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Mammographic Breast Density and Other Factors Associated with Breast Cancer in the City of Ouagadougou (Burkina Faso)

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Abstract: Objectives: to study the categorization of breast density in mammography and factors associated with breast cancer in women of the city of Ouagadougou. Materials and Methods. It was a descriptive cross-sectional study. The sample consisted of mammography reports. The variables analyzed were socio-demographic, anamnestic and radiological data. Breast density was categorized according to the 5th edition of the American College of Radiology (ACR) Breast Imaging Report And Data System (BIRADS), as well as the results of the mammo ultrasound scans, and then with classification into dense breasts and sparsely dense breasts. We compared two groups (< 40 years and 40 years) based on age, parity, estrogen and mammography results based on breast density. The analyses were carried out using the chi-square test. The significance threshold was $p < 0.05$. Results. One thousand two hundred and thirty-six mammography reports were analyzed out of a total of 1423 mammograms completed during the study period. The average age of patients was 46.7 years with extremes of 20 and 82 years. Breast density was significantly associated with age, parity greater than four, menopause, normal results and benign breast abnormalities. There was no significant association noted between breast density, malignant lesions, and oral contraception. Conclusion. The breasts of women in the city of Ouagadougou were generally sparse. Breast density in mammography was inversely associated with age, parity greater than four, absence of visible abnormalities or presence of benign abnormalities in mammography and breast ultrasound.

Keywords: Breast Density, Mammography, Breast Cancer, Burkina Faso

1. Introduction

Breast density is a radiological concept, used to determine the proportion of glandular fibroid tissue in the breast. It has important diagnostic and therapeutic implications [1]. In mammography, a reference examination for the detection of sub-clinical lesions of breast lesions, it is of dual interest. The higher the breast density, the higher the risk of developing breast cancer. This risk is multiplied by two to six times for women with dense breasts in mammography [2]. This increased risk of developing breast cancer is independent of the effect of other over-risk factors such as age, diet, ethnicity, hormone replacement therapy, family history, history of mastopathy at risk [1]. The higher the breast density, the greater the risk of a breast lesion being ignored. Additional imaging, including ultrasound, is then proposed to increase detection sensitivity [1].

In Burkina Faso, breast canr is the first cancer of women in

terms of incidence and mortality [3]. Organized mass screening for breast cancer does not yet exist; The screening is still done individually. Organized mass screening would reduce the specific mortality and morbidity of treatments such as surgery and radiation [4]. In our context, mammography scans are most often at the patient's expense, due to a lack of effective universal health coverage. Ultrasound, most often used in addition to mammography, incurs additional costs. A screening strategy specifying the imaging modalities to be used, the pace of monitoring and the usefulness of additional examinations is therefore necessary.

Several studies have been conducted to determine the types of breast densities in women and the risk factors associated with breast cancer [2, 5–10].

It was important to define the breast density profile of a population because of its predictive nature of breast cancer occurrence, in association with other risk factors.

Hence the objective of this work, which was to analyze breast density among women in the city of Ouagadougou, in order to adapt breast cancer screening solutions in our context.

2. Methods

2.1. Study Design

This was a retrospective, descriptive cross-sectional study, conducted from January 1, 2012, to January 1, 2022. The study took place in a reference imaging centre in the city of Ouagadougou (Burkina Faso), with two digitized mammograms and three functional ultrasound scanners.

2.2. Study Population

The target population was mammography and breast ultrasound reports. The source population consisted of mammography and breast ultrasound reports from the study period. Reports of unilateral mammography, surgery-treated breasts, radiation, chemotherapy were excluded.

2.3. Data Collection and Analysis

The variables studied were related to:

1. Socio-demographic data: age
2. Gynecological background: hormonal contraception, breastfeeding history, menopause status, parity.
3. Radiological data: categorization of breast density. Breast density was first determined by the 5th classification of the American College of Radiology (ACR) Breast Imaging Report And Data System (BIRADS) into four groups:
   A. (full fat breasts);
   B. (scattered islands of glandular fibrous tissue);
   C. (dense and heterogeneous breasts) and
   D. (dense breasts) (Figure 1).

Second, breast density was classified into two groups: "low-density" breasts with classes A and B and "dense breasts" with classes C and D.

We noted the findings of the mammographic and ultrasound scans, classified according to the 5th edition of BIRADS by:

1. ACR1: no breast abnormalities
2. ACR2: presence of benign abnormalities
3. ACR3: probably benign abnormalities with malignant PPV less than 3%
4. ACR4: suspicious anomalies requiring histological verification
5. ACR5: lesions strongly suggestive of malignancy

We calculated the averages of the quantitative variables. Breast density was studied as a function of age group. We used low-density breasts and dense breasts to compare breast density in women under and over 40 years of age. We compared the appearance of breast density (dense breasts and sparsely dense breasts) with the presence or absence of menopause, oral contraception, parity above or below 4, and the findings of the mammography results. We classified the results as follows:

1) Normal (ACR1)
2) Benign and evocative of benign (ACR2 and ACR3)
3) Suggestive and highly suspect of malignancy (ACR4 and ACR5).

The analyses were carried out using the chi-square test. The 95% confidence interval and significance threshold was 0.05.

2.4. Ethical Consideration

The authorization of the management of the medical center was obtained. Confidentiality of data and anonymity of reports were respected.

3. Results

We collected 1,423 reports during the study period, with 1,236 reports meeting our inclusion criteria, a rate of 86.85%. The average age was 46.73 years with extremes of 20 and 82 years. The modal class was 40-50 years old, which represented 36% of the sample. Figure 2 shows the distribution of patients by age.

The categorization of breast density according to the 5th edition of BIRADS showed a preponderance of classes B and C respectively in 42.29% (n=521) and 36.04% (n=444) of cases (Table 1). When the two-group classification was used, 56.82% of the breasts were "low density", corresponding to classes A+ B and 43.18% to "dense breasts", corresponding to classes C+D.

In subjects under 40 years of age and 40-49 years of age, heterogeneous dense breasts (type C) were represented in 45.8% and 45.4% of cases, respectively. In subjects aged 50-59 and over 60, type B (scattered glandular fibro tissue) was reported in 49.7% and 50.7% of cases. Figure 3 shows the distribution of breast density by the 5th edition of BIRADS by age group.

Dense breasts accounted for 62.4%, 24.8% and 18.9% of women under 40, 50-59 and over 60 respectively. Figure 4 shows the categorization of breast density according to dense and sparsely dense breast classification.

Mammograms were without visible abnormalities in 54.46% of cases (n=671) or with typically benign abnormalities in 29.95% of cases (n=369). Table 2 shows the distribution of

mammography findings by RCA classification.

Women with a parity of four or more represented 75.3% of the sample (n=546). History of breastfeeding was observed in 90.4% of cases (n=571). Patients were menopausal in 56.2% of cases (n=780). Oral contraception was used in 36.2% of cases (n=254).

Breast density was inversely associated with age ($p<10^{-7}$) by comparing groups under 40 and over 40. Low-density breasts were significantly associated with breastfeeding ($p<10^{-5}$), menopause ($p<10^{-7}$), normal results ($p<10^{-5}$) or benign ($p<10^{-5}$). The aspect of breast density was not significantly associated with oral contraception ($p = 0.24$) and the presence of malignant lesions ($p = 0.25$). Analysis of the correlation between breast density and other factors is reported in Table 3.

Table 1. *Distribution of Patient Breast Density by 5th Edition of BIRADS.*

Breast density	n	%
A	179	14.53
B	521	42.29
C	444	36.04
D	88	7.14
Total	1 232	100

Table 2. *Distribution of Mammography Findings.*

ACR Classification	n	%
ACR1	671	54.46
ACR2	369	29.95
ACR3	114	9.25
ACR4	57	4.63
ACR5	21	1.70
Total	1 232	100

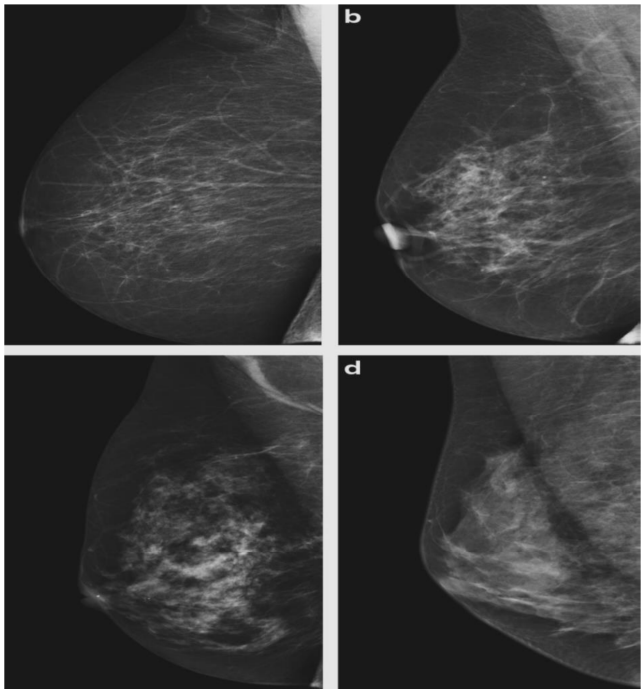

Figure 1. *Breast categorization according to the 5th edition of BIRADS.*

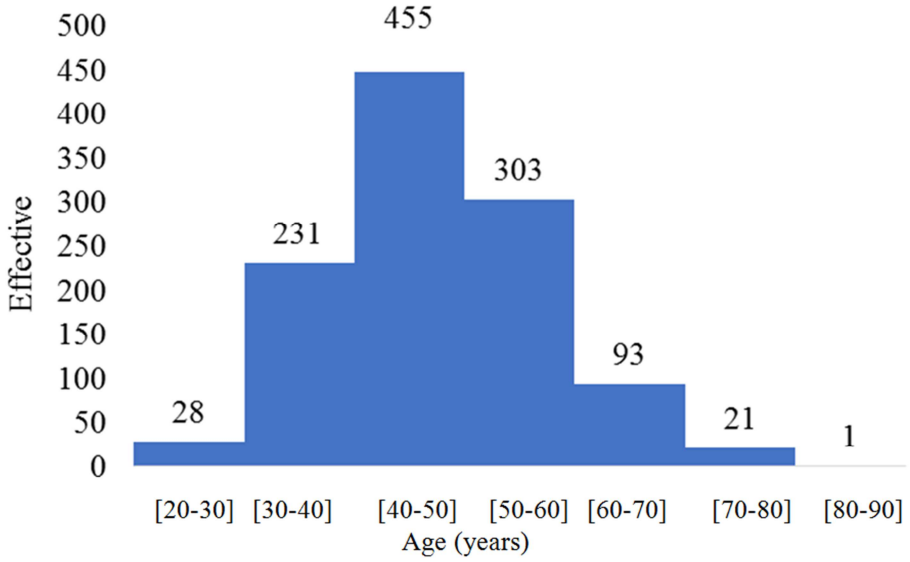

Figure 2. *Age distribution of patients.*

Table 3. *Correlation analysis between breast density and other risk factors.*

Features		SB	DB	OR	IC 95%	p
Average age (N = 1,232)	46.73 years					
Age group (years)						
	≥ 40	549	316	1,78	1.5-2.12	$<10^{-7}$
	< 40	92	167			
Menopause (N = 780)						
	Yes	341	97	2,11		$<10^{-7}$
	Non	126	216			
Breastfeeding (N = 571)						

Features		SB	DB	OR	IC 95%	p
	Yes	328	188	1,7	1.2-2.4	$<10^{-5}$
	Non	20	35			
COD (N = 254)						
	Yes	58	72			0,24
	Non	90	316			
Parity (N = 546)						
	< 4	193	157	0,75	0,66-0,85	$<10^{-5}$
	≥ 4	143	53			
ACR Classification						
	ACR 1	415	256	1,21	1,1-1,34	$<10^{-5}$
	ACR 2.3	238	245	0,79	0,71-0,88	$<10^{-5}$
	ACR 4.5	47	31			0,5

CO: oral contraception
ACR: American College of Radiology
SB: sparse breast
DB: dense breasts
OR: Odd Ratio
CI: confidence interval

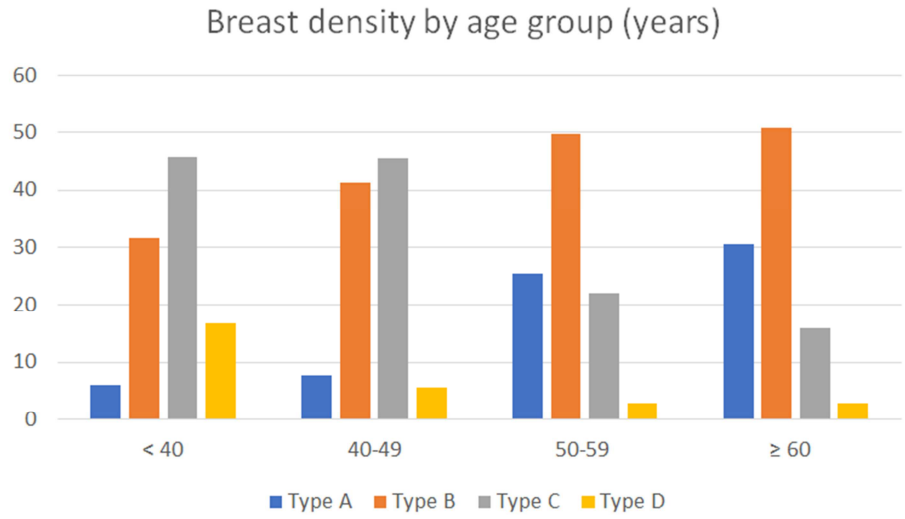

Figure 3. *Distribution of breast density by age group.*

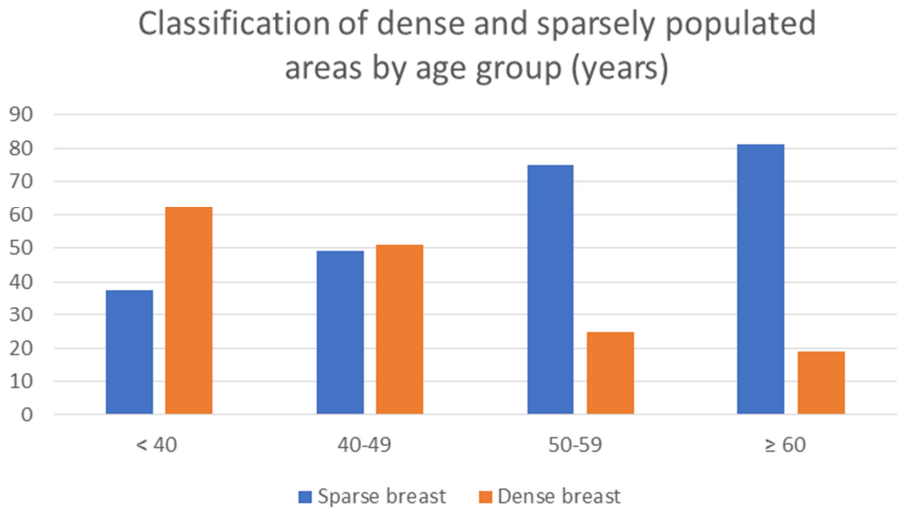

Figure 4. *Distribution of dense and sparsely dense breasts by age group.*

4. Discussion

This study showed that the breasts scanned in mammography were mostly type B and C. Low-density breasts were predominant. Low breast density was significantly correlated with age greater than 40 years, menopause status, history of breastfeeding practice, parity

greater than 4, normal mammographic results and the presence of lesions typically benign or suggestive of benign.

Several studies have shown a preponderance of types B and C in mammography [7, 11]. Before the age of 40, the breasts were dense with a majority of type C. Between the ages of 40 and 50, there were as many dense breasts as few dense breasts. After 50 years, the breasts were sparsely dense with a majority type B and A. Breast density decreased with age. Postmenopausal patients had significantly less dense breasts than postmenopausal women, in agreement with several authors in the literature [5, 7, 12]. There is indeed a breast fat involution that occurs with age, with modifications of the terminal canal lobular unit [9].

There was no statistically significant relationship between dense breasts and the presence of malignant mammographic abnormalities (p =0.5). Some authors have found a positive association between high breast density and the risk of developing malignant breast lesions [5, 14, 15]. Boyd et al [16] estimated that 30% of breast cancers were due to high breast density. Hagay et al [17] reported higher rates of malignant tumours and boundary lesions in dense breasts. However, in most of this work, the malignancy of breast lesions had been histologically proven. While our study was concerned with morphological criteria suggestive of malignancy. The lack of correlation between these two factors in our sample could be explained by a smaller sample of ACR4 and ACR5 patient reports. Adedijba et al [18] found no statistically significant relationship between breast density and the presence of mammographic abnormalities, whether or not they were suggestive of malignancy.

Women who breastfed had low breast density compared to those who did not breastfeed ($p < 10^{-5}$). Breastfeeding is a protective factor for breast cancer [2]. Indeed, differentiation of the mammary epithelium in its final stage of evolution and lengthening of the anovulatory period in breastfeeding women would be protective factors against the occurrence of breast cancer [2, 10].

We did not find a statistically significant relationship between breast density and hormonal contraception (p = 0.24). Hunt et al [19] had noted in a cohort of patients that combined hormonal contraception initially increased breast density at the onset of treatment. But during the follow-up, there was no significant increase in breast density at 7 years of follow-up.

Low-density breasts were associated with parity greater than four. Parity was often inversely proportional to breast density [5, 20, 21]. The deleterious role of nulliparity in breast cancer is well known and the risk of breast cancer in non-nulliparous women is all the lower the higher the parity.

The limitations of our study are related in particular to its monocentric character and the non-exhaustivity of the risk factors associated with cancer. A prospective multicentre study with an analysis of other risk factors associated with breast cancer, would help to better define patient profiles in our context.

5. Conclusion

We remember that the subjects in whom a mammogram was performed had generally low-density breasts, with a majority of type B and C breasts. Breast density was inversely associated with age, parity, normal mammography and benign lesions. These findings need to be integrated into a breast cancer screening strategy tailored to our context.

Mammography could be offered to women, with an ultrasound supplement for young women or women with high breast density. Prospective studies could identify a pace of surveillance of these patients on the one hand and on the other hand to study the influence of other risk factors not explored in this study such as obesity to better understand the breast density profile of the population in Burkina Faso.

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