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Factors Associated with Breast Cancer among Patients Seen in the Obstetrics and Gynecology Department of the Borgou-Alibori Regional University Hospital, 2016-2022

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Abstract

Introduction: Breast cancer represents a growing public health concern in Benin, warranting a more rigorous characterization of its associated risk factors. **Methods:** We conducted a cross-sectional analytical study with retrospective data collection, covering the period January 2016 to December 2022 at the Borgou-Alibori Regional University Hospital (CHUD-B/A). All patients admitted for breast-related complaints were enrolled according to predefined inclusion criteria. Data were collected using KoboCollect and analyzed with Epi Info 7.2.2.6, employing appropriate statistical tests to evaluate associations between exposures and the outcome of interest. **Results:** Breast pain was the primary presenting complaint in 65% of patients. Breast cancer was significantly associated with age over 30 years, tobacco use (aPR = 2.21; p = 0.002), advanced age at first pregnancy (adjusted prevalence ratio [aPR] = 1.92; p = 0.005), and a history of breastfeeding, which was associated with a substantially reduced likelihood of breast cancer diagnosis (aPR = 0.18; p = 0.004). Breast ultrasound was the most frequently performed investigation (62.5%), and metastatic disease constituted the predominant histological presentation (56.41%). Loss to follow-up affected 92.31% of patients, and none received chemotherapy. **Con-**

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clusion: Among patients presenting with breast-related complaints at CHUD-B/A, breast cancer diagnosis was associated with older age, tobacco use, later age at first pregnancy, and absence of breastfeeding. The very high loss to follow-up and absence of chemotherapy point to urgent gaps in the local oncology care pathway. Strengthening early detection at the primary level, structured referral, and continuity of oncological treatment should be prioritized.

Keywords

Breast Cancer, Risk Factors, CHUD-B/A, Benin

1. Introduction

Breast cancer remains the leading cause of cancer-related mortality in women worldwide and constitutes a major global public health burden [1]. In sub-Saharan Africa, incidence rates are rising; however, it is mortality that is most alarming, driven by diagnostic and treatment delays [2]. A meta-analysis demonstrated that nearly 60% of breast cancer patients in Africa experience care-seeking delays attributable to structural, cultural, and economic barriers [2]. In Benin, although nationally representative data remain scarce, clinical observations and trends documented in neighboring countries suggest a high prevalence of cases diagnosed at advanced stages. Risk factors including early menarche, obesity, family history of breast cancer, and low educational attainment, have been robustly associated with breast cancer incidence across multiple African studies [3].

An equitable, timely, and cost-free breast cancer screening system, incorporating mammography and systematic breast self-examination, represents the aspirational standard of care. Such a system would ideally be supported by risk factor surveillance mechanisms, psychosocial support services, and a well-distributed specialized clinical infrastructure, all of which would contribute to meaningful reductions in mortality and improvements in health-related quality of life [4]-[6]. Post-treatment care should further integrate mental health services, physical rehabilitation, and social reintegration programs [7].

In most sub-Saharan African countries, including Benin, the reality diverges sharply from this ideal. Women frequently present to the hospital at advanced stages, often after delays of several months [2]. Screening uptake is limited, particularly in rural settings, and breast self-examination remains infrequently practiced [1] [8]. Underlying reasons include low health literacy, shortages of trained personnel, high out-of-pocket costs, reliance on traditional medicine, and geographic barriers to health facilities [2]-[3]. Compounding these factors are social stigma, fear, misinformation, and the absence of a nationally organized screening program [4]-[9]. The gap between the aspirational standard and the prevailing reality in Benin, characterized by systematic diagnostic delays, poor recognition of early warning signs, and the lack of a coordinated screening policy, underscores

an unresolved public health crisis.

The consequences of late diagnosis are severe. They include high mortality, more aggressive treatment modalities (mastectomy, chemotherapy), physical sequelae (lymphedema, chronic pain), and psychological morbidity (depression, anxiety) [7]-[10]. Patients frequently experience employment loss, social stigmatization, and profound deterioration in quality of life [11]. Although awareness campaigns and breast self-examination guidelines have been implemented in several African countries through community structures and media programs [4]-[8], their coverage remains limited, underfunded, and inconsistent. The absence of organized screening continues to represent the central gap in the fight against breast cancer.

The present study was undertaken to identify factors associated with a diagnosis of breast cancer among patients presenting with breast-related complaints in the Obstetrics and Gynecology Department of the Borgou-Alibori Regional University Hospital (CHUD-B/A). The findings reflect associations within a hospital-based clinical population and are not intended to estimate population-level breast cancer risk.

2. Methods

This cross-sectional analytical study was conducted in the Obstetrics and Gynecology Department of the CHUD-B/A in Parakou, Benin. The study population comprised all patients admitted for breast-related complaints between January 2016 and December 2022. The department encompasses multiple care units, including inpatient wards, an emergency unit, a delivery suite, antenatal consultation rooms, a vaccination unit, a wound care unit, a family planning unit, an operating theater, and a resuscitation unit. The department employed 68 staff members in 2021 and 67 in 2020.

All patients presenting with breast-related symptoms during the study period were eligible for inclusion. An exhaustive census was performed. A total of 147 medical records were screened; 27 were excluded because the file was unavailable or core variables (age, presenting complaint, examination findings, or diagnostic outcome) were missing, yielding a final analytic sample of 120 patients. For each reproductive variable, denominators reflect the patients with non-missing data: age at menarche (n = 120), menstrual cycle regularity (n = 120), age at first pregnancy (n = 86, restricted to ever-pregnant patients), breastfeeding history (n = 120, with parous patients ascertained directly and nulliparous patients classified as never-breastfed), hormone replacement therapy (n = 120), and contraceptive use (n = 120). Data were extracted from medical records, supplemented by telephone contact to retrieve missing information, using a standardized questionnaire developed and administered via KoboCollect, which was piloted prior to deployment.

The primary outcome was a diagnosis of breast cancer. Diagnostic confirmation was hierarchical: histopathological confirmation (core biopsy or surgical specimen) was the reference standard and was available for 23 of the 39 patients diagnosed with breast cancer (59.0%). The remaining 16 patients (41.0%) were classi-

fied as breast cancer cases on the basis of concordant clinical findings (palpable mass with peau d'orange, fixation, or axillary adenopathy) together with imaging features highly suggestive of malignancy on breast ultrasound or mammography (BI-RADS 4 or 5), in the absence of histopathology. Sensitivity analyses restricted to histologically confirmed cases yielded associations consistent in direction and magnitude with those reported for the full case definition.

Data entered via KoboCollect were exported to Microsoft Excel and analyzed using Epi Info version 7.2.2.6. Continuous variables were described using measures of central tendency and dispersion. Categorical variables were expressed as proportions with 95% confidence intervals. Bivariate associations were assessed using the chi-squared test, Fisher's exact test, or Student's t-test, as appropriate, with a significance threshold set at $p < 0.05$. The crude prevalence ratio (PR) was used as the measure of association in bivariate analysis. To account for the interrelations between age, parity, age at first pregnancy, and breastfeeding history, a multivariable Poisson regression model with robust variance was fitted, including age category, tobacco use, age at menarche, age at first pregnancy, and breastfeeding history as covariates. Adjusted prevalence ratios (aPR) with 95% confidence intervals are reported alongside crude estimates.

3. Results

3.1. Sociodemographic Characteristics

The mean age of patients presenting for breast-related complaints was 34.45 ± 14.03 years (range: 15 - 70 years), with 42% aged between 15 and 30 years. The majority of patients were married (58.33%) and had attained secondary-level education (30.83%). Homemakers (33.33%) and traders (22.50%) were the most frequently represented occupational categories (Table 1).

Table 1. Distribution of patients admitted for breast-related complaints in the Obstetrics and Gynecology Department of the CHUD-B/A (2016-2022), by sociodemographic characteristics.

Characteristic	n	%
Educational level		
▪ Illiterate	25	20.83
▪ Primary	33	27.50
▪ Secondary	37	30.83
▪ Higher	25	20.83
Marital status		
▪ Married	70	58.33
▪ Single	43	35.83
▪ Widowed	07	05.83
Occupation		
▪ Homemaker	40	33.33

Continued

▪ Artisan	09	07.50
▪ Student (university)	22	18.33
▪ Civil servant	08	06.67
▪ Student (secondary school)	14	11.67
▪ Trader	27	22.50

3.2. Behavioral Characteristics

Fruit consumption (60.83%) and sweetened beverage consumption (50.83%) were the most prevalent dietary behaviors, while tobacco use was reported by a minority of patients (10.83%) (Table 2).

Table 2. Distribution of patients by behavioral risk factors (CHUD-B/A, 2016-2022).

Behavioral factor	n	%
▪ Tobacco use	13	10.83
▪ Alcohol use	38	31.67
▪ Fruit consumption	73	60.83
▪ Vegetable consumption	53	44.17
▪ Sweetened beverage consumption	61	50.83
▪ Physical activity	42	35.00

3.3. Genetic Background

The vast majority of patients reported no family history of breast cancer (95.83%) and no history of hypertension (94.17%).

3.3.1. Hormonal and Reproductive Factors

Most patients experienced menarche between the ages of 13 and 18 years (82.5%), had regular menstrual cycles (61.67%), had not breastfed (76.74%), and had not used hormone replacement therapy (84.17%). The majority had their first pregnancy at age 30 years or older (77.91%), and most had never used contraception (66.67%) (Table 3).

Table 3. Distribution of patients by hormonal and reproductive characteristics (CHUD-B/A, 2016-2022).

Variable	n	%
Age at menarche (years)		
▪ 10 - 12	21	17.50
▪ 13 - 18	99	82.50
Menstrual cycle regularity		
▪ Regular	74	61.67
▪ Irregular	46	38.33

Continued

Dysmenorrhea		
▪ Yes	31	25.83
▪ No	89	74.17
Age at first pregnancy (years)		
▪ <30	19	22.09
▪ ≥30	67	77.91
History of breastfeeding		
▪ Yes	20	23.26
▪ No	66	76.74
Hormone replacement therapy		
▪ Yes	19	15.83
▪ No	101	84.17
History of contraceptive use		
▪ Yes	40	33.33
▪ No	80	66.67

3.3.2. Obstetric Characteristics

The majority of patients were multigravida (83.72%) and multiparous (77.91%). Primigravida and primiparous patients accounted for 16.28% and 22.09% of the sample, respectively.

3.3.3. Clinical Presentation

Breast pain was the leading chief complaint (65%), followed by a self-detected breast lump (23.33%) and referral for known or suspected breast cancer. Hypertension was present as a comorbidity in 15% of patients.

3.4. Physical Examination Findings

Breast abnormalities were detected in over half of all patients on clinical examination, with a predominance of left-sided involvement (55.83%). Peau d'orange appearance, a hallmark of dermal lymphatic invasion, was observed in 55.83% of cases. Superficial and deep mobility of the breast mass was preserved in 77.5% of patients, while fixation to surrounding structures was noted in 1.67% of cases (Table 4).

Table 4. Distribution of patients by physical examination findings (CHUD-B/A, 2016-2022).

Variable	n	%
Right breast abnormal		
▪ Yes	64	53.33
▪ No	56	46.67

Continued

Left breast abnormal		
▪ Yes	67	55.83
▪ No	53	44.17
Skin appearance over the mass		
▪ Normal	36	30.00
▪ Peau d'orange	67	55.83
▪ Other	17	14.17
Superficial mobility		
▪ Mobile	93	77.50
▪ Fixed	23	19.17
▪ Adherent	02	01.67
▪ Non-adherent	02	01.67
Deep mobility		
▪ Mobile	93	77.50
▪ Fixed	23	19.17
▪ Adherent	02	01.67
▪ Non-adherent	02	01.67

3.5. Paraclinical Investigations

Breast ultrasound was the most frequently requested investigation (62.5%), followed by histopathological examination (34.17%). Other modalities, including core biopsy, mammography, and fine-needle aspiration cytology, were used less frequently.

3.6. Frequency and Histological Classification of Breast Cancer

Of the 120 patients included, 39 (32.5%) received a diagnosis of breast cancer; the remaining 81 patients (67.5%) had benign or non-malignant breast conditions. Among the 39 confirmed breast cancer cases (23 histologically confirmed, 16 diagnosed on concordant clinical and imaging criteria), metastatic disease at presentation was the predominant pattern (56.41%), followed by inflammatory carcinoma (12.82%) and histologically unspecified malignant forms (12.82%). Other histological subtypes were rare, each accounting for less than 6% of cancer cases.

3.7. Treatment

Treatment patterns reported here refer to the 39 confirmed breast cancer cases. Antibiotic therapy alone was administered to 56.41%, reflecting initial misclassification as inflammatory or infectious breast disease before the malignant diagno-

sis was established, 20.51% underwent surgical intervention (typically mastectomy without adjuvant therapy), and 23.08% received no oncology-directed treatment. No patient received chemotherapy. Antibiotic prescription, surgical intervention, and management of benign breast conditions in the remaining 81 patients with non-malignant diagnoses are not detailed here, as the focus of the analysis is breast cancer.

3.8. Clinical Outcomes

Outcomes are reported for the 39 confirmed breast cancer cases. Loss to follow-up was near-universal: 92.31% were lost to follow-up after the diagnosis was established, and 7.69% died during the observation period. No case of confirmed cure was recorded.

3.9. Analytical Findings

In the multivariable Poisson regression, age remained strongly associated with breast cancer diagnosis, with the likelihood of a malignant outcome rising sharply from the age of 30 years onwards ($p < 0.001$). Tobacco use was also independently associated with breast cancer (aPR = 2.21; 95% CI: 1.34 - 3.65; $p = 0.002$), with the adjusted estimate slightly attenuated relative to the crude figure as expected once age was accounted for (**Table 5**).

Table 5. Association between selected factors and breast cancer risk (CHUD-B/A, 2016-2022).

	N	n	%	Crude PR	95% CI	aPR	95% CI	p-value
Age (years)								<0.001
▪ 15 - 29	50	02	4.00	1	-	1	-	
▪ 30 - 44	37	19	51.35	12.83	[3.18; 51.73]	10.41	[2.55; 42.50]	
▪ 45 - 59	26	15	57.69	14.42	[3.56; 58.32]	11.62	[2.79; 48.40]	
▪ 60 - 70	07	03	42.86	10.71	[2.15; 53.32]	8.55	[1.62; 45.10]	
Tobacco use								
▪ No	107	30	28.04	1	-	1	-	
▪ Yes	13	09	69.23	2.47	[1.54; 3.96]	2.21	[1.34; 3.65]	0.002

3.10. Hormonal and Reproductive Risk Factors

After adjustment for age, tobacco use, age at menarche, and breastfeeding history, advanced age at first pregnancy (≥30 years) remained associated with breast cancer diagnosis (aPR = 1.92; 95% CI: 1.21 - 3.04; $p = 0.005$). A history of breastfeeding was independently associated with a substantially lower probability of breast cancer (aPR = 0.18; 95% CI: 0.04 - 0.85; $p = 0.004$), with the magnitude of the association attenuated relative to the crude estimate but the direction and significance preserved. Age at menarche between 13 and 18 years was associated with a

higher likelihood of breast cancer in the adjusted model (aPR = 2.18; 95% CI: 1.02 - 4.66; p = 0.04) (**Table 6**).

Table 6. Association between reproductive factors and breast cancer risk (CHUD-B/A, 2016-2022).

	N	n	%	Crude PR	95% CI	aPR	95% CI	p-value
Age at menarche								
▪ 10 - 12	21	03	14.29	1	-	1	-	
▪ 13 - 18	99	36	36.36	2.55	[1.04; 6.21]	2.18	[1.02; 4.66]	0.04
Age at first pregnancy								
▪ <30	19	04	21.05	1	-	1	-	
▪ ≥30	67	29	43.28	2.06	[1.36; 3.12]	1.92	[1.21; 3.04]	0.005
Breastfeeding history								
▪ No	100	38	38.00	1	-	1	-	
▪ Yes	20	01	5.00	0.13	[0.02; 0.89]	0.18	[0.04; 0.85]	0.004

4. Discussion

4.1. Sociodemographic Characteristics

The mean age of patients presenting for breast complaints was 34.45 ± 14.03 years, with 42% under 30 years. This relatively young age profile warrants attention. Breast cancer has traditionally been regarded as a disease of postmenopausal women; yet this earlier age at presentation is increasingly documented in African contexts. Mihret *et al.* (2021) [8] reported a mean age of 37 years among Ethiopian women practicing breast self-examination, while Wendimu *et al.* (2024) [2], in a meta-analysis, noted high breast cancer prevalence among younger women in the sub-Saharan region. Plausible explanations include rapid lifestyle changes, urbanization, early oxidative stress exposure, and incompletely characterized genetic susceptibility factors. Xu *et al.* (2023) [12] demonstrated in a Chinese cohort that younger age at diagnosis may be associated with disruptions in metabolic pathways and post-transcriptional regulatory mechanisms.

More than half of patients were married (58.33%). This proportion, while reflective of social norms prevalent in West African societies, may influence care-seeking behavior in either direction depending on the quality of spousal support. Tang *et al.* (2024) [13] identified marital partnership as a protective factor against psychological distress in breast cancer patients, whereas Benallel *et al.* (2023) [14] reported that an unsupportive partner increased the risk of clinical depression.

Secondary-level education was the most common educational attainment (30.83%). Multiple studies have established that low educational level constitutes a barrier to timely screening and diagnosis. Shoukat *et al.* (2023) [15] found that 63.2% of Pakistani women surveyed were unaware of early breast cancer symp-

toms, with the highest rates of unawareness among women with no formal schooling.

The overrepresentation of homemakers (33.33%) and traders (22.5%) in this cohort reflects limited socioeconomic security, a structural determinant known to constrain access to health information and care, and to condition health-seeking attitudes [16].

4.2. Genetic Background

Family history of breast cancer, particularly in the context of BRCA1 and BRCA2 mutations, is well-established as a major risk factor. In low-resource settings, however, this factor is systematically underestimated: patients may be unaware of causes of death among relatives or reluctant to disclose such information. The low rates of reported family history observed in the present series are therefore expected. Wendimu *et al.* (2024) [2] identified poor traceability of family cancer history as a critical weakness in breast cancer surveillance systems across sub-Saharan Africa.

From a biological standpoint, the near-absence of reported family history does not preclude a genetic contribution. Sporadic forms of breast cancer, driven by environmental exposures, hormonal influences, and metabolic perturbations, account for the majority of cases [12]. Moreover, heritable susceptibility may also be mediated through epigenetic mechanisms that remain undetectable in current clinical settings.

The low prevalence of hypertension in this cohort (5.83%) is consistent with the relatively young age of the sample. Although some evidence links hypertension to breast cancer through chronic inflammation and oxidative stress [16], this association has been more consistently documented in older patient populations.

4.3. Clinical Presentation

Breast pain was the predominant presenting complaint (65%), followed by a palpable breast lump (23.33%) and referral for confirmed or suspected malignancy. Hypertension was present as a comorbidity in 15% of patients. This symptom profile is characteristic of settings where consultation is driven by alarming symptoms rather than proactive screening.

The preponderance of pain as a presenting symptom is common in low-resource contexts, though it is not a typical early feature of breast malignancy, which is often asymptomatic at initial stages. Pain at presentation more often indicates locally advanced or complicated disease. Wendimu *et al.* (2024) [2] documented mastalgia as a frequent reason for delayed presentation among African women, particularly those residing in rural areas.

The relatively low frequency of self-detected lumps (23.33%) suggests difficulties in lesion identification and inadequate awareness of breast self-examination techniques. This finding is consistent with Urga Workineh *et al.* (2021) [1], who reported that fewer than 40% of Ethiopian women practiced regular breast self-

examination, despite reasonable perceived risk.

Regarding hypertension, present in 15% of patients, Çeli *et al.* (2023) [16] and Lopes *et al.* (2022) [10] have highlighted its association with chronic stress, poor dietary patterns, and oncological treatment toxicity, as well as its role as an indirect marker of cardiovascular vulnerability in women with breast cancer.

4.4. Physical Examination Findings

Clinical examination revealed breast abnormalities in more than half of patients, with left-sided predominance (55.83%). Peau d'orange appearance, a classic indicator of dermal lymphatic permeation, was present in 55.83% of cases. Although superficial and deep mobility was preserved in 77.5% of patients, a small proportion (1.67%) showed fixation to surrounding structures.

The high frequency of palpable abnormalities confirms detection at a relatively advanced stage of disease. Peau d'orange is characteristically associated with inflammatory or locally advanced breast cancer. Wendimu *et al.* (2024) [2] identified this clinical sign among the most frequent markers of delayed diagnosis in settings with limited access to imaging.

The left-sided predominance observed here, though notable, has been reported in earlier literature. Shoukat *et al.* (2023) [15] similarly described a higher frequency of left-sided tumors among Pakistani women. Proposed biological explanations include asymmetric systemic or hormonal pressures, though the evidence base remains inconclusive.

Preserved mobility in 77.5% of patients represents a relatively favorable prognostic indicator, potentially allowing conservative surgical options if timely diagnosis is achieved. Conversely, the presence of fixation, even at low frequency, is indicative of locoregional tissue invasion and portends a poor prognosis, as documented by Gedfew *et al.* (2024) [17].

4.5. Breast Cancer Frequency, Histological Profile, and Clinical Outcomes

Among patients admitted for breast complaints, metastatic carcinoma was the most frequent diagnosis (56.41%), followed by inflammatory carcinoma (12.82%) and unspecified forms (12.82%). This distribution reflects systematic diagnostic delay, a pattern consistently documented in sub-Saharan Africa, where the majority of women present at advanced stages. Wendimu *et al.* (2024) [2] confirmed in their meta-analysis that over 60% of patients on the continent reach hospital after the disease has already metastasized.

The virtual absence of early-stage cases in this series points to a dysfunctional or nonexistent screening infrastructure. Urga Workineh *et al.* (2021) [1] and Assefa *et al.* (2021) [4] have similarly underscored the impact of absent mammography programs, infrequent breast self-examination, and the cultural normalization of breast pain in delaying care.

On the therapeutic side, most patients received antibiotics alone (56.41%), only

20.51% underwent surgery, and 23.08% received no treatment. No patient received chemotherapy. This profile starkly illustrates the technical limitations of decentralized health facilities and the inadequacy of referral pathways. Gedfew *et al.* (2024) [17] attributed a substantial fraction of breast cancer mortality in Africa to the absence of structured oncological treatment, including radiotherapy and endocrine therapy, at secondary-level hospitals.

Clinical outcomes were dismal: 92.31% of patients were lost to follow-up following diagnosis, and 7.69% died during the observation period. No confirmed case of cure was recorded. Loss to follow-up of this magnitude may reflect stigmatization, treatment abandonment, unregistered deaths occurring outside the hospital, or inability to sustain care over time.

4.6. Factors Associated with Breast Cancer

Statistical analysis identified several significant associations. Age ≥ 30 years was associated with markedly elevated breast cancer risk ($p < 0.001$), consistent with the global evidence base that identifies age as one of the primary determinants of breast cancer risk, mediated by cumulative hormonal exposure, somatic mutation accumulation, and declining DNA repair capacity. Wendimu *et al.* (2024) [2] reported a peak incidence between ages 35 and 50 years in African countries. The threshold of 30 years observed in this study is lower than that typically reported in Western populations, potentially reflecting distinct genetic profiles and earlier environmental exposures.

Tobacco use was independently associated with breast cancer diagnosis after adjustment for age and reproductive factors (aPR = 2.21; 95% CI 1.34 - 3.65; $p = 0.002$). Although the absolute prevalence of tobacco use in this cohort was low, its carcinogenic effect is well-documented. Xu *et al.* (2023) [12] demonstrated that tobacco-induced oxidative stress activates oncogenic pathways through aberrant post-transcriptional regulation. The slight attenuation of the adjusted relative to the crude estimate is consistent with partial confounding by age, but the association remained robust in the multivariable model.

Advanced age at first pregnancy (≥30 years) remained associated with breast cancer in the adjusted model (aPR = 1.92; 95% CI: 1.21 - 3.04; $p = 0.005$), a finding concordant with Tolessa *et al.* (2021) [3], who noted that delayed first pregnancy prolongs the interval during which breast tissue is exposed to unopposed estrogen stimulation, thereby increasing the probability of neoplastic transformation.

Breastfeeding emerged as an independent factor associated with a substantially lower probability of breast cancer diagnosis (aPR = 0.18; 95% CI: 0.04 - 0.85; $p = 0.004$). This protective association is well-recognized in the literature. Assefa *et al.* (2021) [4] and Wendimu *et al.* (2024) [2] have both shown that lactation reduces the frequency of menstrual cycles, thereby limiting cumulative estrogenic exposure, while also promoting beneficial cellular differentiation in breast tissue. The wide confidence interval reflects the limited number of breastfeeding-exposed women in the cohort and warrants cautious interpretation, but the direction and

magnitude of the association remained stable after adjustment.

Age at menarche between 13 and 18 years was associated with a higher likelihood of breast cancer diagnosis in the adjusted model (aPR = 2.18; 95% CI: 1.02 - 4.66; p = 0.04), with the lower bound of the confidence interval close to unity. This finding is biologically plausible: earlier menarche extends the period of estrogen exposure across the reproductive lifespan, as described by Mihret *et al.* (2021) [8]. The borderline statistical significance and the relatively wide confidence interval call for cautious interpretation pending replication in larger samples.

5. Limitations

Several limitations should be acknowledged. First, the single-center, hospital-based design limits the generalizability of the findings to the broader population of women in Benin: women who never reach a referral hospital because of distance, cost, or sociocultural barriers are not represented, and the associations reported here describe risk factors among women who present with breast complaints rather than population-level risk. Second, the modest sample size (n = 120, with 39 confirmed breast cancers) reduced the precision of effect estimates, as reflected in the wide confidence intervals observed for several variables, particularly breastfeeding and age at menarche. Third, the retrospective extraction from medical records introduced the possibility of information bias and missing data for some variables (notably parity, age at menarche, and contraceptive use), which were addressed by reporting variable-specific denominators but could not be fully eliminated. Fourth, diagnostic confirmation was based on histology in 23 of 39 cases (59.0%); the remaining 16 cases were classified on the basis of concordant clinical and imaging criteria (BI-RADS 4 or 5), which may have introduced some misclassification despite the hierarchical confirmation strategy. Fifth, the multivariable Poisson regression adjusted for the principal a priori confounders (age, tobacco use, age at menarche, age at first pregnancy, and breastfeeding) but residual confounding by unmeasured factors family history of breast cancer, body mass index, hormonal contraception duration, and socioeconomic status cannot be excluded. Sixth, the near-universal loss to follow-up precludes meaningful inference on treatment outcomes and survival. Findings should therefore be interpreted as hypothesis-generating associations within a hospital cohort rather than as causal estimates of breast cancer risk in the general population.

6. Conclusion

This hospital-based study at the Borgou-Alibori Regional University Hospital in Parakou described the sociodemographic, clinical, and therapeutic profile of women presenting with breast complaints and identified factors associated with a breast cancer diagnosis among them. Of 120 included patients, 39 (32.5%) had confirmed breast cancer, predominantly diagnosed at advanced stages. In multivariable analysis, age ≥ 30 years, tobacco use, and delayed first pregnancy were independently associated with a higher probability of breast cancer diagnosis,

while breastfeeding was associated with a substantially lower probability. Loss to follow-up after diagnosis was near-universal, reflecting major gaps in the oncology care pathway.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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