not having genital ulcers within the last 12 months. Therefore women with FGC, an older first union partner and with genital ulcers have the highest probability of being HIV positive when compared with the other three groups.

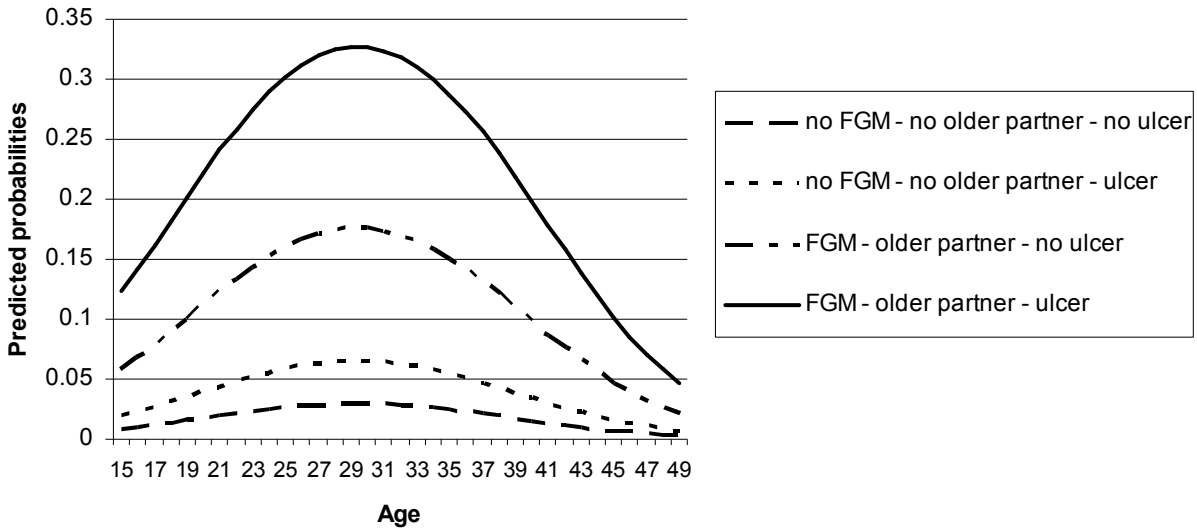

Figure 3: Predicted probabilities of being HIV positive by age for four groups of women

Socio-demographic Characteristics and HIV Status of Women

The study suggests that the probability of being HIV positive is the highest around 29 years of age, and the probability is lower at younger and older ages.

The results of the modelling show that with the exception of Nyanza province, there are no significant differences in the odds of being HIV positive between the other provinces and the reference province (Coast).

The study suggests that there are significant differences in the odds of being HIV positive by the wealth quintiles: the wealthier the quintile a woman belongs to the higher is the risk of HIV infection for her. This finding is consistent with Blatazar *et al.* findings (2005). Yount and Abraham (2007) found the same association and provided two plausible explanations for this: greater wealth may lead to risky behaviour through having more income and through adopting a more "modern" style of life, and that richer women have higher chances of surviving longer with HIV due to the ability to access the life-prolonging antiretroviral therapy (ART) in comparison with poorer women.

According to Akwara *et al.*, "Kenya has a mix of cultural beliefs and practices emanating from the existence of over 41 different ethnic groups" (2003, p.407). Different ethnicities have different attitudes and practices towards FGC. Some ethnic groups do not practice FGC at all, whereas in some ethnic groups FGC prevalence is very high, nearly universal (CBS *et al.* 2004a). The findings from the study suggest that the significant difference in the odds of being HIV positive by ethnicity groups with different FGC prevalence does exist. Women from the group with low FGC prevalence have higher odds of being HIV positive than women from the groups

with middle or high FGC prevalence. The higher the prevalence of FGC in an ethnic group, the lower the odds of being HIV positive for women from this group. These findings contrasts with the findings from the Yount and Abraham study[3], according to them "[m]embers of ethnic groups that practice FGC minimally (Group I) had 40 percent lower odds of being HIV positive than did members of groups in which most (75-100 percent) practiced (often Type III) FGC (Group IV)" (2007, p.82). This finding is surprising after looking at their marginal data table which suggests that more women from the Group I were HIV positive in comparison to women from the Group IV. Moreover, the results look even more surprising as the North Eastern province with 100% of women with FGC and none of these women are HIV positive was included into their analysis. The results from the current study are found to be more realistic. These results can be explained by the fact that ethnicities which have high prevalence of FGC such as the Maasai, Somali are more traditional and relatively closed to mobility and mixing with other ethnicities or communities. HIV prevalence among Somali is very low – 0.4% and the majority of the Somali women in the sample live in provinces with low HIV prevalence such as the Coast, women from the North Eastern province who were excluded from the analysis are predominantly from Somali ethnicity and the prevalence rate in the North Eastern province is the lowest in the country (around 0%). The prevalence rate among the Maasai is also relatively low – 1.1%, majority of the Maasai in the sample live in the Rift Valley province with relatively low HIV prevalence rate (6.3%). The findings suggest that when using the community level variable (ethnicities by FGC prevalence) negative association between HIV status and ethnicities by FGC prevalence exist. However, as mentioned above the results are different for the association between HIV and FGC as the individual level variable.

Figure 4 shows predicted probabilities of being HIV positive for women from different ethnicity groups by FGC prevalence and with different FGC and first union partner's age characteristics. In all three groups probabilities of being HIV positive are higher for women with FGC (with or without an older first union partner) in comparison with those without FGC (with or without an older first union partner).

[3] In their study Yount and Abraham (2007) used slightly different classification of ethnic groups by FGC prevalence, they had four different groups: 0-24%, 25-49%, 50-74%, and 75-100%.

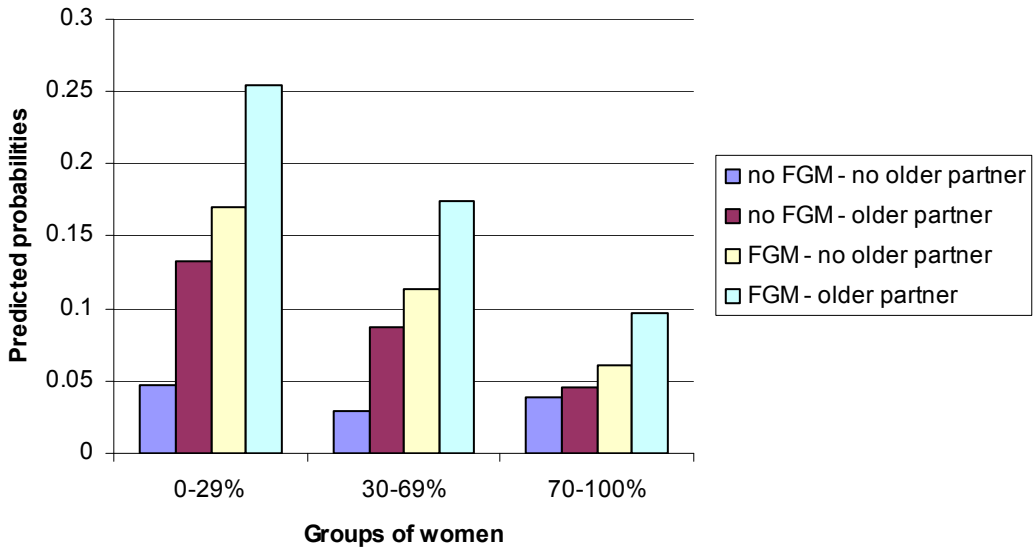

Figure 4: Predicted probabilities of being HIV positive by ethnicity groups for four groups of women

The following socio-demographic characteristics of women were not found to be significantly associated with the increased risk of HIV infection: education, working status, religion, FGC practice in community, childhood residence, and type of residence.

Marital and Sexual Behaviour and HIV Status of Women

The study suggests that there is no significant difference in the risk of HIV infection for women who are in monogamous and polygamous relations. This contradicts to the CBS *et al.* (2004a) and Cheluget *et al.* (2006) results which emphasise the higher risk of HIV infection for women in polygamous relations. The reason for this difference is the fact that both these publications reported results of the analysis of marginal data with no other controls included into the analysis. Therefore there are no differences in findings as exploratory data analysis of the current study produced the same results. The study results suggest that women who have never been married but had sex, who are not living together with their partners and widowed are at higher risk of being HIV positive than women who are married or living together in monogamous unions. Increased risk of HIV infection for those who have never been married but had sex or not living together can be explained by the fact that they are not in stable relationships and might have a number of sexual partners over time and therefore their risk of acquiring HIV infection can be increased. Women who are widowed are at a higher risk of HIV infection in a sub-Saharan African context as their husbands might have died from AIDS. It is important to mention that women who had never been married and never had sex (virgins) have lower odds of being HIV

positive than women who are married but this difference is not significant, and this result suggest that the study has not found evidence about non-sexual mechanism of HIV transmission.

The results of the study suggest that if a woman's first union partner was older, it increases her odds of being HIV positive. The literature suggests that the age difference between younger women and older men is a factor which increases the risk of HIV for women (Kelly *et al*. 2003, Luke 2003, Longfield *et al*. 2004), therefore these results are also in agreement with the existing literature.

The following marital and sexual behaviour were found not to be associated with the probability of being HIV positive: age at first sexual intercourse, the husband lives at home, current contraceptive use, number of unions, sex in exchange for money or gifts, condom use at the last sexual intercourse, and number of sexual partners within the last 12 months.

Sexual and Reproductive Health Characteristics and HIV Status of Women

The results of the study suggest that having a genital ulcer increases the odds of being HIV positive. This result is in agreement with the existing literature which suggests that having a genital ulcer facilitates the transmission of the HIV virus (Shapiro 2002, Bongaarts 1996, Buve *et al*. 2001). Bongaarts argues that "[t]he infectiousness of HIV carriers and the susceptibility of uninfected partners are apparently increased in the presence of STDs, particularly those that cause genital ulcers (e.g., chancroid, genital herpes, and syphilis)" (1996, p.25).

The following sexual and reproductive health variables were found not to be significantly associated with the probability of being HIV positive: STIs in the last 12 months, genital discharge within the last 12 months, HIV test and time. All those variables were self-reported. The bias is high when the data about STIs is collected due to the two main reasons: women might not report having STIs due to cultural reasons or due to the fact that they do not know about having them as many STIs are asymptomatic for women therefore they might not know if they have them or not (Yount and Abraham 2007). Only 1.5% of women reported having STIs in the last 12 months in the dataset. This number gives an indication that STIs are seriously underreported in the survey because the prevalence of STIs is not only high in sub-Saharan Africa (Bongaarts 1996, Caldwell 2000), but according to WHO (2001), sub-Saharan Africa has the highest prevalence of curable STIs in the world. Having genital discharge was also found not to be significantly associated with the risk of HIV infection. It is not surprising as some previous studies (e.g., Gray *et al.* 2001) also found only association between HIV and genital ulcers but not between HIV and genital discharge.

Discussion

Plausible Mechanism of Association between FGC and HIV

The main plausible mechanism (pathway) of association between FGC status and HIV status can be identified on the basis of the results of the current study. The results suggest that the association between HIV and FGC comes mainly through the interaction between FGC and the first union partners age or through *behavioural* pathway. The existing literature highlights that one of the traditional cultural practices which is still common in Africa is marriage to an older partner (Luke 2003). Raw data suggest that women with FGC are more likely to have an older first union partner than women without FGC (70% of women with FGC reported having an older first union partner whereas only 53% of women without FGC reported having an older first union partner). A number of reasons can help explain the fact that women with FGC are more likely to have an older first union partner: tradition, wealth status, and the potential effect of FGC. First of all, women who went through FGC might be from a more traditional background, and therefore they are more likely to have an older first union partner. Secondly, descriptive data analysis suggested that a big proportion of women who went though FGC are from poorer backgrounds, therefore they might be forced by circumstances to have an older, more mature first union partner who is capable of providing economic support. During the XV International AIDS Conference in Bangkok, Njiru (2004) argued that women who were circumcised might be worried about their sexual functioning after the FGC procedure was performed and therefore might prefer having a more 'experienced' or older partner as their first union partners. All of the above mentioned explanations suggest that women with FGC might be under a higher risk of having an older first union partner. FGC coupled with an older first union partner increases the probability of women to be HIV positive in the Kenyan context. This pathway of association is behavioural, and this explanation can be classified as a social or cultural explanation of the association.

The second plausible mechanism of association between FGC and HIV has a biological nature. As it was mentioned earlier, according to Kun (1997) and Brady (1999) women with FGC might be more susceptible to HIV acquisition because they might suffer from open wounds, ulcers and sores at their genital areas which increase susceptibility to the virus. The current study does not have evidence supporting this hypothesis and this potentially plausible mechanism of association due to the limitations of the data available for the analysis. However, it is important to mention that women (with or without FGC), who reported recently having a genital ulcer, have higher odds of being HIV positive, when compared with women without genital ulcers. This result is in agreement with results from other studies which suggested that untreated STIs can facilitate the transmission of HIV through the genital ulceration (Shapiro 2002, Bongaarts 1996,

Buver *et al*. 2001). For women with FGC, genital ulcer is a biological factor which further increases the odds of being HIV positive. Moreover, women with FGC, with an older first union partner and with a genital ulcer have the highest odds of having HIV in comparison with their counterparts.

Limitations

The study has a number of limitations. Data on the types and severity of FGC as well as on mechanisms of HIV transmission are unavailable. This information if collected could help to conduct more detailed analysis and to investigate association between different types of FGC and HIV status. FGC status was based on self-reporting which might be not as accurate measure as a clinical examination (Klouman *et al.* 2005, Snow 2001, Yount and Abraham 2007).

All variables from the sexual and reproductive health group were also self-reported and therefore can introduce bias as women might be either unwilling to report having STIs or genital ulcers or they simply might not know that they have STIs (Yount and Abraham 2007) as in many cases STIs in women are asymptomatic.

As a retrospective survey data, they can suffer from recall bias as women might have forgotten some of the details of events in relation to their sexual behaviour which happened a while ago (Shell-Duncan 2001).

The North Eastern province was excluded from the analysis and therefore the results are only representative for the geographic areas which were included into the analysis.

The behavioural pathway of the association between FGC and HIV cannot be generalized to other countries. The socio-cultural contexts are different in different countries and therefore the results might not be easily transferable to other cultural contexts.

Policy Implications

It is important that the current study provides evidence that FGC status and HIV status are positively associated. The results from this study suggest important policy implications. These results also contribute to the set of arguments supporting the campaign for the eradication of the practice of female genital cutting as being potentially harmful cultural practice which brings adverse health consequences to women. The findings indicate that more efforts should be made in order to be able to eradicate the cultural practice which is potentially harmful to women's health. In the era of HIV/AIDS cultural practices should be adjusted in accordance with the new situation. Grass-root and community level educational campaigns and programs could play an important role in the process. Joint efforts from government, NGOs and grass-roots and

community-based organisations can help reducing FGC prevalence and as a result to improve women's health in Kenya.

Programs towards the eradication of FGC alone might not be sufficient to reduce negative health outcomes for women since the final model demonstrates that the effect comes mainly through the behavioural pathway, therefore a more complex approach towards design of interventions is needed to take into the account the complexity of the issue. As there are a number of other factors which are associated with HIV infection (behavioural and reproductive health factors), appropriate policies and programs can influence changes which would be beneficial for reducing the number of people infected with HIV. A number of possible interventions which might reduce a young women's vulnerability towards HIV infection were suggested by Longfield *et al.* (2004): disseminating messages about increased risk of STIs and HIV/AIDS which is associated with relationships with older partners or cross-generational relationships; condom use should be encouraged; women should be able to negotiate safe sex with older partners. They also mentioned potential long-term interventions which should be directed at the improvement of "young women's access to educational and career opportunities and offering them sources of income independent of men" (Longfield *et al.* 2004, p.133).

Treatment of STIs should become available as genital ulcers caused by STIs increase the risk of HIV and sub-Saharan Africa has the highest prevalence of curable STIs in the world.

If these efforts are effective, the rate of HIV infection can be substantially reduced in Kenya even in the situation where cure or vaccine is not yet available.

Directions for Further Research

There are a number of ways in which further studies can expand or clarify the results of the current study. Firstly, it would be beneficial for further analysis to collect data on participants certain sexual practices such as anal sex and dry sex. The literature highlighted that these factors can be or are associated with both FGC and HIV (Kun 1997, Baldwin and Baldwin 2000, Brown *et al.* 2000, Baleta 1998, Yount and Abraham 2007) and therefore might be important for the understanding of association between FGC and HIV.

Secondly, medical examinations can be done to establish the type and severity of FGC, and to test women for STIs, genital discharge, and genital ulcers and these data can help to produce more accurate results of the analysis without relying on self-reporting of all these indicators. Blood sample for HIV test can also be used to conduct tests for other STIs (for example syphilis and gonorrhoea).

Thirdly, qualitative data collection and analysis can provide useful insights about sexual and marital behaviour in relation to FGC as well as about motivations for women behind their choice of partners, and might also help better explain the behavioural pathways of association between FGC and HIV.

And finally, longitudinal or panel data can help to establish the temporal order of events and achieve a better understanding of the mechanisms of associations between FGC and HIV.

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