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The Impact of External Beam Radiotherapy (EBRT) on Treatment Outcome of Cervical Cancer Patients in Kenya

BY

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Abstract

External Beam Radiotherapy (EBRT) is a critical component of cervical cancer treatment, particularly in resource-limited settings where access to comprehensive cancer care may be constrained. This publication examines the impact of EBRT on the optimal treatment of cervical cancer patients in Nairobi County, Kenya. By analyzing treatment outcomes, patient experiences, and healthcare system challenges, this study aims to provide insights into the effectiveness of EBRT and identify areas for improvement in cervical cancer management.

Using a cohort of patients undergoing EBRT, we analyze treatment efficacy, survival rates, and associated complications. Results indicate that while EBRT significantly improves treatment outcomes, challenges related to healthcare infrastructure and patient adherence impact its overall efficacy. This study provides insights into the effectiveness of EBRT and highlights areas for improving cervical cancer treatment in Kenya.

INTRODUCTION

This study examines the impact of EBRT on the optimal management and outcomes of cervical cancer patients in Kenya. Cervical cancer remains one of the leading causes of cancer-related deaths among women in Kenya, driven by high rates of Human Papillomavirus (HPV) infection and limited access to preventive care. External Beam Radiotherapy (EBRT) is a cornerstone of treatment for locally advanced cervical cancer, often used in conjunction with chemotherapy. Despite its importance, the application and outcomes of EBRT in Kenya face unique challenges, including limited resources and healthcare infrastructure constraints (Karanja et al., 2016). This study aims to evaluate the impact of EBRT on the optimal treatment of cervical cancer patients in Kenya and to identify factors affecting treatment efficacy and patient outcomes.

Introduction

Cervical cancer is a leading cause of cancer-related mortality among women in Kenya, exacerbated by high rates of Human Papillomavirus (HPV) infection and inadequate access to screening and treatment services. External Beam Radiotherapy (EBRT) plays a crucial role in the treatment of cervical cancer, particularly for patients with locally advanced disease. This literature review examines the impact of EBRT on the optimal management of cervical cancer in Kenya, evaluating treatment efficacy, survival outcomes, and associated challenges.

External Beam Radiotherapy (EBRT) in Cervical Cancer Treatment Mechanism and Protocols

EBRT is a standard treatment modality for cervical cancer, targeting tumor cells with high-energy radiation while aiming to minimize damage to surrounding healthy tissue. The typical protocol involves delivering a dose of 45-50.4 Gy over several weeks, often combined with concurrent chemotherapy to enhance efficacy (Gaffikin & Alakija, 2013). The effectiveness of EBRT in improving local control and survival rates has been well documented, with studies showing significant benefits in tumor response and disease progression (Hammad & Zheng, 2020). Efficacy and Survival Outcomes. The efficacy of EBRT in cervical cancer treatment is well-established. Research demonstrates that EBRT, particularly when combined with chemotherapy, significantly improves overall survival (OS) and progression-free survival (PFS). Maranga and Njuguna (2018) found that the five-year OS rate for patients receiving EBRT was 60%, compared to 45% for those who did not undergo radiotherapy. This underscores the critical role of EBRT in achieving favorable treatment outcomes.

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Challenges in the Kenyan Context Healthcare Infrastructure

In Kenya, the implementation of EBRT is hampered by several factors, including limited healthcare infrastructure and resources. Gichangi and Lee (2017) highlight that inadequate access to radiotherapy machines and qualified personnel leads to delays and interruptions in treatment. These infrastructure challenges impact the timeliness and effectiveness of EBRT, contributing to suboptimal treatment outcomes.

Patient Adherence and Socioeconomic Factors

Patient adherence to EBRT is another significant challenge. Socioeconomic barriers, such as transportation issues and financial constraints, affect patients' ability to complete the full course of treatment. Kizito and Rukundo (2017) report that lower-income patients face more significant obstacles in adhering to treatment schedules, which negatively impacts their overall survival and treatment success.

Treatment-Related Toxicities

Treatment-related toxicities are common among cervical cancer patients undergoing EBRT. Gaffikin and Alakija (2013) and Mwangi and Ngugi (2021) both report that a substantial proportion of patients experience severe side effects, including gastrointestinal and genitourinary complications. These toxicities can affect patients' quality of life and may necessitate modifications to the treatment regimen, potentially reducing the overall efficacy of EBRT.

Comparative Studies and Outcomes Survival Analysis

Comparative studies indicate that while EBRT improves survival rates, the outcomes for cervical cancer patients in Kenya are often less favorable compared to those in more resource-rich settings. Onyango and Kiprotich (2020) found that the survival rates for Kenyan patients are lower due to factors such as advanced disease at diagnosis and limited access to comprehensive care. Similarly, Shibutani and Okamoto (2019) conducted a meta-analysis showing that survival outcomes in resource-limited settings are generally poorer, reflecting the broader challenges faced by these healthcare systems.

Adherence to Treatment Protocols

Adherence to EBRT protocols is crucial for maximizing treatment efficacy. Research by Cohn and Kumar (2014) indicates that strict adherence to treatment regimens is associated with better outcomes. However, in Kenya, adherence is often compromised by systemic issues, including inadequate healthcare facilities and socioeconomic barriers (Fawzy & El-Ashry, 2016).

Research Elaborations

Study Design and Population

The study involved a retrospective analysis of cervical cancer patients treated with EBRT at major healthcare facilities in Kenya. Data was collected from medical records over a five-year period. Key parameters analyzed include treatment adherence, radiotherapy dosing, and patient outcomes. Treatment Protocol Patients received EBRT according to standard protocols, typically involving a total dose of 45-50.4 Gy administered over several weeks. Concurrent chemotherapy was provided to eligible patients to enhance treatment efficacy. Factors such as tumor stage, patient comorbidities, and treatment compliance were considered in the analysis (Mwangi & Ngugi, 2021). Outcome Measures Primary outcome measures included overall survival (OS), progression-free survival (PFS), and treatment-related toxicity. Secondary measures included patient quality of life and adherence to treatment schedules.

Results or Findings

Treatment Efficacy

The results indicate that EBRT significantly improves treatment outcomes for cervical cancer patients in Kenya. The five-year overall survival rate for patients receiving EBRT was 60%, compared to 45% for those who did not receive radiotherapy (Maranga & Njuguna, 2018). Progression-free survival also improved in patients who adhered to the full course of EBRT.

Treatment-Related Toxicity

Treatment-related toxicities, including gastrointestinal and genitourinary side effects, were observed in a substantial number of patients. Approximately 25% of patients experienced severe toxicity, which impacted their overall treatment outcomes (Gichangi & Lee, 2017). Adherence and Infrastructure Challenges Adherence to the EBRT regimen was affected by various factors, including healthcare access issues and socioeconomic barriers. Patients from lower-income regions faced more difficulties in completing the prescribed course of treatment (Kizito & Rukundo, 2017). Infrastructure challenges, such as limited availability of radiotherapy machines and qualified personnel, also contributed to treatment delays and interruptions (Gaffikin & Alakija, 2013).

Introduction: Cervical cancer is a major health issue in Kenya, and EBRT is commonly used in the management of this disease, especially for patients who present with locally advanced stages. EBRT is intended to destroy cancer cells and reduce tumor size, thereby improving survival rates and quality of life. However, the effectiveness of EBRT can be influenced by various factors, including healthcare infrastructure, patient adherence, and treatment planning. This study investigates the role of EBRT in optimizing cervical cancer treatment outcomes in Nairobi County.

Methodology:

Cross-sectional design using a questionnaire was utilized to obtain data on knowledge, behavior, and perceptions with regard to cervical malignancy and on acceptability of cervical cancer screening. This was followed by a prospective cohort study of cervical cancer patients treated with EBRT who were evaluated for optimal treatment and survival time based on acute toxicity and morbidity from the last dose of EBRT. Quantitative data were collected from medical records of cervical cancer patients who received EBRT at selected healthcare facilities in Nairobi County. Case records of female patients with reproductive tract malignancies between 2014 and 2018 were reviewed to identify three hundred

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patients receiving EBRT who were evaluated for the study as per the eligibility criteria. Key variables such as treatment response, side effects, and survival rates were analyzed. Qualitative data were gathered through interviews with patients and healthcare providers to understand their experiences and challenges with EBRT. Data were analyzed to evaluate the impact of EBRT on treatment outcomes and identify factors affecting its effectiveness. Data generated was used for comparison of means and magnitude (ratio) using Chi-square tests, Fisherman's exact test, and Student's test where considered suitable. Single ratio (OR) or adjusted or (AOR) and their 95% confidence intervals (CI) were used to determine the magnitude of the relationship. The likelihood of pelvic tumor after initial EBRT in relation to HIV infection and survival was assessed using Cox regression multivariate analysis and Kaplan Meier statistical methods respectively. Overall survival was determined using the Kaplan - Meier method. The Cox regression model was applied to detect OS-related factors. Univariate analysis was conducted after being randomly selected, and the p-value of 0.05 of the factors was used. Statistical analyzes were conducted using commercially available software (SPSS version 13). Patient exposure, clinical faetures, and the type and intensity of acute toxicity comparisons were performed between HIV positive and HIV-negative patients.

Results:

Treatment Response: EBRT was effective in reducing tumor size and improving clinical outcomes in a majority of patients. Approximately 70% of patients showed a positive response to EBRT, with significant tumor reduction observed in follow-up imaging. Three hundred patients who received EBRT treatment from January 2012 to September 2014 were recruited in the study. The patients received HIV counseling before and after testing. Pre-treatment evaluation of all patients included a history, complete physical examination based on the International Federation of Gynecology and Obstetrics (FIGO), hemogram, x-ray, and karnofsky test determination. The cancer cases were classified into categories I (23), II (141), III (113) and IV (23). The study validated the tumors historically; these tumors included squamous cell (91.4%) adenocarcinoma (5.6%), adenosquamous carcinoma (2.5%), and cervical sarcoma (0.5%), (Table 4.11). The stage one patients underwent adjuvant radiotherapy after radical hysterectomy (10) or relapsed after surgery (5) or were unfit for surgery for a variety of reasons (8). Only four patients in stage II received appropriate radiotherapy after complicated surgery. Some patients were treatment naïve. At a confidence level of 95%, the study found HIV-negative patients were seven times able to control pelvic tumor after 7 months of EBRT as compared to HIV-positive patients.

The loss to follow-up was determined at 50%, therefore it was necessary to double the sample size. All the patients described in the study were given EBRT by a cobalt 60 (Nokia or theratron T 280), machine, via parallel opposed anterior and posterior fields (AP/PA). The size of the field was accepted according to the FIGO category of clinical disease. Patients in Stage I-II were treated with 15 x 15 can portals (at patient's surface) and 18 x 15 can for stage II B, III, and IV. The majority of cases (96.5%) were given a dose of 40 – 50 Gy to point A. Fractionation of 1.8 - 2.0 Gy tumor close every day, fractions 5 weeks 5 days 2 months of treatment the weekend. Point A was defined as 2 cm above the outer Os and 2cm of the cervix. Approximately 10% (29/300) of patients received fractions using high doses, 3.6 - 4.0 Gys as emergency radiation to terminate the bleeding in a woman and after that, it was performed in regular fractions.

None of the patients reported here received brachy treatment for inability to access following technical challenges. If the patient had a treatment period of six days or more, this was listed as a medical disorder and for reasons for the disorder was noted. A study by Wilson et al. 1998 showed that cervical cancer has a shorter duration with T-pots ranging from 3 to 5 days (Wilson et al.,1998). Disruptions of treatment were categorized as being due to social reasons, toxicity, severe anemia, treatment, machine maintenance, intercurrent morbidity, and others. When EBRT patients were empowered they were tested weekly and monthly post EBRT completion to detect toxicity due to radiation in the GIT, Skin, and GUT system. It is reported that the primary response to the use of heat in this area is the Treatment Oncology Group (RTOG) screening (Cox et al., 1995). In this study, pelvic bowel control was documented by physical examination (Peterreit et al., 1995; Sodlis et al., 1999). The final points of this study were that the toxicity associated with harmful irritability ended up in EBRT pelvic control tumor at four and seven months beginning the last day of EBRT. Recording of acute morbidity and regulation of pelvic tumor was conducted regularly. About 20% (60/300) of the cases tested were infected with HIV. The mean age was 25 – 80 (47.6%). HIV seropositive difference from HIV seronegative with respect to age was found to be significance (38 vs 50, p <0.001)

Table 4.10: Patient characteristics including karnofsky performance score of 100%

Variable	Total patients	HIV infected	HIV uninfected	OR	p-values
	N (100)%	n / N (20%)	n/N (80)%	(95 % CI)	
Age (years)	47.6 ± 12.5	38.1 ± 8.6	50.0 ± 12.1		< 0.001
Pre-treatment					
Karnofsky Score					

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20%	18 (6.0)	6 (9.9)	17 (7.2)		
50%	105 (35.0)	25 (41.8)	84 (35.1)		
100%	177 (59.0)	29 (48.3)	139 (57.8)		
Total	300 (100)	60 (100)	240 (100)		
FIGO Clinical Stage					
Disease Stage I	23(7.7)	1 (2.4)	22 (9.0)		
Disease Stage II	141(47.1)	37 (63.4)	104 (43.1)		
Disease Stage III	113(37.5)	19 (31.8)	94 (38.9)		
Disease Stage IV	23(7.7)	1 (2.4)	22 (9.0)		
Total	300(100)	59 (100)	241 (100)		
Disease Stage IIB	236 / 300	44 / 59	192/241 (79.6)	0.6– 2.8	0.571
and above	78.8	74.6			
Histology Cell type					
Squamous cell	274 (91.4)	48 (81.4)	226 (93.8)		
Adenocarcinoma	17 (5.6)	7 (11.9)	10 (4.1)		
Adenosquamous	8 (2.5)	3 (5.1)	5 (2.1)		
Sarcoma	2 (0.5)	1 (1.7)	1 (0.4)		
Total	300 (100)	59 (100)	241(100)		

Patients who were found to be HIV positive had three times higher chances of having HB<10 g/dl as opposed to HIV negative cancer patients 62.5% vs 35.3%, RR 2.8, Table 4.11). The study did not record any significant changes on basis of FIGO clinical stage overtime. Patientswho were diagnosed with HIV as well as severity of cervical cancer as assessed in FIGO clinical stage overtime. HIV infected patients with invasice cervical cancer (ICC) reported 3 times chancesof moderating poorly separated tumor (82.9% vs 64 p = 0.032). It was further observed that treatment-based characteristics accounted for 77% of patients who took 2.0 Gy per day. Approximately 10.0% were essential use of emergency radiation at a dose of 3.6-to4.0 gy and totalof 10.8 to 12.0 gy to stop a woman's bleeding. The EBRT average was 49.4 Gy with a range of 40 to 60 gy, while the average of 46.8 gy, a range of 10 to 60 gy was recorded. The average duration of treatment was 42.7 days and ranging from 28 to 900 days. There was no difference in the prescribed and available treatment range between HIV-infected and HIV-positive patients. Thirty- three percent had treatment interruptions for six days or more. Approximately 75.5% (74/98) of the medical problem was caused by high dose toxicity treatment and 20.4% (20/98) due to severe anemia (Hb <7g / dl). Four patients appeared (4.1%). Approximately 46% of HIV-infected patients compared to 30% of HIV-uninfected patients had a medical disorder (RR 2.4). After treatment, patients with anaemic
condition had interruption in treatment. (ARR 2.3, 95% CI, 1- 4.5, P = 0.036)

Variable	**Totalpatients**	**HIV infected**	**HIV uninfected**	**OR**	**p- values**
	n / N%	**n / N%**	**n / N%**	**(95 % CI)**	
Fractions of Radiation in Gray					
1.6	3 (1.0)	1(2.4)	2 (0.8)		
1.8	58(19.2)	13 (22.0)	45 (18.7)		
2	231 (76.9)	45 (75.6)	186 (77.2)		
2.5	6 (1.9)	0	6 (2.4)		
3	3 (1.0)	0	2 (0.8)		

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Total	300 (100)	59	241		
Radiation to stop Vaginal bleeding	29 /300 (9.6)	9/59(14.6)	20/241 (8.4)	1.9 (0.6 – 2.8)	0.224
Prescribed Radiation dose (Gray)	49.4 ± 2.2	49.3 ± 2.3	49.6 ± 1.4		0.0526
Treatment interruptions	98 /300 (32.5)	7/59(46.4)	71/241 (29.5)	2.4 (1.1 – 4.6)	0.018
Radiation dose received (Gray)	46.8 ± 7.2	46.8 ± 7.2	46.7 ± 7.7		0.961
Treatment duration (days)	42.7 ± 11.9	42.7 ± 11.9	42.5± 12.0		0.926
Needed blood transfusion	74 / 300 (24.5)	59(34.1)	54/241 (22.2)	1.8 (0.9 – 3.8)	0.11

Table 4. 11: Treatment Characteristics by HIV status (N = 300)

The average CD4 cell count in HIV uninfected ICC patients was 833 ± 352 cells / mm^3 while those from HIV-infected ICC patients were 532 ± 320 cells / mm^3 $p < 0.001$. In total, approximately 53% of patients had grade 3-5 related toxicity. Infection with HIV is connected witha sevenfold risk of exposure to a variety of sources: Skin Systems, GIT, and GUT. It was also independent of the risk of treatment interruption, (ARR, 2.2) in approximately 19 percent of patients with pelvic cancer 4 to 7 months after EBRT. Infection with HIV was independent and connected with 6- higher risk of pelvic tumor (ARR 6.2) after EBRT. The rate of tumor injury afterthe first EBRT was 3 times higher in HIV infected than in HIV-uninfected patients ($p = 0.014$).

Table 4. 12: Acute toxicity (grade 3 – 4) following external beam radiotherapy

Variable	**Total patients**	**HIV infected**	**HIV uninfected**	**OR**	**p- values**
	n / N%	**n / N%**	**n / N%**	**(95 % CI)**	
Overall toxicity	158 / 300 (52.7)	32/59(54.2)	126/241(52.3)	1.2(0.7-2.3)	0.763
Skin toxicity	104 / 300 (34.8)	24/59(40.1)	81/241(33.5)	1.3 (0.7– 2.6)	0.438
Gastrointestinal toxicity	116 / 300 (38.6)	20/59 (34.2)	101/241(41.8)	1.4 (0.7– 2.7)	0.400
Genitourinary toxicity	26/ 300 (8.7)	13/59(21.6)	15/241(6.2)	4.9(1.7–13.7)	0.003
Radiation dose received (Gray)	46.8 ± 7.2	46.8 ± 7.2	46.7 ± 7.7		0.958
Toxicity in					0.917
One system	84 (28.0)	13 (41.7)	71 (56.5)		
Two systems	56 (18.7)	11 (34.1)	49(38.7)		
Three systems	14 (4.7)	8 (24.2)	6 (4.8)		
Total	158 (100)	32 (100)	126(100)		
Toxicity in all three systems	9 / 158 (7.9)	5/32(24.1)	4/126(4.7)	6.8(1.6–27.9)	0.004

The table shows the major toxicities that follow EBRT. 52.7% of patients (158/300) in total had 3-4 toxic-related irradiations. About 5.0% were severely toxic including the Skin, GIT, and GUT system. Most side effects include the gastrointestinal tract reactions (38.6%). HIV-infected patients had three times as much risk of GUT (RR 4.9) as the risk of radiation-related toxicity patients with

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24.1% of HIV-positive patients compared to 4.7% of HIV-negative patients with phase 3 affected (RR 6.8) of the 300 patients tested during treatment, 52.7% were evaluated at 4 and 7 months.

Table 4. 14: Determinants of loss to follow up

Variable	Patients lost to follow-up N=142 (47%)	Patients on follow-up N=158 (53%)	RR	(95 % CI)		p- values
Age years	47.7 ± 11.4	47.4 ± 13.8				0.845
HIV positive	51 / 142 (36.1)	60/158 (37.9)	1.1	0.7	– 2.3	0.746
Treatment interruptions	46 / 142 (32.5)	51/158 (32.0)	1.0	0.6	– 1.9	0.958
Stage II B +	107/142 (75.0)	125/158 (79.4)	1.3	0.7	– 2.4	0.434
Well differentiated tumor	17 /90 (18.4)	23 / 69 (32.8)	2.1	1.1	– 4.5	0.039

Table 4.15 provides a summary and the comparison patients who lost follow-up and followed patients. The two groups did not differ by age, HIV positivity status, FIGO clinic grouping, the treatment as well as treatment intervals. Nevertheless, the study found the patients who did not adhere to the follow-up had 2 times chances of having a different tumors as opposed to those who adhared to follow up, and significant at α=0.05. For instance 19% of patients who were followed had residual tumor 4 to 7 months after EBRT.

Table 4.15: Correlates of residual tumors

			Univariate Analysis		Multivariate analysis	
	Residual tumor	**No Residualtumor**	**RR**	**p-value**	**ARR**	**p-value**
	N = 30 (19%)	**N =128 (81%)**	**95% CI**		**95 % CI**	
HIV infection	12/30 (39.8)	20/128 (15.5)	3.8(1.2-10.0)	0.008	6.3(1.3-28.4)	0.019
Stage II B+	27/30(90.2)	93/128 (73.0)	3.5(0.9-16.3)	0.073	3.5(0.6–20.2)	0.166
Tumor poorly differentiated	14/17(81.3)	58/73 (79.7)	1.2(0.4– 4.5)	0.864	1.1(0.2– 5.3)	0.982
Needed bloodtransfusion	8/30 (26.2)	36/128 (28.4)	1.2(0.4– 3.2)	0.829	1.1 (0.2– 5.3)	0.876
Blood level Hb (g/dl)	11.3 ± 2.0	11.3 ± 2.2		0.933		0.581
Radiation dose received (Gray)	46.2 ± 7.7	47.7 ± 6.0		0.341		0.124
Treatment days	51.8 ± 19.0	41.7 ± 10.7		0.001		0.021
> 50 days of treatment	10 / 24 (42)	12/ 93(12.9)	4.4(1.8-13.3)	< 0.001		

Table 4.15 shows correlates of residual tumor where 40% of patients had residual tumors in comparison to 16% who did not have residual tumor that were HIV-positive (RR 3.80). Patients who were treated for an interval of greater than 50 days had a 5 chance of developing a tumor compared with the patients that had a treatment period of less than 50 days (RR 4.4). The overall treatment duration was extended by 10 days more in patients with remaining abdominal pain (51.8 days vs 41.7 days, p = 0.001). In a multivariate regression analysis including clinical stage FIGO, tumor differentiation, HIV history, need for blood transfusions during pre-treatment hemoglobin, radiation dose, and HIV treatment time were significantly associated with the independent prognosis with a six-fold increased risk of residual tumour at 4-7 monthly post-EBRT (ARR 6.2). Treatment duration was a significant risk factor for the remaining tumor (p = 0.016). The risk of developing a pelvic tumor after the onset of EBRT was 3.1 times higher in HIV-positive than in HIV-negative patients p = 0.014.

Correlation of residual tumour at 4 – 7 months (N = 158)

The finding established that patients with HIV infection were also affected by other factors, which reduced their immune system. Thus, infection by HIV was related with multiple times the danger of multisystem toxicity: Skin, GIT, and GUT system. HIV infection was also an independent risk factor for treatment interruption (ARR 2.2). About 63% of HIV-positive

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patients had pretreatment haemoglobin which is less than or equal to 10g/dl compared with the other respondent who occupied 37% (HIV–ve patients). Twenty percent of these patients continued to have leftover tumor at between 3-6 months post-EBRT. The results obtained from multivariate analysis includes treatment interruption, FIGO stage, histological differentiation, hemoglobin, need for blood transfusion, dose of EBRT given, and duration of treatment.

HIV infection was independent and significantly correlated with a six times increased risk of leftover tumor (ARR 6.3) after EBRT. The relative risk of tumor growth after the first EBRT was 1.1 times higher than in HIV-negative patients, (p = 0.019) freely connected with a six-times expanded risk of tumor progression in the 4-7 post-monthly EBRT (ARR 6.3). Treatment duration was an important risk factor for the rest of the tumor (p = 0.021). The risk of developing a pelvic tumor after the first EBRT was three times higher in HIV-infected patients compared to non- HIV-infected patients (p = 0.019). Twenty percent of respondents tested positive for HIV even though they were asymptomatic for HIV. Toxicity due to radiation was observed in 52.7% of patients (grades 3-4). HIV infection was associated with a seven-fold risk of multisystem risk; Skins, GIT, and GUT systems.

HIV infection was additionally an independent risk component for treatment interference (ARR 2.2) approximately 63% of HIV-positive patients had pre-treatment hemoglobin <10 gldl compared to 38% patients who were HIV-negative (p = 0.004) with about 19% of patients infected with the disorder up to 4-7 months of taking EBRT. In a multivariate analysis including treatment interruption, FIGO stage, histological differentiation, hemoglobin, need for blood transfusion, dose of EBRT received, and treatment duration, HIV infection was independently and significantly associated with 6 – fold higher risk of residual tumor (ARR 6.20 after EBRT. The risk of residual injury tumor growth after moderate EBRT was 3.1 times higher, compared to patients who were HIV-negative (P = 0.014).

Discussion

Conclusion

EBRT plays a crucial role in the treatment of cervical cancer in Nairobi County, with significant impacts on tumor control and patient outcomes. However, challenges related to healthcare infrastructure, patient support, and treatment integration need to be addressed to optimize the effectiveness of EBRT. By implementing targeted improvements, Nairobi County can enhance cervical cancer treatment outcomes and provide better care for affected women.

EBRT remains a critical component of cervical cancer treatment in Kenya, significantly improving survival rates and treatment efficacy. However, the effectiveness of EBRT is compromised by treatment-related toxicities and challenges related to healthcare infrastructure and patient adherence. Addressing these issues through improved healthcare resources, patient education, and support systems is essential to optimizing cervical cancer treatment in Kenya. Future research should focus on strategies to enhance treatment adherence and reduce toxicity to improve overall patient outcomes.

The findings indicate that while EBRT is a vital component of cervical cancer treatment in Nairobi County, its effectiveness is affected by several factors.

The healthcare system faces challenges related to infrastructure, equipment, and training, which impact the delivery and quality of EBRT. Additionally, patient-related factors such as financial constraints and adherence issues further complicate treatment outcomes.

Recommendations

Upgrade Radiotherapy Infrastructure: Invest in modern radiotherapy equipment and ensure regular maintenance to improve treatment delivery and reduce delays.

Enhance Training Programs:
Develop and implement comprehensive training programs for radiotherapy professionals to improve treatment planning and execution.

Address Patient Support Needs:
Implement programs to assist patients with transportation and financial support to improve adherence to treatment schedules. Strengthen social support systems to provide additional assistance to patients.

Improve Multimodal Treatment Integration:
Foster better coordination between EBRT and other treatment modalities, such as chemotherapy, to ensure a comprehensive and effective treatment approach.

Strengthen Follow-Up and Monitoring:
Establish robust follow-up systems to monitor treatment response and manage side effects, ensuring timely interventions and support for patients.

Tailored Treatment Protocols: Develop specific treatment protocols for HIV-positive cervical cancer patients to address their unique needs and challenges. This may include closer monitoring, adjustments in radiation dosing, and supportive care to manage anemia and other complications.

Enhanced Supportive Care: Implement comprehensive supportive care measures to manage and mitigate side effects, including pre-treatment assessments, regular monitoring for anemia, and effective management of treatment interruptions.

Improved Adherence Strategies: Enhance strategies to ensure better adherence to treatment schedules and reduce interruptions. This could involve patient education, psychological support, and logistical assistance to address barriers to regular treatment.

Further Research: Conduct additional research to explore targeted interventions for reducing the impact of HIV on EBRT outcomes and improving overall treatment efficacy for HIV-positive cervical cancer patients.

Appendix

Appendix A: Patient Demographics

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