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A Comprehensive Cervical Cancer Profile in Nairobi County in Between 2015 and 2019

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ABSTRACT

Cervical cancer is the most prevalent cause of cancer-related deaths and morbidity worldwide that is the most common in women aged 45-60, with a disproportional burden in low- and middle-income countries compared to high-income countries. The high illness burden in resource-limited settings is attributed to insufficient knowledge of disease prevention and the lack of organized screening programs. Low middle income countries account for 80% of cervical cancer cases globally. Cervical cancer has a global incidence rate of 14 per 100,000 women. The present study delves to determine the Prevalence of cervical cancer in Nairobi county, to examine the age standard rates of cervical cancer and to determine the survival rates of cervical cancer patients. The study utilized retrospective design where patient records were reviewed to obtain data of Nairobi county women residents who sought medical attention from health care facilities due cervical cancer between the period of 2015-2019. Structured questionnaire obtained from the Nairobi county Abstract form at cancer registry (KEMRI). The data was analyzed using SPSS version 25 and can Reg 5. Descriptive statistics were utilized. The Results revealed that the mean affected age is 49.53 years. Most patients were diagnosed at stage 11 at 19.61%. Radiotherapy was the most preferred form of treatment at 46.75%. The survival rate was at 80.52%..Cervical cancer is considered the most common cancer in women. It is recommended that creating awareness can alter the trajectory of the cervical cancer orientation; training practitioners on high index cancer detection, early screening and adjustments on government policies can increase the survival rate. Moreover, HPV vaccination can prevent growth of malignant cervical cancer cells.

Keywords: Cervical cancer, human papilloma virus, HPV vaccine, awareness, sexual behavior.

Abbreviations

Abbreviation	Definition
WHO	: World Health Organization
HIC	: High-income countries
LMIC	: Low- and middle-income countries

WLHIV : Women Living With HIV
HPV : Human Papilloma Virus
HBM : Health Belief Model
TRA : Theory of Reasoned Action
PR : Prevalence Rate
MTRH : Moi Teaching and Referral hospital
KNH : Kenyatta national Hospital
ASDR : Age-standardized death rate

INTRODUCTION

Cervical cancer is the most prevalent cause of cancer-related deaths and morbidity worldwide. According to WHO (2018) Cervical cancer is the most common in women aged 45-60, with a disproportional burden in low- and middle-income countries compared to high-income countries account for 80% of cervical cancer cases globally. Cervical cancer has a global incidence rate of 14 per 100,000 women (Serrano, Brotons, Bosch, &Bruni, 2018), compared to 42.7 per 1000000 women in East Africa (Torre, Islami, Siegel, Ward, &Jemal, 2017). The high illness burden in resource-limited settings is attributed to insufficient knowledge of disease prevention and the lack of organized screening programs (Mchome et al., 2020) as well as poor diagnosis and high death rates limited health facilities, access and treatment also contribute to the increased mortality rates (WHO, 2018).

Cancer is the third greatest cause of mortality, behind infectious illness and cardiovascular disorders (Wambalala F.W et al., 2019). Cervical cancer ranks first after lung cancer. Cervical cancer is more frequent among women in Sub-Saharan Africa. It is the top cause of mortality, followed by breast cancer (Ferly, 2018). A proportion of patients are identified at stage (iii) and (iv) advanced levels, where intervention attempts fail to impact, resulting in numerous fatalities according to Sayed, et al. (2014).

In November 2020, the World Health Organization (WHO) launched the global strategy for the elimination of CC as a public health problem, defining the 90-70-90 targets (Das, 2021).To eliminate CC within a century, 90% of girls should be vaccinated by age 15, 70% of women should be screened with a high precision test by 35 and 45 years of age, and 90% of women with precancerous lesions and invasive CC should receive treatment and care at the national level by 2030. In 2021, the WHO updated guidelines for screening and treatment of cervical precancerous lesions, emphasizing particular recommendations for WLHIV, such as the age of initial screening (WHO, 2021). Importantly, the WHO emphasizes the need for national and worldwide quality management of screening programs, including data gathering to monitor defined process, performance, and impact metrics.

Deaths due to cancer are expected to rise in every Country in the 21st Century. Most deaths that occurred in Asia in 2018 considering males and females are due to cancer WHO (2018). In Kenya cancer is rated the third leading cause of death at 7% per year. An estimated 39,000 new cases of cancer and 27,000 deaths per year; Breast cancer 34 per100,000 cervical at 25 per 100,000 prostate cancer at 17 per 100,000 and esophageal cancer at 9 per 100,000. Most of the cancers are diagnosed at stage 3 and 4 (Kenya Network Cancer 2014) Breast cancer is the most diagnosed type of cancer in 154 out of 185 countries. GLOBACON (2019) indicated

that one in 5 men and one in 6 women globally develop cancer in their lifetime of which one in 8 men and one in 11 women succumb to the cancer PLummer et al (2016)

Cancer burden in Kenya affects people at household and at national level; there is loss of income from the most productive age and the loss of productive time due to palliative care giving (Rutto, Muitta, Owino and Makokha, 2020). The costs attributed to cancer burden has resulted to increase in government expenditure on treatment and care Samantha &Lawrence (2019). Insufficient diagnostic equipment, inadequate facilities and illequipped radiotherapy machine Ira et al (2019) has contributed to the rising cancer cases.

PROBLEM STATEMENT

Araghi, Soerjomathan, Jenkins, Brierly, Morris, Bray and Arnold (2019) in their study concluded that cancer burden is associated with population growth, ageing, social and economic orientation. Generally, cancer incidences in Kenya were estimated at 47,887 and mortality at 32,987 deaths as at 2018. A report by Globacon (2018) indicated a high demand for cancer treatment. However, the country is faced by insufficient diagnostic devices and policy adjustments to accommodate the rising demands Wambalala FW et al (2019). There are limited facilities that provide diagnosis and treatment. There is need to change the government policy to allocate enough funds to health care sector. Kenyatta National Hospital is the only public hospital with four cancer oncologists who are in charge of the facility. The facility receives referrals from all the other counties. Diagnosis and treatment of cancer is a major problem due to limited facilities and faulty radiotherapy machines. Ira et al (2019)

RESEARCH OBJECTIVE

1. To estimate the Age Standardized Incidence Rates (ASRs), Prevalence Rates of cervical cancer in Nairobi county, Kenya for the period 2015-2019
2. To examine the trends of cervical cancer in Nairobi county over the period 2015- 2019
3. To identify the survival rates of cervical cancer patients for the same period in Nairobi County.
4. To determine the stage of diagnosis and treatment among cervical cancer patients in Nairobi.

MATERIALS AND METHODS

Research Design

The study utilized retrospective design where patient records were reviewed to estimate the prevalence of cervical cancer in Nairobi County then cervical cancer cases were compared with other types of cancers and finally the trends were monitored-between 2015-2019 following the introduction of HPV vaccine.

Study Area

The study was conducted in Nairobi using Cancer Registry records.

Study Population

The study targeted Nairobi county residents who sought medical attention from health care facilities, hospices, laboratories, radiotherapy and oncology services from both public and private hospitals within the Nairobi County.

The Inclusion Criteria

- All women suffering from cervical cancer in Nairobi County who lived / worked in Nairobi for at least six months.

Exclusion Criteria

- Any incomplete data was excluded for purposes of obtaining the correct information required to carry out the research study as per the objectives stated.

Sampling Techniques

All the cancer cases recorded in the period between 2015 and 2019 were selected.

Sample Size

The study had no sample size since all the women suffering from cervical cancer between the periods of 2015-2019 were included.

Research Instruments

The data was collected using a structured questionnaire obtained from the Nairobi county Abstract form at cancer registry (KEMRI)

Validity and Reliability

Validity refers to an instrument's ability to accurately measure and fulfill its intended function. Instruments are rarely completely valid, thus validity is typically measured in degrees. Eiras, Escoval, Grillo, & Silva-Fortes (2014) suggest that data collection and analysis are necessary for instrument validation. Validity checks ensured clear and concise information. The exercise was used to improve the instruments by adjusting, clarifying, making recommendations, and identifying errors. The study materials, questionnaires, and interview schedules were designed based on expert input. The research equipment provided accurate responses to study inquiries.

Data Collection Techniques

The Cancer Registry followed the guidelines on preserving data and maintaining confidentiality during collecting, storing, utilization and transmission of the data obtained. Data collection tool was tailored at Nairobi Cancer registry is attached to the appendix section. The data was collected by trained research assistants whose duties were to find, abstract clean and code the data after checking for completeness. Data was saved using a Can Reg 5 a software that was developed by International Agency for Research on Cancer.

Data Management and Analysis

The data was analyzed using SPSS version 25 and can Reg 5. Descriptive statics were utilized in measuring the means, mode, standard deviation and range to give a summary of continuous variables. For the categorical variable's student T- test was used for a normally distributed scenario whereas Mann Whitney u- test was used for skewed data in continuous data.

Ethical Consideration

The proposal was presented to center of the scientific committee at the center or clinical research for its review. The approval was sought from scientific and ethics research to access

the informational that has been stored in their data base at the cancer registry department. Approvals were obtained from Kenya medical research center steering committee and ethics during the collection of data. Authorization was also obtained from the ministry of health and the institutions where data was accessed. The report will therefore be shared with the ministry of health, National cancer Institute and any other stakeholder.

THEORETICAL FRAMEWORK

Health Belief Model

The Health Belief Model is one of the oldest methods designed to explain health behavior, it argues that behavior can best be understood if the beliefs about health are clear. Developed by Irwin M. Rosen stock in 1966 for studying and promoting uptake of Health services (Janz& Becker, 1984). This model was furthered by Becker and colleagues in 1970's and 1980's. Further amendments conducted in 1988 to accommodate the role knowledge and perceptions in personal responsibility. It is one of the oldest theories designed to explain health behavior. It argues that behavior can best be understood if beliefs about health are clear. It assumes that individuals make rational choices when presented with the pros and cons of change.

The Health Belief Model (HBM) is mostly used by public health experts to aid in health promotion and disease prevention. It is widely used to understand health behaviors and how risky behaviors occur. When individuals consider themselves susceptible to a condition that has probable consequences, they believe that when they take action, they will reduce the seriousness of the condition and that the advantages will outweigh the disadvantages and reduce their hazard (Jones et al.,2015). When a person believes they are at risk for a condition, they feel that if they take action, the benefits will exceed the drawbacks and lessen their danger. In the case of infectious diseases outbreak, accessing healthcare and assessing the risks of contracting the disease would help in reducing infections (Jones *et al.*, 2015). It is important for individuals to first believe they are vulnerable to cervical cancer as well as consider advantages of getting treatment or not. The Health Belief Model will be used in this study to help understand how women's' beliefs affect their behaviors and the risks associated with such beliefs in relation to non-infectious diseases such as cervical cancer. The individual health perception concerning cervical cancer patients is an important aspect when it comes to non-infectious diseases such as cancer. This model will provide insights on the effects of cervical cancer profile and the effects on the population of Nairobi County.

Theory of Reasoned Action

Theory of Reasoned Action seeks to explain behavior in terms of attitudes, norms, and intentions. Attitude and norms influence the intention to perform a behavior which results in the behavior (Fishbein&Ajzen, 2011). It is always found to be successful when the Theory of Reasoned Action (TRA) is applied to behaviors that are mostly under the complete voluntary control of an individual. However, this may not be the case if the person's act is influenced by their environmental conditions even though they may be highly motivated by their individual attitudes and beliefs (Okumu, 2019). In the case of non-infectious diseases like cervical cancer, a female patent has the full control deciding whether to begin utilizing preventive measures subject awareness and financial status. The theory will help understand how the women with cervical cancer handle their situation when they take charge of the health orientation.

EMPIRICAL FRAMEWORK

Prevalence of Cervical Cancer

In a study conducted on the Lifetime Prevalence of Cervical Cancer Screening in 55 Low- and Middle-Income Countries by Lemp *et al.* (2020) found that, A country-level median of 43.6% (IQR, 13.9%-77.3%) of women aged 30 to 49 years self-reported having ever had a cervical cancer screening test, ranging from 0.3% in Egypt (95% CI, 0.1%-0.6%) to 97.4% in Colombia (95% CI, 97.0%-97.8%). Latin America and the Caribbean had the highest self-reported lifetime prevalence of cervical cancer screening (84.6%; IQR, 65.7%-91.1%; range, 11.7%-97.4%), while Sub-Saharan Africa had the lowest (country-level median, 16.9%; IQR, 3.7%-31.0%; range, 0.9%-50.8%). The study concluded that the median prevalence was only 44%, supporting the need to increase the rate of screening (Lemp et al., 2020).

A population based study conducted in sub-Saharan Africa found that the overall weighted prevalence of cervical cancer screening was 19.0% (95% confidence interval: 18.5%-19.5%), with rates ranging from 0.7% in Benin to 45.9% in Namibia. The adjusted prevalence ratio for cervical cancer screening was 1.77 (95% CI: 1.64, 1.90) compared to younger age (21-29 years), secondary/higher education adjusted prevalent ratio = 1.51, 95% CI: 1.28-1.79) compared to no education, health insurance adjusted prevalent ratio(= 1.53, 95% CI: 1.44-1.61) compared to no insurance, and highest socioeconomic status (adjusted prevalent ratio = 1.39, 95% CI: 1.26-1.52) compared to lowest(Ba et al., 2021).

In Kenya, a study conducted in Mombasa showed that being a public FP clinic was linked to a greater prevalence of reported screening (14/38 [37%] versus 6/32 [16%]; prevalence rate ratio [PR] 1.57, 95% CI 1.05-2.33). Clinics that reported cervical cancer screening were significantly more likely to have at least one provider trained to do the screening (84%, 32/38) than clinics that did not report screening (28%, 9/32; PR 3.77, 95%CI 1.82-7.83) (Eastment et al., 2022).

Wambalaba, Son, Wambalaba Nyong'o (2019) conducted a descriptive study on the prevalence and capacity of cancer diagnostic and treatment entitled demand and supply survey of health care facilities in Kenya. The study found out that 52 and 62 were the frequent ages of males and females respectively. In women the most common was breast cancer followed by cervical cancer while for males esophagus and prostate were rampant. A study on factors contributing to low survival of cervical cancer patients undergoing radiotherapy in Kenya by Maranga, Hampson, Oliver, Gamal, Gichangi, Opiyo and Hampson (2013) using 355 participants at Kenyatta national hospital revealed that 42% of the patients were lost to follow up,18% died during the study period while 80.5% of the patients presented with stage II to cancer. The study showed that cervical cancer can be prevented, lack of awareness, poor education, inadequate screening programs, late patient presentation contributed to the low survival rates. The study recommended that the clinicians to have high index of suspecting and detecting symptoms of cancer at early stage by being keen and making proper referrals in case of any suspicion.

In addition, Ahmed (2021) conducted a study on estimating prevalence of cancer in Wajir county using data from the county health facilities. The utilized quantitative method of analyzing the data. The result was that 50% of the healthcare facilities in Wajir county

between 2014 and 2019. The findings showed that women were mostly affected with 57% while men recorded 43% of the infections. The age mostly affected was above 50. esophagus type of cancer was highest at 69%, stomach cancer at 47%, Prostate cancer at 8.6% cancer of the cervix at 3.5%, liver cancer at1.1, cancer of the breast at 0.9%, cancer of the tongue at 0.9% cancer of the bladder at 0.7%, cancer of the rectum at 0.7%and cancer of the skin at 0.4%. Ahmed recommended proper health record keeping in the healthcare facilities and complete filling in of patient information during patient visits.

A study by Macharia, Mureithi, and Anzala (2018) on types and infection attributable was conducted by using data from two national referral hospitals; Kenyatta national Hospital (KNH)and Moi Teaching and Referral hospital (MTRH) between the 2008 1nd 2012. the study indicated that at KNH the leading cancer type was cervical 12.4% followed by breast 11.8%, colorectal 6.2%, leukemia 5.4%, stomach cancer 5.2%.27.6% of the cancers were attributable to infections namely; cancer of cervix, stomach cancer, naso- pharynx cancer. At MTRH the leading type of cancer was karposis's sarcoma 18.6% breast cancer 15.4. Non-Hodgkin's lymphoma7.4%.Generally 48.2% of the cancers were associated with infectious agents whereas 44.4% were attributable to infections.

RESULTS AND DISCUSSIONS

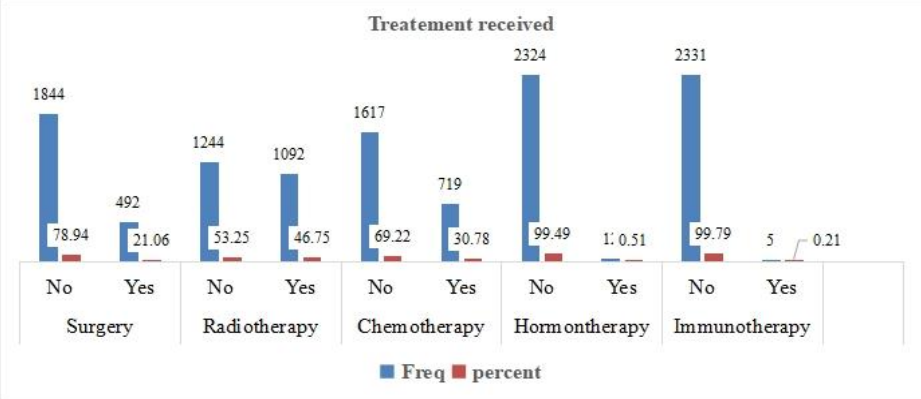
The following is a table illustrating the age, basics of diagnosis, the tumor grade and it's the stage.

Variable	**Category**		
Age	min=14, Max= 103	mean age= 49.33	std 12.7
		Freq	**percent**
basics of diagnosis	Autopsy/Histology	1,655	70.85
	Clinical Invest. /Ultra Sound	528	22.6
	Clinical only	8	0.34
	Cytology	76	3.25
	Death Certificate Only	69	2.95
Grade	B-cell	1	0.04
	Killer cell	1	0.04
	Moderately differentiated	660	28.25
	Poorly differentiated	368	15.75
	Undifferentiated	34	1.46
	Unknown	1,122	48.03
	Well differentiated	150	6.42
Stage	Stage I	157	6.72
	Stage II	458	19.61
	Stage III	452	19.35
	Stage IV	191	8.18
	Unknown	1,078	46.15

The findings indicate that the mean age of the respondents is 49.33 years with the youngest having 14 years and the oldest having 103 years. On the basic diagnosis, more than half 1655(70.85%) were obtained through autopsy/ histology, followed by 528(clinical invest/ultra sound 528(22.6%) and the least 8(0.34%) were diagnosed through clinical only.

For the cancer grade, 660(28.25%) were moderately differentiated, 368(15.75%) were poorly differentiated, 34(1.46%) were undifferentiated few of the respondents 1(0.04%) had B-Cell and Killer cell respectively. Lastly on the cancer stage nearly half 1078(46.15%) had unknown stage, 458(19.61%) had stage II, 452(19.35%) had stage III and a few of the participants 191(8.18%) had stage IV.

Treatment Received



The figure above shows that more than half did not receive any of the treatment in terms of surgery, 1844(78.94%) of the patients did not undergo any surgery while 492(21.06%) underwent a surgery. Half 1244(53.5%) received radiotherapy while nearly the same 1092(46.75%) received radio therapy treatment. Nearly all 2324(99.49%) did not receive hormone therapy while 1(0.51%) received, 2331(99.79%) received immune therapy and 5(0.21%) did not receive the treatment. More than half 1617(69.22%) received chemotherapy treatment while 719(30.78%) did not get chemotherapy.

The Trends of Cervical Cancer in Nairobi County

	Count of dead/alive		
Years	**Alive**	**Dead**	**Grand Total**
2010	186	36	222
2011	210	45	255
2012	165	86	251
2013	209	81	**290**
2014	225	42	267
2015	203	47	250
2016	175	59	234
2017	197	31	228
2018	163	16	179
2019	133	10	**143**
(blank)	12	2	14
Grand Total	**1878**	**455**	**2333**

The table show that the annual number of cervical cancer cases varies, with the highest count recorded in 2013 (290 cases) and the lowest in 2019 (143 cases). The number of patients alive each year consistently surpasses the number of deaths, which is a positive sign.

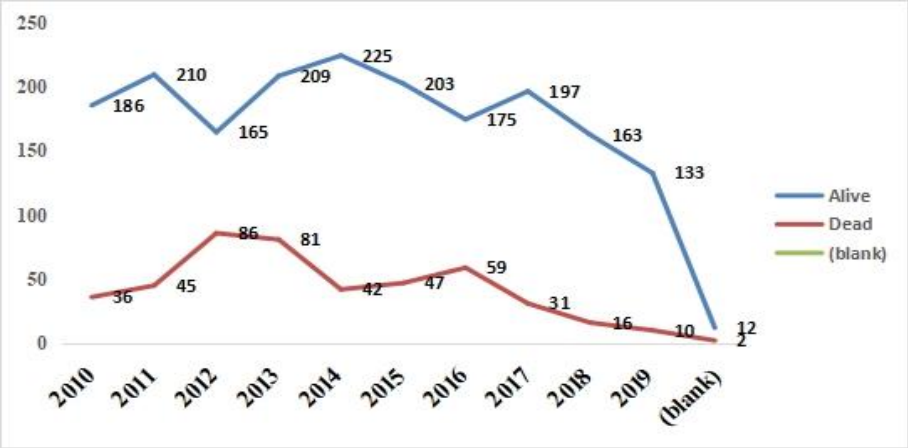


Figure 1: Trends of cervical cancer in Nairobi county

Over the period (2010-2019), the total number of recorded cases sums up to 2333, with 1878 patients alive and 455 dead. There was a peak in the number of alive patients in 2014 with 225 individuals. However, there is a noticeable decline from 2015 onwards, with the lowest count in 2019 (133 alive). The number of deaths shows a significant variation yearly with the highest number of deaths occurring in 2012 (86 deaths), followed by 2013 (81 deaths). However, from 2017 onwards, there is a significant decline in the number of deaths, reaching a low of 10 in 2019.

The Survival Rates of Cervical Cancer

Year	Alive	dead	Total	Survival rate (%)
2010	184	36	220	83.64
2011	210	45	255	82.35
2012	165	86	251	65.74
2013	209	81	290	72.07
2014	225	42	267	84.27
2015	203	47	250	81.20
2016	175	59	234	74.79
2017	197	31	228	86.40
2018	163	15	178	91.57
2019	133	10	143	93.01
(blank)	12	2	14	85.71
Grand Total	**1876**	**454**	**2330**	**80.52**

Across all years, the average survival rate is 80.52%, indicating that the majority of cervical cancer patients survived during this period. The survival rate in 2010 was relatively high, indicating that more than 83% of the patients diagnosed with cervical cancer survived. In 2011 there was a slight decrease in the survival rate compared to 2010, but it remained above 82%, 2012 had significant drop in survival rates, indicating possible challenges in treatment or healthcare delivery, with only about 66% of patients surviving. Additionally, in 2014 there was a substantial improvement in the survival rate, reaching over 84%, suggesting enhancements in medical care or early detection programs. A significant improvement in the survival rate is seen in 2017, reaching over 86%, indicating better healthcare interventions

and outcomes. The highest survival is seen in 2017at 93%, indicating there might be excellent healthcare outcomes and likely advancements in medical interventions as well as increased awareness on sensitization of cervical cancer.

CONCLUSION AND RECOMMENDATION

Cervical cancer is considered a common cancer in women, health seeking behavior, sexual behavior, training of doctors to acquire a high index of cervical cancer, adjusting the health policies in Kenya to allow access to screening for early detection and intervention through provision of human papilloma virus vaccine can actually control and increase cervical cancer survival rate in the country.

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References

Allemani, C., Matsuda, T., Di Carlo, V., Harewood, R., Matz, M., Nikšić, M., . . . Estève, J. (2018). Global surveillance of trends in cancer survival 2000–14 (CONCORD-3): analysis of individual records for 37 513 025 patients diagnosed with one of 18 cancers from 322 population-based registries in 71 countries. *The Lancet, 391*(10125), 1023-1075.

Arbyn, M., Weiderpass, E., Bruni, L., de Sanjosé, S., Saraiya, M., Ferlay, J., & Bray, F. (2020). Estimates of incidence and mortality of cervical cancer in 2018: a worldwide analysis. *The Lancet Global Health, 8*(2), e191-e203.

Awich, L. (2019). Cancer prevalence rate per county. *The Star*.

Ba, D. M., Ssentongo, P., Musa, J., Agbese, E., Diakite, B., Traore, C. B., Maiga, M. (2021). Prevalence and determinants of cervical cancer screening in five sub-Saharan African countries: a population-based study. *Cancer epidemiology, 72*, 101930.

Das, M. (2021). WHO launches strategy to accelerate elimination of cervical cancer. *The Lancet Oncology, 22*(1), 20-21.

Eastment, M. C., Wanje, G., Richardson, B. A., Mwaringa, E., Patta, S., Sherr, K., McClelland, R. S. (2022). A cross-sectional study of the prevalence, barriers, and facilitators of cervical cancer screening in family planning clinics in Mombasa County, Kenya. *BMC Health Services Research, 22*(1), 1-8.

Eiras, M., Escoval, A., Grillo, I. M., & Silva-Fortes, C. (2014). The hospital survey on patient safety culture in Portuguese hospitals: instrument validity and reliability. International Journal of Health Care Quality Assurance.

Kanyina, E. W., Kamau, L., & Muturi, M. (2017). Cervical precancerous changes and selected cervical microbial infections, Kiambu County, Kenya, 2014: a cross sectional study. *BMC infectious diseases, 17*, 1-5.

Lemp, J. M., De Neve, J.-W., Bussmann, H., Chen, S., Manne-Goehler, J., Theilmann, M., Tsabedze-Sibanyoni, L. (2020). Lifetime prevalence of cervical cancer screening in 55 low-and middle-income countries. *Jama, 324*(15), 1532-1542.

Mchome, B., Swai, P., Wu, C., Katanga, J., Kahesa, C., Manongi, R., Linde, D. S. (2020). Comprehensive cervical cancer prevention in Tanzania (CONCEPT) study: cohort profile. *BMJ open, 10*(9), e038531.

Musa, J., Nankat, J., Achenbach, C. J., Shambe, I. H., Taiwo, B. O., Mandong, B., . . . Sagay, A. S. (2016). Cervical cancer survival in a resource-limited setting-North Central Nigeria. *Infectious agents and cancer, 11*(1), 1-7.

Mwaliko, E., Itsura, P., Keter, A., De Bacquer, D., Buziba, N., Bastiaens, H., . . . Gichangi, P. (2023). Survival of cervical cancer patients at Moi teaching and Referral Hospital, Eldoret in western Kenya. *BMC cancer, 23*(1), 1104.

Serrano, B., Brotons, M., Bosch, F. X., & Bruni, L. (2018). Epidemiology and burden of HPV-related disease. *Best practice & research Clinical obstetrics & gynaecology, 47*, 14-26.

Singh, D., Vignat, J., Lorenzoni, V., Eslahi, M., Ginsburg, O., Lauby-Secretan, B., . . . Vaccarella, S. (2023). Global estimates of incidence and mortality of cervical cancer in 2020: a baseline analysis of the WHO Global Cervical Cancer Elimination Initiative. *The Lancet Global Health, 11*(2), e197-e206.

Torre, L. A., Islami, F., Siegel, R. L., Ward, E. M., & Jemal, A. (2017). Global cancer in women: burden and trends. *Cancer epidemiology, biomarkers & prevention, 26*(4), 444-457.

WHO. (2018). Improving data for decision-making: a toolkit for cervical cancer prevention and control programmes.

WHO. (2021). WHO guideline for screening and treatment of cervical pre-cancer lesions for cervical cancer prevention: web annex A: syntheses of evidence.

Zhang, X., Zeng, Q., Cai, W., & Ruan, W. (2021). Trends of cervical cancer at global, regional, and national level: data from the Global Burden of Disease study 2019. *BMC public health, 21*(1), 1-10.

Zhao, M., Wu, Q., Hao, Y., Hu, J., Gao, Y., Zhou, S., & Han, L. (2021). Global, regional, and national burden of cervical cancer for 195 countries and territories, 2007–2017: findings from the Global Burden of Disease Study 2017. *BMC Women's Health, 21*(1), 1-13.

Aniekwu NI. Gender and human rights dimensions of HIV/AIDS in Nigeria. African Journal of Reproductive Health. 2002;6(3):30- 37.

Brinton LA, Schairer C, Haenszel W. Cigarette smoking and invasive cervical cancer [Article]. J Am Med Assoc. 1986;255(23):3265–3269.

Ahmed, M. A. . Cancer Prevalence in Wajir County, Kenya: Estimation Using Cancer Data at the Healthcare Facilities. *Journal of Medicine, Nursing &Public Health,* (2021) 4(1), 25-45.

Araghi, M., Soerjomataram, I., Jenkins, M., Brierley, J., Morris, E., Bray, F., & Arnold, M. (2019). Global trends in colorectal cancer mortality: projections to the year 2035. *International journal of cancer*, *144*(12), 2992-3000.

Arbyn, M.; Weiderpass, E.; Bruni, L.; de Sanjosé, S.; Saraiya, M.; Ferlay, J.; Bray, F. Estimates of incidence and mortality of cervical cancer in 2018: A worldwide analysis. *Lancet Glob. Health* 2020, *8*, e191–e203.

Cibula, D.; Pötter, R.; Planchamp, F.; Avall-Lundqvist, E.; Fischerova, D.; Haie-Meder, C.; Köhler, C.; Landoni, F.; Lax, S.; Lindegaard, J.C.; et al. The European Society of Gynaecological Oncology/European Society for Radiotherapy and Oncology/European Society of Pathology Guidelines for the Management of Patients with Cervical Cancer. *Virchows Arch.* 2018, *472*, 919–936.

de Sanjose, S.; Brotons, M.; Pavon, M.A. The natural history of human papillomavirus infection. *Best Pract. Res. Clin. Obstet. Gynaecol.* 2018, *47*, 2–13.

de Sanjose S, Quint WG, Alemany L, et al. Human papillomavirus genotype attribution in invasive cervical cancer: a retrospective cross-sectional worldwide study. *Lancet Oncol.* 2010; 11:1048-1056.

Edelman, C.L. &Mandle C.L. (2006), Health Promotion throughout the lifespan (5th Edition). St. Louis Missouri: Elsevier Mosby

Einstein MH, Schiller JT, Viscidi RP, et al. Clinician's guide to human papillomavirus immunology: knowns and unknowns. *Lancet Infect Dis.* 2009; 9:347-356.

Ferlay J, Ervik M, Lam F, *et al.* Global Cancer Observatory: Cancer Today. Population Fact Sheets: Africa. Lyon, France: International Agency for Research on Cancer, 2018.
https://gco.iarc.fr/today/data/factsheets/populations/903-africa-fact-sheets.pdf.

Ferlay J, Soerjomataram I, Ervik M, Dikshit R, Eser S, Mathers C, et al. GLOBOCAN 2012 v 1.0, Cancer Incidence and Mortality Worldwide. Lyon: International Agency for Research on Cancer; 2013. (IARC CancerBase No. 11).

Ferlay, J., Colombet, M., Soerjomataram, I., Mathers, C., Parkin, D. M., Piñeros, M., ... & Bray, F. (2019). Estimating the global cancer incidence and mortality in 2018: GLOBOCAN sources and methods. *International journal of cancer*, *144*(8), 1941-1953

Green J. Berrington de Gonzalez A, Sweetland S, et al. Risk factors for adenocarcinoma and squamous cell carcinoma of the cervix in women aged 20–44 years: the UK National case–control study of cervical cancer. Br J Cancer. 2003 [2003 December 01];89(11):2078–2086.

Human papillomavirus vaccines: WHO position paper, October 2014. *Wkly Epidemiol Rec.* 2014;89:465-491.

Ho GYF, Bierman R, Beardsley L, et al. Natural history of cervic ovaginal papillomavirus infection in young women [Article]. New Engl J Med. 1998;338(7):423–428.

Kahn JA, Xu J, Kapogiannis BG, et al. Immunogenicity and safety of the human papillomavirus 6, 11, 16, 18 vaccine in HIV-infected young women. *ClinInfect Dis.* 2013; 57:735-744.

Kelly H, Weiss HA, Benavente Y, et al. Association of antiretroviral therapy with high-risk human papillomavirus, cervical intraepithelial neoplasia, and invasive cervical cancer in women living with HIV: a systematic review and metaanalysis. *Lancet HIV.* 2018;5:e45-e58.

Kenya National Cancer Organizations, (2014), Kenya Cancer Statistics & National Strategies

Retrieved from: https://kenyacancernetwork.wordpress.com/kenya-cancer-facts/

Korir, A., Okerosi, N., Ronoh, V., Mutuma, G., & Parkin, M. (2015). Incidence of cancer in N airobi, K enya (2004–2008). *International journal of cancer*, *137*(9), 2053-2059.

Khaemba, E. N., Mugo, C. W., & Mutai, C. (2013). The Survival Of Patients With Cancer Of The Cervix In Nairobi, Kenya.

Macharia, L. W., Mureithi, M. W., & Anzala, O. (2018). Cancer in Kenya: types and infection attributable. Data from the adult population of two National referral hospitals (2008- 2012). *AAS Open Research*, *1*.

Makama GA. Patriarchy and Gender Inequality in Nigeria: The Way Forward. European Scientific Journal. 2013;9(17):1857- 7881.

Makau-Barasa, L. K., Greene, S. B., Othieno-Abinya, N. A., Wheeler, S., Skinner, A., & Bennett, A. V. (2017). Improving access to cancer testing and treatment in Kenya. *Journal of Global Oncology*, *4*, 1-8.

Maranga, I. O., Hampson, L., Oliver, A. W., Gamal, A., Gichangi, P., Opiyo, A. ... & Hampson,

I. N. (2013). Analysis of factors contributing to the low survival of cervical cancer patients undergoing radiotherapy in Kenya. *PloS one*, *8*(10), e78411.

Massad LS, Xie X, D'Souza G, et al. Incidence of cervical precancers among HIV-seropositive women. *Am J Obstet Gynecol.* 2015;212:606.e1-e8.

McHome B, Linde DS, Manongi R, et al. Incident detection of human papillomavirus—a prospective follow-up study among Tanzanian women with focus on HIV status. *Int J Infect Dis.* 2021; 110:165-170.

McLeroy, K. R., Bibeau, D., Steckler, A., & Glanz, K. (1988). An ecological perspective on health promotion programs. *Health education quarterly*, *15*(4), 351-377.

Ministry of Health: National Cancer Control Strategy 2017 – 2022. 2017.

Morandell, D.; Rostek, U.; Bouvard, V.; Campo-Fernandez, B.; Fiedler, M.; Jansen-Durr, P.; Zwerschke, W. Human papillomavirus type 45 E7 is a transforming protein inducing retinoblastoma protein degradation and anchorage-independent cell cycle progression. *Virology* 2008, *379*, 20–29.

Parkin DM, Sitas FD, Chirenje M, Stein L, Abratt R, and Wabinga H (2008). Part I: Cancer in Indigenous Africans—burden, distribution, and trends. Lancet Oncology Vol 9: 683–692

Parkin DM, Bray F, Ferlay J, *et al.*: Cancer in Africa 2012. *Cancer Epidemiol Biomarkers Prev.* 2014; 23(6): 953–966. PubMed Abstract | Publisher Full Text

Plummer M, de Martel C, Vignat J, *et al.*: Global burden of cancers attributable to infections in 2012: a synthetic analysis. *Lancet Glob Health.* The Author(s). Published by Elsevier Ltd.

This is an Open Access article under the CC BY-NC-ND license; 2016; 4(9): e609–e616. Possati-Resende, J.C.; Fregnani, J.H.; Kerr, L.M.; Mauad, E.C.; Longatto-Filho, A.; Scapulatempo-Neto, C. The Accuracy of

p16/Ki-67 and HPV Test in the Detection of CIN2/3 in Women Diagnosed with ASC-US or LSIL. *PLoS ONE* 2015, *10*, e0134445. [CrossRef] [PubMed]

Ruto, P. K., Muitta, E., Owino, A., & Makokha, F. W. (2020). Frequency and Pattern of All Cancer Cases at Thika Level Five Hospital in Kiambu County, Kenya. *International Research Journal of Oncology*, 1-9.

Ortiz AP, Engels EA, Nogueras-Gonzalez GM, et al. Disparities in human papillomavirus-related cancer incidence and survival among human immunodeficiency virus-infected Hispanics living in the United States. *Cancer.* 2018;124:4520-4528.

Schiffman M, Castle PE, Jeronimo J, Rodriguez AC, Wacholder S. Human papillomavirus and cervical cancer. *Lancet.* 2007;370:890-907.

Silverberg MJ, Leyden WA, Chi A, et al. Human immunodeficiency virus (HIV)- and non-HIV-associated immunosuppression and risk of cervical neoplasia. *Obstet Gynecol.* 2018;131:47-55.

Sung H, Ferlay J, Siegel RL, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2021;71:209-249.

Samantha, L. & Lawrence N., (2019), Cancer as a Non-Communicable Disease and the Status of Cancer Control in Kenya, KIPPRA; Retrieved from: https://kippra.or.ke/cancer-as-a-non communicable-disease-and-the-status-of-cancer-control-in-kenya/

Salambanga, C.; Zohoncon, T.M.; Traore, I.M.A.; Ouedraogo, R.A.; Djigma, W.F.; Ouedraog, C.; Simpore, J. High prevalence of high-risk human papillomavirus (HPV) infection among sexually active women in Ouagadougou. *Med. Sante Trop.* 2019, *29*, 302–305.

Stolnicu, S.; Barsan, I.; Hoang, L.; Patel, P.; Terinte, C.; Pesci, A.; Aviel-Ronen, S.; Kiyokawa, T.; Alvarado-Cabrero, I.; Pike, M.C. International Endocervical Adenocarcinoma Criteria and Classification (IECC): A new pathogenetic classification for invasive adenocarcinomas of the endocervix. *Am. J. Surg. Pathol.* 2018, *42*, 214.

Sankaranarayanan R, Ramadas K, Thara S et al. (2011). Clinical breast examination: preliminary results from a randomized controlled trial in India. Journal of the National Cancer Institute, 103:1476-1480

Torre LA, Bray F, Siegel RL, et al. Global cancer statistics, 2012 [Article]. CA Cancer J Clin. 2015;65(2):87–108.

Uwins, C.; Patel, H.; Bhandoria, G.P.; Butler-Manuel, S.; Tailor, A.; Ellis, P.; Chatterjee, J. Laparoscopic and robotic surgery for endometrial and cervical cancer. *Clin. Oncol.* 2021, *33*, e372–e382.

Szarewski, A.; Ambroisine, L.; Cadman, L.; Austin, J.; Ho, L.; Terry, G.; Liddle, S.; Dina, R.; McCarthy, J.; Buckley, H. Comparison of predictors for high-grade cervical intraepithelial neoplasia in women with abnormal smears. *Cancer Epidemiol. Prev. Biomark.* 2008, *17*, 3033–3042. [CrossRef]

Van Eerd EAM, Bech Risør M, Spigt M, et al. Why do physicians lack engagement with smoking cessation treatment in their COPD patients? A multinational qualitative study. NPJ Prim Care Respir Med. 2017 [2017 June 23];27(1):41.

Wambalaba, F. W., Son, B., Wambalaba, A. E., Nyong'o, D., & Nyong'o, A. (2019). Prevalence and Capacity of Cancer Diagnostics and Treatment: A Demand and Supply Survey of Health-Care Facilities in Kenya. *Cancer Control*, *26*(1), 1073274819886930.

Wambalaba, F. W., Son, B., Wambalaba, A. E., Nyong'o, D., & Nyong'o, A. (2019). Prevalence

and Capacity of Cancer Diagnostics and Treatment: A Demand and Supply Survey of Health-Care Facilities in Kenya. *Cancer Control*, *26*(1), 1073274819886930

Whitworth HS, Gallagher KE, Howard N, et al. Efficacy and immunogenicity of a single dose of human papillomavirus vaccine compared to no vaccination or standard three and two-dose vaccination regimens: a systematic review of evidence from clinical trials. *Vaccine.* 2020; 38:1302-1314.

World Health Organization (WHO), & International Agency for Research on Cancer. (2020). Latest global cancer data: cancer burden rises to 18.1 million new cases and 9.6 million cancer deaths in 2018. Geneva; 2018.

World Health Organization. (2018). Latest global cancer data: Cancer burden rises to 18.1 million new cases and 9.6 million cancer deaths in 2018. *International Agency for Research on Cancer. Geneva: World Health Organization*.

Wright, T.C., Jr.; Behrens, C.M.; Ranger-Moore, J.; Rehm, S.; Sharma, A.; Stoler, M.H.; Ridder, R. Triaging HPV-positive women with p16/Ki-67 dual-stained cytology: Results from a sub-study nested into the ATHENA trial. *Gynecol. Oncol.* 2017, *144*, 51–56. [CrossRef]