

Predictors of Patient's Survival after a Diagnosis of Cervical Cancer Patients at Moi Teaching and Referral Hospital

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ABSTRACT

Cervical cancer is one of the most prevalent cancer in women. It is the fourth leading cause of cancer deaths in women worldwide after breast cancer, lung cancer and colorectal cancer. In Kenya, cervical cancer is the leading cause of death in women, and has been shown to have increased by 3 211 in the past 5 years. An increase in cervical cancer in Kenya, has resulted in an economic burden for patients and families. There is an increase in healthcare spending as well as productivity losses due to morbidity and mortality at a productive age. The purpose of the study was to determine the predictors of survival after a diagnosis of cervical cancer. A retrospective cohort design was used in the study. A total of 175 cervical cancer patients were studied over a five-year period, from January 1st to December 31st, 2014. A Cox regression model were used to assess the predictors of survival after cervical cancer diagnosis. The study findings revealed that age, marital status, employment status, family history, smoking status, comorbidity, cancer grade, staging of the disease and treatment plan were factors that increased the risk of death for cervical cancer patients. In conclusion, risk factors affecting the life expectancy of cervical cancer patients include age, marital status, employment status, family history, smoking status, comorbidity, cancer grade, staging of the disease and treatment plan. In an effort for an intervention on factors that increased the risk of death for cervical cancer patients, a collaboration between the Government, private organizations, and local communities is critical. This includes promoting and developing cervical cancer awareness among the public so that women adopt healthy lifestyles and early screening behaviours.

Submitted: July 08, 2023

Published: October 16, 2023

 10.24018/ejmath.2023.4.5.264

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Keywords: Cervical cancer, diagnosis, patient's survival, predictors.

1. INTRODUCTION

Cervical cancer remains a significant global health concern, particularly in low- and middle-income countries where access to comprehensive treatment options is often limited [1]. Cervical cancer is the fourth most common cancer among women worldwide, and the leading cause of cancer death among women in Africa [2]. The predictors of patient survival after a diagnosis of cervical cancer vary from country to country [3]. However, some of the most common factors include: stage of cancer at diagnosis: The earlier the cancer is detected, the better the chances of survival [4]. In general, the 5-year survival rate for localized cervical cancer is 92%, while the 5-year survival rate for distant metastatic cancer is only 17%. Age is also a factor to survival where younger patients tend to have better survival rates than older patients. Socioeconomic status where women with lower socioeconomic status tend to have worse survival rates for cervical cancer [5]. Comorbidities where women with other chronic health conditions, such as HIV/AIDS, diabetes, or heart disease, tend to have worse survival rates for cervical cancer. Access to care where women who have difficulty accessing care, such as those who live in rural areas or who do not have health insurance, tend to have worse survival rates for cervical cancer.

The type of treatment received can have a significant impact on survival. For example, women who receive surgery and radiation therapy tend to have better survival rates than women who only receive



surgery [6]. The patient's overall health, including their immune system and nutritional status, can also affect survival. The predictors of survival for cervical cancer patients from different countries include United States where stage of cancer at diagnosis, age, race/ethnicity, and socioeconomic status are all significant predictors of survival. The women who received surgery and radiation therapy had better survival rates than women who only received surgery [7]. In India the stage of cancer at diagnosis, age, and the patient's overall health are all significant predictors of survival. The women who received surgery and chemotherapy had better survival rates than women who only received surgery [8].

In South Africa the stage of cancer at diagnosis, age, and the patient's access to care are all significant predictors of survival [9]. The women who received surgery and radiation therapy had better survival rates than women who only received surgery. In Kenya, cervical cancer is the most common cancer among women, with an estimated 5,000 new cases and 2,500 deaths each year [10]. The survival rate for cervical cancer depends on a number of factors, including the stage of the cancer at diagnosis, the patient's age and overall health, and the type of treatment received. However, even with early diagnosis and treatment, the five-year survival rate for cervical cancer is only about 60% [11].

There is a need to identify the factors that predict patient survival after a diagnosis of cervical cancer in order to improve the quality of care for these patients. A study of the predictors of patient survival after a diagnosis of cervical cancer at Moi Teaching and Referral Hospital would provide valuable information that could be used to improve the survival rates for these patients. The findings of the study would be used to develop interventions that could improve the survival rates for cervical cancer patients. For example, the study could identify patients who are at high risk of poor survival and provide them with more intensive treatment or social support. The study could also identify factors that are associated with non-adherence to treatment and develop interventions to improve adherence.

2. RESEARCH METHODOLOGY

The study used data from cervical cancer patients' treatment at MTRH in a retrospective cohort study design. This study included all cervical cancer patients aged 20 to 70 years who were registered at MTRH's Oncology Centre between January 1, 2014, and December 31, 2014, and were followed up on for five years. Data were collected from patient records kept at the Medical Records Department (MRD) of CDC at MTRH using a pretested data extraction sheet. Data for this study were extracted and entered into Microsoft Excel before being analyzed with R software. The Cox regression model was used to explore the relationship between patients' survival and individual/clinical predictors. Ethical approval was granted by the Institutional Research and Ethics Committee (IREC) of the College of Health Sciences/Moi Teaching & Referral Hospital (MTRH) prior to starting the study. The researcher ensured that confidentiality was maintained throughout the study.

3. STUDY RESULTS

According to the study findings, the number of cervical cancer cases reported in the Moi Teaching and Referral Hospital in 2014 was 175 at the start of the study. In the final year of the study, 2018, 32 of the previous cases were recorded, but 31 (17.7%) survived cervical cancer.

3.1. Predictors of Survival after a Diagnosis of Cervical Cancer

Cox regression model was fitted to data containing all data (175 cases). Of all 175 cervical cancer patients in the study period, 144 (82.3%) died.

3.2. Omnibus Tests of Model Coefficients

The study carried out the Omnibus Tests of Model Coefficients to get a likelihood ratio test of the fit of the full model relative to a null (intercept only) model. Statistical significance suggests the model is a significant improvement in fit relative to the null. The results are presented in Table I.

The study results in Table I revealed that the model is a significant [$\chi^2(15) = 68.251$, $p < 0.05$] improvement in fit relative to the null. Omnibus tests of model coefficients provide a score test for

TABLE I: OMNIBUS TESTS OF MODEL COEFFICIENTS

-2 Log likelihood	Overall (score)			Change from previous step			Change from previous block		
	Chi-square	df	Sig.	Chi-square	df	Sig.	Chi-square	df	Sig.
1301.326	68.251	15	0.000	84.815	15	0.000	84.815	15	0.000

TABLE II: COX REGRESSION MODEL

Covariates	B	SE	Sig.	Exp(B)	95.0% CI for Exp(B)	
					Lower	Upper
Age category	0.369	0.101	0.000	1.446	1.186	1.764
Marital status	-0.258	0.117	0.027	0.772	0.615	0.971
Insurance cover	0.182	0.209	0.384	1.200	0.796	1.809
Employment status	0.328	0.161	0.042	1.389	1.012	1.905
Menopause	0.322	0.232	0.165	1.380	0.876	2.174
Contraceptives	0.303	0.414	0.465	1.353	0.601	3.047
Types of contraceptives	0.002	0.119	0.986	1.002	0.793	1.266
Family history	0.444	0.224	0.048	1.559	1.005	2.418
Smoking status	0.807	0.254	0.002	2.241	1.361	3.688
Comorbidity	0.825	0.237	0.001	2.282	1.433	3.635
HIV status	-0.144	0.206	0.486	0.866	0.578	1.298
HPV infections	-0.043	0.315	0.892	0.958	0.517	1.776
Cancer grade	0.472	0.145	0.001	1.604	1.208	2.130
Staging of the disease	0.265	0.109	0.015	1.303	1.052	1.614
Treatment plan	-0.124	0.061	0.043	0.883	0.783	0.996

simultaneously assessing the effects of the parameters in the model. It was found that the covariates contribute significantly in explaining the variability in the survival of cervical cancer ($P = 0.00$).

3.3. Predictors of Survival after a Diagnosis of Cervical Cancer

Predictors of survival after a diagnosis of cervical cancer was determined by the use of a Cox regression model. The study findings are presented in Table II.

Therefore, the cox model was obtained as given below;

$$\ln \{h(t)\} = 0.369X_1 - 0.258X_2 + 0.328X_3 + 0.444X_4 + 0.807X_5 + 0.825X_6 + 0.472X_7 + 0.265X_8 - 0.124X_9$$

where

$h(t)$ denotes the death due to the effects of predictor variables.

X_1 represents age, X_2 represents marital status, X_3 represents employment status, X_4 represents family history, X_5 represents smoking status, X_6 represents comorbidity, X_7 represents cancer grade, X_8 represents staging of the disease and X_9 represents treatment plan.

The study findings in Table II revealed that age, marital status, employment status, family history, smoking status, comorbidity, cancer grade, staging of the disease and treatment plan were factors that increased the risk of death for cervical cancer patients. The estimated coefficient for age of the patient being $\beta = 0.369$ implies the hazard ratio is $\exp(\beta) = 1.446$. This indicates the change of hazard rate for every age increase for patients there is an increase hazard risk of dying ($HR = 1.446$, 95% CI: 1.186–1.764, $P = 0.000$). The study findings concurred with [12] study which revealed that the overall cervical cancer mortality rates generally increased with age of the women. The age effect on mortality rates of cervical cancer was an increase with advancing age.

The marital status of the patient was also another risk factor for the survival of cervical cancer. Those patients who were married, the hazard rate of dying of the disease may be lower by 7.7% than those who were single or previously married ($HR = 0.772$, 95% CI: 0.615–0.971, $P = 0.027$). Cancer patients who are single are more likely to be diagnosed at a later stage and have a lower chance of living longer than those who are married. In many ways, marriage helps protect women with women's cancer when it comes to their diagnosis and prognosis. The study findings concurred with [13], who noted that being married or having a good relationship with a partner is linked to early cancer diagnosis and can help people with cancer live longer.

The patients who were not employed, the hazard rate is 1.389 times higher than those patients who were employed with ($HR = 0.328$, 95% CI: 1.012–1.905, $P = 0.042$). This implied that there is an increased cervical cancer survival rate with employment status since income is a predictive factor of employment status. Unemployed cervical cancer patient has fewer financial resources to comply with their basic needs; they can have reduced access to healthcare. Psychological conditions and stress may also derive from unemployment and engage the women in poor behaviours that are well-known risk factors for diseases, injuries and death. The study findings agreed with [14], who showed that an average of 89% of employees had returned to work within 2 years after their cervical cancer diagnosis.

The hazard rate for patients with family history of cervical cancer, is 1.559 times higher than for patients who did not have family history of cervical cancer with ($HR = 1.559$, 95% CI: 1.005–2.418,

$P = 0.048$). This implied that patients with a family history of cervical cancer may be genetically predisposed to carcinogenesis. This could affect risk of recurrence, second primary tumors and overall outcomes after treatment of a primary cancer. The study findings contradicted the findings of [15], who discovered that patients with a family history of cancer had greater overall and disease-free survival than patients without a family history of cancer.

The hazard rate of patients who smoke was 2.241 times risk of dying of cervical cancer than those of patients who did not smoke ($HR = 2.241$, 95% CI: 1.361–3.688, $P = 0.002$). Smoking increases the chance of developing precancerous lesions of the cervix (called moderate or severe dysplasia) and an increase in the chance of developing cervical cancer. Smoking weakens immune system as well as greatly increasing the risk for dysplasia. The study findings concurred with [16] who showed that the relative risks of death due to cervical cancer among current smokers was two times higher compared with non-smokers. Smokers had an increased risk of death due to cervical cancer.

The patients with comorbidities, the hazard rate of dying of the disease was higher by 22.8% than those who without comorbidities ($HR = 2.282$, 95% CI: 1.433–3.635, $P = 0.001$). This implied that increased comorbidity is associated with reduced survival time among women diagnosed with cervical cancer. Comorbidity may form a barrier to participation in cancer screening, which may lead to more advanced disease at diagnosis. Comorbidity may also limit treatment options and increase the risk of treatment complications. The study findings concurred with [17] who established that comorbidity is associated with higher mortality from cancer.

The patients with cancer grade 3, the hazard rate increase by 1.604 than those in grade 1 with ($HR = 1.604$, 95% CI = 1.208–2.130, $P = 0.001$). This implied that cancer grade is a prognostic factor for squamous cervical cancer. The study findings concurred with [18] who noted that grade 2–3 reduces the survival time of cervical cancer patients. They found that tumor grade is useful to identify a group of women with decreased survival outcome with current treatments.

The estimated coefficient for staging of the cervical cancer of the patient being $\beta = 0.265$ implies the hazard ratio is $\exp(\beta) = 1.303$. This indicates the change of hazard rate for every stage increase for patients there is an increase hazard risk of dying ($HR = 1.303$, 95% CI: 1.052–1.614, $P = 0.015$). This implies that if cervical cancer is detected and treated early, while it is still located only in your cervix and uterus, the survival rate is high. If cervical cancer spreads to nearby lymph nodes, or to other organs or other areas of body, the survival rate is lower. One-year relative survival decreased with increasing stage at diagnosis. The risk of distant tumour metastasis grows as the stage advances, resulting in a substantial drop in patients' life expectancy. Patients in the early stages (stages I and II) have a greater life expectancy than those in the latter stages (stage III and IV). Cervical cancer can be treated and has a better chance of survival if detected early. This discovery is consistent with others [19].

According to the American Cancer Society, if cervical cancer is detected early, the 5-year survival rate is 92%. Approximately 44% of cervical cancer patients are diagnosed at an early stage. The 5-year survival percentage for cervical cancer that has spread to neighbouring tissues or organs and/or regional lymph nodes is 58%. The 5-year survival rate for cancer that has progressed to a distant portion of the body is 18%.

The estimated coefficient for treatment plan of cervical cancer being $\beta = -0.124$ implies the hazard ratio is $\exp(\beta) = 0.883$. This indicates the change of hazard rate for every treatment plan of the patients there is a decrease hazard risk of dying ($HR = 0.883$, 95% CI: 0.783–0.996, $P = 0.043$). This implies that if cervical cancer is diagnosed at the early stages, it can be treated and has a higher survival rate. Cervical cancer is treated in a variety of methods. It is determined by the type of cervical cancer and the extent to which it has spread. Surgery, chemotherapy, and radiation therapy are all options for treatment. Surgery is the removal of cancer tissue through an operation. Chemotherapy is the use of specific drugs to shrink or destroy cancer. Radiation kills cancer by using high-energy beams (similar to X-rays).

4. CONCLUSION

In conclusion, cervical cancer remains a significant public health problem in MTRH and in Kenya. Risk factors affecting the life expectancy of cervical cancer patients include age, marital status, employment status, family history, smoking status, comorbidity, cancer grade, staging of the disease and treatment plan. Late diagnosis of cervical cancer appears to be mainly associated with a higher risk of dying from cervical cancer.

5. RECOMMENDATION

In an effort for an intervention on factors that increased the risk of death for cervical cancer patients, a collaboration between the Government, private organizations, and local communities is critical. This

includes promoting and developing cervical cancer awareness among the public so that women adopt healthy lifestyles and early screening behaviours.

6. EDITORIAL POLICY

The submitting author is responsible for obtaining the agreement of all coauthors and any consent required from sponsors before submitting a paper. It is the obligation of the authors to cite relevant prior work.

Authors of rejected papers may revise and resubmit them to the journal again.

ACKNOWLEDGMENT

The authors would like to thank the Moi Teaching and referral hospital who contributed to the study.

FUNDING

There were no funding for the paper.

CONFLICT OF INTEREST

We the authors, declare there is no conflict of interest in this work.

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