ORIGINAL RESEARCH

Predictors of cervical cancer being at an advanced stage at diagnosis in Sudan

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Background: Cervical cancer is the second most common cancer among women in Sudan, with more than two-thirds of all women with invasive cervical cancer being diagnosed at an advanced stage (stages III and IV). The lack of a screening program for cervical cancer in Sudan may contribute to the late presentation of this cancer, but other factors potentially associated with advanced stages of cervical cancer at diagnosis are unknown. The purpose of this research was to investigate the relationship between age, marital status, ethnicity, health insurance coverage, residence in an urban vs a rural setting, and stage (at diagnosis) of cervical cancer in Sudan.

Methods: This was a cross sectional study of 197 women diagnosed with different stages of cervical cancer. Data was obtained from the cancer registry unit at the Radiation and Isotopes Centre in Khartoum for all women diagnosed with cervical cancer in 2007.

Results: There was an association between older age and advanced stage (at diagnosis) of cervical cancer (odds ratio [OR]: 1.03, 95% confidence interval [CI]: 1.01–1.05). Being of African ethnicity was associated with 76% increased odds (OR: 1.76, 95% CI: 1.01–3.05), living in a rural area was associated with 13% increased odds (OR: 1.13, 95% CI: 1.78–5.50), and being uninsured was associated with an almost eight-fold increase in odds (OR: 7.7, 95% CI: 3.76–15.38). Marital status and education level were not associated with an advanced stage of cervical cancer at diagnosis.

Conclusion: Women with cervical cancer who are elderly, not covered by health insurance, of African ethnicity, and living in a rural area are more likely to be diagnosed at an advanced stage of cervical cancer in Sudan. These women should be targeted for cervical cancer screening and a health education program, and encouraged to have health insurance.

Keywords: predictors, cervical cancer, diagnosis, advanced, health insurance, Sudan

Introduction

Cervical cancer is the second most common cancer among women worldwide, with a particularly high incidence in sub-Saharan Africa where there were an estimated 57,000 cases in 2000, comprising 22% of all cancers in women.[1] In many developing countries cervical cancer is not only the most frequently occurring cancer among middle-aged women, but also a leading cause of death, partly due to poor access to medical care and the unavailability of routine screening in many of these countries.[2] One of the most important prognostic factors is how early the cancer is detected and how far it has spread. Women who undergo annual pelvic examinations and Pap smears have a greater chance of any abnormalities or cancerous tissue being detecting during the early stages, which can play a crucial role regarding the chances of treating the cancer successfully. Lack of cervical screening consequently leads to very advanced disease in African women.[3–6] Whereas many cancers tend to have a

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high incidence in more urban areas, cervical cancer tends to have a higher incidence in more remote areas. Ethnicity plays an important role in morbidity and mortality from cervical cancer. The mortality rate for women with cervical cancer varies according to race and ethnicity. In 2007, black women were more likely to die from cervical cancer than any other group of women. Hispanic women had the second highest death rate from cervical cancer, followed by American Indian/Alaska Natives, white, and Asian/Pacific Island women.[7] Ethnicity and specific cultural barriers play an important role in disparate utilization of cancer health care services. Sociodemographic factors and comorbidity contribute to the probability of experiencing a delay in the diagnosis of cervical and ovarian cancers. The likelihood of a long delay in referral was greater in rural vs urban areas.[8] Having health insurance has a crucial role in early diagnosis of cervical cancer. Garcés-Palacio et al found that women in Colombia with subsidized health insurance were significantly more likely to seek cervical cancer screening than women without health insurance.[9] Paolino and Arrossi found that having health insurance and being married were the factors most significantly related to screening for early detection of cervical cancer in Argentina.[10] Up to 95% of cancer patients in African countries are diagnosed when they have late-stage or end-stage disease. Delayed diagnosis in these patients is due to the low level of cancer awareness in the population and health workers, culture, and limited access to specialized care, which is close to nonexistent in African countries.[6]

In the absence of a screening program in Sudan, the majority of women with invasive cervical cancer are diagnosed at an advanced stage and factors potentially associated with advanced stage of cervical cancer at diagnosis are unknown. The objective of this study was to identify predictors of cervical cancer already being at an advanced stage at diagnosis in Sudan.

Methods and materials

This was a cross sectional study of women diagnosed with cervical cancer from January 1, 2007 to December 31, 2007 in Sudan. Data was obtained in January 2009 from the cancer registry at the Radiation and Isotopes Centre in Khartoum, which is the only specialized cancer hospital in Sudan. Suspected or diagnosed cancer cases from all hospitals around Sudan were referred to this center for confirmation of diagnosis and further treatment. All patient information is registered and stored in a database using CanReg4 software, which is also used by the International Agency on Research for Cancer. The study variables were age, marital status, tribe, residence area, state, health insurance status, and tumor staging at diagnosis. Tumors were classified using the FIGO (Fédération Internationale de Gynécologie et d'Obstétrique) classification[11] as: stage I, confined to the cervix; stage II, extending beyond the cervix, but not into the pelvic wall, involving two-thirds of the upper vagina; stage III, extending into the pelvic wall and involving the lower third of the vagina but not adjacent organs; and stage IV, extending beyond the pelvis into adjacent and distant organs. Staging is based on a combination of anatomical, pathological, operative, and clinical variables.

Patients in the study sample were stratified by geographical residence into urban or rural and also by health insurance status. Patients with health insurance were also stratified according to whether their policy was taken out before or after their diagnosis of cervical cancer. If a patient had health insurance before diagnosis of the disease, she was considered to be insured; if the patient took out health insurance after the diagnosis of cancer she was considered to have been uninsured. This distinction was made to enable assessment of the effect of health insurance on the detection of cervical cancer. The study sample included women from 94 tribes, which were grouped into African and Arabic ethnicity based on the classification of tribes of Sudan.[12] The main outcome variable for this study was staging of cervical cancer at diagnosis. Variables identified as potential predictors of an advanced stage at diagnosis were age, ethnicity, marital status, urban residence, and health insurance.

Statistical analysis

The Chi-squared test was used for comparison of proportions and the *t*-test was used to compare mean values. The relationship between predictor variables and disease staging at diagnosis was then examined by logistic regression. The *P* value, odds ratio (OR) and 95% confidence interval (CI) were reported. All statistical analyses were performed using Stata (v 10.0; Stata Corporation, College Station, TX).

Results

The mean age of the patients at diagnosis was 54.5 (range 25–76) years. About 70% of the women were currently married and more than half were living in a rural area (Table 1). Twenty-seven percent of the women had health insurance. About 72% of women in the sample were diagnosed with invasive cervical cancer that had spread beyond the cervix. Women diagnosed at an advanced stage of cervical cancer were older than those diagnosed at an earlier stage (Table 1). More than half of the cases were

Table 1 Characteristics of 197 women diagnosed with cervical cancer and having data held in the Radiation and Isotopes Centre in Khartoum, Sudan, in 2007

Characteristics	n (%)
Age (years)	
≤54	73 (37.1)
≥55	124 (62.9)
Marital status	
Single	60 (30.5)
Married	137 (69.5)
Ethnicity	
African	103 (52.3)
Arabic	94 (47.7)
Education level	
Basic school	122 (61.9)
Secondary school	75 (38.1)
Geographical area	
Urban	90 (45.7)
Rural	107 (54.3)
Health insurance	
Covered	53 (26.9)
Not covered	144 (73.1)
Tumor morphology	
Squamous cell carcinoma	145 (73.6)
Adenocarcinoma	52 (26.4)
Disease stage at diagnosis (FIGO)	
Stage I	17 (8.7)
Stage II	39 (19.8)
Stage III	27 (13.7)
Stage IV	114 (57.9)

Abbreviation: FIGO, Fédération Internationale de Gynécologie et d'Obstétrique.

Table 2 Distribution of predictors and stages of cervical cancer at diagnosis in 197 Sudanese women

Predictor	Early stages (I and II) n = 56 (28.4%)	Advanced stages (III and IV) n = 141 (71.5%)	P value
Age (years)			
≤54	22 (11.1%)	51 (25.9%)	0.8
≥55	34 (17.3%)	90 (46.7%)	
Marital status			
Single	16 (8.1%)	44 (22.3%)	0.7
Married	40 (20.3%)	97 (49.2%)	
Educational level			
Primary school	34 (17.3%)	88 (44.6%)	0.8
Secondary school	22 (11.2%)	53 (26.9%)	
Ethnicity			
Arabic	38 (19.3%)	56 (28.4%)	0.003
African	18 (19.3%)	85 (43.1%)	
Geographical area			
Urban	38 (19.3%)	52 (26.4%)	0.001
Rural	18 (19.3%)	89 (45.1%)	
Health insurance			
Insured	32 (16.2%)	21 (10.7%)	0.0001
Not insured	24 (12.2%)	120 (60.9%)	

diagnosed at stage IV. The proportion of women diagnosed at advanced stages of cervical cancer was higher than those diagnosed at an earlier stage (71.5% vs 28.4%). Women aged 54 years and older were more frequently diagnosed with advanced cervical cancer compared to those who were younger. Women of African ethnicity were more likely to be diagnosed with stage III–IV disease than Arabic women. Women living in urban areas had a higher chance of being diagnosed earlier than those living in rural areas. Women covered by health insurance were diagnosed more frequently in the early stages of cervical cancer than those not covered by health insurance (16.2% vs 12.2%, respectively). There was a statistically significant difference between the proportion of women covered and not covered by health insurance who were diagnosed at an advanced stage of cervical cancer (60.9% vs 12.2%, respectively, $P < 0.0001$; Table 2).

The relationship between predictor variables and staging of cervical cancer at diagnosis was examined using multivariate logistic regression (Table 3). Age, ethnicity, geographical residence, and health insurance status were found to be associated with staging at diagnosis. Older age

(≥ 55 years) was associated with increased odds of diagnosis at an advanced stage (OR: 1.03, 95% CI: 1.01–1.05). Rural residence was associated with increased odds of diagnosis at an advanced stage (OR: 1.13, 95% CI: 1.78–5.50). Diagnosis at an advanced stage was far more likely in women of African ethnicity (OR: 1.76, 95% CI: 1.01–3.05). Those without health insurance had much higher odds of a diagnosis of cervical cancer at an advanced stage than those with health insurance (OR: 7.7, 95% CI: 3.76–15.38).

Discussion

About 72% of the cervical cancer cases in this Sudanese study were diagnosed at an advanced stage. Older age, lack of insurance, African ethnicity, and rural residence were independent risk factors for the diagnosis of advanced cervical cancer. The risk was especially high in women with no health insurance. This finding is consistent with earlier reports.[13–15] Women without health insurance were less likely than those with health insurance to seek health care and to receive appropriate treatment. In this study, nearly 46% of advanced (FIGO stages III and IV) cervical cancer cases were aged over 55 years. Older women were less often diagnosed at an early stage of cervical cancer than younger women. This may be due to older women not seeking obstetrics and gynecology services in the post-menopausal years, and particularly women in rural areas where health care services are not readily accessible. Another likely factor is lack of awareness about cervical cancer.[14–21] Furthermore, a crucial

Table 3 Multivariate logistic regression analysis of predictors of cervical cancer staging at diagnosis

Predictor	Early stages (I and II)	Advanced stages (III and IV)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	P value
Age ≥ 55 years	34 (17.3%)	90 (46.7%)	1.1 (0.60–2.15)	1.03 (1.01–1.05)	0.8
Married	40 (20.3%)	97 (49.2%)	0.8 (0.44–1.74)	0.8 (0.43–1.45)	0.7
Primary school	34 (35.1%)	88 (44.7%)	0.9 (0.49–1.75)	0.7 (0.43–1.32)	0.9
African ethnicity	18 (19.3%)	85 (43.1%)	3.2 (1.66–6.16)	1.76 (1.01–3.05)	0.003
Rural area	18 (19.3%)	89 (45.1%)	3.7 (2.54–9.31)	1.13 (1.78–5.50)	0.001
No health insurance coverage	24 (12.2%)	120 (60.9%)	8.6 (4.55–16.24)	7.7 (3.76–15.38)	<0.0001

Notes: Reference groups: Age ≤ 55 years, single, secondary school, Arabic ethnicity, urban area, have health insurance coverage.
Abbreviations: OR, odds ratio; CI, confidence interval.

contributor to delayed detection of cervical cancer is probably poor dissemination of information and communication by health care providers.[22–25]

In this study, women of African ethnicity were more likely to be diagnosed with advanced disease than those of Arabic ethnicity. Ethnic differences in staging at diagnosis of cervical cancer have been reported by several other studies. Brewer et al[26] found major ethnic differences in survival rates for Maori and Pacific Island women with cervical cancer in New Zealand. They reported that this difference was almost entirely due to staging at diagnosis, indicating that ethnic differences in access to and uptake of screening and treatment of premalignant lesions may have played a role. Brookfield et al[27] reported similar findings for a population in Florida that included Caucasian, African-American, and Hispanic women. Their study concluded that racial, ethnic, and socio-economic disparities in cervical cancer survival rates were explained by late-stage presentation and undertreatment.[27] In line with our results, Wu et al[28] found that certain ethnic groups, ie, Black and Hispanic, as well as older women, were more likely to be diagnosed with late-stage cervical cancer. This difference is due to lack of awareness, poverty, and lack of health insurance, resulting in an underprivileged situation in terms of access to health care services. In our study, there was a difference in geographical distribution between women of African and Arabic ethnicity, but the spatial distribution of African and Arab ethnicity in Sudan (with respect to hospital care) is equal. Spatial disparity in access to health services exists between urban and rural areas in Sudan but there is no clear evidence that populations of African ethnicity concentrate in rural areas. There is a lack of access to health services and health insurance cover in rural areas and this probably contributes to late presentation, again resulting in diagnosis of cervical cancer at an advanced stage.

Single women in Sudan are not usually sexually active and rarely seek reproductive health care, so are unlikely to have regular gynecological examinations. Due to an inherent social stigma about loss of virginity, unmarried women are considered to be virgins. Unmarried women may avoid undergoing a gynecological examination for fear of being stigmatized if it is discovered that they are sexually active.[29] Moreover, social mores in Sudan consider sex outside marriage to be sinful, and are widely suspected to affect health care being sought for gynecological symptoms, which are often associated with sexually transmitted infections.[30] In this study, married women were more likely to be diagnosed at early stages of cervical cancer compared with unmarried women, which may be due to the more frequent obstetric and gynecological care they receive during their childbearing years.

There are some limitations to this study. First, data on earlier staging of cervical cancer, such as carcinoma in situ, are not held by the cancer registry, and the tumor stages were classified into broad major stages without substaging. Second, invasive cervical cancer cases were reported to the cancer registry directly from secondary and tertiary care institutions, so data on patients who were not hospitalized would not have been entered into this hospital-based registry. The extent to which unregistered cases may have differed in age, ethnicity, and geographical distribution is unknown.

Conclusion

Women with cervical cancer who are elderly, not covered by health insurance, of African ethnicity, and living in rural areas are more likely to be diagnosed at an advanced stage of cervical cancer in Sudan. These women should be targeted for cervical cancer screening and health education programs and encouraged to take out health insurance cover.

Disclosure

The authors report no conflicts of interest in this work.

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