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Risk factors and histomorphological patterns of female patients suspected of breast cancer attending Kisii Teaching and Referral Hospital, Kenya

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Abstract

Background: Breast cancer is a significant public health concern globally, and it is the leading cause of cancer among females. In Kenya, breast cancer accounts for 25.6% of all female cancer cases and presents, with a high incidence of late-stage diagnoses. Previous studies have shown that risk factors for breast cancer differ in their associations with histomorphological patterns.

Objectives: This study aimed to determine the histomorphological characteristics and patterns of breast cancer in female patients suspected of having breast cancer at Kisii Teaching and Referral Hospital (KTRH), identify prevalent risk factors among these patients, and establish associations between these risk factors and the histomorphological patterns observed.

Methods: A retrospective cross-sectional study was conducted at KTRH, reviewing 194 female patients' breast lump biopsies collected between September 2022 and August 2023. Data from pathological slides and hospital records were analyzed using IBM SPSS software version 28, with descriptive statistics and multinomial logistic regression applied to identify significant risk factors associated with histopathological patterns of breast cancer.

Results: The mean age of participants was 39.53±17.467 years, with the majority being nulliparous (23.7%). Most participants lacked educational records (80.9%), and the majority did not have records of smoking (80.9%) or alcohol consumption (80.4%). The most

common histomorphological pattern was fibroadenoma (33.0%), followed by invasive ductal carcinoma (21.1%). Benign conditions were diagnosed in 66.5% of cases, while 33.5% were malignant. A significant association was found between age (df=20.203, p=0.000), parity (df=23.616, p=0.000), history of cancer (df=6.061, p=0.046), and histomorphological patterns. Parity was significantly associated with all tumor types (ductal; OR=2.312, 95%CI=1.546-3.458, p=0.000), (lobular; OR=2.919, 95%CI=1.190-7.159, p=0.019 and (mixed; OR=2.781, 95%CI=1.217-6.358, p=0.015). ($p<0.05$).

Conclusion: The study highlights a high incidence of late-stage breast cancer diagnoses at KTRH, underscoring the need for enhanced education and screening programs. Socio-demographic factors, particularly parity and age, significantly influence breast cancer histomorphological patterns. These findings can inform targeted public health interventions and policy development to reduce breast cancer morbidity and mortality in Kenya.

Keywords: breast cancer, histomorphological patterns, risk factors, malignant, benign

Public Interest Statement

Breast cancer is a principal cause of cancer deaths in low-income countries, affecting women of all ages, with risk increasing with age. Stigma often leads to poor health-seeking behavior. In Kisii, patient-related factors obstruct diagnosis and management. These include socio-cultural beliefs, delayed reporting, lack of cancer education, denial, and economic challenges. Consequently, most breast cancer cases are diagnosed at advanced stages, complicating treatment and resulting in high mortality.

Introduction

Breast cancer is a public health problem of concern, with much research focusing on it in the past decades. Being the leading cause of new cases of cancer at 11.7% and 24.5% of cancer cases in females, the disease burden informs that more research and public health intervention needs to be intensified. In Kenya, breast cancer is the leading cause of all cancers, contributing to 16.1% as of 2020 (GLOBOCAN, 2023). It contributes 25.6% of all cancers in females in all new cases (GLOBOCAN, 2023). With an incidence of 41.0% and a mortality of 19.4%, breast cancer remains a disease of concern that requires attention from resources and skilled professionals (GLOBOCAN, 2023). Breast cancer in Kenya correlates with the situation in Africa, with 16.8% for all cancers and 29.5% for females (GLOBOCAN, 2023).

Breast cancer is a public health problem in Kisii Teaching and Referral Hospital (Mong'are et al., 2022). It is reported that breast cancer cases contributed to 22% of all the breast cases reported at the breast oncology clinic(Bahaty & Kenneth, 2012). The majority of the cases of breast cancer, which contributed to 79%, presented to the clinic at advanced stages (stages 3 and 4). The main reasons for late presentation included a lack of knowledge and financial constraints hindering early health seeking; some were treated at peripheral facilities and reassured without biopsy, and some also visited herbalists (Bahaty & Kenneth, 2012).

Kisii Teaching and Referral Hospital also serves the nearby counties, with Nyamira County being the chief dependent. Homa Bay County recorded lower screening levels of 7.8%. Furthermore, no cancer center exists in Homa Bay (Odhiambo et al., 2023). The breast cancer prevalence and incidence in Bomet County are not documented, yet morbidities and mortalities attributable to it are reported (Chelangat et al, 2019). An unpublished report from one mission hospital in Bomet County reports breast cancer as the second cancer among women, estimated at 60 cases per 1700 in 2015 (Eddis et al., 2019). Unless urgent action is taken to advance breast cancer screening and diagnosis, breast cancer will compound Kenya's disease burden and increase poverty and gender inequalities (Ministry of Health, 2021).

The purpose of this study was to determine the risk factors and histomorphological patterns of suspected cancerous breast lumps in female patients attending Kisii Teaching and Referral Hospital. The social demographic characteristics of the study participants were further associated with the histomorphological patterns and defined possible risk factors, which will inform the decision-making process and development of new policies to curb the surge of breast cancer cases.

Methods

Study Area

The study was done at Kisii Teaching and Referral Hospital. The hospital offers oncologic services, a histology laboratory, functional surgical departments, a consultant oncoplastic breast, and a general surgeon, all of which are key in cancer diagnosis and management. Counties bordering KTRH are Nyamira, Narok, Migori, Bomet and Homabay. Most patients were streaming into Kisii Teaching and Referral Hospital for oncologic reviews and other services. The catchment was estimated to be over 1.5 million. The gynecology clinic booking stood at an average of 15 clients per week with at least six breast lumps for biopsy removal and processing at the laboratory.

Study Design

A retrospective cross-sectional study design with both primary and secondary data was used. Primary data was obtained from reviewed pathological slides, and secondary data was obtained from the hospital records. The study targeted all female breast lump biopsies collected at the Kisii Teaching and Referral Hospital gynecology clinic. The purposive sampling method was used to sample blocks between 1st September 2022 and 31st August 2023. The following checklist was used with the rejection of block in case any of the lists in the checklist were not met. Purposive sampling of all eligible archived tissue blocks within one year was done. The study data was coded to obscure identity. All information was entered into a password-protected computer spreadsheet, cleaned, and exported into IBM SPSS software version 28 for analysis (SPSS, 2022). Descriptive statistics were used to describe categorical data and presented using graphs and tables. Multinomial logistic regression was used to test for the significance of different variables. All p-values <0.05 were considered statistically significant.

Inclusion Criteria

All female patients of any age with breast lumps whose breast lumps samples were collected and stored in the Kisii Teaching and Referral Hospital pathology department were included in the study.

Exclusion Criteria

Participants whose file records and tissues were not available.

Results

4.1 Characteristics of Study Participants

The study enrolled a total of 194 women who met the inclusion criteria. In **Table 4.1a**, the socio-demographic characteristics are shown. The mean age of the study participants was 39.53±17.467, indicating an extensive age range of 76. The mean weight was 61.691±12.682. Most of the participants had no record in terms of their education level. The highest number of women was nulligravida, with a parity of zero (n=46/23.7%). The majority of the women had no record in terms of cigarette smoking (80.9%), while 80.4% had no record of alcohol consumption. 41 (21.1%) practiced family planning and were exposed to hormonal contraceptives, while 119(61.3%) had no record, with only 41(21.1%). **Table 4.1b** presents a summary of the histomorphological patterns of study participants. Most patients were diagnosed with fibroadenoma, 64(33.0%). Invasive ductal carcinoma followed at 41(21.1%), with only one patient presenting with lactating adenoma, 1(0.5%). Fibrocystic changes were diagnosed at 20(10.3%) with mastitis cases reported at 16(8.2%).

The clinical characteristics of the study participants are presented in **Table 4.1c**. The majority of women were diagnosed with benign conditions of breast cancer, with 129(65.5%) and 65(33.5%) presenting with malignant conditions. History of cancer was reported at 3(1.5%), most of the patients had no record, 158(81.4%). Within those who were diagnosed with malignant conditions of cancer, 22 patients (11.1%) were diagnosed with Breast cancer stage IV, 32 (16.5%) with stage III, and 9 (4.6%) with stage II. In terms of the grade of cancer. 35(18.0%) was reported with grade II while 21(10.8%) was presenting with grade III. Only 9(4.6%) of the women presented with grade I breast cancer.

Table 4.1a: Summary of socio-demographic characteristics of the study participants

Characteristic	Condition	Frequency	Percent	Valid Percent
Age (SD)	39.53±17.467; Range; 76			
Weight (SD)	61.691±12.682; Range; 56			
Level of education	NR	157	80.9	80.9
	Primary	2	1.0	82.0
	Secondary	10	5.2	87.1
	Tertiary	25	12.9	100.0
Parity	0	46	23.7	23.7
	1	23	11.9	35.6
	2	25	12.9	48.5
	3	29	14.9	63.4
	4	18	9.3	72.7
	5	26	13.4	86.1
	6	13	6.7	92.8
	7	6	3.1	95.9
	8	6	3.1	99.0
	9	1	0.5	99.5
	14	1	0.5	100.0
Smoking cigarette	NO	36	18.6	18.6
	NR	157	80.9	99.5
	YES	1	0.5	100.0
Alcohol consumption	NO	35	18.0	18.0
	NR	156	80.4	98.5
	YES	3	1.5	100.0
Family planning	NO	34	17.5	17.5
	NR	119	61.3	78.9
	YES	41	21.1	100.0

SD; standard deviation

NO: No History YES: History Present NR: No Record N/A: Not Applicable

Table 4.1b: Histomorphological Patterns of the Study Participants

	Pattern	Frequency	Percentage	Cumulative %
Histological Pattern	Breast lipoma	6	3.1	3.1
	Ductal Carcinoma In Situ	2	1.0	4.1
	Ductal ectasis	11	5.7	9.8
	Fibroadenoma	64	33.0	42.8
	Fibrocystic changes	20	10.3	53.1
	Galactocele	4	2.1	55.2
	High-Grade cell Carcinoma	1	0.5	55.7
	Inflammatory Breast cancer	6	3.1	58.8
	Intraductal papilloma	3	1.5	60.3
	Invasive Ductal Carcinoma	41	21.1	81.4
	Invasive Lobular Carcinoma	7	3.6	85.1
	Lactating adenoma	1	0.5	85.6
	Lobular Carcinoma In Situ	2	1.0	86.5
	Mastitis	16	8.2	94.8
	Paget's Disease of Breast	2	1.0	95.8
	Phyllodes tumor	5	2.6	98.5
	Triple Negative Breast Cancer	3	1.5	100.0
	Total	194	100.0	100.0

Table 4.1c: Clinical Characteristics of Study Participants

History of cancer	NO	33	17.0	17.0
	NR	158	81.4	98.5
	YES	3	1.5	100.0
Cancer condition	Benign	129	66.5	66.5
	Malignant	65	33.5	100.0
Cancer stage	0	1	1.5	1.5
	1	1	1.5	3.0
	2	9	13.8	16.8
	3	32	49.2	66.0
	4	22	34.0	100.0
Cancer grade	I	9	13.8	13.8
	II	35	53.9	67.7
	III	21	32.3	100.0
	IV	0	0.0	100.0

In this study, the most common type of histomorphological pattern was other tumors 111(60.3%). The ductal type was presented in 59(30.4%) patients, while the lobular type was reported in only 9(4.6%) of the patients enrolled. Most (57.2%) of the "Other tumors" were benign, with 3.1% malignant. The mixed type 9(100.0%) presented with malignant conditions. The majority (72.9%) of the ductal tumor types were malignant. The results are presented in Table 2.

Table 4.1: Characteristics of histopathological conditions of patients attending Kisii Teaching and Referral Hospital

Benign Malignant			Cancer condition		Total
Histologic characteristics	Ductal	Count	16	43	59
		% within Histologic characteristics	27.1%	72.9%	100.0%
		% of Total	8.2%	22.2%	30.4%
	Lobular	Count	2	7	9
		% within Histologic characteristics	22.2%	77.8%	100.0%
		% of Total	1.0%	3.6%	4.6%
	Mixed	Count	0	9	9
		% within Histologic characteristics	0.0%	100.0%	100.0%
		% of Total	0.0%	4.6%	4.6%
	Others	Count	111	6	117
		% within Histologic characteristics	94.9%	5.1%	100.0%
		% of Total	57.2%	3.1%	60.3%
Total		Count	129	65	194
% within Histologic characteristics		66.5%	33.5%	100.0%	
% of Total		66.5%	33.5%	100.0%	

Mixed tumor type means both ductal and lobular tumors.

A total of 194 patients had breast lumps. There is a wide range of ages among the women in our study, between 15 and 91 years old, with a median age of 37. The average age was 39.53±17.467. The weight range spans from 37 kg to 93 kg, with a median weight of 61.5 kg. The average weight was 61.691±12.682. More than half of the participants (55.57%) were below the age of 40 years. The independent chi-square test of association showed a statistical association between age category with risk to tumors; {20.203, p = 0.000}, Alcohol consumption; {5.006, p = 0.057}; parity; {23.616, p = 0.000}, history of cancer; {6.061, p = 0.046}, histopathological characteristics {194.000, p =0.000} and level of education {12.488, p = 0.000}. The results are presented in Table 4.2

Classifications	Ductal	Lobular	Mixed	Others
Histomorphological Pattern	1.Ductal Carcinoma In situ Carcinoma	1.Invasive Lobular Carcinoma	1.Inflammatory Breast Cancer	1.High-Grade Spindle Cell Carcinoma
	2.Intraductal Papilloma	2.Lobular carcinoma In situ	2.Tripple Negative Breast Cancer	2.Lactating Adenoma
	3. Ductal Ectasia			3. Mastitis
	4. Invasive Ductal			4. Galactocele
	5. Paget's disease of the breast			5. Phyllodes Tumor
				6. Fibroadenoma
				7. Breast Lipoma
				8.Fibrocystic changes

Table 4.2: Association between demographic, clinical, and histomorphological characteristics of study participants

Characteristics	Cancer condition		Chi-square value (df)	95%CI	p-value
	Benign (n=129)	Malignant (n=65)			
Age (mean±SD)	39.53±17.467				
Weight (mean±SD)	61.691±12.682				
Age (years)					
<40	85(78.7)	23(21.3)	20.203(4)	0.000-0.015	0.000
40-49	18(58.1)	13(41.9)			
50-59	10(43.5)	13(56.5)			
60-69	13(59.1)	9(40.9)			
≥70	3(30.0)	7(70.0)			
Total	129(66.5)	65(33.5)			
Cigarette Smoking					
NO	21(58.3)	15(41.7)	3.432(2)	0.082-0.176	0.129
YES	0(0.0)	1(100.0)			
NR	108(68.8)	49(31.2)			
Total	129(66.5)	65(33.5)			
Family Planning					
No	25(73.5)	9(26.5)	5.123(2)	0.028-0.096	0.077
YES	32(78.0)	9(22.0)			
NR	72(60.5)	47(39.5)			
Total	129(66.5)	65(33.5)			

Alcohol Consumption					
NO	18(51.4)	17(48.6)	5.006(2)	0.024-0.089	0.057
YES	3(100.0)	0(0.00)			
NR	108(69.2)	48(30.8)			
Total	129(66.5)	65(33.5)			
Parity					
0	42(91.3)	4(8.7)	23.616(3)	0.000-0.015	0.000
1-3	52(67.5)	25(32.5)			
4-6	30(52.6)	27(47.4)			
≥7	5(35.7)	9(64.3)			
Total	129(66.5)	65(33.5)			
History of Cancer					
NO	22(66.7)	11(33.3)	6.061(2)	0.017-0.076	0.046
YES	0(0.0)	3(100.0)			
NR	107(67.7)	51(32.3)			
Total	129(66.5)	65(33.5)			
Histomorphological Patterns					
Breast lipoma	6(100.0)	0(0.0)	194.000(16)	0.000-0.015	0.000
Ductal Carcinoma In Situ	2(100.0)	0(0.0)			
Ductal Ectasia	11(100.0)	0(0.0)			
Fibroadenoma	64(100.0)	0(0.0)			
Fibrocystic changes	20(100.0)	0(0.0)			
Galactocele	4(100.0)	0(0.0)			
High-grade spindle cell carcinoma	0(0.0)	1(100.0)			
Inflammation breast cancer	0(0.0)	6((100.0)			
Intraductal papilloma	3(100.0)	0(0.0)			
Invasive ductal Carcinoma	0(0.0)	41(100.0)			
Invasive lobular Carcinoma	0(0.0)	7(100.0)			
Lactating adenoma	1(100.0)	(090.0)			
Lobular Carcinoma In Situ	2(100.0)	0(0.0)			
Mastitis	16(100.0)	0(0.0)			
Paget's disease of the breast	0(0.0)	2(100.0)			
Phyllodes tumour	0(0.0)	5(100.0)			
Triple-negative Breast cancer	0(0.0)	3(100.0)			
Total	129(66.5)	65(33.5)			
Education Level					
Primary	1(50.0)	1(50.0)	12.488(3)	0.000-0.015	0.000

Secondary	10(100.0)	0(0.0)			
Tertiary	22(88.0)	3(12.0)			
NR	96(61.1)	61(38.9)			
Total	129(66.5)	65(33.5)			

SD = standard deviation

The multinomial logistic regression model was used to predict the risk factors associated with histomorphological characteristics of breast cancer. The results show that parity was significantly associated with histomorphological patterns in all the types of tumors (ductal; OR=2.312, 95%CI=1.546-3.458, p=0.000), (lobular; OR=2.919, 95%CI=1.190-7.159, p=0.019 and (mixed; OR=2.781, 95%CI=1.217-6.358, p=0.015). The results are shown in Table 4.3;

Table 4.3: Association between risk factors and histomorphological patterns in women suspected of breast cancer attending KTRH

Histomorphological characteristics		p-value	OR Lower Bound	95% Confidence Interval for Exp(B) Upper Bound	
Ductal	Intercept	0.020			
	Smoking	0.739	0.867	0.373	2.013
	Family planning	0.296	0.740	0.421	1.301
	Alcohol	0.135	0.543	0.244	1.209
	Parity	**0.000*** **	2.312	1.546	3.458
	History of cancer	0.660	1.218	0.505	2.938
Lobular	Intercept	0.001			
	Smoking	0.251	5.766	0.289	114.866
	Family planning	0.522	1.552	0.403	5.977
	Alcohol	0.964	1.045	0.152	7.183
	Parity	**0.019****	2.919	1.190	7.159
	History of cancer	0.336	2.667	0.362	19.631
Mixed	Intercept	0.064			
	Smoking	0.872	1.144	0.222	5.885
	Family planning	**0.023****	0.212	0.056	0.805
	Alcohol	0.426	0.515	0.100	2.641
	Parity	**0.015****	2.781	1.217	6.358
	History of cancer	0.421	0.522	0.107	2.545

** Denotes significant association.

In this multinomial regression model, the reference category was Other tumors. OR: odds ratio. In this instance, the model is treating the other tumors as the referent group and, therefore, estimated a model for ductal tumors relative to other tumors and a model for lobular and mixed tumors (ductal and lobular) relative to Other tumor types.

Discussion

Breast cancer is the most frequently diagnosed cancer among women in the world, as well as the dominant root of death from malignant tumors. The incidence of breast cancer is continually growing in all regions of the world(Smolarz et al., 2022). This current surge in breast cancer cases necessitates a need for more research and resource allocation to curb this menace. It is for this reason that despite the progress in its detection and treatment, which explains improved mortality rates, it seems necessary to improve the awareness and early diagnosis of breast cancer(Smolarz et al., 2022).

The study involved 194 women, providing a broad spectrum of socio-demographic characteristics relevant to breast cancer research. The various breast archived tissue blocks were analyzed for the various histomorphological patterns. The study revealed that a significant majority of the participants were diagnosed with benign breast conditions (65.5%), while 33.5% had malignant conditions. This unveiled a high incidence of breast cancer cases at 33.5% at Kisii Teaching and Referral Hospital, representing Kisii County and the neighboring counties seeking oncology services at the facility, compared to the national tally of 16.1%(GLOBOCAN, 2023). According to the Ministry of Health publication of 2020, the estimates were, however, thought to be higher given the many unreported and unaccounted cases (Ministry of Health, 2020)

In the year 2012, it was reported that breast cancer cases contributed to 22% of all the breast cases reported at the breast oncology clinic (Bahaty & Kenneth, 2012). The majority of the cases of breast cancer, which contributed to 79%, presented to the clinic at advanced stages (stages 3 and 4). The main reasons for late presentation included: a lack of knowledge, financial constraints hindering early health seeking, some were treated at peripheral facilities and reassured without biopsy, and some also visited herbalists (Bahaty & Kenneth, 2012). With improved awareness and breast cancer campaigns, more people have been visiting the facilities, leading to even higher incidences of breast cancer.

Among those with malignant conditions, a notable percentage were diagnosed at late stages: Stage III (49.2%) and Stage IV (34.0%), making a total of 83.2% diagnosed at late stage. Compared to other studies, it was reported that 77% of breast cancer cases were diagnosed with advanced disease(Matheka et al., 2023). Late-stage diagnoses are associated with poorer prognoses and highlight the need for improved early detection and screening programs (Erratum: Global Cancer Statistics, 2020). The grading of breast cancer showed that most malignant cases were of Grade II (53.9%) and Grade III (32.3%). Grade II and III cancers are more aggressive and have a worse prognosis compared to Grade I, which constituted 13.8% of the cases (Elston & Ellis, 1991).

Some benign breast conditions are capable of undergoing neoplasia to become malignant tumors (Kar & Arora, 2023). For instance, Fibroadenoma has in the past been reported to have undergone neoplasm to become a malignant tumor over time. However, it is a rare condition that accounts for 0-2% of the cases of malignancy(Kar & Arora, 2023). However, in this study, some cases were previously diagnosed as fibroadenoma in the previous clinical visits but were later confirmed to be malignancy. This calls for being vigilant with the benign conditions and high suspicion index to avoid an advance in breast disease.

Late diagnosis has always been attributed to a lack of awareness. Women with secondary and tertiary education levels showed lower frequencies of malignant conditions, possibly due to improved health literacy and access to healthcare services (DeSantis et al., 2019). The majority of women with secondary or tertiary levels of education were mainly diagnosed with fibroadenoma or other benign breast conditions as opposed to their counterparts with a primary level of education who were diagnosed mainly with late-stage breast tumors. This health-seeking outcome suggested a high level of awareness and suspicion by those with secondary or tertiary levels of education prompting them to seek early medical intervention in cases of any breast abnormality.

Economic vulnerability has reduced the utilization of cancer care and impact on the health outcomes(Haier & Schaefers, 2022). Poverty and lack of enough economic resources are key reasons for

reduced uptake of screening services and cancer diagnosis. Patients from less privileged families usually take too long to seek healthcare due to financial constraints thereby seeking help when the disease is at advanced stages. Late health-seeking behavior usually leads to poor health outcomes.

Histomorphological Patterns

The various histomorphological patterns that were discovered included; breast lipoma, Ductal Carcinoma In Situ (DCIS), Ductal ectasia, Fibroadenoma, Fibrocystic changes, Galactocele, High-Grade Cell Carcinoma, Inflammatory Breast Cancer, Intraductal Papilloma, Invasive Ductal Carcinoma (IDC), Invasive Lobular Carcinoma (ILC), Lactating Adenoma, Lobular Carcinoma In Situ (LCIS), Mastitis, Paget's Disease of the Breast, Phyllodes Tumor, and Triple Negative Breast Cancer. Fibroadenoma was the most prevalent diagnosis (33.0%), followed by invasive ductal carcinoma (21.1%). Fibroadenomas are benign tumors common in younger women, while invasive ductal carcinoma is the most frequent type of breast cancer, typically occurring in older women (Lima et al., 2021).

The histomorphological diversity observed in this study emphasizes the importance of accurate histopathological diagnosis in managing breast lumps. The histomorphological patterns show a wide range of both benign and malignant breast conditions, with fibroadenoma being the most common benign condition and invasive ductal carcinoma being the most prevalent malignant condition(Laxman et al., 2018). The clinical characteristics indicate a significant number of participants with advanced-stage and high-grade cancers, suggesting a need for early detection and improved diagnostic methods. Invasive ductal carcinoma as in concurrence with other studies is the most prevalent form of breast cancer(Waks & Winer, 2019).

Risk Factors for Breast Cancer

Risk factors are generally classified into modifiable and non-modifiable risk factors(Smolarz et al., 2022). Modifiable risks include; hormonal factors, lifestyle (alcohol consumption, smoking, obesity, and physical inactivity), and reproductive factors (parity). Non-modifiable factors include age, gender, family history, genetic predisposition and reproductive history(Smolarz et al., 2022). Environmental factors such as radiation exposure have also been linked to incidences of cancer in general. These risk factors have previously been positively associated with the risk of breast cancer development in humans(Smolarz et al., 2022).

Gender is a non-modifiable risk factor that is considered the strongest risk factor for breast cancer. It is estimated that about 99% of breast cancer cases are women with only 1% of the cases being men(Smolarz et al., 2022). This high incidence of breast cancer in females compared to males depicts sex as one of the greatest risk factors for breast cancer. However, in this study, it was not considered since the study only settled for women as the major risk group.

Age is another important non-modifiable risk factor for breast cancer. It has been witnessed initially that with advances in age (age 40 years and above), there is an increased incidence of breast cancer(Sun et al., 2017). In 2016, about 99.3% of breast cancer-related deaths were reported in women over 40 years in America, and 71.2% of breast cancer-related deaths in women over 60 years(Siegel et al., 2018). In this study, there was a significant association between age and breast cancer risk. This proved that age is one of the key risk factors for breast cancer. Women aged 40-49 and 50-59 showed higher frequencies of malignant conditions compared to younger age groups, aligning with the typical age distribution of breast cancer incidence (Islami et al., 2022).

A family history of cancer is another predisposition to breast cancer. It is reported that only a small fraction of breast cancers about 5-10% are genetic(Smolarz et al., 2022). The most known and common mutations in breast cancer are the mutations in BCRA1 and BCRA2 genes(Mehrgou & Akouchekian, 2016). The presence of mutation of these genes usually occurs in 3-5% of the patients diagnosed with cancer with carriers estimated to have 10 fold high risk of developing breast cancer(Collaborative

Group on Hormonal Factors in Breast Cancer, 1996). However, this study registered a weak association with cases of malignancy probably due to so many participants having a missing record for a history of cancer.

Hormonal factors like the use of hormonal contraceptives have been widely linked to incidences of breast cancer. Studies have shown that estrogen exposure and early menarche pose more risk for developing breast cancer(Smolarz et al., 2022). Moreover, it was clear that early first menstruation was associated with an increased risk of developing breast cancer, similar to the impact of late menopause. Each additional year of delayed menopause raised the relative risk by 2.9%. Menopause occurring after age 54 was considered late and doubled the risk of breast cancer compared to menopause occurring before age 45(Smolarz et al., 2022).

Lifestyle is one of the modifiable risk factors for breast cancer. They include alcohol consumption, obesity, physical inactivity, and cigarette smoking(Smolarz et al., 2022). In this study, however, there were insufficient existing records of alcohol consumption, obesity, physical inactivity, and smoking, hence, weaker association with breast cancer. Many studies suggest a link between alcohol consumption and a higher risk of breast cancer(Khushalani et al., 2020; Kim et al., 2017; Martin et al., 2018; Meyer et al., 2019; Smolarz et al., 2022). Lack of physical activity along with obesity raises the risk of developing breast cancer, regardless of menopausal status. Additionally, various studies have shown that being overweight or obese is linked to a poorer prognosis for breast cancer patients both before and after menopause(Smolarz et al., 2022; Suzuki et al., 2009).

Parity was significantly associated with breast cancer risk. These findings suggest a complex relationship between reproductive factors and the type of breast cancer, with parity exerting differential effects on various histomorphological patterns. Higher parity showed a protective effect against certain types of breast cancer, which is consistent with previous findings (Collaborative Group on Hormonal Factors in Breast Cancer, 2002). Nulliparity was the most common parity status (23.7%), signifying that most participants had not experienced pregnancy. This is an important consideration, as nulliparity has been allied to a higher risk of certain types of breast cancer, including hormone receptor-positive breast cancer (Collaborative Group on Hormonal Factors in Breast Cancer, 2002). It is, however, contentious as various studies have suggested various outcomes, some documenting high parity as a risk for breast cancer while others linking nulliparity or lower parities as a risk for breast cancer.

Implications for Practice

The study found that late-stage diagnoses were prevalent, with 83.2% of malignant cases identified at stages III and IV, leading to poorer prognoses. Most malignant cases were Grade II (53.9%) and Grade III (32.3%), indicating more aggressive cancer types. Various benign conditions, such as fibroadenoma, could potentially develop into malignant tumors, emphasizing the need for vigilance in managing benign breast conditions. Educational and economic factors also played a significant role, with women having higher education levels showing lower frequencies of malignant conditions due to better health literacy and access to healthcare. Economic vulnerability hindered cancer care utilization, leading to late diagnoses and poor health outcomes. The study's findings stress the importance of early detection, improved diagnostic methods, and addressing socioeconomic barriers to enhance breast cancer outcomes.

Conclusion

This study highlights the diverse socio-demographic, histomorphological, and clinical characteristics associated with breast cancer in women attending Kisii Teaching and Referral Hospital. The findings emphasize the significant burden of both benign and malignant breast conditions, with a notable proportion of late-stage cancer diagnoses. Socio-demographic factors, particularly age, parity, and education level, play a vital role in breast cancer risk and should be considered in public health strategies.

Recommendations

1. **Enhanced Screening Programs**: Implementing regular breast cancer screening programs, mainly targeting women over 40, could facilitate earlier detection and improve prognosis.
2. **Public Health Education**: Increasing awareness about breast cancer symptoms and risk factors through community education programs can improve early detection rates.
3. **Addressing Educational Gaps**: Efforts to improve health literacy, particularly among women with lower educational levels, are essential for effective breast cancer prevention and early detection.
4. **Further Research**: Additional studies are needed to explore the complex relationship between reproductive factors and breast cancer risk, particularly in diverse populations.

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Disclaimer Statement

This work is part of a thesis submitted to Maseno University for the award of a master's degree in Histopathology and Cytology.

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Anunda Job Marege is an academic researcher pursuing a master's in Histopathology and Cytology. With a primary background as a medical laboratory officer at Kisii Teaching and Referral Hospital, he brings 20 years of extensive experience in the field. Anunda's expertise spans various diagnostic and research techniques, significantly contributing to the understanding and awareness of breast cancer. His current research focuses on the histomorphological patterns and risk factors of breast cancer, aiming to inform better clinical practices and public health policies.

References

Bahaty, R., & Kenneth, O. (2012). The Experience of a Newly Set up Breast Clinic in a Resource Limited Hospital. *The ANNALS of AFRICAN SURGERY 9*(2), 69-70.

Chelangat et al, George Ayodo and Fred Amino. (2019). KNOWLEDGE ON RISK FACTORS TO BREAST CANCER AND SELF -EXAMINATION, AMONG WOMEN OF REPRODUCTIVE AGE (15-49 YEARS) AT LONGISA COUNTY REFERRAL HOSPITAL, BOMET COUNTY, KENYA. *International Journal of Development Research*, *9*(9). https://doi.org/http://www.journalijdr.com

Collaborative Group on Hormonal Factors in Breast Cancer. (1996). Breast cancer and hormonal contraceptives: collaborative reanalysis of individual data on 53 297 women with breast cancer and 100 239 women without breast cancer from 54 epidemiological studies. *The Lancet*, *347*(9017), 1713-1727. https://doi.org/https://doi.org/10.1016/S0140-6736(96)90806-5

Collaborative Group on Hormonal Factors in Breast Cancer. (2002). Breast cancer and breastfeeding: collaborative reanalysis of individual data from 47 epidemiological studies in 30 countries, including 50 302 women with breast cancer and 96 973 women without the disease. *The lancet*, *360*(9328), 187-195. https://doi.org/https://doi.org/10.1016/S0140-6736(02)09454-0

DeSantis, C. E., Ma, J., Gaudet, M. M., Newman, L. A., Miller, K. D., Goding Sauer, A., Jemal, A., & Siegel, R. L. (2019). Breast cancer statistics, 2019. *CA: a cancer journal for clinicians*, *69*(6), 438-451. https://doi.org/https://acsjournals.onlinelibrary.wiley.com/doi/full/10.3322/caac.21583

Eddis, C., Ayodo, G., & Amino, F. (2019). Knowledge on Risk Factors to Breast Cancer and Self-Examination, among Women of Reproductive Age (15-49 Years) at Longisa County Referral Hospital, Bomet County, Kenya.

Elston, C. W., & Ellis, I. O. (1991). Pathological prognostic factors in breast cancer. I. The value of histological grade in breast cancer: experience from a large study with long-term follow-up. *Histopathology*, *19*(5), 403-410. https://doi.org/https://doi.org/10.1111/j.1365-2559.1991.tb00229.x

Erratum: Global Cancer Statistics. (2020). GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*, *70*(4), 313.

GLOBOCAN. (2023). *Breast Cancer Facts*. Retrieved 7th March from https://gco.iarc.fr/today/data/factsheets/populations/404-kentya-fact-sheets.pdf

Haier, J., & Schaefers, J. (2022). Economic perspective of cancer care and its consequences for vulnerable groups. *Cancers*, *14*(13), 3158. https://doi.org/ https://doi.org/10.3390/cancers14133158

Islami, F., Guerra, C. E., Minihan, A., Yabroff, K. R., Fedewa, S. A., Sloan, K., Wiedt, T. L., Thomson, B., Siegel, R. L., & Nargis, N. (2022). American Cancer Society's report on the status of cancer disparities in the United States, 2021. *CA: a cancer journal for clinicians*, *72*(2), 112-143. https://doi.org/ https://doi.org/10.3322/caac.21703

Kar, P., & Arora, J. (2023). When Friend Becomes Foe: Complications of Fibroadenoma Imaging Spectrum. *Indographics*, *2*(01), 20-27. https://doi.org/ https://doi.org/10.1055/s-0043-1771196

Khushalani, J. S., Qin, J., Ekwueme, D. U., & White, A. (2020). Awareness of breast cancer risk related to a positive family history and alcohol consumption among women aged 15–44 years in United States. *Preventive Medicine Reports*, *17*, 101029. https://doi.org/https://doi.org/10.1016/j.pmedr.2019.101029

Kim, H. J., Jung, S., Eliassen, A. H., Chen, W. Y., Willett, W. C., & Cho, E. (2017). Alcohol consumption and breast cancer risk in younger women according to family history of breast cancer and folate intake. *American journal of epidemiology*, *186*(5), 524-531. https://doi.org/https://doi.org/10.1093/aje/kwx137

Laxman, S., Sangolgi, P., Jabshetty, S., Bhavikatti, A., & Uttam, A. (2018). Clinical profile of patients with fibroadenoma of breast. *International Surgery Journal*, *5*(3), 1057-1061. https://doi.org/

https://doi.org/10.18203/2349-2902.isj20180830

Lima, S. M., Kehm, R. D., & Terry, M. B. (2021). Global breast cancer incidence and mortality trends by region, age-groups, and fertility patterns. *EClinicalMedicine*, *38*. https://doi.org/https://doi.org/10.1016/j.eclinm.2021.100985

Martin, N., Buykx, P., Shevills, C., Sullivan, C., Clark, L., & Newbury-Birch, D. (2018). Population level effects of a mass media alcohol and breast cancer campaign: a cross-sectional pre-intervention and post-intervention evaluation. *Alcohol and Alcoholism*, *53*(1), 31-38. https://doi.org/https://doi.org/10.1093/alcalc/agx071

Matheka, M., Mutebi, M., Sayed, S., Shah, J., & Shaikh, A. J. (2023). Metastatic breast cancer in Kenya: survival, prognosis and management at a tertiary referral centre. *Ecancermedicalscience*, *17*. https://doi.org/https://doi.org/10.3332/ecancer.2023.1566

Mehrgou, A., & Akouchekian, M. (2016). The importance of BRCA1 and BRCA2 genes mutations in breast cancer development. *Medical journal of the Islamic Republic of Iran*, *30*, 369. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4972064/

Meyer, S. B., Foley, K., Olver, I., Ward, P. R., McNaughton, D., Mwanri, L., & Miller, E. R. (2019). Alcohol and breast cancer risk: Middle-aged women's logic and recommendations for reducing consumption in Australia. *PloS one*, *14*(2), e0211293. https://doi.org/https://doi.org/10.1371/journal.pone.0211293

Ministry of Health, M. (2020). *Kenya Cancer Policy 2019-2030*. Retrieved 7th march from http://guidelines.health.go.ke/#/category/7/448/meta

Ministry of Health, M. (2021). *Breast Cancer Screening and Early Diagnosis Action Plan 2021-2025*. Retrieved 17th July from http://guidelines.health.go.ke/#/category/7/401/meta

Mong'are, S., David, R. N., Araka, G. O., & Obwocha, E. O. (2022). Health seeking behavior among women diagnosed with breast cancer attending Kisii teaching and referral hospital in Kisii County. https://doi.org/https://doi.org/10.18203/2394-6040.ijcmph20220679

Odhiambo, F. B., John, P. O., & A, B. (2023). Knowledge, attitude, and practice towards breast cancer and breast

cancer screening among women in Homa Bay County, Kenya. *International Journal of Community Medicine and Public Health*, *10*(6), 1994-2000. https://doi.org/ https://dx.doi.org/10.18203/2394-6040.ijcmph20231673

Siegel, R. L., Miller, K. D., & Jemal, A. (2018). Cancer statistics, 2018. *CA: a cancer journal for clinicians*, *68*(1), 7-30. https://doi.org/ https://doi.org/10.3322/caac.21442

Smolarz, B., Nowak, A. Z., & Romanowicz, H. (2022). Breast cancer—epidemiology, classification, pathogenesis and treatment (review of literature). *Cancers*, *14*(10), 2569. https://doi.org/https://doi.org/10.3390/cancers14102569

SPSS, I. (2022). *How to Cite IBM SPSS Statistics or earlier versions*. https://render-prd.support-drupal.cis.ibm.net/support/pages/how-cite-ibm-spss-statistics-or-earlier-versions-spss

Sun, Y.-S., Zhao, Z., Yang, Z.-N., Xu, F., Lu, H.-J., Zhu, Z.-Y., Shi, W., Jiang, J., Yao, P.-P., & Zhu, H.-P. (2017). Risk factors and preventions of breast cancer. *International journal of biological sciences*, *13*(11), 1387. https://doi.org/https://doi.org/10.7150/ijbs.21635

Suzuki, R., Orsini, N., Saji, S., Key, T. J., & Wolk, A. (2009). Body weight and incidence of breast cancer defined by estrogen and progesterone receptor status—a meta-analysis. *International journal of cancer*, *124*(3), 698-712. https://doi.org/ https://doi.org/10.1002/ijc.23943

Waks, A. G., & Winer, E. P. (2019). Breast Cancer Treatment: A Review. *Jama*, *321*(3), 288-300. https://doi.org/https://doi.org/10.1001/jama.2018.19323