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Influence of Demographic Factors on Uptake of Diagnostic Imaging by Oncology Patients in South Rift Counties, Kenya

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Abstract

Purpose: To determine the influence of demographic factors on uptake of diagnostic imaging by oncology patients in South Rift Counties, Kenya.

Methodology: A cross-sectional research design was adopted when collecting data from 5 public hospitals in South Rift Counties. The study issued questionnaires to oncology patients and interviewed the rest of the respondents. A pre-test study was done at Texas Cancer Center in Nairobi County. Quantitative data was analyzed using descriptive statistics and binary logistic regression analysis. Qualitative results data was analyzed through thematic method.

Results: 74(25%) patients had 41-50 years and 65(22%) were 61-70 years. The least number of oncology patients who were 3(1%) and they were 18-20 years of age. Further, 264(89%) were married while 33(11%) were not married. Additionally, 182(61%) were male patients while 115(39%) were female patients. Additionally, 166(56%) had a tertiary level of education while 39(13%) had primary school qualifications. In addition, 203(68%) were Christians and 80(27%) were Muslims and only 5(2%) were not religious. Notably, 110(37%) of the patients had breast cancer while 77(26%) had colon cancer. The least group of patients who were 12(4%) had lung cancer. Additionally, most of healthcare workers who were 12(39%) had more than 50 years while 10(32%) had 41-50 years. However, 4(13%) had 18-30 years. Further, 18(58%) had a master's degree while 5(16%) had a PhD. In addition, 17(55%) had more than 10 years of service while only 5(16%) had 5-7 years. The Chi-square result revealed that χ^2 (1, N = 297) = 461.599, $p < 0.05$. That is the Pearson Chi-Square was 461.599 at a p-value of 0.027.

Conclusion and Recommendations: Most patients that sought cancer diagnostic imaging were middle and old aged male people who were married. This meant that unmarried young female adults hardly sought imaging services. The most common cancer illnesses scanned were breast, colon, and cervical cancers. The study recommends that that the hospital management should provide more funding for sensitization programs to inform unmarried young people especially females to seek early diagnostic imaging services. This will enable them to ensure that no cancerous cells are growing to be discovered at a late stage for effective management.

Keywords: *Demographic factors, Uptake of Diagnostic Imaging, Oncology Patients, South Rift Counties, Kenya*

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1.0 Introduction

Diagnostic imaging is an integral part of modern healthcare infrastructure when it comes to cancer illness. This is because, cancer has become a global life-threatening non-communicable disease, which requires modern solutions of early scanning to provide accurate images (Ng et al., 2022). This enables the patient to get information on cancer stage for an appropriate treatment plan subscription. Therefore, established medical facilities ensure that imaging services are provided consistently to a diverse number of patients (Kinahan, et al., 2020). The services range from availing imaging equipment at the facility; provision of oncology wards and awareness programs that improve public knowledge of cancer; and recruiting an adequate number of qualified medical practitioners whose field of specialization is oncology, among others.

There are different types of cancer associated with their location in the bodies of patients such as breast, cervix, bones, lungs, blood, colon, and prostate, among others (Innovative for Cancer Care in Africa [ICCA], 2021). This means that for an accurate identification of which type of cancer a patient has and its stage, imaging is relevant. Different types of imaging systems range from Positron emission tomography [PET] Scans, Computed Tomography [CT] Scans, Magnetic resonance imaging [MRI] Scans, and Bone Scans (ICCA, 2021).

In global nations such as America, patients have failed to get scans due to a limited number of scanners such as PET scanners (Waite et al., 2021). There have also been a low number of hospitals with oncology departments that support diagnostic imaging in European nations like Sweden (Alberto et al., 2023). Further, the uptake of cancer scans is generally low in Congo due to aspects such as low education, age, inadequate machines that can do imaging, qualified and experienced staff, high scanning costs, and low insurance cover (Crumley et al., 2020).

In South Rift counties in Kenya, the prime challenge in uptake of diagnostic imaging services by oncology patients has been the availability of the technology in many public hospitals, coupled with a high cost of getting the service, and lack of knowledge of the existence of this technology among oncology patients (Mokua, 2022; National Cancer Institute [NCI], 2023).

1.1 Problem Statement

The definitive goal of Kenya's Universal Health Coverage [UHC], is to deliver unbiased, reasonably priced, and quality care through the established healthcare infrastructure (MOH, 2020). This encompasses prevention, diagnosis, treatment, and palliative care for both communicable and non-communicable diseases. Cancer being a non-communicable disease, has not only been a national but global threat whose diagnosis and treatment is demanding (Lehmann et al., 2020). Therefore, public hospitals ought to have health infrastructures related to adequate imaging equipment, qualified medical staff, and insurance coverage, to enable cancer patients to subscribe to early diagnosis. Through this initiative, the rate of cancer fatalities would be reduced to manageable thresholds (Njeru et al., 2021).

However, there has been late diagnosis of diverse cases of cancer, which has contributed to high mortality rates in Kenya (NCI, 2023). According to WHO (2021b), there were 37,000 new cancer cases and 28,500 deaths in 2012. In 2018 there were 47,887 new cancer cases and 32, 987 deaths. According to MOH (2023), due to increased cancer awareness and early screening, 42,116 new cases of cancer and 27,092 deaths were registered in 2020. In 2023, the number of cancer cases that could have been prevented through early diagnosis and healthy lifestyle were 16,846. Additionally, MOH (2023) suggested that there would be a projection of 58,000 new cancer cases by the year 2028 if early screening was not encouraged.

Late diagnosis causes cancerous cells to spread to vital organs without detection hence limiting the treatment options to palliative care (Njeru et al., 2021). According to Lehmann et al. (2020), majority of cancers such as breast and cervical-related cases, were mainly detected in late stages. This was partially attributed to inadequate infrastructure, limited diagnostic imaging services, high costs of scanning, low education among cancer patients, and limited hospital facilities, supporting cancer screening services and specialists. Therefore, the patients had to rely on a few imaging equipment that were in selected hospitals to be scanned, leading to high-cost implications (Mokua, 2022). Locally, studies such as (Kamita et al., 2023; Makau-Barasa et al., 2020; Mbugua et al., 2021; Mwenda et al., 2021) explored decentralizing issues of imaging services to rural towns, scanning costs and awareness levels of different cancers. However, there have been few studies conducted that examined the influence of demographic factors on uptake of diagnostic imaging by oncology patients in South Rift Counties, Kenya. This study, therefore, sought to determine the influence of demographic factors on uptake of diagnostic imaging by oncology patients in South Rift Counties, Kenya.

1.2 Research Hypothesis

$H_0$1: Demographic factors did not influence uptake of diagnostic imaging by oncology patients in South Rift Counties, Kenya.

2.0 Literature Review

2.1 Theoretical Review

The study was guided by the Health Belief Model [HBM] which was developed by Rosenstock, Hochbaum, Kegeles, and Leventhal in the 1950s.This model depicted that the health-promoting behavior of a person was closely caused by their belief on issues of health, the foreseen advantages of engaging in a health activity, the limitations they encountered, and the personal motivation towards the intended health behavior. This meant that there were factors that influenced a person's readiness to take action to protect their health. Perceived susceptibility, perceived severity, and perceived benefits were all beliefs that motivated people to engage in health-promoting behaviors. Perceived barriers, cues to action, and self-efficacy were factors that hindered or facilitated people's engagement in health-promoting behaviors. oncology patients would only make deliberate decisions to get imaging services when they were able to access PET, CT, MRI, and bone scan services.

2.2 Empirical Review

Demographic factors are background factors of an oncology patient that play a central role in uptake of diagnostic imaging. In this study, various demographic factors such as sex, education, marital status, and age of the patients are discussed.

Flores et al. (2021) examined the causal demographic aspects causing miss out of pediatric radiology appointments. 7,275 Children less than 18 years old were included in a study conducted over a period of one year. Using a multivariate logistic regression to determine that the gender, race, age group (adolescence stage), and household income played an important role in ensuring that the children did not miss out on radiology appointments. However, Flores et al. (2021) did not examine demographic factors affecting the uptake of diagnostic imaging among adults. Additionally, the study was longitudinal covering a spectrum of one year, however, the current study will be retrospective.

Ngetich et al. (2021) explored how Nandi County's patients living with HIV/AIDS were able to uptake cancer screening and how demographic elements affected the process. A sample size of one hundred and ninety women answered questionnaires to point out that, age and Level of

education influenced uptake of cancer screening whereas marital status and number of children did have a significant influence. However, Ngetich et al. (2021) failed to examine what demographic factors affected uptake of diagnostic imaging among patients without HIV/AIDS.

Nja et al. (2022) evaluated how Nigeria's women were uptaking mammography services and how their demographic aspects were influencing the process. Three hundred and sixty-five women were included by answering a questionnaire in a cross-sectional descriptive study design. The findings revealed that mammography screening had been done for only thirty-six women. These women who had undergone mammography were married, had higher levels of education, had high incomes, and had stable civil service jobs. Notably, Nja et al. (2022) also discovered that low knowledge of what mammography was all about, poor health system, and lack of income were determined as greatest impediments to uptake of mammography. That notwithstanding, Nja et al. (2022) did not explore demographic factors like sex and age affecting the uptake of imaging services related to cervical, colon, and prostate cancers.

3.0 Methodology

Cross-sectional research design was adopted when collecting data from 5 public hospitals in South Rift Counties. The main respondents were 326 patients while key informants were 5 oncologists, 7 radiologists, 11 radiographers, and 19 nurses. The study issued questionnaires to oncology patients and interviewed the rest of the respondents. A pre-test study was done at Texas Cancer Center in Nairobi County. Reliability and validity were measured. SPSS software was used to analyze descriptive and binary logistic regression statistics. In regard to descriptive results, the study analyzed frequencies, percentages, and mean. The findings were presented using tables, figures, and explanations. Qualitative results (interviews) were analyzed through thematic method.

4.0 Results and Discussion

4.1 Response Rate

The study sampled 5 oncologists, 6 radiologists, 11 radiographers, 19 oncology nurses, and 326 oncology patients. Table 1 provides their response rate.

Table 1: Response Rate

Respondents	Sampled	Response	Percentage
Oncologists	5	3	60
Radiologists	6	4	66
Radiographers	11	9	81
Oncology Nurses	19	15	79
Oncology Patients	326	297	91
Total	367	328	89

Table 1 indicates that the respondents who agreed to take part in the study were 3 oncologists, 4 radiologists, 9 radiographers, 15 oncology nurses, and 297 oncology patients. This was a total of 328 (89%) respondents which was significantly high. The study attracted a high response rate due to the dedication of the researcher in explaining details of the study and what the study sought to achieve as far as improving the imaging diagnosis process of oncology patients was concerned. According to West et al. (2023) a response rate with more than 70% feedback signified excellent participation of the respondents in the study.

4.2 Reliability Results

A pre-test study was done at Texas Cancer Center in Nairobi County among various respondents to measure reliability. The results are in Table 2.

Table 2: Reliability Results

Instrument	Cronbach's Alpha	N of Items
Interviews	0.911	5
Questionnaires	0.870	33
Average	0.891	

Table 2 indicates that the interview guide had a Cronbach alpha of 0.911 while the questionnaires had 0.870. Therefore, the average value was 0.891 and as noted by Nikmard et al. (2023), when Cronbach index was between 0.7 to 1, it indicated that the instruments were reliable enough to be used again in a similar kind of study. Therefore, since the results revealed that the index was 0.891, it was an indication that the questionnaires and interviews used had questions related to the study and that was simple for the respondents to understand.

4.3 Demographic Factors on Uptake of Diagnostic Imaging by Oncology Patients

Demographic factors of patients comprised of indicators like age, sex, marital status, education, religion, and the type of cancer. Their responses are provided in Table 3.

Table 3: Background Information of Patients

Age	**Frequency**	**Percentage**
Above 71 years	33	11
61-70 years	65	22
51-60 years	59	20
41-50 years	74	25
31-40 years	48	16
21-30 years	15	5
18-20 years	3	1
Marital Status	**Frequency**	**Percentage**
Married	264	89
Not married	33	11
Total	**297**	**100**
Sex	**Frequency**	**Percentage**
Male	182	61
Female	115	39
Level of Education	**Frequency**	**Percentage**
Tertiary Level	166	56
Secondary school	92	31
Primary school	39	13
Religion	**Frequency**	**Percentage**

Christian	203	68
Muslim	80	27
Hindu	9	3
Not religious	5	2
Cancers Experienced by Patients	**Frequency**	**Percentage**
Breast	110	37
Cervical	59	20
Prostate	39	13
Colon	77	26
Lung	12	4
Total	**297**	**100**

Table 3 indicates that majority of the patients who were 74(25%) had 41-50 years and 65(22%) were 61-70 years. The least number of oncology patients who were 3(1%) and were 18-20 years of age. Further, 264(89%) were married while 33(11%) were not married. Additionally, 182(61%) were male patients while 115(39%) were female patients. Additionally, 166(56%) had a tertiary level of education while 39(13%) had primary school qualifications. In addition, 203(68%) were Christians and 80(27%) were Muslims and only 5(2%) were not religious. Notably, 110(37%) of the patients had breast cancer while 77(26%) had colon cancer. The least group of patients who were 12(4%) had lung cancer.

The results mean that most of the oncology patients were middle-aged and old-aged people. There were however few exceptions of young people who were victims of cancer illness. Further, majority of them were of male gender and married individuals. The level of education was noted to be tertiary level. Religion of the patients was mostly Christianity closely followed by Islam. Notably, breast and colon cancer were the major types of cancers noted by the respondents. Similar findings were also obtained by Njeru et al. (2021) revealed that most cancer patients were suffering from breast, cervical, and colon cancers, as compared to other types of cancers. Additionally, Ngetich et al. (2021) noted that majority of the respondents with cervical cancer, were in Middle Ages between 40-49 years, married, and Christians.

4.4 Background Information of Oncology Health Workers

The study also inquired about the background information of the oncology health workers relating to their age, level of education, and years of service. Table 4 provides the results.

Table 4: Background Information of Oncology Health Workers

Age	**Frequency**	**Percentage**
Above 50 years	12	39
41-50 years	10	32
31-40 years	5	16
18-30 years	4	13
Total	**31**	**100**
Level of Education	**Frequency**	**Percentage**
PhD	5	16
Master's Degree	8	26
Bachelor's Degree	18	58
Total	**31**	**100**
Years of Service	**Frequency**	**Percentage**
Above 10 years	17	55
8-10 years	9	29
5-7 years	5	16
2-4 years	0	0
Less than 2 years	0	0
Total	**31**	**100**

Table 4. indicates that 12(39%) healthcare workers had more than 50 years while 10(32%) had 41-50 years. However, 4(13%) had 18-30 years. Further, 18(58%) had a master's degree while 5(16%) had a PhD. In addition, 17(55%) had more than 10 years of service while only 5(16%) had 5-7 years. The results mean that most healthcare specialists were well experienced based on the number of years in life and medical service. They were also equally educated to support various diagnostic imaging and other related services. In support of the results, Adambounou et al. (2022) noted that there was a need for radiologists to advance their academic levels to a basic degree qualification to be knowledgeable on matters to do with nuclear medicine in French-speaking African nations. Further, Omotoso et al. (2023) revealed that the main problem encountered in Sub-Saharan Africa in fight against cancer was due to a low number of qualified specialists. Their qualifications are measured through their level of education and years of experience.

4.5 Interview Results of Demographic Factors

The study also interviewed the oncology healthcare workers. In this section, there were three questions that required the healthcare workers to explain how the age of the patients affected their uptake of diagnostic imaging in this hospital. Their responses were grouped into three themes which were children, young adults, and older patients. On patients who were children, the healthcare workers revealed that they were not able to wait for the imaging to be taken in a still position hence requiring sedation. A health worker 13 was quoted saying,

"When dealing with children, their curiosity and playful nature makes them not remain in a still position for the imaging to be done."

On young adults, the respondents indicated that they sought early diagnostic imaging since they were more aware and understood the benefits. The old patients, they majorly sought the diagnostic imaging late and were not cooperative in ensuring the imaging process easily administered. A health worker 28 was quoted saying,

"The old aged patients are not cooperative since they are doubtful of the imaging machines towards making their health worse as it is."

Comparatively, Gopika et al. (2022) also noted that in India, cancer screening was faced with challenges such as uncooperative patients who have misconceptions about the entire screening process to their mental and physical health.

The second question required the healthcare workers to elaborate on how other underlying health conditions of the patients affect their uptake of diagnostic imaging in these hospitals. A health worker 1 was quoted saying,

"Underlying epilepsy disease causes a patient to have a seizure and not be able to be still during imaging."

The respondents also noted that diabetic patients cannot effectively undergo imaging services since their blood sugars could rise during the imaging which was catastrophic. In support of the results, ICCA (2021) noted that for an effective cancer screening process, there was a need for the patients to fully disclose their underlying ailment that could hamper effective screening process to begin treatment immediately.

4.6 Chi-Square Test of Demographic Factors on Uptake of Diagnostic Imaging

Chi-square test was conducted at 95% confidence to determine the influence of demographic factors on uptake of diagnostic imaging by oncology patients in South Rift Counties, Kenya. Table 5 presents the outcome.

Table 5: Chi-Square Test of Demographic Factors on Uptake of Diagnostic Imaging

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	461.599	22	.027
Likelihood Ratio	357.128	22	.000
Linear-by-Linear Association	1.562	1	.011
N of Valid Cases	297		

0 cells (0.0%) have an expected count of less than 5. The minimum expected count is .67.

The results presented in Table 5 indicate that χ^2 (1, N = 297) = 461.599, $p < 0.05$. That is the Pearson Chi-Square was 461.599 at a p-value of 0.027. Therefore, since the Pearson Chi-Square was above 3.841 and the p-value was less than 0.05, the study construed that the demographic factors had a positive influence on uptake of diagnostic imaging by oncology patients. The result meant that the capacity of a patient being able to uptake diagnostic imaging was greatly influenced by who they were in terms of their gender, education, marital status, and age. These factors affect a patient's ability to make sound decisions with supporting mechanisms on the outcome of imaging results. A report by the World Bank (2020) established

that increment in cancer cases in Kenya had both economic and social consequences for respective households. Therefore, the social demographics of the patients such as age, marital status, educational level, income level, and religion had a role to play especially in early diagnosis procedures.

4.6 Summary

The questionnaires indicated that 74(25%) patients had 41-50 years and 65(22%) were 61-70 years. The least number of oncology patients who were 3(1%) and were 18-20 years of age. Further, 264(89%) were married while 33(11%) were not married. Additionally, 182(61%) were male patients while 115(39%) were female patients. Additionally, 166(56%) had a tertiary level of education while 39(13%) had primary school qualifications. In addition, 203(68%) were Christians and 80(27%) were Muslims and only 5(2%) were not religious. Notably, 110(37%) of the patients had breast cancer while 77(26%) had colon cancer. The least group of patients who were 12(4%) had lung cancer. Additionally, most healthcare workers who were 12(39%) had more than 50 years while 10(32%) had 41-50 years. However, 4(13%) had 18-30 years. Further, 18(58%) had a master's degree while 5(16%) had a PhD. In addition, 17(55%) had more than 10 years of service while only 5(16%) had 5-7 years.

The interview results pointed out that the income level of the patients affected their uptake of diagnostic imaging in hospitals based on their ability to pay for the initial consultation fee, book diagnostic imaging appointments, top up the imaging charges, and affordability of transport costs. Additionally, underlying health conditions of the patients such as epilepsy made the patients unable to lie down in the imaging machine, hence affecting the process. Additionally, underlying diabetic disease limited the patients to effectively undergo imaging services since the blood sugars could rise during the imaging.

The Chi-square result revealed that χ^2 (1, N = 297) = 461.599, $p < 0.05$. That is the Pearson Chi-Square was 461.599 at a p-value of 0.027. Therefore, since the Pearson Chi-Square was above 3.841 and the p-value was less than 0.05, the study construed that the demographic factors had a positive influence on uptake of diagnostic imaging by oncology patients.

5.0 Conclusion

The study concluded that most patients who sought cancer diagnostic imaging were middle-aged and old-aged male people who were married. This meant that unmarried young female adults hardly sought imaging services. The most common cancer illnesses scanned were breast, colon, and cervical cancers. Apart from that it was also concluded that most cancer patients who sought imaging services had other underlying illnesses such as kidney diseases and diabetes which majorly affected the effectiveness of the process. Further, the healthcare facilities were well prepared in terms of providing mature, experienced, and well-educated specialists to conduct the diagnostic imaging process. The qualifications enabled them to deal professionally and patiently with uncooperative cancer patients.

6.0 Recommendations

The hospital management should provide more funding for sensitization programs to inform unmarried young people especially females to seek early diagnostic imaging services. This will enable them to ensure that no cancerous cells are growing to be discovered at a late stage for effective management. The government needed to enact more policy frameworks for equipping and training more healthcare cadres on early identification of breast, colon, and cervical cancers. This would reduce the number of cases significantly. The hospital staff should create

a more friendly environment for the cancer patients so that they can disclose underlying health conditions easily to minimize medical risk exposure while scanning them.

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