

RESEARCH ARTICLE

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Breast and Cervical Cancer Screening Prevalence and Associated Factors among Women in the South African General Population

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Abstract

Purpose: The aims of the study were to estimate the prevalence of breast and cervical cancer screening among women in the South African general population and assess associated factors. **Methods:** Data from a national population-based cross-sectional household survey in South Africa in 2012 for 10,831 women aged 30+ years were analysed using bivariate and multivariable logistic regression. The outcome variables were cervical cancer screening (Papanicolaou smear test) and breast cancer screening (mammography). Exposure variables were sociodemographic factors, lifestyle variables, and chronic conditions. **Results:** The prevalences of Papanicolaou (PAP) smear test and mammography participation were 52.0% and 13.4%, respectively. On multivariable logistic regression analysis, women with higher education, those who were non-black African, having medical aid and having chronic conditions were more likely to undergo a Pap smear test and mammography. Living in rural areas was related to a lower likelihood of receiving both types of screening. In addition, undertaking moderate or vigorous physical activity was associated with breast cancer screening. **Conclusion:** Screening for cervical cancer was relatively high but for breast cancer it was low, despite the latter being a major public health problem in South Africa. This may be attributed to the limited availability, affordability, and accessibility of breast cancer screening services among socio-economically disadvantaged individuals. There are some socio-economic disparities in adopting both breast and cervical cancer screening guidelines that could be targeted by interventions.

Keywords: Breast cancer- cervical cancer- chronic conditions- lifestyle factors- South African women- national survey

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Introduction

Breast and cervical cancers are major malignancies in women in low- and middle-income countries (LMICs) and globally (Sankaranarayanan, 2014; Gutnik et al., 2016). Over the recent decades, mortality and incidence of breast cancer has increased significantly (Global Burden of Disease Cancer Collaboration et al., 2015). The incidence of breast cancer increased by “more than 50% from 1980 to 2010 globally” (Institute for Health Metrics and Evaluation (IHME), 2011); it increased much faster in LMICs, disproportionately affecting young women in LMICs (23% versus 10% in high-income countries) (IHME, 2011). In South Africa, breast cancer is the most common type of cancer in women (21.8% of all cancer cases; age-adjusted incidence of 35.1 per 100,000) (National Cancer Registry, 2012).

The burden of breast cancer death is in LMICs due to breast cancer misconceptions, delayed detection, poverty, cultural and religious beliefs, and fear of breast

removal, among others (Akinyemiju, 2012; Yip et al., 2008). Unfortunately, breast cancer screening in LMICs is still very low; e.g., the “World Health Survey” in 2003 found that “only 2.2% of women aged 40 to 69 years in LMICs had received any breast cancer screening” (Akinyemiju, 2012). In South Africa, breast cancer screening is recommended to start at the age of 40 years (Nyman, 2010). In a national population-based survey among women 50 years or older in South Africa in 2008, 15.5% ever underwent breast cancer screening (had a mammography) (Peltzer and Phaswana-Mafuya, 2014). Population based breast cancer screening has been recommended by WHO in high income countries although there are mixed views about this (Pace and Keating, 2014; Jørgensen and Gøtzsche, 2009; Welch and Passow, 2014).

With regard to cervical cancer, great successes in the reduction of cervical cancer in high resource countries were realized due to cytology-based screening programs (WHO, 2002), however this has not been the case in LMIC due to health system challenges (Sankaranarayanan,

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2014). In South African females, cervical cancer is the third most common cancer (15.4% of all cancer cases; age-adjusted incidence of 24.2 per 100,000) (National Cancer Registry, 2012). The South African Cervical Cancer Screening Program recommends three Pap smears in a lifetime (at 10-year intervals, starting at the age of 30 years) (National Department of Health, 2000). Cervical cancer screening is on average three times higher in high income countries (63%) compared to LMICs (19%) (Gakidou et al., 2008). Cervical cancer screening uptake among a local sample of South African women aged 30+ years was 18-25% more than a decade ago (Fonn et al., 2002, Hoque et al., 2008). In a sub-sample of the 2003 World Health Survey involving South African women aged 18+ years attending health in previous year, the estimated prevalence of cervical cancer screening was 25.3% (n = 65) (Akinyemiju et al., 2015). Cervical cancer screening is critical early detection and treatment (Sankaranarayanan, 2014).

Factors associated with cervical and breast screening uptake include higher socioeconomic position (education, occupation and income) (Kim and Kang, 2016; Narayan et al., 2017; Serral et al., 2017; Sözmen et al., 2016; Williams-Brennan et al., 2012), ethnic or racial (white-skinned) (Theme et al., 2016), increased access to health care (Narayan et al., 2017); covered by private health insurance (Theme et al., 2016), urban residence (Peltzer and Phaswana-Mafuya, 2014), positive lifestyle behaviours such as physical activity and fruit and vegetable consumption (Sözmen et al., 2016; Theme et al., 2016).

There is a lack of knowledge about recent prevalence of breast and cervical cancer screening and its correlates in adult women from different ethnic or racial backgrounds in South Africa. The aim of the study was to estimate the prevalence of and factors associated with breast and cervical cancer screening among South African women in the general population.

Materials and Methods

Data

The data source was the “2012 South African national HIV prevalence, incidence, and behaviour cross-sectional survey” (Shisana et al., 2014). This analysis focused only on adult data from a multi-stage stratified sub-sample of 10831 women aged 30+ years. The sampling strategy was stratified by province, type of geolocalities, and predominant population or racial groups. Using multistage sampling, a random sample of “enumeration areas” (EAs) was selected, and within EAs households were randomly selected. All individuals within a household were eligible to participate. Details about the sample and methodology have been provided elsewhere (Shisana et al., 2014). Data collection methods included face-to-face interviews and dried blood spot collection for HIV testing and exposure to antiretroviral therapy (ART). Informed consent was obtained for conducting interviews and collection of dry blood spots (DBS). The study proposal was approved by the institutional review boards of the “Human Sciences Research Council” (REC: 5/17/11/10) and the Centres for

Disease Control and Prevention (CDC) in Atlanta.

Measures

Cancer screening questions included: “Have you ever had a test for a PAP smear (By PAP smear test, I mean did a doctor or nurse use a swab or stick to wipe from inside your vagina, take a sample and send it to the laboratory?” and “Have you ever had a mammogram (when your breasts are examined using X-rays).” Response options were “yes” and “no”, and if “Yes” it was asked, “How long ago was it done?” The response option ranged from 1=within the last year to 5=more than 10 years ago. (Shisana et al., 2014).

Chronic medical condition was assessed with the question, “Do you have any chronic medical condition that is affecting what you do or how you feel?” (Response option was yes no) (Shisana et al., 2014).

Medical aid coverage was asked with the question: “Are you covered by a Medical Aid or Medical Benefit Scheme?” (Response option was yes no) (Shisana et al., 2014).

Physical activity was assessed with two questions, 1) “Do you do any VIGOROUS INTENSITY sport, fitness or recreational activities in your leisure or spare time, that cause large increases in breathing or heart rate (like running or strenuous sports, weightlifting) for THREE times a week at least 30 minutes at a time?” 2) “Do you do any MODERATE-INTENSITY sport, fitness or recreational activities in your leisure or spare time that cause small increases in breathing and heart rate (like brisk walking, cycling or swimming) for THREE times a week at least 30 minutes at a time?” (Response options were yes or no) (Shisana et al., 2014).

Demographic measures included age, race or population group, locality type and province (Shisana et al., 2014).

Data analysis

Statistical analysis was performed using Stata software version 12 (Stata Corp., College Station, TX, USA) using the “svy” command taking into account the complex design of the study. Descriptive statistics were utilized to summarize sociodemographic factors, health characteristics, and cancer screening prevalence using weighted percentages. Associations between socio-demographic and health variables and cancer screening methods were examined through bivariate methods and multivariable logistic regression using two-sided 95% confidence intervals and P values less 5% were used during multivariable analysis to indicate statistical significance. All variables statistically significant at bivariate analyses were subsequently added in the multivariable models.

Results

Descriptive analysis

Sample characteristics

Overall response rates for the interview was 89.5% and for the provision DBS specimens for HIV testing 67.5% (Shisana et al., 2014). About 60.4% of the participants were aged 30 to 49 years. Almost three quarters came

Table 1. Sample Characteristics

Variable	Sample	Cervical smear	Mammography
	N (%)	N (%)	N (%)
All	10,831	5,470 (52.0)	1,455 (13.4)
Age			
30-39	2,992 (34.7)	1,439 (49.3)	203 (5.7)
40-49	2,687 (25.7)	1,541 (58.3)	372 (14.6)
50-59	2,415 (18.6)	1,374 (59.0)	447 (18.9)
60-69	1,568 (12.3)	773 (48.9)	298 (22.6)
70+	1,169 (8.7)	343 (33.5)	135 (16.2)
Education			
Grade 0-7	2,194 (24.7)	830 (35.2)	112 (3.7)
Grade 8-11	3,093 (35.1)	1,690 (51.5)	394 (11.6)
Grade 12 or more	3,453 (40.2)	2,271 (74.2)	796 (23.4)
Population group			
African Black	5,681 (74.3)	2,057 (40.1)	265 (5.1)
White	1,440 (12.8)	1,074 (90.8)	608 (53.4)
Coloured	2,119 (9.9)	1,385 (82.9)	329 (20.4)
Indian or Asian	1,560 (3.0)	947 (77.8)	251 (24.7)
Residence			
Urban formal	6,857 (53.8)	4,097 (67.7)	1213 (21.3)
Urban informal	911 (6.9)	363 (43.4)	37 (3.9)
Rural informal	2,160 (34.6)	566 (28.2)	48 (2.1)
Rural formal	903 (4.8)	444 (62.0)	157 (19.6)
Employment status			
Employed	3,413 (39.9)	2,625 (65.3)	639 (16.5)
Not employed	5,274 (60.1)	2,274 (44.0)	615 (9.7)
Province			
Western Cape	1,401 (13.1)	1,015 (85.8)	309 (27.5)
Eastern Cape	1,317 (11.1)	527 (30.2)	120 (4.8)
Northern Cape	819 (2.2)	441 (58.8)	111 (11.3)
Free State	758 (5.2)	391 (56.1)	119 (12.1)
KwaZulu-Natal	2,461 (17.4)	1,221 (40.6)	236 (5.3)
Northwest	732 (6.7)	352 (49.2)	86 (7.4)
Gauteng	1,693 (26.6)	912 (63.0)	310 (22.0)
Mpumalanga	703 (6.8)	273 (37.9)	73 (8.2)
Limpopo	947 (10.8)	338 (32.6)	91 (4.9)
Has medical aid			
No	7,238 (77.0)	3,401 (42.5)	564 (6.3)
Yes	2,438 (23.0)	2,032 (84.4)	883 (37.2)
Chronic conditions			
None	6,127 (66.8)	3,306 (49.4)	798 (10.2)
One or more	3,528 (33.2)	2,093 (56.6)	625 (18.6)
Physical activity			
Inactive	6861 (71.0)	3,398 (46.2)	775 (9.4)
Moderate or vigorous	2,827 (29.0)	2,027 (66.2)	663 (22.8)
HIV status			
Negative	6,402 (79.2)	3,507 (53.6)	877 (14.9)
Positive	1,189 (20.8)	515 (42.2)	54 (4.9)
On antiretroviral therapy			
No	722 (60.3)	258 (33.9)	29 (3.9)
Yes	467 (39.7)	257 (54.7)	25 (6.5)

from the African Black population group (74.3%) and had Grade eight or more education (75.3%) respectively. Slightly over 50% (53.8%) came from urban formal areas and almost 405 (39.9%) were employed. About one-third (33.2%) reported to have one or more chronic conditions, Only 13.0% had medical aid, and 29.0% engaged in moderate or vigorous physical activity. From those who got tested for HIV in the survey, 20.8% were HIV positive and from those who were tested for antiretroviral therapy (ART) in the survey 39.7% were on ART. In terms of cervical cancer screening, 52.0% ever had a PAP smear test (89.2% in within the past 10 years), and regarding breast cancer screening, 13.4% ever had a mammography (see Table 1).

Association between sociodemographics, health variables and cancer screening

In multivariable logistic regression analysis, the age groups 40 to 59 years better education, coming from the White Coloured and Indian or Asian population group, being employed, having medical aid and having one or more chronic conditions were associated with cervical cancer screening. Further, in multivariable logistic regression analysis older age, higher education, coming from the White Coloured and Indian or Asian population group, having medical aid, having one or more chronic conditions and engaging in moderate or vigorous physical activity were associated with breast cancer screening. Living in rural informal areas was associated with lower likelihood of receiving both types of screening (see Table 2).

Discussion

This large study among women 30 years and older in South Africa estimated a low prevalence of breast cancer screening, similar to a 2008 survey among older adults in South Africa (Peltzer and Phaswana-Mafuya, 2014) and a survey among women 30 years and older in Turkey (Sözmen et al., 2016) and Thailand (Mukem et al., 2015), but lower than in Brazil (Theme Filha et al., 2016) and in high income countries such as Spain (Serral et al., 2017) and USA (Narayan et al., 2017).

The prevalence of cervical cancer screening seemed to have increased to over 50 percent in this study, compared to previous older studies in South Africa (<30%) (Fonn et al., 2002, Hoque et al., 2008; Peltzer and Phaswana, 2014; Akinyemiju et al., 2015). The current found prevalence rate of cervical cancer screening in South Africa is similar to Thailand (Mukem et al., 2015), higher than in Turkey (Sözmen et al., 2016) and globally (Sankaranarayanan, 2014) but is still short of reaching the national target of a coverage of at least 70% (National Department of Health, 2000).

Our study found that age was significantly associated with breast and cervical cancer screening, with individual 50 to 59 years had the highest odds for cervical cancer screening and the 60 to 69 years age group had the highest odds for breast cancer screening. These findings seem to reflect the cancer screening guidelines in South Africa,

Table 2. Association between Sociodemographics, Health Variables and Cancer Screening

Variable	Cervical cancer screening		Breast cancer screening	
	Unadjusted Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)	Unadjusted Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)
Age				
30-39	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
40-49	1.43 (1.22, 1.68)***	1.48 (1.18, 1.85)***	2.83 (2.03, 3.94)***	2.39 (1.54, 3.69)***
50-59	1.47 (1.22, 1.78)***	1.48 (1.10, 1.99)**	3.84 (2.80, 5.27)***	3.28 (2.10, 5.13)***
60-69	0.98 (0.79, 1.22)	1.03 (0.69, 1.53)	4.81 (3.32, 6.97)***	4.68 (2.70, 8.10)***
70+	0.52 (0.38, 0.70)***	0.54 (0.34, 0.86)**	3.18 (1.94, 5.20)***	3.20 (1.61, 6.37)***
Education				
Grade 0-7	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
Grade 8-11	1.33 (1.10, 1.61)**	1.53 (1.20, 1.95)***	2.89 (1.85, 4.53)***	2.25 (1.34, 3.78)**
Grade 12 or more	5.79 (4.68, 7.15)***	2.55 (1.92, 3.38)***	8.62 (5.70, 13.01)***	2.72 (1.55, 4.77)***
Population group				
African Black	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
White	12.61 (9.06, 17.55)***	4.84 (3.06, 7.66)***	21.48 (15.75, 29.31)***	5.06 (3.36, 7.60)***
Coloured	5.51 (4.37, 6.96)***	4.45 (3.32, 5.96)***	4.70 (3.40, 6.50)***	2.87 (1.87, 4.41)***
Indian or Asian	4.71 (3.55, 6.24)***	2.11 (1.31, 3.38)**	6.14 (3.99, 9.46)***	2.52 (1.47, 4.32)***
Residence				
Urban formal	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
Urban informal	0.40 (0.30, 0.53)***	0.77 (0.54, 1.11)	0.16 (0.09, 0.27)***	0.79 (0.39, 1.53)
Rural informal	0.20 (0.16, 0.24)***	0.51 (0.38, 0.67)**	0.09 (0.06, 0.13)***	0.40 (0.24, 0.72)**
Rural formal	0.86 (0.62, 1.20)	0.74 (0.53, 1.04)	0.93 (0.56, 1.52)	0.81 (0.38, 1.81)
Employment status				
Not employed	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
Employed	3.26 (2.79, 3.80)***	1.45 (1.17, 1.81)***	2.20 (1.71, 2.84)***	0.93 (0.65, 1.33)
Has medical aid				
No	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
Yes	6.15 (5.05, 7.50)***	2.12 (1.55, 2.88)***	8.77 (6.82, 11.27)***	2.58 (1.90, 3.50)***
Chronic conditions				
None	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
One or more	1.72 (1.48, 1.99)***	1.48 (1.18, 1.85)***	2.30 (1.86, 2.85)***	1.49 (1.08, 2.05)*
Physical activity				
Inactive	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
Moderate or vigorous	1.58 (1.36, 1.84)***	1.20 (0.96, 1.50)	2.44 (1.93, 3.09)***	1.55 (1.12, 2.13)**

***, P<0.001; **, P<0.01; *, P<0.05

beginning at an earlier age with cervical cancer than breast cancer screening (National Department of Health, 2000; Snyman, 2010) and are similar to findings in other countries (Sözmen et al., 2016).

The study found, in agreement with previous studies (Williams-Brennan et al., 2012; Kim and Kang, 2016; Sözmen et al., 2016; Theme et al., 2016; Narayan et al., 2017; Serral et al., 2017), that a higher socioeconomic position (higher education, being employed, and non-African Black) was positively associated with cervical and breast cancer screening uptake. The particularly low access to cancer screening among the African Black population in this study may be related, as reviewed among women in sub-Saharan Africa (Akuoko et al., 2017, p.1), to “lack of awareness of early detection treatment, poor perception of breast cancer, socio-cultural

factors such as belief, traditions and fear.” There were also stark regional differences in the uptake of both breast and cervical cancer screening, with the lowest rates in Eastern Cape and Limpopo provinces and the highest in the Western Cape province. These differences may be taking into account in cancer screening programming.

Coupled with higher socioeconomic position, having a medical aid was in this investigation associated with cancer screening, as also found in previous studies (Theme et al., 2016; Narayan et al., 2017). The likelihood of having accessed cancer screening was in this study lower among dwellers in rural informal settlements than in urban formal areas. This finding conforms to previous studies (e.g., Peltzer and Phaswana-Mafuya, 2014) that urban residence increased the access and uptake to cancer screening. Further, as found in a previous study (Heflin

et al., 2002), this study also found that having one or more chronic conditions was related to higher rate of cancer screening. This may be explained by increased opportunities to cancer screening with increased health care visits due to having one or more chronic conditions (Heflin et al., 2012).

The possibility that engaging in other positive lifestyle behaviours besides cancer screening may increase also cancer screening (Sözmen et al., 2016; Theme et al., 2016) was confirmed in this study in the case physical activity. Further, the study found that among those tested for HIV status in this survey the uptake of cancer screening of HIV negative persons was higher (53.6% for cervical and 14.9% for breast cancer) than for those who tested HIV negative (42.2% for cervical and 4.9% for breast cancer). However, among those who tested positive to exposure to ART the cancer-screening uptake was significantly higher, in particular in the case of cervical cancer screening, (analysis not shown) than those who tested non-exposure to ART. This finding seems to show the increased uptake of cervical cancer screening among individuals on ART, responding to the South African Department of Health guidelines for HIV-infected women that “Pap smear screening should be done for all women at least 18 years of age at initiation of antiretroviral therapy (ART) and once every 3 years following a negative Pap result” (South African Department of Health, 2010, p.3).

Study limitations

This investigation had several limitations. Due to the cross-sectional survey data, no causative conclusions can be drawn between independent variables and cancer screening methods. Further, data on cancer screening methods were assessed by self-report over a long time period, which may have led to underreporting. Other factors that may have impacted on cancer screening uptake such as knowledge and perception of cancer were not assessed in this study and should be included in future studies.

In conclusion, cervical cancer screening was high but breast cancer screening was low in spite of it being a public health problem in South Africa. There are some socio-economic disparities in both breast and cervical cancer screening that can be targeted for interventions. This may be attributed to the limited availability, affordability, and accessibility of breast cancer screening services among socio-economically disadvantaged individuals.

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Statement conflict of Interest

The authors declare no conflict of interest.

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