



## Research article

# Assessment of breast cancer awareness and detection of asymptomatic cases in Ngaoundere, Adamawa region of Cameroon

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## ABSTRACT

**Introduction:** In Cameroon and most African countries, breast cancer (BC) is mainly diagnosed at an advanced stage, leading to worse prognosis and disease consequences. This is partly due to the delayed presentation of patients, which constitutes a significant barrier to the effective management of the disease. The aim of this descriptive, cross-sectional study is to identify the level of awareness of breast cancer and screening practice among women and health professionals in the city of Ngaoundere, Cameroon.

**Methods:** Women and medical personnel were randomly recruited in two health institutions in the Adamawa region, Cameroon: the Ngaoundere Regional Hospital and the Ngaoundere Protestant Hospital. Two different questionnaires were prepared. The first was to collect sociodemographic data and assess participants' awareness of BC and related symptoms. The second was to collect information from the recommended screening methods for early detection of cases, including the frequency of screening practice among women and the daily practice of medical personnel.

**Results:** Out of the women surveyed, 88.05 % have heard of breast cancer, but the majority were unaware of its clinical signs (47.1 %) and the means of treatment (22 %). In the studied population, 66.4 % were aware of the screening, but the practice was very low, as only 1.1 % of women had ever undergone screening by mammography and only 6 % often practiced breast self-examination (BSE). The levels of screening knowledge and practice were significantly associated with the level of education and employment status ( $P = 0.0001$ ). In the group of 94 health personnel surveyed, 68.1 % had no knowledge of breast cancer screening methods, and only 30 % performed breast cancer screening in their daily practice. The practice of BSE during the study allowed a detection of 2 % of screened women with some suspicious clinical signs.

**Conclusion:** This study revealed a lack of knowledge about BC and its screening methods and practice among women and health personnel in Ngaoundere. This lack of knowledge constitutes a significant barrier to early diagnosis of BC. There is a need to raise awareness and provide education and information about BC screening.

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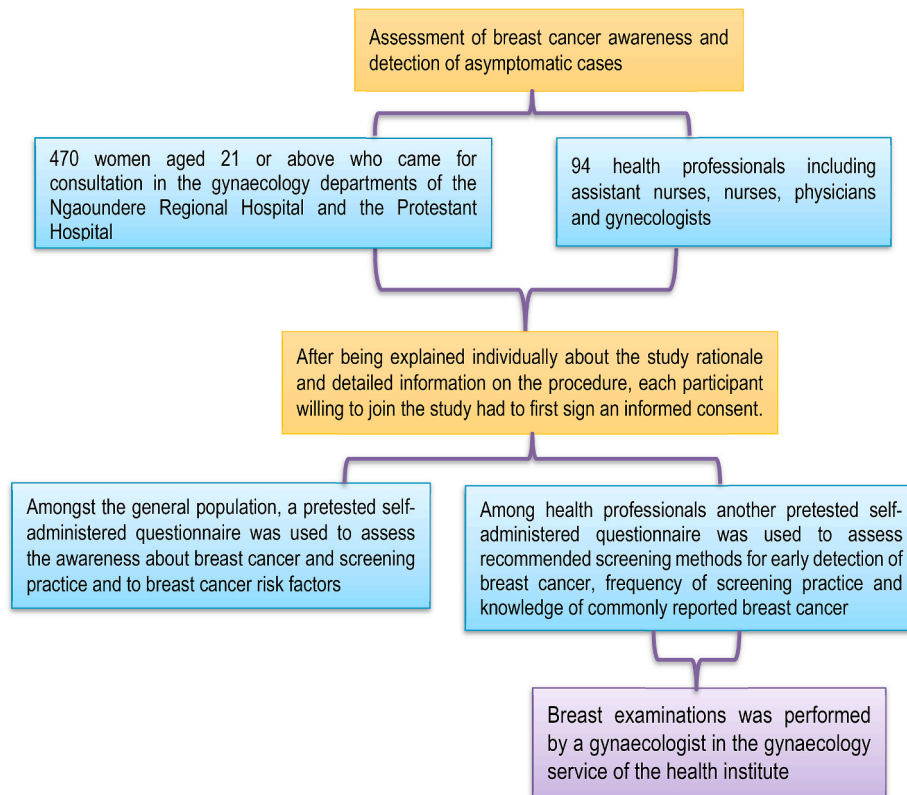
## 1. Introduction

Regardless of the economic status of countries, breast cancer poses a huge burden in terms of prevention, diagnosis, and treatment worldwide [1,2]. Identified as the most common cancer in women and the leading cause of cancer-related deaths in the recent years throughout the world, the situation is becoming more and more disturbing [3–5]. According to GLOBOCAN (2020) and studies on the estimate of cancer incidence and mortality produced by the International Agency for Research on Cancer (IARC), female breast cancer has surpassed lung cancer, becoming the most commonly diagnosed cancer, with an estimated 2.3 million new cases (11.7 %); female breast cancer is now the fourth leading cause of cancer-related deaths, estimated at 6.7 % of overall cancers [6]. In Cameroon, like in most African countries, breast cancer is the most prevalent cancer in women with 4170 new cases and 2108 deaths in 2020. This represents 18 % increase in mortality rate compared to 2018 [3,6].

It has been shown that the diagnosis of breast cancer at an early stage of development can ensure a much effective treatment and less burdensome thus, improving the overall prognosis of the disease [7]. Unfortunately, this is not the case in low and middle-income countries, particularly in sub-Saharan Africa. In Cameroon and many African countries, breast cancer is mostly diagnosed at advanced stages. This leads to a worse prognosis and disease consequences, with a very poor survival rate, most patients dying within 12 or 24 months of diagnosis [1,8–11]. Previous reports have linked the situation to a possible lack of knowledge and awareness about BC screening. Indeed, very few women attend national screening campaigns when organised. There is also misconceptions and false beliefs about the origin and consequences of the disease [2,12]. In addition, the limited infrastructures for mammography screening in the majority of low and middle-income countries constitutes a barrier to early-stage breast cancer diagnosis. Indeed, access to breast cancer screening, examination is still very limited to most Cameroonian women due to the small number of imaging centers in the country and the high examination cost [2,13]. It is therefore urgent to find a reliable and sustainable alternative, accessible for all women and adapted to our socio-economic context. Considering these facts, the present study was carried out to assess the awareness of breast cancer and screening practice among women and health professionals in the city of Ngaoundere, Cameroon.

## 2. Materials and methods

This is a descriptive cross-sectional study that lasted for four months, from September to December 2020.



**Fig. 1.** SPIRIT flow diagram outlining the phases of assessment of breast cancer awareness and detection of asymptomatic cases.

## 2.1. Study population

This study included 470 women aged 21 or above who came for consultation in the gynaecology departments of the Ngaoundere Regional Hospital and the Protestant Hospital in the Adamawa Region of Cameroon, as well as 94 health professionals including assistant nurses, nurses, physicians and gynecologists.

## 2.2. Study procedures

Women previously diagnosed with breast cancer and those undergoing a unilateral or bilateral mastectomy were not included. The questionnaire was initially pretested in the pilot study conducted by Tagne et al. [14]. This was originally prepared in French after an exhaustive literature review, and, subsequently, was translated into the local language, “Ffulde” through a back-and-forth translation process.

Simple random sampling was used to recruit asymptomatic/healthy women in these health facilities. i.e. women who do not yet have visible clinical symptoms of breast cancer. After being explained individually about the study rationale and detailed information on the procedure, each participant willing to join the study had to first sign an informed consent.

Amongst the general population, a pretested self-administered questionnaire was used to assess the awareness about breast cancer and screening practice, breast cancer risk factors, and to collect some sociodemographic data such as age and the educational level of participants. The entire procedure lasted about 1h per participant (Fig. 1).

Breast cancer awareness among health professionals was evaluated using another questionnaire that included questions regarding recommended screening methods for early detection of breast cancer, frequency of screening practice as well as knowledge of commonly reported breast cancer symptoms.

**Table 1**  
Sociodemographic characteristics, and awareness about breast cancer among women.

Variables	N	%
<b>Age (years)</b>		
21–30	279	59.4
31–40	159	33.8
41–50	22	0.04
51–60	6	0.01
>60	4	0.01
<b>Education</b>		
No formal education	15	3.2
Primary school	93	19.8
Secondary school	217	46.2
University	145	30.9
<b>Occupation</b>		
Unemployed	177	37.7
Student	127	27.
Officer	38	8.1
Health-Care provider	54	11.5
Other	74	15.7
<b>Breast cancer awareness</b>		
Heard about breast cancer	414	88.1
<b>Source of information</b>		
Media	209	50.5
Relatives	86	20.8
Hospital	124	30
School	74	17.9
Campaigns	11	2.7
<b>Clinical Symptoms</b>		
None	195	47.1
Lump in the Breast	226	54.6
Pain in the breast	97	23.4
Nipple discharge	45	10.9
The wound on the breast	46	11.1
Changes in the breast shape and appearance	107	25.8
Others (false idea)	19	4.5
<b>Aware treatment existence</b>	285	68.8
<b>Aware of treatment methods</b>		
None	91	22
Surgery	158	38.2
Radiotherapy	2	0.5
Drug therapy	135	32.1
Traditional therapy	8	1.9

### 2.3. Breast examination

Breast examinations were performed by a gynecologist in the gynaecology service of the health institute. The breast of the consenting women was examined in the upright (sitting) and supine positions with the woman's hands behind her head. The breasts were inspected for differences in size, retraction of the skin or nipple, prominent venous patterns, and signs of inflammation. The flat surface of the fingertips was used to palpate the breast tissue against the chest wall. The axillary and supraclavicular areas were checked for adenopathy. A nipple was gently squeezed to check for discharge.

### 2.4. Ethical consideration

All the procedures of the study were approved by the National Committee on Ethics in Human Health Research (CNERSH) of Cameroon, through authorization N° 2020/12/80/CE/CNERSH/SP. Signed informed consent was obtained from each participant at recruitment. Before analysis, the data collected was anonymized to protect the privacy of the participants.

### 2.5. Statistical analysis

Data analysis was performed using XLStat software version 2019. Results were expressed in frequency and percentage for categorical variables. The  $\chi^2$  test was used to compare proportions and correlations were determined between education, occupation, and breast cancer awareness and also between education, occupation, and BC screening awareness and its practice. Statistical significance was set at  $p < 0.05$ .

## 3. Results

### 3.1. Sociodemographic information

Out of 470 women involved in this study, 54 (11.5 %) were health care providers. Table 1 shows the sociodemographic characteristics of participants and their knowledge about BC. The average age was 29.5 years with a minimum age of 21 and a maximum age of 65. Women aged 21 to 30 were most represented (59.4 %), the majority (46.2 %) attended secondary school, and most of them were housewives (37.7 %).

### 3.2. Awareness about breast cancer among women

In terms of participants' knowledge on breast cancer, 88.1 % had heard of it before, and most of them had acquired the information from media (57 %) and health care providers (34.1 %) in hospitals. Almost half (47.1 %) of the women who had heard about breast cancer had no knowledge on the clinical signs of the disease. The lump (54.6 %), changes in the shape and appearance of the breast (25.8 %) and pain (23.4 %) were the most common symptoms listed by the women. According to 68.8 % of the participants, it is

**Table 2**  
Screening methods cited by women and personal frequency of screening practice.

Variables	N	%
<b>Screening method awareness</b>		
None	67	16.2
Clinical Examination	97	23.4
BSE <sup>a</sup>	160	38.6
Mammography	75	18.1
Ultrasound	67	16.9
False ideas	10	2.4
<b>Awareness of BSE</b>		
Heard about BSE	214	51.7
<b>BSE source of information</b>		
Media	69	32.2
Relatives	11	5.1
Hospital	103	48.1
Campaigns	3	1.4
School	37	17.3
<b>Screening practice</b>		
Mammography	3	1.1
BSE	152	55.3
<b>Frequency of BSE practice</b>		
Never	62	29
Sometimes	124	57.9
Often	28	13.1

<sup>a</sup> BSE: breast self-examination.

possible to treat BC and most of them named drug usage (48.1 %) as a therapy method.

Table 2 presents the distribution of participants according to their awareness of BC screening and practice. Out of 414 women who heard about BC, 66.4 % were aware of the possibility of screening. The most known screening method was BSE (51.7 %) followed by Clinical Breast examination (22.7 %). Health care providers in the hospital were the first source of information (48.1 %), followed by the media (31.8 %).

About breast self-examination, the main sources of information were health professionals (48.1 %) in hospitals and the media (32.2 %). Out of 214 women who had heard about breast self-examination, only 13.1 % practiced it regularly, which is only 6 % of the total studied population. 30 % of the 214 women had never practiced it. Out of the total studied population, only 3 of the 71 women who knew about mammography had done it, representing only 0.63 % of the overall studied population.

The women were tested on their awareness on clinical signs/symptoms, treatment and the screening methods. Table 3 shows the association between occupation and educational level of participants and their knowledge regarding BC. Highly educated and employed women were more likely to identify symptoms of breast cancer such as lumps and pain in the breast, changes in breast shape and appearance and nipple discharge, compared to less educated and unemployed ones, with a very significant statistic difference ( $p < 0.0001$ ). However, we noted that among 145 women who attended university, 23 (15.9 %) had no idea about BC's symptoms, 26 (17.9 %) on treatment methods, and 6 (4.13 %) on screening methods. Similarly, occupational status also affected the knowledge of BC among the participants. Employed women were more aware of the disease, its symptoms, treatment and screening methods, compared to unemployed women, with a very significant statistic difference ( $p < 0.0001$ ) (Table 4).

Table 4 illustrates the factors affecting BSE knowledge and practice among the studied participants. BSE was mostly known and performed by women with a higher educational level and those who were employed, with a significant statistic difference ( $p < 0.0001$ ).

Table 5 presents the characteristics and awareness about breast cancer screening and practice among health personnel. The survey revealed that only 31.9 % of medical personnel were aware of breast cancer screening methods. Among these, BSE was the most known (96.7 %), followed by ultrasound (93.3 %) and CBE (70 %). Mammography, which is the reference method, was the least mentioned (60 %) among others. Moreover, the frequency of routine breast cancer screening in their daily practice was poor. It was observed that

**Table 3**  
Association between occupation and educational level of participants and their awareness on BC.

Variables	Occupation					Total	P; df; $\chi^2$	Education level(n)				Total	P; df; $\chi^2$
	O1	O2	O3	O4	O5			E1	E2	E3	E4		
<b>Breast cancer awareness</b>	132	125	37	54	66	414	df = 4; $\chi^2 = 43.880$ p < 0.0001***	7	68	194	145	414	df = 3 $\chi^2 = 64.339$ 0.0001***
<b>Symptoms of BC</b>													
None	113	36	13	2	31	195	<0.0001***	15	69	88	23	195	<0.0001***
Lump in the breast	53	77	16	50	30	226	<0.0001***	0	11	104	111	226	<0.0001***
Pain in the breast	12	48	6	26	5	97	<0.0001***	0	4	36	57	97	<0.0001***
Wound on the breast	4	13	6	19	4	46	<0.0001***	0	3	17	26	46	<0.0004***
Changes in breast shape and appearance	12	39	11	37	8	107	<0.0001***	0	8	37	62	107	<0.0001***
Nipple discharge	7	15	3	18	2	45	<0.0001***	0	3	18	24	45	<0.002**
Other false	4	7	1	1	6	19	0.205	0	5	12	2	19	<0.176
<b>Aware of treatment</b>	72	91	29	46	47	285	<0.0001*** df = 8; $\chi^2 = 58.821$	0	35	133	117	285	df = 6; $\chi^2 = 77.299$ <0.0001***
<b>Treatment Method</b>													
None	35	21	7	3	25	91	0.002**	0	26	39	26	91	0.037
Surgery	26	51	22	36	23	158	<0.0001***	0	12	73	73	158	<0.0001***
Drugs	32	40	15	32	16	135	<0.0001***	0	10	76	49	135	<0.0001***
Radiotherapy	0	1	0	1	0	2	0.384	0	0	0	2	2	0.212
Traditionally	5	1	1	0	1	8	0.505	0	1	4	3	8	0.892
<b>Aware of BC screening</b>	64	96	32	51	32	275	df = 0; $\chi^2 = 101.624$ p < 0.0001***	00	28	120	127	275	df = 6; $\chi^2 = 107.652$ p < 0.0001***
<b>Screening methods</b>													
None	28	12	7	3	17	67	0.018*	0	16	45	06	67	<0.0001***
BSE <sup>a</sup>	23	64	21	40	12	160	<0.0001***	0	4	54	102	160	<0.0001***
CBE <sup>b</sup>	20	43	3	22	9	97	<0.0001***	0	8	39	50	97	<0.0001***
Mammography	5	29	9	32	0	75	<0.0001***	0	1	25	49	75	<0.0001***
Ultrasound	4	29	6	27	1	67	<0.0001***	0	0	21	46	67	<0.0001***
Other, False	4	1	0	0	0	5	0.345	00	4	1	0	5	0.008**

<sup>a</sup> Breast Self-Examination.

<sup>b</sup> Clinical Breast Examination; O1= Housewife; O2=Student; O3 = officer; O4=Health care provider; O5 = other informal sector; E1 = No formal education; E2 = Primary school; E3 = Secondary school; E4 = University; P = p-value; df = degree of freedom;  $\chi^2$  = khi square value (observed); \* = statistical significance; (\*=p<0.05; \*\*p<0.005; \*\*\*<0.0005)

**Table 4**

Association between occupation and educational level of participants and their awareness on BSE and screening practice.

Variables	Occupation(n)					Total	P; df; $\chi^2$	Educational level(n)				Total	P, df, $\chi^2$
	O1	O2	O3	O4	O5			E1	E2	E3	E4		
<b>BSE<sup>a</sup> awareness</b>	50	71	29	48	16	214	df = 4; $\chi^2 = 97.847$ p < 0.0001***	4	9	90	111	214	df = 3 $\chi^2 = 108.059$ <0.0001***
Screening Practice													
Never	13	11	11	8	3	46	df = 16;	4	4	23	15	46	df = 12;
Sometimes	22	44	13	22	5	106	$\chi^2 = 184.739$ p <	0	5	37	64	106	$\chi^2 = 129.004$ p <
Often	1	5	3	18	1	28	0.0001***	0	0	14	14	28	0.0001***

<sup>a</sup> Breast Self-Examination; O1= Housewife; O2=Student; O3 = officer; O4=Health care provider; O5 = other informal sector; E1 = No formal education; E2 = Primary school; E3 = Secondary school; E4 = University; P = p-value; df = degree of freedom;  $\chi^2$  = khi square value (observed); \* = statistical significance; (\* = p < 0.05; \*\*p < 0.005; \*\*\*<0.0005).

**Table 5**

Characteristics, and awareness about breast cancer screening and practice among health personnel.

Variables	N	%
<b>Occupation and Grade</b>		
AMLT <sup>a</sup>	29	30.9
MLT <sup>d</sup>	21	22.3
Assistant Nurses	10	10.6
Nurses	22	22
Physician	9	9.6
Gynecologist	3	3.9
<b>Awareness of BC screening</b>		
No	64	68.1
Yes	30	31.9
<b>Awareness of BC screening methods</b>		
BSE <sup>a</sup>	29	96.7
CBE <sup>b</sup>	21	70
Mammography	18	60
Ultrasound	28	93.3
<b>Systematic BC screening practice on patients</b>		
No	21	70
Yes	9	30

<sup>a</sup> Breast Self-Examination.

<sup>b</sup> Clinical Breast; Examination;<sup>c</sup>AMLT: Assistant Medical Laboratory Technician.

<sup>d</sup> MLT: Medical Laboratory Technician.

the majority (70 %) of those who know the methods do not systematically screen their patients, thus showing that only 30 % effectively do it.

Table 6 reports the association between health professionals' grade/specialization and breast cancer screening awareness. The level of awareness was significantly associated with the specialization (p < 0.0001). Knowledge was good among staff with a high level of responsibility in the gynecology-obstetrics departments (gynecologists, physicians, and nurses), while low or non-existent knowledge was observed among professionals in the laboratory technicians (AMLT, MLT).

Table 7 shows the reasons given by medical staff for not routinely and systematically screening patients for breast cancer in their

**Table 6**

Association between grade/specialization and breast cancer screening awareness.

Variable Grade/Specialization	BC screening awareness		Total	$\chi^2$	p-value
	Yes	No			
Nurse assistant	0	10	10	70.5	<0.0001
AMLT	3	26	29		
MLT	3	18	21		
Nurses	12	10	22		
Physician	9	0	9		
Gynecologist	3	0	3		
Total	30	64	94		

<sup>a</sup> Breast Self-Examination.

<sup>b</sup> Clinical Breast; Examination;<sup>c</sup>AMLT: Assistant Medical Laboratory Technician.

<sup>d</sup>MLT: Medical Laboratory Technician.

daily practice.

Table 8 shows the results of clinical examination of breasts among participants of the study. Out of 470 women who underwent the exam, 10 presented some anomalies. The last was 2 lumps, 1 axillary lymph nodes, 1 change in the breast shape, and 2 changes in breast size.

#### 4. Discussion

Despite significant progress in the laboratory, epidemiological and clinical research, especially for early diagnosis and less toxic treatment, breast cancer incidence continues to rise and is still the first leading cause of cancer-related deaths among women worldwide, with a huge burden in African countries [3,6,15,16]. This study indicates poor knowledge about breast cancer's clinical signs/symptoms, its treatment, screening methods, and screening practice among women in the city of Ngaoundere, despite most of them were young with good education level to listen and understand information on breast cancer from the media and healthcare providers. Indeed, more than 40 % of the women who heard about the disease, had no idea of any clinical symptoms and about 5 % had false ideas such as breast itching as a clinical symptom of BC. This could be related to the fact that another important source of information was their relatives, such as elders, friends, neighbors, and people who have had wrong or incomplete information about the disease in the past, including source of myth-based ideas on BC. Indeed, studies conducted across Africa revealed that BC has often been associated with misfortune, witchcraft, or as a result of divine punishment, supernatural or spiritual problems [8,17]. However, lump in the breast, changes in the shape, appearance of the breast, and pain were the most common symptoms listed by the women as reported in previous studies [13,14,18,19]. In Africa, and particularly in the northern part of Cameroon, people mostly associate the severity of diseases, including breast cancer, with the onset of pain. Consequently, patients usually consult a physician when ulceration appears on the breast or the lumps grow and/or become painful, thus contributing to a late diagnosis of breast cancer. Unfortunately, since these signs usually occur at late stages of the disease, they are associated with a very poor prognosis [14,19–24].

This study also demonstrated that highly educated and employed women were more aware of the clinical symptoms of BC than uneducated and unemployed women ( $p < 0.0001$ ). However, out of 145 women with university degrees, 23 (15.82 %) had no idea about disease symptoms, and 02 (1.37 %) had false ideas on them. This shows the extent to which information from the community is believed without any verification of its veracity and highlights the need to increase efforts in breast cancer education through well-structured programs disseminated through the media and health institutions, as they are the first sources of information on breast cancer, as observed in this study and previous ones conducted in the country [13,14,21]. However, for these programs to attract a large audience and be effective, it would be more appropriate to present them in local languages [14,21]. In addition, training and informing community leaders about breast cancer would help to ensure that this source of information is effectively and efficiently used to reach more people in the community.

A low level of BC screening awareness and routine screening practice was observed among health professionals in this study. This is surprising but could be justified by the high participation of laboratory technicians whose professional training and duties do not include patients' clinical screening. This could be one of the reasons for the late diagnosis, as the time spend for a patient to discover a symptom himself and consult a health professional is often long, in addition to the delay in diagnosis. There is therefore an urgent need to increase awareness among health professionals, including laboratory professionals, on the need and importance of screening for early detection of suspicious signs in patients, thus contributing to a faster diagnosis for a more effective management of the disease [22,25,26].

Other reasons raised by health professionals to justify the low screening practice were the difficulty to convince some women, the workload, and limited financial means and infrastructures.

Many participants indicated it was possible to screen and diagnose BC at an early stage, citing BSE and CSE as screening methods. However, practice is very low and highly associated with educational and employment status ( $p < 0.0001$ ). Out of the 470 women surveyed in this study, only 3 (0.63 %) had ever had a mammogram. This low use of mammography as a screening technique for breast cancer can be explained by the lack of equipment in the health institutions of the city of Ngaoundere, in addition to poverty. Indeed, to benefit from a mammogram, women must afford the travelling cost to referral centers in the country's big cities, in addition to the examination cost which is already high. This makes this examination unaffordable for most women, since many of them are unemployed or have very limited financial incomes. This demonstrates the urgent need to find a reliable and accessible alternative for all women who cannot benefit from regular mammography screening, as well as the urgency to draw the government's attention to the need to provide hospitals with the necessary infrastructures for screening breast cancer. BSE is a screening technique that can fulfill this

**Table 7**

Reasons presented for non-practice of BC screening.

Reasons
Health personnel claimed to lack time for screening
Health personnel claimed that they do not have the required training
Health personnel claimed not being specialized in the domain
Health personnel claimed not having the required equipment for screening
Health personnel claimed that it is difficult to convince patients to do the screening
Health personnel claimed not being motivated
Health personnel said they perform screening only when needed
Health personnel claimed a lack of financial resources from the patients

**Table 8**  
Results of clinical examination.

Clinical aspect of the breast	N	%
Normal breasts	460	97.9
Nodules	2	0.4
Axillary lymph nodes	1	0.2
Pain in the breast	2	0.4
Changes in the breast shape	1	0.2
Change of the breast size	2	0.4

role and would allow women to take their breast health more seriously with lower doubt when visiting a health institution. This will allow cancer cases to be diagnosed as early as possible. The Clinical breast examination performed in this study allowed for the detection of 2 % of women with some clinical signs of breast cancer. Unfortunately, although more than 50 % of our participants had heard of BSE and mentioned it as a screening method, only a small number practiced it regularly and many never performed it, proving that awareness does not always imply practice [13,18,21,26–28]. This is mostly due to a lack of awareness on BC risk factors, signs, and symptoms, the lack of mastery of the BSE technique, the fear of discovering a sign of the disease, considered as a precursor of mastectomy and death, lack of time, among others, as reported by women in this and previous studies across the country and continent [9, 18,21,27,29,30]. These findings highlight the need for increased education on breast cancer risk factors and the importance of breast cancer screening through regular clinical examination and breast mammography or ultrasound, with an emphasis on teaching breast self-examination techniques.

The findings from the current study should be taken into consideration in awareness campaigns about the importance of BSE, especially in the Adamaoua region of Cameroon, where breast cancer is mostly diagnosed at advanced stages. Our data supports that Breast Self-Examination and Clinical Breast Examination could provide reliable and accessible tumor detection for all women, regardless of their financial situation, once the medical staff is trained. It is worth mentioning that the current study has some limitations, including the limited sample size, which may not be adequate to represent entirety the studied region. Some survey responders were also unsure and perplexed about how to undertake BSE.

## 5. Conclusion

This study showed that the low level of knowledge and the poor practice of breast cancer screening are the main causes of the late diagnosis of breast cancer in the city of Ngaoundere, in addition to the lack of infrastructure and low financial incomes. This therefore emphasizes the need to raise awareness and provide education on BSE to public, regardless of the education level. This can be done by introducing for instance, information, education, and communication (IEC)-based approaches to schools and hospitals, as well as advertising in public places using local languages, in addition to classical media. There is also urgency to call on governments' attention to provide hospitals with necessary screening infrastructures for early detection of breast cancer.

## Ethics declaration

Consent/assent was obtained for all individuals. All the procedures of the study were approved by the National Committee on Ethics in Human Health Research (CNERSH) of Cameroon, through authorization N° 2020/12/80/CE/CNERSH/SP.

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## Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to their containing information that could compromise the privacy of research participants.

## CRedit authorship contribution statement

**Tagne Simo Richard:** Writing – review & editing, Writing – original draft, Methodology, Data curation, Conceptualization. **Adèle Patience Nyemb:** Writing – review & editing, Writing – original draft, Investigation. **Erika Myriam Baiguerel:** Writing – review & editing, Writing – original draft, Formal analysis. **Armel Hervé Nwabo Kamdje:** Writing – review & editing, Writing – original draft. **Mohamadou Ahmadou:** Writing – review & editing, Formal analysis. **Charlette Nangue:** Writing – original draft, Methodology, Conceptualization. **Phelix Bruno Telefo:** Writing – original draft, Supervision.



## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## References

- [1] F.Z. Francies, R. Hull, R. Khanyile, et al.Z. Dlamini, Breast cancer in low-middle income countries: abnormality in splicing and lack of targeted treatment options, *Am. J. Cancer Res.* 10 (5) (2020) 1568–1591.
- [2] S.S. Coughlin, et al.D.U. Ekwueme, Breast cancer as a global health concern, *Cancer Epidemiol* 33 (5) (nov 2009) 315–318, <https://doi.org/10.1016/j.canep.2009.10.003>.
- [3] F. Bray, J. Ferlay, I. Soerjomataram, R.L. Siegel, L.A. Torre, A. Jemal, Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries, *CA Cancer J Clin* 68 (6) (nov 2018) 394–424.
- [4] J. Ferlay, I. Soerjomataram, R. Dikshit, S. Eser, C. Mathers, M. Rebelo, et al., Cancer incidence and mortality worldwide: sources, methods and major patterns in GLOBOCAN 2012, *Int J Cancer.* 1 mars 136 (5) (2015) E359–E386.
- [5] L.A. Torre, F. Bray, R.L. Siegel, J. Ferlay, J. Lortet-Tieulent, et al.A. Jemal, Global cancer statistics, 2012, *CA Cancer J Clin.* 1 mars 65 (2) (2015) 87–108, <https://doi.org/10.3322/caac.21262>.
- [6] H. Sung, J. Ferlay, R.L. Siegel, M. Laversanne, I. Soerjomataram, A. Jemal, et al., Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries, *CA Cancer J Clin* 71 (3) (4 mai 2021) 209–249, <https://doi.org/10.3322/caac.21660>.
- [7] A. Ahmad, A. Ahmad, Breast cancer statistics: recent trends, in: *Advances in Experimental Medicine and Biology*, Adv Exp Med Biol, 2019, pp. 1–7, [https://doi.org/10.1007/978-3-030-20301-6\\_1](https://doi.org/10.1007/978-3-030-20301-6_1).
- [8] E. Jedy-Agba, V. McCormack, C. Adebamowo, et al.I. Dos-Santos-Silva, Stage at diagnosis of breast cancer in sub-Saharan Africa: a systematic review and meta-analysis, *déc, Lancet Glob Health* 4 (12) (2016), [https://doi.org/10.1016/S2214-109X\(16\)30259-5](https://doi.org/10.1016/S2214-109X(16)30259-5). e923-3.
- [9] C. Espina, F. McKenzie, et al.I. Dos-Santos-Silva, Delayed presentation and diagnosis of breast cancer in African women: a systematic review, *Ann. Epidemiol.* 27 (10) (oct 2017) 659–671.e7, <https://doi.org/10.1016/j.annepidem.2017.09.007>.
- [10] L. Gutnik, C. Lee, V. Msosa, A. Moses, C. Stanley, S. Mzumara, et al., Clinical breast examination screening by trained laywomen in Malawi integrated with other health services, *J. Surg. Res.* 204 (1) (juill 2016) 61–67, <https://doi.org/10.1016/j.jss.2016.04.017>.
- [11] J.D.K. Ngowa, J.M. Kasia, J. Yomi, A.N. Nana, A. Ngassam, I. Domkam, et al., Breast cancer survival in Cameroon: analysis of a cohort of 404 patients at the yaounde; general hospital, *Adv. Breast Cancer Res.* 4 (2) (2015) 44–52, <https://doi.org/10.4236/abcr.2015.42005>.
- [12] K. Maajani, M. Khodadost, A. Fattahi, et A. Pirouzi, Survival rates of patients with breast cancer in countries in the Eastern Mediterranean Region: a systematic review and meta-analysis, *East Mediterr Health J.* 1 févr 26 (2) (2020) 219–232, <https://doi.org/10.26719/2020.26.2.219>.
- [13] T.S. Richard, L.C.C. Ndongwang, P.F.S. Etet, A.H.K. Nwabo, H. Mohamadou, T.P. Bruno, et al., Breast cancer awareness and detection of asymptomatic cases using breast palpation and fine-needle aspiration in bafoussam, Cameroon, *Asian Pac J Cancer Care.* 15 févr 5 (1) (2020) 61–66, <https://doi.org/10.31557/apjcc.2020.5.1.61-66>.
- [14] R. Tagne Simo, E.M. Baiguereel, A.H. Nwabo Kamdje, P.F. Seke Etet, M. Ahmadou, C. Nangue, et al., Awareness of breast cancer screening among the medical and general population of the north region of Cameroon. Sahgal P, éditeur, *Int. J. Breast Cancer* 27 (2021) 1–7, <https://doi.org/10.1155/2021/6663195>, juill 2021.
- [15] M. Solanki, et al.D. Visscher, Pathology of breast cancer in the last half century, *Hum. Pathol.* 95 (2020) 137–148, <https://doi.org/10.1016/j.humpath.2019.09.007>.
- [16] K.L. Britt, J. Cuzick, et K.A. Phillips, Key steps for effective breast cancer prevention, *Nat. Rev. Cancer* 20 (8) (2020) 417–436, <https://doi.org/10.1038/s41568-020-0266-x>.
- [17] N.A. Ibrahim, et al.M.A. Oludara, Socio-demographic factors and reasons associated with delay in breast cancer presentation: a study in Nigerian women, *Breast Edinb Scotl.* juin 21 (3) (2012) 416–418, <https://doi.org/10.1016/j.breast.2012.02.006>.
- [18] M. Halmata, R. Tagne Simo, G. Nganwa Kembrau, E.M. Baiguereel, L.C.C. Ndongwang, A.H. Nwabo Kamdje, et al., Breast cancer awareness and screening practice amongst health personnel and general population of the littoral region of Cameroon, *Heliyon.* juill 7 (7) (2021) e07534, <https://doi.org/10.1016/j.heliyon.2021.e07534>.
- [19] J. Moodley, L. Cairncross, T. Naiker, et al., Constant, from symptom discovery to treatment - women's pathways to breast cancer care: a cross-sectional study, *BMC Cancer* 18 (1) (2018) 312, <https://doi.org/10.1186/s12885-018-4219-7>, 21 déc.
- [20] M.N. Okobia, C.H. Bunker, F.E. Okonofua, et U. Osime, Knowledge, attitude and practice of Nigerian women towards breast cancer: a cross-sectional study, *World J. Surg. Oncol.* 4 (2006) 1–9, <https://doi.org/10.1186/1477-7819-4-11>.
- [21] E. Kudzawu, F. Agbokey, et al.C.S.K. Ahorlu, A cross sectional study of the knowledge and practice of self-breast examination among market women at the makola shopping mall, accra, Ghana, *Adv. Breast Cancer Res.* 5 (3) (2016) 111–120, <https://doi.org/10.4236/abcr.2016.53013>.
- [22] A. Tesfaw, S. Getachew, A. Addissie, A. Jemal, A. Wienke, L. Taylor, et al., Late-stage diagnosis and associated factors among breast cancer patients in south and southwest Ethiopia: a multicenter study, *Clin. Breast Cancer* 21 (1) (févr 2021), <https://doi.org/10.1016/j.clbc.2020.08.011> e112-9.
- [23] E. Jedy-Agba, V. McCormack, C. Adebamowo, et I. Dos-Santos-Silva, I. Dos-Santos-Silva, Stage at diagnosis of breast cancer in sub-Saharan Africa: a systematic review and meta-analysis, *déc, Lancet Glob Health* 4 (12) (2016), [https://doi.org/10.1016/S2214-109X\(16\)30259-5](https://doi.org/10.1016/S2214-109X(16)30259-5). e923-35.
- [24] F. Agbokey, E. Kudzawu, M. Dzodzomenyo, K.A. Ae-Ngibise, S. Owusu-Agyei, et al.K.P. Asante, Knowledge and health seeking behaviour of breast cancer patients in Ghana, *Int. J. Breast Cancer* 1 (2019) 1–9, <https://doi.org/10.1155/2019/5239840>, avr 2019.
- [25] C.T. Nguéfack, C. N'djeudjui, J.P.N. Engbang, T.N. Nana, G.H. Ekane, et al.P.-M. Tebeu, Knowledge, attitude, and practice on breast cancer among health professionals in douala references hospitals, Cameroon, *J Cancer Educ Off J Am Assoc Cancer Educ.* 13 avr 33 (2) (2018) 457–462, <https://doi.org/10.1007/s13187-016-1158-3>.
- [26] K. Yurdakos, Y.B. Gulhan, D. Unalan, et al.A. Ozturk, Knowledge, attitudes and behaviour of women working in government hospitals regarding breast self examination, *Asian Pac J Cancer Prev APJCP.* 30 août 14 (8) (2013) 4829–4834, <https://doi.org/10.7314/apjcp.2013.14.8.4829>.
- [27] E.M. Baiguereel, R.S. Tagne, A.H.K. Nwabo, C. Nangue, A. Mohamadou, P.F.S. Etet, et al., Breast cancer and its screening awareness in the north region of Cameroon, *J. Cancer Ther.* 12 (7) (2021) 424–436, <https://doi.org/10.4236/jct.2021.127037>.
- [28] M.A.B. Suh, J. Atashili, E.A. Fuh, et al.V.A. Eta, Breast Self-Examination and breast cancer awareness in women in developing countries: a survey of women in Buea, Cameroon, *BMC Res Notes.* 9 déc 5 (1) (2012) 627, <https://doi.org/10.1186/1756-0500-5-627>.
- [29] O.S. Agodirin, I. Aremu, G.A. Rahman, S.A. Olatoke, H.J. Akande, A.S. Oguntola, et al., Prevalence of themes linked to delayed presentation of breast cancer in Africa: a meta-analysis of patient-reported studies, *JCO Glob Oncol* 6 (6) (nov 2020) 731–742.
- [30] F.Y. Fouelifack, R.P. Binyom, A.M. Ofeh, J.H. Fouedjio, et al.R.E. Mbu, Knowledge, attitude and practice of breast self-examination amongst women in two communities of Cameroon, *Open J. Obstet. Gynecol.* 11 (6) (2021) 773–793, <https://doi.org/10.4236/ojog.2021.116072>.