Awareness, perceived risk and practices related to cervical cancer and Pap smear screening: A cross-sectional study among HIV-positive women attending an urban HIV clinic in Johannesburg, South Africa

I Mokhele,[1] BSc, MSc; **D Evans**,[2] DBiomed; **K Schnippel**,[1,3] MPA; **A Swarts**,[3] MSc; **J S Smith**,[4] BA, MPH, PhD; **C Firnhaber**,[1,3] MD, MS, DTM&H

[1] *Right to Care, Johannesburg, South Africa*
[2] *Health Economics and Epidemiology Research Office, Department of Internal Medicine, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa*
[3] *Clinical HIV Research Unit, Department of Internal Medicine, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa*
[4] *Department of Epidemiology, Gillings School of Global Public Health, University of North Carolina-Chapel Hill, Chapel Hill, NC, USA*

Corresponding author: *I Mokhele (idah.mokhele@gmail.com)*

Background. Cervical cancer is a major cause of cancer-related deaths, especially in the context of the HIV epidemic.
Objective. To examine awareness, perceived risk and practices related to cervical cancer screening among HIV-positive women.
Methods. Interviewer-administered structured questionnaires were administered to HIV-positive women (aged ≥18 years) enrolled in a cervical cancer screening study at the Themba Lethu Clinic, Johannesburg, South Africa, from November 2009 to December 2011. Modified Poisson regression with robust standard errors was used to identify factors at enrolment associated with awareness, perceived risk and adequate practice related to cervical screening. Adjusted relative risks (aRRs) with 95% confidence intervals (CIs) are presented.
Results. Of the 1 202 women enrolled, 71.3% and 18.2% were aware of the Pap smear and HPV, respectively. Of the 1 192 participants with data evaluated, 76.5% were worried and 23.5% were not worried about cervical cancer; 28.6% of the women had adequate screening practice. Older age (40 - 49 years or ≥50 years v. 18 - 29 years) (aRR 1.63, 95% CI 1.12 - 2.37; aRR 2.22, 95% CI 1.44 - 3.41), higher education (tertiary v. less than grade 10) (aRR 1.39, 95% CI 1.00 - 1.93), initiation on combination antiretroviral therapy (aRR 1.36, 95% CI 1.00 - 1.85) and awareness of Pap smear screening (aRR 16.18, 95% CI 7.69 - 34.01) were associated with adequate screening practice.
Conclusions. High levels of Pap smear awareness and low levels of Pap smear screening uptake were observed. However, Pap smear awareness was associated with adequate screening practice. More research into effective health education programmes to address these gaps is needed.

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Cervical cancer is the second most common cancer to affect women globally, with 527 624 new cases and 265 672 deaths from the disease annually.[1] The age-standardised incidence rate was reported as 31.7/100 000 for South Africa (SA) in 2014.[1] It has been shown previously that human papillomavirus (HPV) plays an important role in the development of precancerous lesions and their progression to cancer.[2] In addition, development of cervical cancer has been found to be associated with an early sexual debut, multiple sexual partners, smoking, and extended use of oral contraceptives.[3]

The association between HIV and invasive cervical cancer (ICC) is complex, with several studies now demonstrating an increased risk of preinvasive cervical lesions among HIV-positive women.[2,4] HIV-positive women with more advanced immunosuppression (CD4 count <200 cells/μL) seem to be particularly vulnerable to infection with persistence of the high-risk HPV types that can lead to cancer.[4] Previous studies have found a significantly higher prevalence of HPV among HIV-positive women compared with HIV-negative women (87% v. 54% in Burkina Faso and 80% v. 50% in Zambia), and an increased prevalence of high-risk HPV types (71% v. 40% in Burkina Faso and 70% v. 35% in Zambia).[5,6] SA has the highest burden of HIV globally, with an estimated 4 million women living with HIV.[7] Because of the increased risk of acquiring HPV among women who are HIV-positive, after 2010 the national HIV treatment guidelines included specific guidance for cervical cancer screening.[8]

For a national approach to cervical cancer screening to work, women need to be aware of cervical cancer and the associated risk factors, as well as the screening and treatment services available to them. If they are not aware of the disease and associated risks, they will not seek timely screening or treatment services and are therefore at an increased risk of poor health outcomes.[9,10]

Screening behaviour and general health-seeking behaviour related to prevention services have not been widely studied among HIV-positive women in SA, especially in the area of perceived risk and prevention screening practice in the era of increased life expectancy due to combination antiretroviral therapy (cART). Many of the studies involving cervical cancer and HIV-positive women in southern Africa focus on clinical aspects related to both diseases, as opposed to behavioural aspects such as women's cervical cancer screening practice.

Objective

To examine awareness, perceived risk and practices related to cervical cancer screening among HIV-positive women in an urban HIV clinic in Johannesburg, SA.

Methods

Study site and participants

In April 2005, the non-governmental organisation Right to Care, in partnership with the SA government, established a cervical cancer screening and treatment centre alongside the HIV care, management and treatment facility at Themba Lethu Clinic, situated in a tertiary hospital in Johannesburg. A cervical cancer screening study (Validation of Implementation of Cervical Cancer Screening Applications in HIV-seropositive Women, VICAR 1) evaluating visual inspection with acetic acid, a standard Pap smear and HPV detection was performed at this centre. A questionnaire was administered by study staff. The primary results have been published.[11]

HIV-positive women aged 18 - 65 years who were eligible to participate, enrolled into the primary study (VICAR 1) from November 2009 to December 2011, not pregnant at the time of enrolment and signed an informed consent form were included.

Cervical cancer screening guidelines

The conventional Papanicolaou (Pap) smear for cervical cancer screening is used in the SA public health system.[12]

The guidelines for the management of HIV/AIDS released by the SA National Department of Health in 2010[8] (applicable to the women in the study) states that all HIV-positive women need cervical cancer screening on diagnosis of HIV. If this test is negative, they are then screened every 3 years, irrespective of prior initiation cART status. If results are abnormal, the guidelines recommend a repeat Pap smear or referral for further investigation or treatment.[8]

Data sources

In the primary study, participants answered an interviewer-administered structured questionnaire containing coded questions about their medical, social and sexual history. The questionnaire also included a section that examined awareness, perceived risk and practices concerning cervical cancer and cervical cancer screening. The interviews were administered by trained female interviewers in the local languages, as appropriate. After the interview, women were provided with an education session that included information regarding cervical cancer and cervical cancer screening and treatment.

We conducted a cross-sectional study of these data for our study. Our study made use of all data collected as at the end of December 2011, which included all 1 202 study participants.

Study definitions

Self-reported alcohol use, smoking or taking snuff (fine-ground tobacco intended for consumption by being inhaled or sniffed into the nose) denoted current use. Frequency of smoking and taking snuff was categorised according to the number of times the woman took snuff or the number of cigarettes smoked daily (<5 or ≥5). Age at study enrolment was categorised as 18 - 29, 30 - 39, 40 - 49 and ≥50 years. We also analysed race (black or other than black, including white, Asian and mixed races), nationality (South African or non-South African), marital status (single, married or cohabitating, divorced or separated, or widowed), highest level of education completed (less than Grade 10, Grade 10 - 12, or tertiary education), and employment status (full time, part time, self-employed or not employed). Clinical characteristics analysed included CD4 count at study enrolment (≤100, 101 - 250 and >250 cells/μL), cART status at study enrolment (on cART or not on cART), self-reported previous Pap smear history (yes or no), and results if applicable (negative, low-grade lesion, high-grade lesion or invasive cervical cancer, or unknown).

Awareness (a dichotomous variable) regarding Pap smear screening and HPV was assessed based on whether the woman reported knowing what a Pap smear test is and whether she had ever heard about HPV, respectively. Perceived risk was assessed based on whether the woman indicated that she was very worried, somewhat worried or not worried about getting cervical cancer. For the analysis, a dichotomous variable was created by combining very worried and somewhat worried about getting cervical cancer. Pap screening practice was based on self-reported screening history before enrolment in the study and assessed according to the number of Pap smears over the number of years since HIV diagnosis. This was then categorised as adequate or not adequate practice according to the national HIV treatment guidelines.[8]

Measurement and analysis

Descriptive statistics were used to summarise demographic and clinical characteristics at enrolment in the primary study (VICAR 1). Categorical variables were described by frequencies and percentages using tabulations. For continuous variables, medians and interquartile ranges (IQRs) were used where appropriate.

Modified Poisson regression with robust standard errors was used to estimate relative risk (RR) to identify predictors at study enrolment of awareness, perceived risk and practices related to cervical cancer and screening.[13] Factors identified as significant in the univariate model (using $p<0.2$) and a priori variables of importance and potential confounders were included in the multivariate model. The adjusted relative risk (aRR) and 95% confidence intervals (CIs) are reported. All statistical tests performed in the analysis excluded missing data. Study data were analysed using Stata version 11 (StataCorp, USA).

Ethical considerations

The primary study (VICAR 1) was approved by the University of the Witwatersrand's Human Research Ethics Committee (Medical) (HREC ref. no. M090516) and for secondary analysis by the Human Ethics Committee (Medicine) of the University of North Carolina (Human Research Ethics Committee ref. no. 09-1968). Ethical clearance for the analysis presented in this article was obtained from the University of the Witwatersrand in 2012 (HREC ref. no. M120310). To maintain confidentiality, all personal identifiers were removed from the data before analysis.

Results

A total of 1 202 HIV-positive women were screened and then enrolled in the study. Further information on screening results is reported from the primary study (VICAR 1).[11] The median age at study enrolment was 38 years (IQR 32 - 43) (Table 1). Of the 1 202 participants, 160 (13.3%) were divorced/separated or widowed. The majority of the women (*n*=834, 69.4%) had Grade 10 - 12 education, and 113 (9.4%) had tertiary education. A total of 125 women (10.4%) reported currently drinking alcohol and 125 (10.4%) reported taking snuff. A small number reported current smoking (*n*=42, 3.5%).

Almost all the women (*n*=1 117, 92.9%) were on cART at study enrolment (Table 2). The overall median CD4 count for the group was 394 cells/μL (IQR 252 - 577) for the 1 190 participants with data evaluated, based on their most recent CD4 level at study enrolment. The majority of the small number of study participants (*n*=84, 7.0%) who were not initiated on cART at study enrolment were not eligible for cART on the basis of their CD4 count and the HIV treatment guidelines at the time.[8]

Previous Pap smear results

A total of 57.2% of the women (688/1 202) self-reported a Pap smear screening history before the study, and 80.4% (553/688) of these

Table 1. Sociodemographic characteristics of the study participants at enrolment (*N*=1 202)

Variable	*n* (%)
Age (yr)	
Median (IQR)	38 (32 - 43)
18 - 29	161 (13.4)
30 - 39	546 (45.4)
40 - 49	397 (33.0)
≥50	98 (8.2)
Race	
Black	1 179 (98.1)
Other	23 (1.9)
Nationality	
South African	1 075 (89.4)
Non-South African	112 (9.3)
Information missing	15 (1.3)
Marital status	
Single	658 (54.7)
Married/cohabiting	384 (32.0)
Divorced/separated/widowed	160 (13.3)
Education	
< Grade 10	229 (19.1)
Grade 10 - 12	834 (69.4)
Tertiary	113 (9.4)
No education	26 (2.2)
Employment	
Full time	448 (37.3)
Part time	182 (15.1)
Self-employed	26 (2.2)
Not employed	523 (43.5)
Information missing	23 (1.9)
Drinking alcohol	
Yes	125 (10.4)
No	1 077 (89.6)
Smoking	
Yes	42 (3.5)
<5 cigarettes/day	28 (66.7)
≥5 cigarettes/day	14 (33.3)
No	1 160 (96.5)
Taking snuff	
Yes	125 (10.4)
<5 times/day	98 (82.4)
≥5 times/day	21 (17.7)
No	1 077 (89.6)

Table 2. Clinical characteristics of the study participants at enrolment (*N*=1 202)

Variable	*n* (%)
CD4 count (cells/μL) at study enrolment	
Median (IQR)	394 (252 - 572)
0 - 100	44 (3.7)
101 - 250	249 (20.7)
>251	897 (74.6)
Information missing	12 (1.0)
On cART	
Yes	1 117 (92.9)
No	84 (7.0)
Information missing	1 (0.1)
Previous Pap smear screening history	
Yes	688 (57.2)
No	514 (42.8)
Previous Pap smear results	
Negative	523 (76.0)
Low grade	29 (4.2)
High grade/ICC	1 (0.1)
Information missing	135 (19.6)

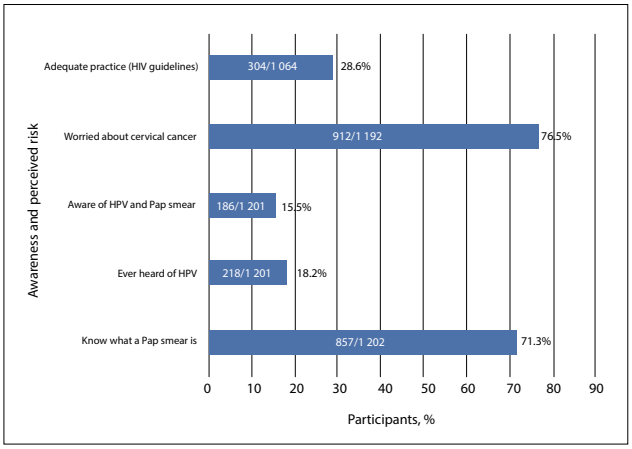

Fig. 1. Survey responses.

could recall their result. Of these, 94.6% (523/553) reported that their previous Pap smear results were negative, 5.2% (29/553) reported low-grade Pap smear results, and 0.2% (1/553) reported high-grade Pap smear results.

Awareness, perceived risk, and adequate practice

A total of 71.3% of participants (857/1 202) were aware of Pap smear screening, and 18.2% (218/1 201) were aware of HPV. A few women (1.9%, 13/688) who reported having a previous Pap smear indicated they were not aware of the Pap smear screening test. Only 15.5% of participants (186/1 201) indicated awareness of both the Pap smear test and HPV (Fig. 1). A total of 1 192 participants responded to the question about perceived risk related to cervical cancer. Of these, 912 (76.5%) were worried or very worried about getting cervical cancer.

According to the national HIV treatment guidelines based on year of HIV diagnosis before the study, 28.6% (304/1 064) had adequate cervical cancer screening practice.

Factors associated with awareness and perceived risk

Table 3 presents results of the analysis of association between socio-demographic and clinical characteristics and awareness related to Pap smear screening and HPV. Multivariate analysis indicated that older women (aged 40 - 49 years or ≥50 years v. 18 - 29 years) (aRR 1.14, 95% CI 1.00 - 1.30; aRR 1.29, 95% CI 1.09 - 1.52) and those with a higher level of education (Grade 10 - 12 or tertiary v. less than Grade 10) (aRR 1.26, 95% CI 1.12 - 1.42; aRR 1.35, 95% CI 1.16 - 1.56) were more likely than other women in the study to be aware of Pap smear screening. Non-South Africans (aRR 0.86, 95% CI 0.74 - 1.00) and women who did not have a previous history of Pap smear screening (aRR 0.36, 95% CI 0.32 - 0.41) were less likely than other women in the study to be aware of Pap smear screening. The other covariates were not found to be statistically associated with awareness of Pap smear screening (Table 3).

Women with a higher level of education (Grade 10 - 12 or tertiary v. less than Grade 10) (aRR 2.56, 95% CI 1.57 - 4.15; aRR 2.97, 95%

Table 3. Factors associated with awareness of Pap smear screening and HPV

Factor	Pap awareness, aRR (95% CI)†	HPV awareness, aRR (95% CI)‡
Age (yr)		
18 - 29	Ref	Ref
30 - 39	1.11 (0.98 - 1.25)	1.32 (0.88 - 1.97)
40 - 49	1.14 (1.00 - 1.30)*	1.37 (0.90 - 2.08)
≥50	1.29 (1.09 - 1.52)*	0.82 (0.41 - 1.63)
Race		
Black	Ref	-
Other	1.03 (0.91 - 1.16)	-
Nationality		
South African	Ref	-
Non-South African	0.86 (0.74 - 1.00)*	-
Marital status		
Single	Ref	-
Married/cohabiting	0.99 (0.90 - 1.06)	-
Divorced/separated/widowed	1.05 (0.95 - 1.17)	-
Education		
< Grade 10	Ref	Ref
Grade 10 - 12	1.26 (1.12 - 1.42)*	2.56 (1.57 - 4.15)*
Tertiary	1.35 (1.16 - 1.56)*	2.97(1.67 - 5.30)*
No education	0.92 (0.65 - 1.31)	0.53 (0.07 - 3.89)
Employment		
Full time	Ref	Ref
Part time	-	1.15 (0.80 - 1.68)
Self-employed	-	1.60 (0.88 - 2.91)
Not employed	-	1.16 (0.89 - 1.53)
Drinking alcohol		
Yes	Ref	Ref
No	0.98 (0.78 - 1.45)	0.73 (0.53 - 1.01)
Taking snuff		
Yes	Ref	-
No	1.41 (0.99 - 1.09)	-
On cART		
Yes	Ref	-
No	1.10 (0.98 - 1.25)	-
Previous Pap screening history		
Yes	Ref	Ref
No	0.36 (0.32 - 0.41)*	0.71 (0.55 - 0.92)*

Ref = 1.00; - = not included in the multivariate analysis, not significant in the univariate analysis.
*Statistically significant ($p<0.005$).
†Adjusted for age, nationality, marital status, education, alcohol, snuff, cART and Pap screening history.
‡Adjusted for age, education, employment, alcohol and Pap screening history.

CI 1.67 - 5.30) were more likely than other women in the study to be aware of HPV. Women who did not have a previous history of Pap smear screening (aRR 0.71, 95% CI 0.55 - 0.92) were less likely than other women in the study to be aware of HPV. The other covariates were not found to be statistically associated with awareness of HPV (Table 3).

Table 4 presents results of the analysis of association between sociodemographic and clinical characteristics and being at risk of cervical cancer and practice related to Pap smear screening. Women with a higher level of education (Grade 10 - 12 or tertiary v. less than Grade 10) (aRR 1.10, 95% CI 1.01 - 1.20; aRR 1.16, 95% CI 1.03 - 1.31) and those who did not take snuff (aRR 1.14, 95% CI 1.00 - 1.29) were more likely than other women in the study to be worried about cervical cancer. Women who reported a history of alcohol use (aRR 0.89, 95% CI 0.82 - 0.97) were less likely than other women in the study to be worried about cervical cancer. The other covariates were not found to be statistically associated with practice related to Pap smear screening (Table 4).

Older women (aged 40 - 49 or ≥50 years v. 18 - 29 years) (aRR 1.63, 95% CI 1.12 - 2.37; aRR 2.22, 95% CI 1.44 - 3.41), those with a higher education (tertiary v. less than Grade 10) (aRR 1.39, 95% CI 1.00 - 1.93) and those initiated on cART (aRR 1.36, 95% CI 1.00 - 1.85) were more likely than other women in the study to have adequate Pap smear screening practice according to the HIV treatment guidelines.

Association between awareness and perceived risk and adequate practice

Table 5 presents the results of the analysis examining the association between awareness, perceived risks and adequate screening practice

Table 4. Factors associated with Pap smear screening practice and perceived risk

Factor	Perceived risk, aRR (95% CI)†	Practice according to HIV treatment guidelines, aRR (95% CI)‡
Age (yr)		
18 - 29	Ref	Ref
30 - 39	1.18 (0.72 - 1.93)	1.33 (0.92 - 1.92)
40 - 49	1.01 (0.61 - 1.69)	1.63 (1.12 - 2.37)*
≥50	1.09 (0.60 - 2.00)	2.22 (1.44 - 3.41)*
Race		
Black	-	Ref
Other	-	1.31 (0.85 - 2.02)
Education		
< Grade 10	Ref	Ref
Grade 10 - 12	1.10 (1.01 - 1.20)*	0.85 (0.66 - 1.08)
Tertiary	1.16 (1.03 - 1.31)*	1.39 (1.00 - 1.93)*
No education	0.88 (0.64 - 1.22)	0.77 (0.39 - 1.52)
Employment		
Full time	Ref	Ref
Part time	1.06 (0.81 - 1.71)	0.78 (0.58 - 1.06)
Self-employed	1.20 (1.03 - 1.39)	1.30 (0.76 - 2.23)
Not employed	1.09 (1.01 - 1.17)	0.92 (0.75 - 1.14)
Drinking alcohol		
Yes	Ref	Ref
No	0.89 (0.82 - 0.97)*	0.98 (0.76 - 1.27)
Taking snuff		
Yes	Ref	Ref
No	1.14 (1.00 - 1.29)*	1.28 (0.93 - 1.76)
On cART		
Yes	-	Ref
No	-	1.36 (1.00 - 1.85)*

Ref = 1.00; - = not included in the multivariate analysis, not significant in the univariate analysis.
*Statistically significant ($p<0.005$).
†Adjusted for age, education, employment, alcohol use and snuff use.
‡Adjusted for age, education, employment, alcohol use, snuff use and cART.

according to the HIV treatment guidelines. Crude and aRR results are reported. Models were adjusted for age, education level, and prior initiation on cART.

Multivariate analysis indicated that awareness of Pap smear screening was associated with adequate screening practice (aRR 16.18, 95% CI 7.69 - 34.01) according to the HIV treatment guidelines. However, awareness of HPV and perception of being at risk of cervical cancer were not significantly associated with adequate screening practice.

Discussion

Pap smear screening and HPV awareness

Results from our study showed that most (71.3%) HIV-positive women in care at a public sector HIV clinic in urban Johannesburg reported being aware of Pap smear screening. A study conducted among much younger (mean age 22 years) tertiary students in the Eastern Cape Province of SA showed similar results, with 70% awareness of Pap smear screening among the study participants.[14]

Higher education was a common significant factor in all outcomes assessed in our study. Low literacy/education has been shown to correlate with negative health behaviour and a higher risk of morbidity and mortality.[10,15]

Our results also showed that older women were more likely to be aware of Pap smear screening and to have adequate cervical cancer screening practice according to the HIV treatment guidelines. Cervical cancer has traditionally been a disease that mostly affects older women, and this age group would have been targeted with health education and screening services as part of the national screening programme.[10,12]

Our study participants were found to have low levels of HPV awareness, further highlighting the urgent need for effective health education programmes. Our study was conducted before the HPV vaccination programme was initiated in SA. The national HPV vaccination programme the country now has may result in wider awareness and knowledge regarding HPV in the country. This could be through media coverage of the vaccine programme, or women with daughters having access to information when interacting with the programme.[16]

Table 5. Impact of awareness and perceived risk on practice

Factor	Not adequate practice, *n* (%)	Adequate practice, *n* (%)	RR (95% CI)	aRR (95% CI) †
Awareness of Pap smears (*n*=1 063)				
Not aware	288 (37.9)	7 (2.3)	Ref	Ref
Aware	471 (62.1)	297 (97.7)	16.27 (7.78 - 34.04)*	16.18 (7.69 - 34.01)*
Awareness of HPV (*n*=1 062)				
Not aware	622 (82.1)	252 (82.9)	Ref	Ref
Aware	136 (17.9)	52 (17.1)	0.96 (0.75 - 1.23)	0.99 (0.77 - 1.27)
Perceived risk (*n*=1 053)				
Not worried	179 (23.8)	73 (24.1)	Ref	Ref
Worried	572 (76.2)	230 (75.9)	0.99 (0.79 - 1.24)	1.00 (0.81 - 1.25)

Ref = 1.00.
*Statistically significant ($p<0.005$).
†Adjusted for age group, education and on cART.

Perceived risk related to cervical cancer and Pap screening

Previous studies found that women's perceived risk may negatively influence screening behaviours and lead to an increased risk of morbidity and mortality.[10,17] Women may believe that they are not susceptible to the disease, which may lead them to forgo screening, thereby missing out on the chance to have the disease detected and treated appropriately. Lack of awareness and knowledge about the disease and its prevention is seen as an important factor influencing women's perceptions regarding their risk related to the disease.[10,17]

Our study found that a majority (76.5%) of the participants were worried about getting cervical cancer. Not taking snuff was one of the factors found to increase the likelihood of study participants being more worried about cervical cancer. Snuff use, a culturally relevant practice in our study setting, is a factor that has not been explored extensively in relation to cervical cancer. Nonetheless, it is a risky negative behaviour that may negatively influence health outcomes. Women who did not use snuff could therefore be expected to be more worried about cervical cancer than other women in the study, as their non-snuff-taking behaviour may indicate concern about negative health behaviour and outcomes. Alcohol use was found to decrease the likelihood of being worried about cervical cancer. Alcohol consumption is known to adversely influence both health-related behaviour and health outcomes, but levels of alcohol use were not quantified in the study, and this result should therefore be interpreted with caution.[18]

Practices related to Pap smear screening

In addition to older women and those with tertiary education, women on cART were found to be more likely than other women in the study to have adequate cervical cancer screening practice. Women on cART have probably been provided with health education and Pap smear screening through their encounters with the healthcare system during the course of their care and treatment, as recommended in the HIV guidelines.

Study limitations

This study has similar limitations to others that have included patient questionnaires about sexual and substance abuse history. Some individuals may have been too embarrassed to answer study questions of a personal nature truthfully. Information bias was minimised by using trained interviewers, having a standard operating procedure for conducting interviews, and using interviewers fluent in the local languages who could interview participants in their own language.

Selection bias may exist, as participants could have enrolled in the study because they were unwell (lower CD4 cell count), because their healthcare provider was particularly worried about their exposure to HPV, or because they were worried about cervical cancer and therefore willing to participate in a screening study. Since they were seeking HIV care and cART, these patients may be healthier than their HIV-positive counterparts who were eligible for cART but not in HIV care, or on cART and not seeking further care and treatment. Generalisability of our findings to populations at the non-tertiary, smaller or rural facilities found throughout SA may be limited, as Themba Lethu Clinic is an urban HIV treatment site situated in a tertiary hospital.

Conclusions

An important finding was that if participants were aware of Pap smear screening they were more likely to have adequate screening practice. However, despite high levels of Pap smear screening awareness, low screening uptake was noted among our study participants. Examining health education programmes related to cervical cancer could provide an opportunity to effectively address gaps in knowledge and awareness in order to improve screening practice.

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Competing interests. JSS has received research grants and/or served on paid advisory boards for Hologic, BD Diagnostics, Trovagene and QIAGEN over the past 5 years. All the other authors have declared that they have no competing interests.

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