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Association between menopause and unprotected sex in high-risk HIV-positive women in Mombasa, Kenya

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Abstract

Objective—Many HIV-positive women now live well beyond menopause. Postmenopausal women are no longer at risk for pregnancy, and some studies suggest they may use condoms less often than premenopausal women. This study tests the hypothesis that, in HIV-positive women who report trading sex for cash or in-kind payment, unprotected sex is more common at postmenopausal visits compared to premenopausal visits.

Design—Prospective cohort study of HIV-positive women 16 years old in Mombasa, Kenya.

Methods—At enrollment and monthly follow-up visits, participants completed a standardized interview. Study clinicians collected genital samples at enrollment and quarterly visits. Menopausal status was assessed annually. The primary outcome of unprotected sex was determined by detection of prostate specific antigen (PSA) in vaginal secretions.

Results—This study followed 404 HIV-positive women who contributed 2753 quarterly examination visits. Detection of PSA was less frequent at postmenopausal visits compared to

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Author contribution

MSG and RSM designed the study. RD and LM collected the clinical data and conducted participant examinations. JS and KM conducted and oversaw laboratory procedures. MSG and BAR analyzed the data, and MSG drafted the manuscript. RSM and WJ provided oversight of study procedures and data collection. All authors contributed to editing of the manuscript, and approved submission of the final draft for publication.

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Conflicts of interest

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premenopausal visits (55/554, 10.5% versus 394/2199, 17.9%; relative risk [RR] 0.58, 95% confidence interval [CI] 0.39–0.87). Adjusting for age diminished the association between menopause and PSA detection (adjusted RR 0.73, 95%CI 0.47–1.14). At visits where women reported sexual activity in the past week, they reported similar rates of 100% condom use at postmenopausal and premenopausal visits (RR 0.99, 95%CI 0.87–1.13).

Conclusion—In this population of high-risk HIV-positive Kenyan women, postmenopausal status was not associated with a greater risk of unprotected sex. The relationship between menopause and unprotected sex is likely context-specific and may differ with varying risk groups, regions, and levels of exposure to sexual health education.

Keywords

Menopause; Condoms; Sexual Risk Behavior; Africa; HIV; Sex Workers

INTRODUCTION

The rollout of antiretroviral therapy (ART) in sub-Saharan Africa is extending survival for many people living with HIV.¹ As a result, a growing number of HIV-positive women now live well beyond menopause. During their reproductive years, women may use condoms for both pregnancy prevention and HIV/STI prevention. After menopause, because the risk of pregnancy is absent, they may be less motivated to use condoms. In addition, healthcare providers may assume that postmenopausal women are no longer sexually active and that they do not need HIV/STI risk reduction counseling. As a result, providers may fail to deliver counseling that reinforces the importance of condom use.²

Most studies of the association between menopause and condom use have been conducted in industrialized countries, and the effect of menopause on condom use appears to vary in different populations.^{3–8} Studies of HIV-negative women in the United States (US) and Australia have found lower condom use in postmenopausal compared to premenopausal women, and in older compared to younger women.^{3–7} In contrast, a study of HIV-positive US women found no difference in condom use between postmenopausal and premenopausal women.⁸

There is little information about condom use in postmenopausal women in sub-Saharan Africa. In the context of the African HIV epidemic, this relationship is an important one to investigate, as the population of HIV-positive postmenopausal women is growing. Female sex workers are a key population in the African HIV epidemic.⁹ High-risk behavior, including transactional sex, may continue after menopause, so it is important to understand how menopause influences sexual risk behavior. The failure of high-risk, HIV-positive women to use condoms could put them at elevated risk for STIs, HIV superinfection, and transmission of HIV to sex partners. This study tested the hypothesis that unprotected sex, defined as sex without a condom, would be more common at postmenopausal visits compared to premenopausal visits in a cohort of high-risk HIV-positive women in Mombasa, Kenya.

METHODS

Analyses were performed using data from the Women's Lifecourse Study, an ongoing prospective cohort study of HIV-positive Kenyan women enrolled between October 2012 and March 2015. Detailed methods for this high-risk cohort have been published.¹⁰ Briefly, to be eligible for enrollment, women had to be 16 years old, confirmed HIV-positive, and report currently trading sex for cash or in-kind payment. All participants were provided with risk reduction education, free male condoms, and condom instruction. At enrollment and monthly follow-up visits, participants completed a standardized face-to-face interview to collect data including demographic characteristics, sexual risk behavior, obstetrical and gynecological history, and health status. Interviews were conducted in Kiswahili or English by a Kenyan study nurse. At enrollment and quarterly follow-up visits, a physical examination was performed and included a speculum-assisted pelvic examination with collection of genital specimens. If a quarterly examination visit was missed, the examination was performed at the next monthly visit. Institutional review boards at Kenyatta National Hospital and the University of Washington approved the study, and all participants provided written informed consent.

Menopausal status was assessed at enrollment and annual follow-up visits using a clinical decision tool based on a standard definition.¹¹ Women were considered to be postmenopausal if they were >40 years old and reported 12 months of amenorrhea from the time of their last menstrual period. Exclusions from postmenopausal status, regardless of age and duration of amenorrhea, included pregnancy, breastfeeding, post-partum status (within 9 months of delivery), and use of unopposed progesterone contraception such as depot medroxyprogesterone acetate or progesterone only oral contraceptive pills. Once a woman was classified as postmenopausal, she was considered postmenopausal for the remainder of the study.

The primary outcome was detection of semen in vaginal secretions by prostate specific antigen (PSA) test, a biological marker of exposure to semen within the past 24–48 hours.^{12–14} Self-reported sexual risk behaviors in the past week were assessed at enrollment and monthly follow-up visits. Unprotected sex was considered present if participants' frequency of vaginal intercourse was greater than their frequency of vaginal intercourse with condoms. Abstinence was defined as reporting zero vaginal sex acts. Consistent (100%) condom use, number of vaginal sex acts, and number of different sex partners were restricted to visits at which women were not abstinent during the past week. Consistent condom use was defined as reported frequency of vaginal intercourse with condoms being equal to reported frequency of vaginal intercourse.

Socio-demographic characteristic covariates were collected at enrollment. The psychosocial and clinical risk factors were collected at enrollment and follow-up visits. Semen in vaginal secretions, assessed every 3 months, was detected by PSA test (ABACard, Abacus Diagnostics, West Hills, CA). An automated method (FACS Count, Becton Dickinson, Forest Lakes, NJ) was used to measure CD4 count.

Log-binomial generalized estimating equation (GEE) models, with working independence correlation structure and robust standard errors, were used to evaluate the association between menopause and detection of PSA in vaginal secretions. GEE models were chosen to account for the correlation between multiple measurements of data across a series of visits for individual participants. Relative risks (RRs) and 95% confidence intervals (CI) were calculated. Several variables were collected less frequently than every month, and values for these variables were filled forward until the next visit when the variable was updated. If a woman's menopausal status transitioned from premenopausal to postmenopausal, this transition was assumed to occur at the midpoint of that time interval.

Age (continuous) was pre-specified as a potential confounding factor and was included *a priori* in all multivariable models. Education (≤ 8 vs. >8 years), marital status (ever vs. never married), age at first sex (continuous), place of work (bar, nightclub, home, or other), alcohol use (Alcohol Use Disorders Identification Test [AUDIT]¹⁵), depression (Patient Health Questionnaire [PHQ-9]^{16,17}), intimate partner violence (adapted version of the World Health Organization survey on Violence Against Women¹⁸), HIV disclosure status, baseline CD4 count, ART use (self-reported), and Karnofsky performance score¹⁹ were considered as additional potential confounding factors based on our hypothesized causal model. Bivariate regression analyses were conducted with each of these covariates and the primary outcome. Associations with $p < 0.1$ were considered for inclusion in the multivariable model in descending order of the magnitude of their effect on the outcome. Variables that changed the primary effect estimate by $\geq 10\%$ on the relative risk scale were retained in the model. Since no other variables met this threshold for inclusion, only age was retained in the final multivariable model.

Analyses of secondary outcomes were conducted using the same approach described for the primary outcome. Analyses of 100% condom use, number of vaginal sex acts, and number of sex partners in the past week were restricted to visits where women reported any sexual activity in the past week. We also evaluated the association between menopause and detection of PSA in vaginal secretions in the subset of visits at which women reported any sexual activity in the past week. All analyses were conducted using Stata 13.0 (StataCorp, College Station, TX).

RESULTS

Between October 2012 and March 2015, 404 women contributed 2753 quarterly examination visits where the primary outcome was measured, and 6138 monthly visits where secondary outcomes were assessed. The median number of quarterly visits per participant was 8 (interquartile range [IQR]: 3, 11). Analyses based on quarterly visits included 606.4 woman-years of follow-up time, while those based on monthly visits included 628.8 woman-years of follow-up time. Baseline demographic, psychosocial, and clinical characteristics are provided by menopausal status in Table 1.

In contrast to the primary hypothesis, detection of PSA was less frequent at postmenopausal visits compared to premenopausal visits (58/554, 10.5% versus 394/2199, 17.9%; RR 0.58,

95%CI 0.39–0.87) (Table 2). The effect of menopause was attenuated, and no longer statistically significant, after adjusting for age (adjusted RR [aRR] 0.73, 95%CI 0.47–1.14).

At postmenopausal visits compared to premenopausal visits, women were more likely to report no sex in the past week (RR 1.65, 95%CI 1.41–1.92) and were less likely to report unprotected sex in the past week (RR 0.52, 95%CI 0.28–0.98). At visits when women reported sex in the past week, comparing postmenopausal and premenopausal visits, women were less likely to have had more than two sex acts in the last week (RR 0.50, 95%CI 0.29–0.87), and there was no difference in the rate of 100% condom use (RR 0.99, 95%CI 0.87–1.13). When restricted to visits at which women reported that they were sexually active in the past week, there was a modest negative association between menopausal status and detection of PSA, but this was not statistically significant (RR 0.81, 95%CI 0.53, 1.24).

DISCUSSION

In this prospective cohort analysis of high-risk HIV-positive Kenyan women, postmenopausal status was associated with less unprotected sex using the primary biological outcome, detection of PSA in vaginal secretions in the unadjusted analysis. The adjusted analyses suggest that lower rates of unprotected sex at postmenopausal visits are largely a reflection of lower rates of unprotected sex in women who are older. Women had sex less frequently at postmenopausal visits compared to premenopausal visits. However, when sexually active, they reported the same rate of 100% condom use and had similar rates of PSA detected in vaginal secretions at postmenopausal and premenopausal visits. Taken together, the results of these analyses suggest that postmenopausal status was associated with less sexual activity overall. When postmenopausal women were sexually active, they had similar rates of condom use in comparison to premenopausal women. The net result of these two factors was a lower overall rate of unprotected sex in postmenopausal women.

The results of this study parallel those of studies of HIV-positive women in the US Women's Interagency HIV Study (WIHS) cohort. The WIHS investigators detected no association between menopause and condom use, but observed a decline in unprotected sex and any sexual activity (vaginal and anal) in the last 6 months among postmenopausal compared to premenopausal women.^{4,8} In contrast, a number of studies of HIV-negative women in the US and Australia have demonstrated a significant association between menopause, older age, and decreased condom use.^{3,5–7} The results differing by the HIV status of the study population could be a result of exposure to risk reduction counseling and an increased motivation to use condoms in HIV-positive women.

This study had a number of important strengths. First, the primary outcome (PSA in vaginal secretions) was a biological marker rather than a self-reported behavior, which eliminates potential reporting biases due to social desirability and recall. Second, complementary secondary outcomes using self-reported behavior allowed for exploration of mechanisms that help to explain these findings.

This study also had limitations. Age and menopause are collinear which made it difficult to disentangle the two when measuring their effect on unprotected sex. As a result, some of the

effect of menopause may have been adjusted away when models were adjusted for age. Secondary outcomes relied on self-report, which can be subject to social desirability bias. For example, comparison of PSA data to participants' self-report of unprotected sex suggests underreporting of unprotected sex. Notably, PSA may also be positive when condoms fail or are used incorrectly.¹³ Since PSA is detectable for only 24–48 hours after unprotected sex, some episodes of unprotected sex were likely missed. Despite this limitation, the unadjusted analysis illustrated that there was sufficient power to detect a significant difference in PSA detection between premenopausal and postmenopausal visits. These results from a cohort of women who reported transactional sex should not be interpreted as generalizable to all postmenopausal women. However, they represent a key population in terms of HIV transmission in sub-Saharan Africa.

Among sex workers receiving risk reduction education, free condoms, and condom instruction, menopause was not associated with an increased risk of unprotected sex. The relationship between menopause and unprotected sex is likely context-specific, and preventive counseling to older women may need to be strengthened in other settings. Further studies to examine this association in different risk groups, diverse regions, and populations with varying levels of exposure to sexual health education will be important to develop a comprehensive understanding of the effect of menopause on sexual risk behavior.

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Table 1Baseline characteristics, by baseline menopausal exposure status¹

	Postmenopausal N=64 n (%) or Median (IQR)	Premenopausal N=340 n (%) or Median (IQR)
<i>Demographic factors</i>		
Age	47 (43, 52)	38 (31, 42)
Primary school or less education (≤ 8 years)	47 (73.4)	188 (55.3)
Ever married	56 (87.5)	254 (74.7)
Age at first sex	17 (15, 18)	17 (15, 19)
Place of work		
Bar	46 (71.9)	190 (55.9)
Nightclub	5 (7.8)	95 (27.9)
Home based	2 (3.1)	8 (2.4)
Other	11 (17.2)	47 (13.8)
<i>Psychosocial risk factors</i>		
Alcohol - AUDIT score category		
No risk (0)	45 (70.3)	156 (45.9)
Minimal risk (1–6)	14 (21.9)	101 (29.7)
Moderate risk (7–15)	3 (4.7)	70 (20.6)
High risk (16–40)	2 (3.1)	13 (3.8)
Depression - PHQ-9 ≤ 5	18 (28.1)	99 (29.1)
IPV in last year ²	8 (12.7)	59 (17.4)
HIV status disclosure to anyone ³	42 (65.6)	215 (63.4)
<i>Clinical characteristics</i>		
CD4	490 (372, 710)	448 (316, 616)
Not Taking ART ^{3,4}	20 (31.3)	140 (41.3)
Karnofsky Performance Score ³	90 (90, 100)	90 (90, 100)

¹ 17 women transitioned from pre to postmenopausal during the course of the study. These women are categorized as premenopausal in this table (their status at baseline).

² Analyzed only among 63 postmenopausal and 340 premenopausal women.

³ Analyzed only among 64 postmenopausal and 339 premenopausal women.

⁴ 125/243 (51.4%) women who reported being on ART received treatment from the study clinic.

Table 2

Associations between menopause and sexual risk behavior

Outcomes	Postmenopausal		Premenopausal		RR (95% CI)	p value	aRR ¹ (95% CI)	p value
	#/total visits	(%)	#/total visits	(%)				
Positive PSA	58/554	(10.5)	394/2199	(17.9)	0.58 (0.39, 0.87)	0.008	0.73 (0.47, 1.14)	0.2
Self-reported behaviors in the past week								
Abstinent	929/1302	(71.4)	2096/4836	(43.3)	1.65 (1.41, 1.92)	<0.001	1.12 (0.94, 1.35)	0.2
Unprotected sex	70/1302	(5.4)	497/4836	(10.3)	0.52 (0.28, 0.98)	0.04	0.72 (0.37, 1.40)	0.3
100% condom use ²	303/373	(81.2)	2241/2740	(81.8)	0.99 (0.87, 1.13)	0.9	1.00 (0.87, 1.15)	0.9
# vaginal sex acts (>2) ²	66/373	(17.7)	962/2740	(35.1)	0.50 (0.29, 0.87)	0.01	0.80 (0.44, 1.46)	0.5
# sex partners (>1) ²	93/373	(24.9)	1167/2740	(42.6)	0.59 (0.32, 1.06)	0.08	0.91 (0.49, 1.69)	0.8

¹ Adjusted for age at visit.² Restricted to visits where the participant reported any sexual activity in the past week.