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Prevalence and Determinants of Breast Cancer Among Women aged 15-49 Years at Butaro Cancer Referral Hospital, Rwanda

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Abstract

Background: Breast cancer is the leading malignancy among women globally and the most prevalent cancer among women in Rwanda. Despite this, limited research exists on breast cancer prevalence and associated factors among reproductive-aged women in Rwanda.

Methods:This prospective study collected quantitative data from 288 women aged 15-49 years who were initially screened positive for breast cancer at health facilities and transferred to Butaro Cancer Referral Hospital for confirmatory testing. Data were analyzed using Statistical package for data science (SPSS) version 21, with logistic regression applied to determine associations between breast cancer and socio-demographic, reproductive, and behavioral factors.**Results**:The study found a high prevalence of breast cancer among the sample population, with 76.7% testing positive. Age, alcohol consumption, and lack of physical exercise were significantly associated with breast cancer risk. Women aged 35-39 were 4.7 times more likely to have breast cancer than those under 30 (AOR = 4.7, 95% CI:1.99 - 11.38, $p < 0.001$). Women consuming modern alcohol had a 14.2-fold higher risk (AOR = 14.2, 95% CI: 3.39 - 59.57, $p < 0.001$), while those engaging in physical activity had lower odds (AOR = 0.1, 95% CI: 0.01 - 0.84, $p = 0.033$).**Conclusion:**A high prevalence of breast cancer was observed, call for targeted prevention strategies, including community-based awareness campaigns on the risks of alcohol consumption and promoting physical exercise, as well as strengthening early screening programs to reduce the burden of breast cancer in Rwanda.

Keywords: Breast cancer, Prevalence, Reproductive-aged women, Rwanda

Introduction

Breast cancer is a global public health problem and the leading cause of cancer-related deaths, it is a cancer resulted from uncontrolled development and spread of abnormal cells[1]. In 2020, [2] estimated 2.3 million women were diagnosed with breast cancer and 685 thousand deaths; globally, 7.8 million women alive at the end of 2020 classified the breast cancer to be the most prevalent cancer. Breast cancer mortality gradually increased since 1930s through 1970s, the countries with early detection programs began to eradicate the invasive disease.1 in 4 (24.2%) women are diagnosed with breast cancer which makes it the most commonly diagnosed cancer in women worldwide, the incidence of breast cancer far exceeds those for other cancers in all nations[2].

The breast cancer overwhelmingly occurs in high-income countries (90%) these include Belgium (113 women per 100,000) followed by Netherlands (101 women per 100,000), Luxembourg (100 women per 100,000) and France (99 women per 100,000 population),[3]. the westernized lifestyle and urbanization extended the burden to LMICs including Rwanda. Since the health care system cannot easily handle care and treatment for the expending incidence rates of breast cancer due to resource barriers and inappropriate identification and exposure control to the risk factors [3].

WHO targets to reduce the breast cancer mortality by 2.5% per year by 2030 and 40% by 2040 among women aged under 70 years, the suggested approaches include health promotion for early detection, timely diagnosis, and comprehensive breast cancer management[2]. Approximately 50% of breast cancer cases occur among women who have no identifiable risk factors and aged above 40, certain factors such as increasing age, history of radiation exposure, reproductive history, tobacco use and postmenopausal hormone therapy among others increase the risk of breast cancer[4].

In Africa, breast cancer is the leading malignancy caused around 74 072 deaths in 2018, 40% of breast cancer occur in sub-Saharan Africa where Rwanda is located; Africa countries have not yet built the therapeutic and screening infrastructure to tackle the breast cancer which is the main challenge and leads to late-stage disease prevention[5].

In Rwanda, 54 out of 100,000 women develop breast cancer in a given five-years period (RBC, 2020). Few studies conducted on breast cancer in Rwanda[6], [7] focused on breast cancer early

detection and knowledge on breast cancer screening and community awareness. Therefore, the aim of this study is to identify the Prevalence and factors associated with breast cancer among reproductive women attending to Butaro hospital as one of the hospitals that provide care and treatment for breast Cancer in Rwanda.

Few studies conducted in Rwanda such as [7]–[9] focused on benign and malignant breast disease and awareness on breast cancer, screening practices respectively. Among others[9] found that participants had low knowledge about preventive practices (19.1%) and level of practice was low too; about only 56 (33.3%) respondents had done breast self- examinations. However, they did not explore the risk factors and prevalence of breast cancer among reproductive women was the aim of this. Conducting research on Prevalence and factors associated with breast cancer in Butaro hospital in Burera district of Rwanda informed the development of evidence-based health policies related to breast cancer prevention, early detection, diagnosis, treatment, and survivorship.By identifying the prevalence of breast cancer and associated risk factors, healthcare providers can design effective screening strategies tailored to the local context.

Methods and Materials

Studydesign

A prospective quantitative study design was employed to collect data from reproductive-aged women (15-49 years) attending Butaro Cancer Referral Hospital for breast cancer screening from July 2023 onwards.

Setting

The study was conducted at Butaro Cancer Referral Hospital, located in Rwanda's Northern Province, Burera District. The hospital is the country's only public cancer referral center, offering specialized oncology services, including breast cancer screening and treatment.

Study population andsample

The study population consisted of reproductive-aged women (15-49 years) who were referred to Butaro Cancer Referral Hospital after initially testing positive for breast cancer at other health facilities across Rwanda. The hospital is a national referral center for oncology services. A total sample size of 288 women was calculated using Cochran’s formula, based on a national breast

cancer prevalence rate of 25%. The simple random sampling technique was employed to select participants, ensuring that every eligible woman had an equal chance of being included in the study.

Data collection instrument and procedures

Data were collected using a structured questionnaire designed to capture information on socio-demographic, reproductive, and behavioral factors. The questionnaire included variables such as age, education level, marital status, number of children, alcohol consumption, physical activity, and breast cancer status. The participants were women who had undergone initial screening at health facilities and were referred to Butaro Hospital for confirmatory testing, which was performed using biopsy. Trained data collectors administered the questionnaire during the participants' visit to the hospital. All data were securely stored and anonymized to maintain participant confidentiality.

Data analysis

Data were analyzed using SPSS Version 21. Descriptive statistics summarized the characteristics of the study population. Bivariate analysis (chi-square test) was conducted to identify significant associations between independent variables and breast cancer status. Logistic regression was used to calculate adjusted odds ratios (AORs) and 95% confidence intervals (CIs) for significant variables.

Results

The characteristics of participants

The characteristics of the participants indicated that the majority of respondents fall within the age groups of 35-39 years, comprising 22.7% of the sample, indicating that the study predominantly includes women in their late reproductive and early menopausal years. Education levels among respondents show a significant portion (77.1%) have had no formal education, while only a small percentage have attained tertiary education (3.5%). Marital status indicates that a substantial majority are married (89.2%), reflecting a typical demographic profile for women of reproductive age. In terms of occupation, the majority of respondents (63.9%) report having no occupation, potentially indicating a significant proportion of homemakers or individuals engaged in informal work. Health care providers are the primary source of information regarding breast cancer for most respondents (81.9%). Regarding lifestyle factors, a considerable portion of respondents do not engage in regular physical exercises (91.7%), while the prevalence of alcohol consumption is relatively high, with traditional alcohol being the most common type consumed (31.9%). Smoking is infrequent (0.7%), and the majority of respondents are not currently breastfeeding (97.6%).

(**Table 1)**

Table 1.The characteristics of Participants

Demographic characteristics	**Frequency N (%)**
Age	
Below 30	34 (11.7)
30-34	33 (11.5)
35-39	74 (25.7)
40 and more	147 (51)
Education Level	
No formal education	222 (77.1)
Secondary and more	66 (22.9)
Marital status	
Single	20 (6.9)
Married	268 (93.1)
Occupation	

Public servant	56 (19.4)
Private servant	42 (14.6)
No occupation	190 (66)
Source of information	
Health care provider	236 (81.9)
Family/friends	33 (11.5)
Media	19 (6.6)
Alcohol use	
No alcohol intake	107 (37.2)
Traditional alcohol	92 (31.9)
Modern Alcohol	89 (30.9)
Smoking status	
Yes	2 (0.7)
No	286 (99.3)
Physical exercises	
Yes	24 (8.3)
No	264 (91.7)
Contraceptive methods	
No method	193 (67)
Condom use and pills	15 (5.2)
Implants and IUD	80 (27.8)
Currently breastfeeding	
Yes	7 (2.4)
No	281 (97.6)
Age at Menarche	
Less than 15	28 (9.7)
15 and above	260 (90.2)
Age at first birth	
below 25	75 (26.1)
25-29	202 (70.1)
30 and above	11 (3.8)
Number of children	
None	28 (9.7)
2-3	152 (52.8)
More than 3	108 (37.5)

Source: Primary data, 2023

Prevalence of breast cancer among women aged 15-49years Butaro cancer referral hospital The results (**Error! Reference source not found.**) revealed that a total number of women who were screened positive countrywide who sought care at Cancer referral hospital, out

of these who screened positive on breast cancer and have sought care at Cancer referral hospital, a physician requested a confirmatory test which Biopsy and out of 288 women as our sample size, 221(77%) tested positive and 67(23%) were tested negative. Further investigation into the factors contributing to this high prevalence, including socio-demographic, reproductive, and behavioral factors, was also done for informing targeted interventions and improving breast cancer outcomes in this population.

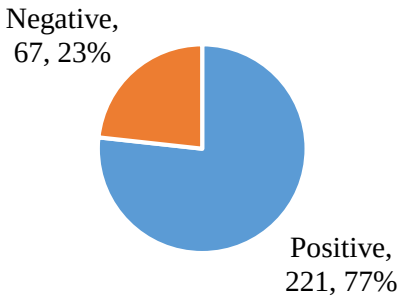

Figure 1:The prevalence of breast cancer among women aged 15-49years.

Source: Primary data, 2023

The demographic, reproductive and behavioral factors associated with breast cancer.

The results (Table 2)

The bivariate analysis reveals several significant associations between various demographic and reproductive factors and breast cancer incidence among the study population. Firstly, age demonstrates a highly significant association with breast cancer status ($p < 0.001$), with increasing age groups showing progressively higher percentages of breast cancer cases. Similarly, education level exhibits a significant association ($p = 0.001$), with individuals having no formal education showing a higher prevalence of breast cancer compared to those with secondary or tertiary education. Marital status approaches significance ($p = 0.061$), with divorced individuals showing a higher prevalence of breast cancer compared to single or married individuals. Occupation also demonstrates a significant association ($p < 0.01$), with individuals with no occupation showing a higher prevalence of breast cancer compared to those in public or private servant roles. Additionally, factors such as currently breastfeeding ($p = 0.002$) and the number of children ($p < 0.01$) show significant associations with breast cancer incidence. These

findings highlight the importance of demographic and reproductive factors in understanding breast cancer risk among women of reproductive age at Butaro Cancer Referral Hospital and provide valuable insights for further investigation and intervention.

alcohol use demonstrates a highly significant association ($p < 0.01$), with individuals consuming modern alcohol exhibiting a notably higher prevalence of breast cancer compared to those consuming traditional alcohol or abstaining from alcohol altogether. Conversely, smoking status does not show a significant association ($p = 0.435$), with both smokers and non-smokers having similar prevalence rates of breast cancer. However, engaging in physical exercises exhibits a significant association ($p = 0.029$), with individuals not participating in physical exercises showing a higher prevalence of breast cancer compared to those who do engage in physical activities. These findings underscore the potential influence of lifestyle choices, particularly alcohol consumption and physical activity levels, on breast cancer risk among women of reproductive age at Butaro Cancer Referral Hospital.

Table 2.The demographic, reproductive and behavioral factors associated with breast cancer (Bivariate level Analysis)

Variables	Breast cancer status				P-value
	Yes	(%)	No	(%)	
Age					<0.001
15-19	0	0.0	1	100.0	
20-24	3	13.6	19	86.4	
25-29	2	18.2	9	81.8	
30-34	25	75.8	8	24.2	
35-39	60	81.1	14	18.9	
40-44	63	84.0	12	16.0	
45-49	68	94.4	4	5.6	
Education Level					0.001
No formal education	180	81.1	42	18.9	
Secondary	37	66.1	19	33.9	
Tertiary	4	40.0	6	60.0	
Marital status					
Single	7	35.0	13	65.0	0.061
Married	205	79.8	52	20.2	
Divorced	4	66.7	2	33.3	
Separated	3	100.0	0	0.0	

Widowed	2	100.0	0	0.0	
Occupation					<0.01
Public servant	32	57.1	24	42.9	
Private servant	27	64.3	15	35.7	
No occupation	161	87.5	23	12.5	
Student	1	16.7	5	83.3	
Source of information					0.27
Health care provider	185	78.4	51	21.6	
Family/friends	24	72.7	9	27.3	
Media	12	63.2	7	36.8	
Contraceptive methods					0.082
No method	150	77.7	43	22.3	
Condom use	10	100.0	0	0.0	
Pills	1	20.0	4	80.0	
Implants	14	42.4	19	57.6	
IUD	46	97.9	1	2.1	
Currently breastfeeding					0.002
Yes	2	28.6	5	71.4	
No	219	77.9	62	22.1	
Age at Menarche					0.14
Less than 15	14	50.0	14	50.0	
15-19	204	79.4	53	20.6	
20-24	2	100.0	0	0.0	
45-49	1	100.0	0	0.0	
Age at first birth					0.23
15-19	3	60.0	2	40.0	
20-24	51	72.9	19	27.1	
25-29	160	79.2	42	20.8	
30-34	7	70.0	3	30.0	
35-39	0	0.0	1	100.0	
Number of children					<0.01
None	12	42.9	16	57.1	
2-3	112	73.7	40	26.3	
4-5	61	89.7	7	10.3	
More than 5	36	90.0	4	10.0	
Alcohol use					<0.01
No alcohol intake	70	65.4	37	34.6	
Traditional alcohol	69	75.0	23	25.0	
Modern Alcohol	82	92.1	7	7.9	

Smoking status					0.435
Yes	2	100.0	0	0.0	
No	219	76.6	67	23.4	
Physical exercises					0.029
Yes	14	58.3	10	41.7	
No	207	78.4	57	21.6	

Source: Primary data, 2023

The demographic, reproductive and behavioral factors associated with breast cancer (Multivariable level Analysis)

The results from bivariate analysis shown some significant variables associated with breast cancer which were further regressed in logistic regression to understand the magnitude of association between significant variables and breast cancer.

The logistic regression analysis revealed significant associations between certain demographic factors and the odds of having good knowledge levels among HIV patients towards HIV-based services. The results (**Table 3**) revealed that 87 (36.9%) individuals aged 40-49 and 102 (43.2%) of individuals aged 50 and above showed a good knowledge 102 (43.2%)where those 40-50 had 11.5 odds of possessing good knowledge compared to those below 30 (AOR:11.59, 95% CI: 1.560- 86.063, p = 0.017) while individuals above 50 had 16.4 odds (AOR:16.44,95% CI: 2.150-125.653, p = 0.007).

In terms of residence, the majority of individuals 228 (96.6%) from urban displayed good knowledge, moreover, urban residents displayed a notable increase in the odds of possessing good knowledge compared to their rural counterparts, with an odds ratio of (AOR: 7.05, 95% CI: 1.999- 24.88, p = 0.002).The individuals who stayed longer (more than 5 years) in the program demonstrated good proportion of knowledge towards HIV-based services 162 (68.6%), these exhibited a significant increase in the odds of having good knowledge, with an odds ratio of (AOR:13.29, 95% CI: 1.694, 104.182, p = 0.014).

Other variables such as gender, ubudehe categories, occupation, gender of household head, relationship with household head, religion, marital status, having insurance and distance from home to health facility did not show any significance association with knowledge to HIV-based services. However, the majority of females 136 (57.6%), individuals from UBUDEHE category 2, 121 (51.3%), unemployed individuals 106 (44.9%), male-headed households 135(57.2%),

respondents who were spouse to household head 201 (85.2%), participants from protestants religion 134 (56.8%), married individuals 105 (44.5%), individuals with insurance 211 (89.4%) and those who travel 2-3 kilometers to health facility 90 (38.1%) displayed good knowledge towards HIV-based services.

Table 3. The demographic, reproductive and behavioral factors associated with breast cancer (Multivariable level Analysis)

Variables	AOR	95% CI	P-Value
Age			
Below 30	1*		
30-34	0.004	[0.001 - 0.032]	1
35-39	4.7	[1.99 - 11.38]	<0.01
40 and more	1.4	[1.06 - 3.16]	0.002
Education Level			
No formal education	1*		
Secondary and more	1.0	[0.12 - 7.71]	1.00
Occupation			
Public servant	1*		
Private servant	11.8	[0.35 - 39.7]	0.169
No occupation	13.9	[0.43 - 47.6]	0.145
Alcohol use			
No alcohol intake	1*		
Traditional alcohol	5.4	[1.52 - 19.42]	0.009
Modern Alcohol	14.2	[3.39 - 59.57]	<0.01
Physical exercises			
Yes	1*		
No	0.1	[0.01 - 0.84]	0.033
Currently breastfeeding			
Yes	1*		
No	1.9	[0.11 - 35.62]	0.66
Number of children			
None	1*		
2-3	0.3	[0.02 - 3.52]	0.32
More than 3	0.8	[0.14 - 4.18]	0.77

1*: Reference category

Source: Primary data, 2023

Discussion

Comparing the findings with similar study conducted in Lesotho by [10].In terms of prevalence, the study in Rwanda identified a notably high prevalence of breast cancer among reproductive women, with 76.7% testing positive for the disease. Conversely, the study in Lesotho found that the level of breast cancer among women of reproductive age was relatively high, at 86.8% (95% CI: 85.5, 87.9). This suggests that while prevalence of breast cancer is higher in Lesotho, Rwanda faces a higher burden of the disease among its reproductive female population.

Another study conducted in sub-Saharan Africa by[11]on breast cancer screening prevalence in sub-Saharan Africa found that the overall prevalence of breast cancer screening was only 12.9% during the study period, with significant variability across countries, ranging from 5.2% in Ivory Coast to 23.1% in Namibia.Regarding factors associated with breast cancer risk or screening, both studies identified age and education level as significant determinants, albeit in different contexts. In our study, age demonstrated a significant association with breast cancer risk, with individuals aged 25-29 and 30-34 showing increased odds compared to younger age groups.

In the breast cancer screening study, older participants aged 35–49 years had higher odds of undergoing screening compared to younger participants aged 15–24 years, with an adjusted prevalence ratio (PR) of 1.73 (95% CI: 1.56 to 1.91), highlighting the importance of age in both disease risk and screening behaviors.These differences highlight the multifaceted nature of breast cancer prevention and control efforts, with various socio-demographic and socio-economic factors influencing both disease risk and screening behaviors across different populations[11].

The study byAfaya et al. (2023) also identified significant factor associated with breast cancer risk or awareness where women aged 45–49 years had higher odds of developing breast cancer, with an adjusted odds ratio (AOR) of 2.87 (95% CI: 1.83, 4.48), while in Rwanda, individuals aged 25-29 showed a significantly increased risk of breast cancer compared to younger age groups, with an AOR of 4.7 (95% CI: 1.99 - 11.38). However, the associations between age and breast cancer risk differ slightly between the two studies, possibly due to variations in demographics and healthcare infrastructure[10].

Comparing our findings with the study conducted by [1]. Both studies recognize age as a significant factor associated with breast cancer risk. While our study identified specific age groups associated with increased odds of breast cancer prevalence, the study in Addis Ababa found that the mean age of cases was slightly higher than controls, suggesting age as a contributing factor to breast cancer riskfor early onset of menarche. However, the studies focus on different geographical regionsRwanda and Addis Ababa, Ethiopia, respectively. Consequently, while our study investigates breast cancer prevalence among reproductive women in Rwanda, the Addis Ababa study delves into risk factors specific to women in Ethiopia's capital city. Furthermore, while both studies examine various factors associated with breast cancer risk, they identify different determinants. Our study highlights lifestyle factors such as alcohol consumption and physical exercise, whereas the Addis Ababa study identifies factors such as rural residence, utilization of packed foods or drinks, smoke-dried meat consumption, family history of cancer, overweight and/or obesity, and parity as associated factors with breast cancer risk. Understanding these contextual differences is crucial for interpreting and applying study findings. Tailoring intervention strategies to address specific risk factors identified in each context can enhance their effectiveness in reducing breast cancer burden. Moreover, recognizing the diverse array of factors contributing to breast cancer risk emphasizes the need for a comprehensive approach that integrates lifestyle modifications, awareness campaigns, and healthcare access improvements to mitigate the increasing burden of breast cancer.

Study limitation

The study was conducted in a single referral hospital, limiting the generalizability of the findings to the broader population of Rwandan women. Additionally, the reliance on self-reported behavioral factors may introduce reporting bias.

Conclusion

Breast cancer is highly prevalent among reproductive-aged women in Rwanda, with socio-demographic and behavioral factors such as age and alcohol consumption contributing significantly to breast cancer risk. Targeted interventions should prioritize lifestyle modifications, particularly reducing alcohol consumption and promoting physical activity,

alongside strengthening early screening and detection programs. These efforts could play a critical role in reducing the burden of breast cancer in this population and improving health outcomes for women across the country.

Authors' contribution

JCHN conceptualized and designed the study, led data collection, and drafted the manuscript. JAO and MM. TK assisted with data analysis, manuscript drafting, and provided substantial inputs during the review process. All authors read and approved the final manuscript.

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Data Availability Statement

The data supporting the findings of this study are available from the corresponding author, [JCHN], upon reasonable request.

Ethical consideration

The study was conducted in accordance with ethical principles and guidelines for research involving human subjects[12]. The researcher obtained ethical approval from Mount Kenya university before commencing the study. Patient confidentiality was maintained by using anonymous codes instead of personal identifying information. The clearance was obtained from Butaro district Hospital and permission was offered by Mount Kenya University-Rwanda, School of Public health.

Conflictofinterest declaration

The authors declare that they have no competing interests.

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