Archives of Public Health

RESEARCH

Open Access

Breast cancer screening uptake and its associated factors among women in Ghana: evidence from the 2022 Demographic and Health Survey

Florence Gyembuzie Wongnaah[1], Richard Gyan Aboagye[2*], Rebecca Peniel Storph[3,4], Abdul-Aziz Seidu[5,6], Qorinah Estiningtyas Sakilah Adnani[6] and Bright Opoku Ahinkorah[7,8]

Abstract

Introduction Early detection of breast cancer enhances the likelihood of effective treatment and prevention, thereby reducing the disease burden. Despite its significance, breast cancer screening services in Ghana are underutilised, with variations across the 16 regions. This study estimated the uptake of breast cancer screening and examined its associated factors in Ghana.

Methods A weighted sample of 15,014 women of reproductive age from the 2022 Ghana Demographic and Health Survey was analysed. A spatial map illustrated regional variations in breast cancer screening uptake. Multilevel binary logistic regression was used to examine factors associated with screening uptake. Adjusted odds ratios (aORs) with 95% confidence intervals (CI) were reported, with statistical significance set at $p < 0.05$.

Results The national prevalence of breast cancer screening was 18.4% [17.2, 19.6], with regional variations. The likelihood of screening increased with age, peaking among women aged 45–49 (aOR = 4.88; 95% CI = 3.58–6.66). Women with secondary (aOR = 1.76; 95% CI = 1.39–2.24) and higher (aOR = 4.25; 95% CI = 3.15–5.75) education, those who were employed (aOR = 1.25; 95% CI = 1.03–1.51), insured (aOR = 1.82; 95% CI = 1.38–2.41), or had recent health facility visits (aOR = 1.53; 95% CI = 1.33–1.77) were more likely to be screened. Media exposure via radio (aOR = 1.21; 95% CI = 1.03–1.42), newspaper (aOR = 1.41; 95% CI = 1.16–1.71), and internet use (aOR = 1.34; 95% CI = 1.14–1.59) increased screening odds, while rural residence (aOR = 0.65; 95% CI = 0.52–0.82) and Islamic affiliation (aOR = 0.77; 95% CI = 0.61–0.98) reduced the odds. Women in Bono East, Oti, Savannah, and Upper West regions were less likely to be screened.

Conclusion The study reveals low participation in breast cancer screening in Ghana, with notable regional disparities. Major factors associated with breast cancer screening included women's age, level of education, wealth index, religious affiliation, employment status, health insurance coverage, recent health facility visits, media exposure, place of residence and region. Culturally and religiously sensitive screening interventions are essential for addressing

*Correspondence:
Richard Gyan Aboagye
aboagyegyan94@gmail.com

Full list of author information is available at the end of the article

regional and religious variations. Expanding Ghana's national health insurance to cover breast cancer screening will enhance access. Awareness campaigns, conducted through both traditional and digital platforms, are crucial for boosting participation.

Keywords Breast cancer screening, Demographic and Health and Survey, Determinants, Ghana

Text box 1. Contributions to the literature

- Our study used empirical data to examine the factors associated with breast cancer screening uptake among women of reproductive age in Ghana.
- Approximately 2 in every 10 women had been screened for breast cancer, indicating low national coverage with substantial variations observed across the regions.
- Factors associated with breast cancer screening included women's age, level of education, wealth index, religious affiliation, employment status, health insurance coverage, recent health facility visits, media exposure, place of residence and region.
- The study offers policy and practical implications for breast cancer screening uptake in Ghana.

Introduction

Breast cancer is the most prevalent cancer among women worldwide [1]. Global data from 2022 shows that approximately 2.3 million women were diagnosed with breast cancer, and there were 670,000 deaths, accounting for 6.9% of all cancer deaths [2]. In low- and middle-income countries, breast cancer is a leading cause of cancer-related mortality in women and is therefore a significant public health concern [3].

In sub-Saharan Africa, breast cancer was the most diagnosed cancer among females in 2020, with an estimated 186,598 cases and 85,787 deaths [4–6]. If left unaddressed, breast cancer incidence in sub-Saharan Africa is projected to double by 2040 due to socio-economic factors, demographic characteristics, and changes in fertility patterns [6]. In Ghana, the situation is no different. The World Health Organization (WHO) - Cancer Country Profile of Ghana 2020 indicates that breast cancer remains the number one cancer among Ghanaian women, with an incidence rate of 20.4% and a high mortality rate of 12.4%, reflecting late diagnosis and limited access to screening and treatment services [7, 8].

Despite the high incidence rate, the survival rate for breast cancer patients remains low, with a 5-year survival estimate of around or below 50% [6]. This indicates that one in two women diagnosed with the disease will die within five years. The poor survival rate can be linked to late diagnosis and insufficient diagnostic equipment [9]. Other factors influencing survival include a limited technical platform, low awareness levels [7], low education, poor standard of living, delays in seeking early treatment due to misconceptions about cancer [10], and various socio-cultural factors [11]. The high prevalence and incidence of breast cancer, coupled with its low survival rate, emphasise the need for public health interventions focused on early detection, prevention, and treatment to improve outcomes [4]. In response, the WHO launched the Global Breast Cancer Initiative (GBCI) in 2021. The GBCI aims to reduce breast cancer incidence by 2.5% each year through collaboration with stakeholders and key strategies such as health promotion, early detection, screening programmes, and timely diagnosis and treatment [12].

Among the various interventions introduced by the WHO, the most common screening methods for breast cancer are breast self-examination (BSE), clinical breast examination (CBE), and mammography [13, 14]. Mammography has been declared the gold standard for early detection in high-income countries, reducing breast cancer mortalities by 20–35% [14]. The WHO recommends population-based mammography screening for women aged 40–75 in well-resourced settings, while CBE is recommended for resource-limited settings [15].

Early detection through breast cancer screening is crucial for effective management and prevention [11]. However, screening services in Ghana are often centralised, costly, and difficult for economically disadvantaged women to access [16]. Low awareness of breast cancer, combined with sociocultural factors such as limited education, beliefs in witchcraft, fatalism, and strong spiritual orientations, further hinder participation in screening programmes [17–19]. Despite government initiatives and public health campaigns, uptake remains low [20]. Understanding the socio-economic, demographic, and cultural factors that influence screening is therefore essential to develop targeted interventions and enhance early detection. Therefore, we examined breast cancer screening uptake and its associated factors in Ghana.

Methods

Data source

This study used the 2022 Ghana Demographic and Health Survey (GDHS). The DHS is an international survey collecting data on health and socioeconomic trends affecting women, men, and children in many countries [21]. Over 350 surveys have been conducted in more than 90 low- and middle-income countries since the DHS's inception [21]. Since the first survey in 1988, Ghana's 2022 DHS is the seventh standard DHS [22]. Respondent data were collected using pretested and validated structured questionnaires [22]. The GDHS employed a cross-sectional design, and respondents were sampled

using a multistage sampling technique. The detailed sampling method has been documented in the literature [23]. A sample of 15,014 women of reproductive age was used. We followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist [24] as a guide in writing this paper.

Variables

Outcome variable

The outcome variable was the uptake of breast cancer screening. The women in the GDHS were asked the question: *Have you ever had a breast cancer screening*? Or *has a doctor or other health professional examined your breast to detect or check for breast cancer*? The responses to these questions were combined to create a binary variable. The response options were 0 = No (indicating no screening or examination), 1 = Yes (indicating at least one instance of screening or examination) [25, 26].

Explanatory variables

A total of fourteen variables, identified in the GDHS and reported in the literature as having significant influence on breast cancer screening, were considered for this study [25–29]. The variables were grouped into individual-level and contextual-level variables. The individual-level variables included women's age, educational level, marital status, religion, employment status, health insurance status, visited health facility in last 12 months, and media exposure (television, radio, newspapers or magazines, and internet usage). On the other hand, household wealth index, place of residence, and region of residence were the contextual-level variables. Table 1 shows the categories of each variable included in the study.

Statistical analyses

All analyses were performed using Stata version 17.0. The uptake of breast cancer screening was summarised using percentages with confidence intervals (CI). The results of the regional variations in breast cancer screening uptake were presented using Stata's spmap command. Next, we performed a cross-tabulation analysis to determine the distribution of breast cancer screening uptake, and the Pearson chi-square test of independence was used to identify significant variables for the regression model. We used the Stata command 'gvselect' to select the best set of variables for the regression model due to the multitude of variables. The best set of variables, based on the lowest Akaike Information Criterion, was selected for inclusion in the regression model. As a result, exposure to watching television and marital status were excluded from the regression analysis.

Next, we employed a four-modelled mixed-effect binary logistic regression analysis to examine the factors associated with breast cancer screening. Model I, an empty model devoid of any explanatory variables, depicts the variance in the uptake of breast cancer screening that is ascribed to the primary sample unit's (PSU) clustering. Model II contained the individual-level variables, whereas Model III had the contextual-level variables. Model IV contained all the explanatory variables that were significant at the chi-square analysis level. Two categories—fixed-effect and random-effect models—were created from the output. The fixed effect results demonstrate the association between the explanatory variables and breast cancer screening. The adjusted odds ratio (aOR) and associated 95% confidence interval (CI) were used to present the results, with statistical significance determined at $p < 0.05$. Conversely, the result of the random effect quantifies the variation in breast cancer screening uptake evident by the intra-class correlation coefficient (ICC). All the analyses were weighted.

Ethical consideration

No ethical clearance was sought for this study since the GDHS dataset is freely available in the public domain. We sought permission from the Monitoring and Evaluation to Assess and Use Results Demographic and Health Surveys (MEASURE DHS) before analysing the dataset for publication.

Results

Regional variations in the uptake of breast cancer screening in Ghana

Across the 16 regions, variations were observed in the prevalence of breast cancer screening. As illustrated in the the spatial map, the regions with the highest prevalence were Eastern, Western, Brong Ahafo, and Greater Accra (Fig. 1).

Bivariate analysis of breast cancer screening among women

Table 1 shows the results of the bivariate analysis of breast cancer screening across various explanatory variables. The national prevalence of breast cancer screening was 18.4% [17.2, 19.6]. The uptake of breast cancer screening was high among women aged 45–49 (23.9%), those with higher educational levels (47.3%), currently married women (22.9%), those who identified as Christians (20.0%), and those who were employed (20.4%). Additionally, breast cancer screening was prevalent among women covered by health insurance (19.3%) and those who had visited a health facility in the past 12 months (23.5%). Regarding media exposure, a higher proportion of women who watched television (20.6%), listened to the radio (20.9%), read newspapers (29.6%), or used the internet (25.7%) reported undergoing breast cancer screening. The uptake of breast cancer screening was higher among women from the richest wealth quintile households

Table 1 Bivariate analysis of breast cancer screening among the women

Variables	Weighted sample	Screened for breast cancer	
	n (%)	% [95% CI] **18.4 [17.2, 19.6]**	*p*-value
Women's age (years)			< 0.001
15–19	2,682 (17.9)	6.9 [5.8, 8.3]	
20–24	2,695 (17.9)	14.9 [13.2, 16.9]	
25–29	2,339 (15.6)	20.1 [18.0, 22.4]	
30–34	2,252 (15.0)	23.6 [21.3, 26.0]	
35–39	2,059 (13.7)	24.5 [21.8, 27.3]	
40–44	1,675 (11.2)	21.1 [18.6, 23.9]	
45–49	1,312 (8.7)	23.9 [20.6, 27.5]	
Level of education			< 0.001
No education	2,411 (16.1)	9.1 [7.6, 10.8]	
Primary	2,071 (13.8)	11.4 [9.4, 13.6]	
Secondary	8,999 (59.9)	17.6 [16.2, 19.0]	
Higher	1,533 (10.2)	47.3 [43.7, 51.0]	
Marital status			< 0.001
Never in union	5,267 (35.1)	13.9 [12.5, 15.5]	
Married	6,008 (40.0)	22.9 [21.1, 24.7]	
Cohabiting	2,197 (14.6)	15.6 [13.5, 18.1]	
Previously married	1,542 (10.3)	20.1 [16.8, 23.9]	< 0.001
Religion			
Christianity	11,531 (76.8)	20.0 [18.6, 21.5]	
Islamic	2,906 (19.4)	14.2 [12.3, 16.4]	
African Traditionalist	277 (1.8)	4.7 [2.4, 9.0]	
No religion or other	300 (2.0)	9.2 [5.5, 15.0]	
Current working status			< 0.001
Not working	3,808 (25.4)	12.4 [10.9, 14.1]	
Working	11,206 (74.6)	20.4 [19.1, 21.8]	
Covered by health insurance			< 0.001
No	1,482 (9.9)	9.7 [7.6, 12.3]	
Yes	13,532 (90.1)	19.3 [18.1, 20.6]	
Visited health facility in last 12 months			< 0.001
No	7,226 (48.1)	12.9 [11.7, 14.2]	
Yes	7,788 (51.9)	23.5 [21.8, 25.2]	
Watch television			< 0.001
No	3,463 (23.1)	10.9 [9.3, 12.6]	
Yes	11,551 (76.9)	20.6 [19.3, 22.1]	
Listen to radio			< 0.001
No	4,993 (33.3)	13.3 [11.9, 14.8]	
Yes	10,021 (66.7)	20.9 [19.5, 22.4]	
Read reading newspaper or magazine			< 0.001
No	13,293 (88.5)	16.9 [15.7, 18.2]	
Yes	1,721 (11.5)	29.6 [26.8, 32.7]	
Use internet			< 0.001
No	8,028 (53.5)	12.0 [10.9, 13.2]	
Yes	6,986 (46.5)	25.7 [23.9, 27.6]	
Wealth index			< 0.001
Poorest	2,447 (16.3)	7.7 [6.4, 9.2]	
Poorer	2,712 (18.1)	11.2 [9.4, 13.3]	
Middle	3,121 (20.8)	15.4 [13.5, 17.5]	
Richer	3,379 (22.5)	19.4 [17.1, 21.8]	
Richest	3,355 (22.3)	33.8 [31.4, 36.3]	
Place of residence			< 0.001

Table 1 (continued)

Variables	Weighted sample	Screened for breast cancer	
	n (%)	% [95% CI] **18.4 [17.2, 19.6]**	*p*-value
Urban	8,557 (57.0)	23.0 [21.3, 24.8]	
Rural	6,457 (43.0)	12.3 [10.9, 13.8]	
Region			< 0.001
Western	955 (6.4)	22.5 [18.5, 27.1]	
Central	1,702 (11.3)	17.8 [14.6, 21.6]	
Greater Accra	2,327 (15.5)	24.4 [20.8, 28.4]	
Volta	713 (4.7)	18.4 [14.6, 22.9]	
Eastern	1,219 (8.1)	22.2 [18.9, 25.9]	
Ashanti	2,928 (19.5)	18.8 [15.4, 22.6]	
Western North	411 (2.7)	13.9 [11.5, 16.8]	
Ahafo	317 (2.1)	17.4 [14.5, 20.9]	
Bono	567 (3.8)	19.1 [14.8, 24.4]	
Bono East	676 (4.5)	13.7 [10.2, 18.2]	
Oti	403 (2.7)	8.6 [6.3, 11.6]	
Northern	1,149 (7.7)	15.4 [11.1, 20.9]	
Savannah	319 (2.1)	6.9 [4.9, 9.7]	
North East	290 (1.9)	17.7 [13.2, 23.3]	
Upper East	640 (4.3)	13.3 [9.8, 17.8]	
Upper West	398 (2.7)	10.0 [7.0, 13.9]	

*P-values obtained from chi-square test

(33.8%), those living in urban areas (23.0%), and women from the Greater Accra region (24.4%).

Factors associated with breast cancer screening among women

Table 2 presents the results of the factors associated with breast cancer screening. The odds of breast cancer screening uptake increase as the age of the women increases, with the highest odds among those aged 45–49 (aOR = 4.88; 95% CI = 3.58, 6.66). Women who belonged to the Islamic religion (aOR = 0.77; 95% CI = 0.61, 0.98) were less likely to undergo breast cancer screening compared to Christian women. Women who had attained secondary (aOR = 1.76; 95% CI = 1.39, 2.24] and higher (aOR = 4.25; 95% CI = 3.15, 5.75) educational levels were more likely to undergo breast cancer screening relative to those with no education. The odds of breast cancer screening uptake were higher among the women who were working compared to those who were not working (aOR = 1.25; 95% CI = 1.03, 1.51). Women covered by health insurance (aOR = 1.82; 95% CI = 1.38, 2.41) and those who visited the health facility in the last 12 months (aOR = 1.53; 95% CI = 1.33, 1.77) had higher odds of breast cancer screening uptake relative to those not covered by insurance and those who did not visit the health facility in last 12 months respectively.

In terms of media access, listening to radio (aOR = 1.21; 95% CI = 1.03, 1.42), reading newspaper or magazine (aOR = 1.41; 95% CI = 1.16, 1.71), and using internet (aOR = 1.34; 95% CI = 1.14, 1.59) were associated with higher odds of breast cancer screening uptake among the women. Regarding wealth index, women living in middle (aOR = 1.36; 95% CI = 1.01, 1.85) and richest (aOR = 1.74; 95% CI = 1.20, 2.51) households were more likely to undertake breast cancer screening compared to those from the poorest households. Compared to women living in urban areas, those living in rural areas had lower odds of being screened for breast cancer (aOR = 0.65; 95% CI = 0.52, 0.82). Women residing in the Bono East (aOR = 0.56; 95%CI = 0.32, 0.99), Oti (aOR = 0.57; 95%CI = 0.33, 0.99), Savannah (aOR = 0.49; 95%CI = 0.28, 0.88), and Upper West (aOR = 0.54; 95%CI = 0.31, 0.96) were less likely to undertake breast cancer screening (Model IV of Table 2).

Discussion

In this study, we assessed the uptake of breast cancer screening and its associated factors in Ghana using nationally representative dataset. The uptake of breast cancer screening was 18.4%. We found a wide variation in the uptake of breast cancer screening across Ghana's regions. The factors identified to be associated with breast cancer screening uptake were mother's age, level of education, occupation, religion, health insurance coverage, visit to health facility, mass media exposure, wealth index, place of residence, and region.

Our study found a relatively low prevalence of breast screening (18.4%), which is still higher than previous studies in sub-Saharan Africa. The low screening rate in Ghana has been attributed in [26] prior research to

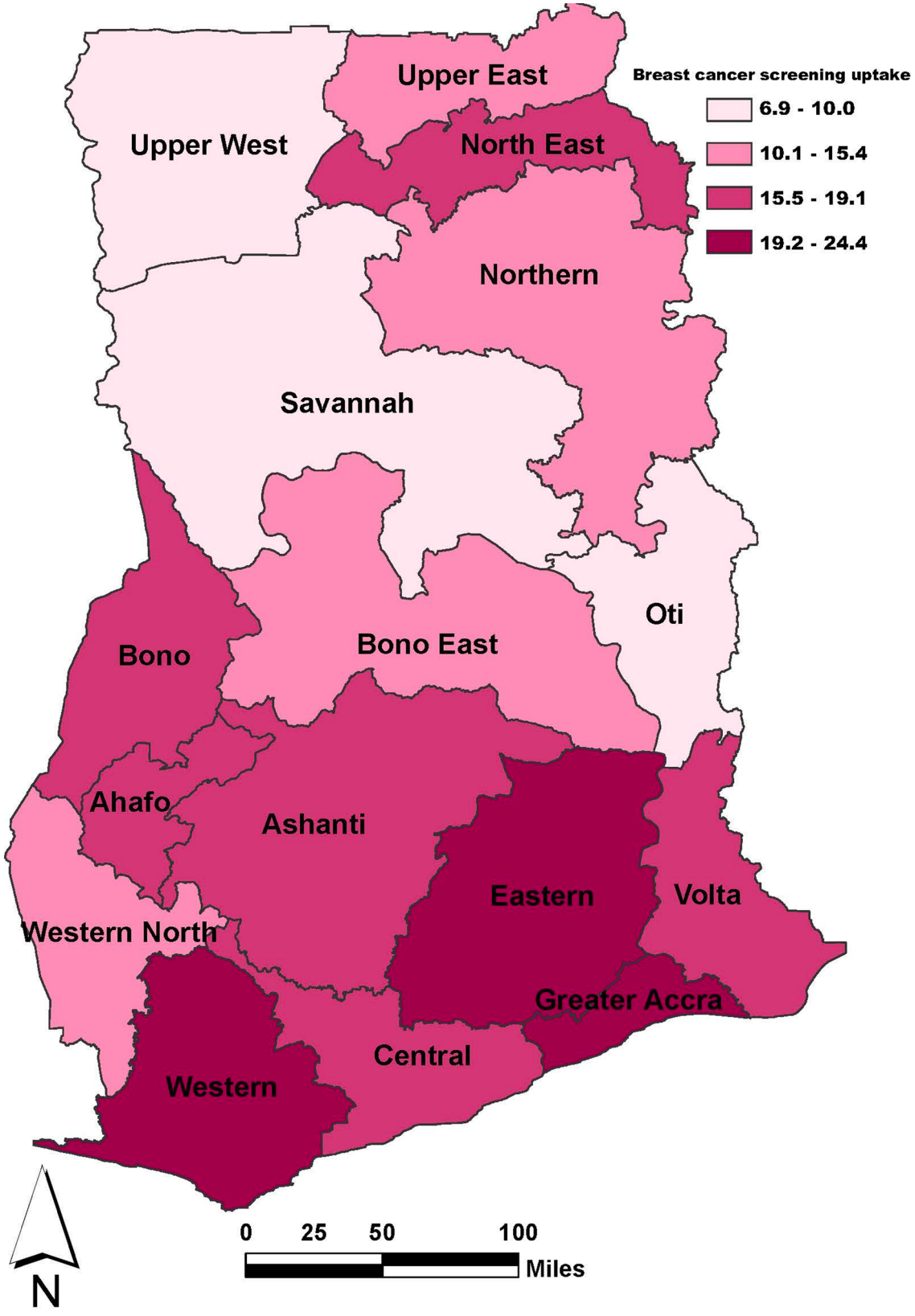

Fig. 1 Spatial distribution of breast cancer screening uptake among women in Ghana, 2022

Table 2 Factors associated with breast cancer screening among women in Ghana

Variables	Model I	Model II aOR [95% CI]	Model III aOR [95% CI]	Model IV aOR [95% CI]
Fixed effect results				
Women's age (years)				
15–19		1.00		1.00
20–24		1.67*** [1.29, 2.16]		1.72*** [1.33, 2.22]
25–29		2.21*** [1.68, 2.89]		2.23*** [1.70, 2.92]
30–34		2.87*** [2.15, 3.84]		2.88*** [2.15, 3.85]
35–39		3.56*** [2.64, 4.78]		3.50*** [2.60, 4.71]
40–44		3.47*** [2.53, 4.77]		3.42*** [2.48, 4.71]
45–49		4.98*** [3.66, 6.79]		4.88*** [3.58, 6.66]
Religion				
Christianity		1.00		1.00
Islamic		0.76* [0.61, 0.96]		0.77* [0.61, 0.98]
African Traditionalist		0.55 [0.24, 1.28]		0.59 [0.26, 1.35]
No religion or other		0.75 [0.36, 1.58]		0.78 [0.37, 1.61]
Level of education				
No education		1.00		1.00
Primary		1.30 [0.97, 1.72]		1.26 [0.94, 1.67]
Secondary		1.86*** [1.48, 2.35]		1.76*** [1.39, 2.24]
Higher		4.91*** [3.69, 6.53]		4.25*** [3.15, 5.75]
Current working status				
Not working		1.00		1.00
Working		1.25* [1.03, 1.52]		1.25* [1.03, 1.51]
Covered by health insurance				
No		1.00		1.00
Yes		1.83*** [1.38, 2.43]		1.82*** [1.38, 2.41]
Visited health facility in last 12 months				
No		1.00		1.00
Yes		1.54*** [1.33, 1.78]		1.53*** [1.33, 1.77]
Listen to radio				
No		1.00		1.00
Yes		1.22* [1.04,1.43]		1.21* [1.03, 1.42]
Read reading newspaper or magazine				
No		1.00		1.00
Yes		1.42*** [1.17, 1.73]		1.41*** [1.16, 1.71]
Use internet				
No		1.00		1.00
Yes		1.43*** [1.22, 1.69]		1.34*** [1.14, 1.59]
Wealth index				
Poorest			1.00	1.00
Poorer			1.36* [1.07, 1.73]	1.19 [0.93, 1.53]
Middle			1.81*** [1.35, 2.43]	1.36* [1.01, 1.85]
Richer			2.08*** [1.53, 2.83]	1.19 [0.86, 1.66]
Richest			4.43*** [3.21, 6.12]	1.74** [1.20, 2.51]
Place of residence				
Urban			1.00	1.00
Rural			0.65*** [0.51, 0.83]	0.65*** [0.52, 0.82]
Region				
Western			1.00	1.00
Central			0.91 [0.60, 1.40]	0.87 [0.58, 1.31]
Greater Accra			0.83 [0.57, 1.23]	0.83 [0.56, 1.23]
Volta			0.85 [0.51, 1.40]	0.75 [0.46, 1.23]
Eastern			1.30 [0.85, 1.98]	1.21 [0.80, 1.84]

Table 2 (continued)

Variables	Model I	Model II aOR [95% CI]	Model III aOR [95% CI]	Model IV aOR [95% CI]
Ashanti			0.73 [0.47, 1.14]	0.66 [0.43, 1.02]
Western North			0.94 [0.61, 1.47]	0.82 [0.53, 1.28]
Ahafo			1.21 [0.73, 2.01]	1.06 [0.65, 1.76]
Bono			0.89 [0.52, 1.51]	0.80 [0.48, 1.35]
Bono East			0.57 [0.32, 1.03]	0.56* [0.32, 0.99]
Oti			0.53* [0.30, 0.92]	0.57* [0.33, 0.99]
Northern			0.65 [0.38, 1.12]	0.84 [0.48, 1.46]
Savannah			0.38*** [0.22, 0.67]	0.49* [0.28, 0.88]
North East			1.16 [0.64, 2.10]	1.55 [0.83, 2.90]
Upper East			0.89 [0.53, 1.48]	0.74 [0.45, 1.22]
Upper West			0.51* [0.29, 0.92]	0.54* [0.31, 0.96]
Random effect model				
PSU variance (95% CI)	1.54 [1.26, 1.86]	1.04 [0.84, 1.29]	0.94 [0.76, 1.16]	0.88 [0.71, 1.09]
ICC	0.32 [0.28, 0.36]	0.24 [0.20, 0.28]	0.22 [0.19, 0.26]	0.21 [0.18, 0.25]
N	15,014	15,014	15,014	15,014
Number of clusters	618	618	618	618

aOR = adjusted odds ratios; CI = Confidence Interval; *$p<0.05$, **$p<0.01$, ***$p<0.001$; 1.00 = Reference category; PSU = Primary Sampling Unit; ICC = Intra-Class Correlation

factors such as lack of infrastructure, absence of comprehensive cancer screening programs and treatment facilities, and shortage of healthcare professionals [25, 30–32]. In a broader study including four countries in sub-Saharan Africa, the breast cancer screening rate was reported at 12.9% [26], and similar disparities were found in other regions worldwide [13, 33, 34]. In our study, we also identified these disparities within different regions of Ghana. The utilisation of screening services is influenced by regional social structures and awareness [35]. Previous research consistently showed a positive correlation between higher median incomes [36], higher levels of education [37, 38], and increased participation in cancer screening. Notably, the southern regions of Ghana, including the Greater, Eastern, and Western regions, have higher screening rates, which aligns with Afoakwah et al. [39]'s claim that poverty and lower educational attainment are more prevalent in the Northern region of Ghana [39]. Vogt et al. [38]'s study further supports this trend by linking improved access to healthcare with higher cancer screening rates [38]. The fact that only 4% of Ghana's communities have physical access to district hospitals [40], coupled with inadequately trained professionals and limited health infrastructure in the northern part of the country [31, 32], could explain the lower rates of breast cancer screening in those areas. Given the increasing incidence of breast cancer and rising mortality rates in sub-Saharan Africa, there is an urgent need for intensified advocacy programs to promote the benefits of breast cancer screening and increase women's participation.

The strong correlation between age groups and breast cancer screening, even after considering other factors, highlights that age is a key independent predictor. Similar to the findings of Ghanbari et al. [41] and Asghari et al. [42], a woman's perceived risk of developing breast cancer tends to grow with age. This heightened perception of risk may encourage women to seek preventive actions, such as regular screenings, self-examinations, clinical breast examinations, and mammography, as supported by earlier studies [43–45]. However, our results differ from previous research, which indicates that breast cancer screening and mammography decline with age [46]. While barriers such as transportation, mobility issues, or financial constraints can hinder older women, public health campaigns aimed at raising breast cancer awareness may assist in reaching women across all age groups. To maximise impact, educational initiatives in Ghana should continue to target women of all ages.

Our study discovered that women with higher levels of education are more likely to be screened for breast cancer compared to those with lower levels of education. This finding reinforces the impact of education on breast cancer screening. This observation is consistent with previous studies conducted in various African countries, including Ghana, which have demonstrated that education plays a crucial role in determining women's utilisation of healthcare services, including maternal healthcare and breast cancer screening [7, 47, 48]. Education can provide individuals with the opportunity to gain knowledge about health-related issues, such as cancer screening, and understand the importance of seeking healthcare. In Ghana, where breast cancer awareness is limited among women [49], initiatives focused on women's education and educational campaigns targeting those with lower educational levels can help bridge the gap

in screening rates and increase awareness about breast cancer.

Contrary to a previous study by Takkar et al. [50], our research shows that living in rural areas decreases the likelihood of being screened for breast cancer compared to urban residents. As expected, rural areas in developing countries such as Ghana often lack social infrastructure, including hospitals and healthcare facilities [31]. Factors such as insufficient staffing, a shortage of trained personnel, limited space, and supply issues contribute to inadequate healthcare delivery in rural Ghana [31, 32]. Consequently, women in rural regions may face additional financial burdens because they need to travel to urban hospitals for cancer screenings [51]. This rural–urban disparity probably explains some regional differences observed in our study, with regions having larger rural populations (e.g., Upper East, Upper West, Savannah, and Oti regions) showing lower screening uptake compared to more urbanised regions (e.g., Greater Accra, Western, and Eastern regions).

Furthermore, our research revealed that living in specific regions such as Bono East, Oti, Savannah, and Upper West was negatively associated with women's uptake of breast cancer screenings. These findings align with previous studies that highlight limited access to maternal healthcare in the Northern and Oti regions of Ghana [52]. Therefore, we argue that various factors in these regions hinder women's access to healthcare. Notably, the Northern part of Ghana has a predominantly Muslim population. A review of existing literature by Tackett and colleagues concluded that Muslim women may not disclose embarrassing or devaluing information due to their commitment to modesty [53]. Additionally, a study conducted in Northern Ghana indicated that religious obligations, such as avoiding bodily exposure and receiving care only from female providers, may disadvantage Muslim women in accessing healthcare [54]. These sociocultural factors could explain the lower rates of breast cancer screening among Muslims in Ghana's northern regions. Previous studies have also documented instances of discrimination faced by Muslim women during visits to health facilities, including issues related to Muslim clothing, offensive remarks, and prayer rituals [55]. Taking into account these religious constraints, it is likely that geographical barriers and limited access to advanced healthcare services such as mammograms contribute to the low rates of breast cancer screening observed among women in the Northern part of Ghana [40]. Moreover, the findings of several studies in developing countries [13, 25, 41, 56] support our findings that health insurance coverage is associated with clinical breast screening. This is likely because health insurance helps women access preventive and diagnostic healthcare services without financial or logistical obstacles. Many developing countries, particularly in sub-Saharan Africa, lack the resources to implement and sustain screening interventions due to the financial burden [57]. In Ghana, for example, the high cost of screening may prevent women from undergoing regular breast cancer screenings [58]. However, if breast cancer screenings are included in the national health insurance program [59], they will have access to these services. Evidence shows that the cost of breast cancer screening using mammography is high in Ghana [60] and incorporating mammography services into the Ghana National Health Insurance Scheme would increase screening rates among women.

Another important factor we found is that women who are exposed to media, such as radio and newspapers/magazines, are more likely to utilise breast cancer screening services. This aligns with previous studies in Lesotho [13] and other low and middle-income countries [29], which have also reported a connection between media use and the utilisation of breast cancer screening services. Exposure to media increases awareness and significantly improves screening rates by providing readily available information about healthcare services, including breast cancer screening locations, procedures, and guidelines. Furthermore, social media has been found to be an effective tool for educating women about the benefits of breast self-examination and screening [33]. Consequently, conventional media, especially social media, newspapers, magazines, and radio, should be utilised to disseminate information about breast cancer and screening in Ghana.

Additionally, our study revealed that women who visited healthcare facilities in the twelve months prior to the study were more likely to utilise breast cancer screening services, which is consistent with previous research [13]. This could be attributed to the fact that regular visits to healthcare facilities are associated with better access to healthcare. Women who use healthcare facilities are more likely to establish relationships with their healthcare providers, making it easier for them to obtain information on reproductive health and diagnostic procedures such as breast cancer screenings.

Strengths and limitations

A key strength of this study is its use of nationally representative data from the GDHS, collected through rigorous sampling and standardised protocols. The large sample size and inclusion of detailed socio-demographic and geographic variables enable reliable estimates and meaningful analysis of disparities in breast cancer screening, making the findings valuable for evidence-based policy and interventions in Ghana. The study has some limitations. First, the data is limited to women of reproductive age (15–49 years), so the findings cannot be generalised to the entire female population, even though the

risk of breast cancer extends beyond that age range. Second, the use of a cross-sectional design in the DHS limits the ability to establish causality between breast cancer screening and associated factors. Additionally, the survey may have been influenced by social desirability bias, particularly among adolescents (15–19 years), who made up 17.9% of the study population. Although the extent of its impact on our results could not be quantified, this potential bias should be taken into account when interpreting the findings. Given the sensitive nature of the topic, respondents may have felt compelled to overstate their adherence to recommended screening practices to fit in or be viewed positively by their social circles. This could affect the interpretation of associated factors and the overall study outcome. Furthermore, using secondary data means that potential confounding factors, such as perceived risk level for breast cancer, were not considered in this study. This type of bias could impact the interpretation of associated factors and the study's results. Lastly, since the data were self-reported, recall bias is a possibility. Respondents may not accurately recall past events or experiences, leading to under- or over-reporting of variables.

Conclusions and recommendations

Our study emphasises the factors affecting breast cancer screening in Ghana, including regional disparities and individual and contextual influences. Presently, the prevalence of breast cancer screening in Ghana remains suboptimal. Age has been identified as a key independent predictor, highlighting the importance of targeted educational programmes for women across all reproductive age groups. Married women exhibited higher screening rates, likely due to shared health-conscious lifestyles. A woman's level of education significantly impacts her participation in breast cancer screening, emphasising the need to enhance women's socioeconomic status in Ghana. Although our analysis was not stratified by region, the rural–urban differences in uptake suggest that increasing accessible and affordable breast cancer screening facilities in rural communities nationwide could help reduce geographical inequalities. It is also crucial to offer breast cancer screening services that are culturally and religiously sensitive, considering regional and religious variations. Moreover, the government should broaden the coverage of national health insurance in Ghana to include breast cancer screenings, making them more affordable for women who face financial barriers. Traditional and social media channels can be utilised to raise awareness about breast cancer and disseminate information regarding screening.

Abbreviations

aOR	Adjusted odds ratio
BSE	Breast self-examination
CBE	Clinical breast examination
CI	Confidence interval
DHS	Demographic and Health Survey
GBCI	Global Breast Cancer Initiative
GDHS	Ghana Demographic and Health Survey
ICC	Intra-cluster correlation coefficient
MEASURE DHS	Monitoring and Evaluation to Assess and Use Results Demographic and Health Surveys
PSU	Primary sampling unit
STROBE	Strengthening the Reporting of Observational Studies in Epidemiology
WHO	World Health Organization

Acknowledgements

The authors are grateful to MEASURE DHS for making the dataset available to use.

Author contributions

RGA and BOA conceived the study. FGW, RGA, and BOA wrote the methods section and performed the data analysis. FGW, RPS, RGA, AS, QESA, and BOA were responsible for the initial draft of the manuscript. All the authors reviewed and approved the final version of the manuscript.

Funding

The study received no funding.

Data availability

The dataset used can be accessed via the MEASURE DHS repository https://dhsprogram.com/data/dataset/Ghana_Standard-DHS_2022.cfm?flag=1.

Declarations

Ethics approval and consent to participate

No ethical clearance was sought for this study since we analysed a secondary dataset publicly available for its usage. Before the GDHS, ICF International sought ethical approval.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

[1]Department of Global Public Health, Karolinska Institutet, Stockholm, Sweden
[2]Department of Family and Community Health, Fred N. Binka School of Public Health, University of Health and Allied Sciences, Hohoe, Ghana
[3]Department of Medical Laboratory Science, School of Allied Health Sciences, College of Health and Allied Sciences, University of Cape Coast, Cape Coast, Ghana
[4]Laboratory Department, Cape Coast Teaching Hospital, Cape Coast, Ghana
[5]College of Public Health, Medical and Veterinary Sciences, James Cook University, Townsville, QLD 4811, Australia
[6]Department of Public Health, Faculty of Medicine, Universitas Padjadjaran, Bandung, West Java, Indonesia
[7]REMS Consultancy Services, Takoradi, Western Region, Ghana
[8]School of Clinical Medicine, University of New South Wales Sydney, Sydney, Australia

Received: 10 May 2025 / Accepted: 26 September 2025
Published online: 30 October 2025

References

1. Centers for Disease Control and Prevention. Breast cancer - What is breast cancer?. 2023. [cited January 24, 2024] Available at https://www.cdc.gov/cancer/breast/basic_info/what-is-breast-cancer.htm

2. World Health Organization. Breast cancer. 2025. World Health Organisation. [cited August 13, 2025] Available at https://www.who.int/news-room/fact-sheets/detail/breast-cancer
3. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, Bray F. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. Cancer J Clin. 2021;71(3):209–49.
4. Addo IY, Acquah E, Ayebeng C, Dickson KS. Influence of distance to health facilities on clinical breast cancer screening behaviour among women in five sub-Saharan African countries. BMC Public Health. 2023;23(1):915. https://doi.org/10.1186/s12889-023-15782-w.
5. Sharma R, Nanda M, Fronterre C, Sewagudde P, Ssentongo AE, Yenney K, Arhin ND, Oh J, Amponsah-Manu F, Ssentongo P. Mapping cancer in africa: a comprehensive and comparable characterization of 34 cancer types using estimates from GLOBOCAN 2020. Front Public Health. 2022;10:744.
6. International Agency for Research on Cancer. Breast Cancer Outcomes in Sub-Saharan. Africa-The need to tackle advanced stage at diagnosis and improve access to high-quality treatment. 2021. Retrieved from https://www.iarc.who.int/wp-content/uploads/2021/03/IARC_Evidence_Summary_Brief_1.pdf
7. Afaya A, Seidu AA, Sang S, Yakong VN, Afaya RA, Shin J, Ahinkorah BO. Mapping evidence on knowledge of breast cancer screening and its uptake among women in ghana: a scoping review. BMC Health Serv Res. 2022;22(1):526. https://doi.org/10.1186/s12913-022-07775-z.
8. World Health Organization. Cancer Country Profile Ghana: Burden of Cancer 2020. World Health Organisation. 2020.
9. Olaogun JG, Omotayo JA, Ige JT, Omonisi AE, Akute OO, Aduayi OS. Socio-demographic, pattern of presentation and management outcome of breast cancer in a semi-urban tertiary health institution. Pan Afr Med J. 2020;36(1).
10. Shirazu I, Mumuni AN, Mensah YB, Sackey TA, Hasford F, Awua AK, Manson EN. Breast cancer screening awareness among women of reproductive age in Ghana. https://doi.org/10.21203/rs.3.rs-2507704/v1
11. Kinteh B, Kinteh SL, Jammeh A, Touray E, Barrow A. Breast cancer screening: Knowledge, Attitudes, and practices among female university students in the Gambia. Biomed Res Int. 2023;2023. https://doi.org/10.1155/2023/9239431.
12. Global Breast Cancer Initiative. The Global Breast Cancer Initiative: Empowering women, building capacity, providing care for all. 2021. Available from https://www.who.int/initiatives/global-breast-cancer-initiative
13. Afaya A, Laari TT, Seidu AA, Afaya RA, Daniels-Donkor SS, Yakong VN, Ahinkorah BO. Factors associated with the uptake of clinical breast examination among women of reproductive age in lesotho: analysis of a National survey. BMC Cancer. 2023;23(1):114. https://doi.org/10.1186/s12885-023-10566-2.
14. Elmore JG, Armstrong K, Lehman CD, Fletcher SW. Screening for breast cancer. JAMA. 2005;293(10):1245–56.
15. World Health Organization. WHO position paper on mammography screening. World Health Organ. 2014.
16. Sanyang O, Lopez-Verdugo F, Mali M, Moustafa M, Nellermoe J, Sorensen J, Bittaye M, Njie R, Singhateh Y, Sambou NA, Goldsmith A. Geospatial analysis and impact of targeted development of breast cancer care in the gambia: a cross-sectional study. BMC Health Serv Res. 2021;21:1–2.
17. Bona LG, Kereba AT, Negera DG. Breast self-examination and health seeking behavior of women in Leku Town, Sidama Region, Southern Ethiopia. Biomedical J Sci Tech Res. 2021;36(5):28860–7.
18. McKenzie F, Zietsman A, Galukande M, Anele A, Adisa C, Parham G, Pinder L, dos Santos Silva I, McCormack V. Breast cancer awareness in the sub-Saharan African ABC-DO cohort: African breast Cancer—Disparities in outcomes study. Cancer Causes Control. 2018;29:721–30.
19. Westerlund D. African indigenous religions and disease causation: From spiritual beings to living humans. 2006. African Indigenous Religions and Disease Causation. edn.
20. O'Mahony M, Comber H, Fitzgerald T, Corrigan MA, Fitzgerald E, Grunfeld EA, Flynn MG, Hegarty J. Interventions for raising breast cancer awareness in women. Cochrane Database Syst Rev. 2017;2(2):CD011396. Available from: https://doi.org/10.1002/14651858CD011396.pub2. PMID: 28185268; PMCID: PMC6464597.
21. Croft TN, Marshall AMJ, Allen CK. Guide to DHS Statistics, DHS-7. Maryland, USA: ICF;. Rockville 2018. https://dhsprogram.com/pubs/pdf/DHSG1/Guide_to_DHS_Statistics_DHS-7.pdf.
22. Ghana Statistical Service (GSS), ICF. Ghana demographic and health survey 2022. Accra, Ghana, and Rockville. Maryland, USA: GSS and ICF 2024.
23. ICF International. Demographic and health survey sampling and household listing manual. Maryland, U.S.A.: ICF International.: MEASURE DHS, Calverton 2012.
24. Von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP, Initiative S. The strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. Int J Surg. 2014;12(12):1495–9.
25. Antabe R, Kansanga M, Sano Y, Kyeremeh E, Galaa Y. Utilization of breast cancer screening in kenya: what are the determinants? BMC Health Serv Res. 2020;20(1):1–9.
26. Ba DM, Ssentongo P, Agbese E, Yang Y, Cisse R, Diakite B, Traore CB, Kamate B, Kassogue Y, Dolo G, Dembele E. Prevalence and determinants of breast cancer screening in four sub-Saharan African countries: a population-based study. BMJ Open. 2020;10(10).
27. Sriplung H, Viroj Tangcharoensathien MD. Breast cancer screening among women in thailand: analyses of population-based household surveys. J Med Assoc Thai. 2014;97(11):1106–8.
28. Negi J, Nambiar D. Intersectional social-economic inequalities in breast cancer screening in india: analysis of the National family health survey. BMC Women's Health. 2021;21:1–9.
29. Mahumud RA, Alam K, Keramat SA, Renzaho AM, Hossain MG, Haque R, Ormsby GM, Dunn J, Gow J. Wealth stratified inequalities in service utilisation of breast cancer screening across the geographical regions: a pooled decomposition analysis. Archives Public Health. 2020;78:1–2.
30. Denny L, Anorlu R. Cervical cancer in Africa. Cancer Epidemiol Biomarkers Prev. 2012;21(9):1434–8.
31. Osadolor OO, Osadolor AJ, Osadolor OO, Enabulele E, Akaji EA, Odiowaya DE. Access to health services and health inequalities in remote and rural areas. Janaki Med Coll J Med Sci. 2022;10(2):70–4.
32. Asamani JA, Chebere MM, Barton PM, D'almeida SA, Odame EA, Oppong R. Forecast of healthcare facilities and health workforce requirements for the public sector in ghana, 2016–2026. Int J Heal Policy Manag. 2018;7(11):1040–52.
33. Osei-Afriyie S, Addae AK, Oppong S, Amu H, Ampofo E, Osei E. Breast cancer awareness, risk factors and screening practices among future health professionals in Ghana: A cross-sectional study. PLoS One. 2021;16(6 June):1–17. Available from: https://doi.org/10.1371/journal.pone.0253373
34. Rabiei Maryam HH, Seyyed K, Shiva S, Elham. and SE. Factors related to clinical breast examination: A cross-sectional study. J Fam Med Prim care. 2022; Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9480697/
35. Andersen RM. Revisiting the behavioral model and access to medical care: does it matter? J Health Soc Behav. 1995;36 (1):1–10. Available from: https://www.jstor.org/stable/2137284?origin=crossref
36. Vallée J, Cadot E, Grillo F, Parizot I, Chauvin P. The combined effects of activity space and neighbourhood of residence on participation in preventive health-care activities: the case of cervical screening in the Paris metropolitan area (France). Heal Place. 2010;16(5):838–52.
37. Coughlin SS, Leadbetter S, Richards T, Sabatino SA. Contextual analysis of breast and cervical cancer screening and factors associated with health care access among united States women, 2002. Soc Sci Med. 2008;66(2):260–75.
38. Vogt V, Siegel M, Sundmacher L. Examining regional variation in the use of cancer screening in Germany. Soc Sci Med. 2014;110:74–80. Available from: https://doi.org/10.1016/j.socscimed.2014.03.033
39. Afoakwah C, Deng X, Onur I. Reforms and education inequality in Ghana. Rev Dev Econ. 2023;27(2):853–78.
40. Agbenyo F, Marshall Nunbogu A, Dongzagla A. Accessibility mapping of health facilities in rural Ghana. J Transp Heal. 2017;6(April):73–83. Available from: https://doi.org/10.1016/j.jth.2017.04.010
41. Ghanbari A, Rahmatpour P, Hosseini N, Khalili M. Social determinants of breast cancer screening among married women: A cross-sectional study. J Res Health Sci. 2020;20(1):e00467–e00467. Available from: https://doi.org/10.34172/jrhs.2020.02
42. Asghari E, Nahamin M, Khoshtarash M, Ghanbari A, Parizad N, Mahdavi N, Asgarlo Z. The relationship between health belief and breast self-examination among Iranian university students. Int J Wom Health Reprod Sci. 2016;4(3):110–3.
43. Dourado F, Carreira H, Lunet N. Mammography use for breast cancer screening in portugal: results from the 2005/2006 National health survey. Eur J Public Health. 2013;23(3):386–92.
44. Eisinger F, Blay JY, Morère JF, Rixe O, Calazel-Benque A, Cals L, et al. Cancer screening in france: subjects' and physicians' attitudes. Cancer Causes Control. 2008;19(4):431–4.

45. Karimi SE, Rafiey H, Sajjadi H, Nejad FN. Identifying the social determinants of breast health behavior: A qualitative content analysis. Asian Pac J Cancer Prev. 2018;19(7):1867–77.
46. Taymoori P, Farhadifar F, Berry T. Predicting mammography stage of adoption among Iranian women. J Educ Health Promot. 2012;1(1):13.
47. Agyemang S, Asibey BO. Effect Of Education On Health Care Utilization In Rural Ghana: The Case Of Selected Communities In The Bekwai Municipality. KNUST J Geogr Dev. 2018;2(1):114–27. Available from: https://www.researchgate.net/publication/327023818
48. Mahumud RA, Gow J, Keramat SA, March S, Dunn J, Alam K, et al. Distribution and predictors associated with the use of breast cancer screening services among women in 14 low-resource countries. BMC Public Health. 2020;20(1):1–15.
49. Iddrisu M, Aziato L, Ohene LA. Socioeconomic impact of breast cancer on young women in ghana: A qualitative study. Nurs Open. 2021;8(1):29–38.
50. Takkar N, Kochhar S, Garg P, Pandey A, Dalal U, Handa U. Screening methods(clinical breast examination and mammography) to detect breast cancer in women aged 40–49 years. J Midlife Health. 2017;8(1):2–10.
51. Atuoye KN, Dixon J, Rishworth A, Galaa SZ, Boamah SA, Luginaah I. Can she make it? Transportation barriers to accessing maternal and child health care services in rural Ghana. BMC Health Serv Res. 2015;15(1):1–10. Available from: https://doi.org/10.1186/s12913-015-1005-y
52. Seidu AA, Darteh EKM, Agbaglo E, Dadzie LK, Ahinkorah BO, Ameyaw EK, et al. Barriers to accessing healthcare among women in ghana: a multilevel modelling. BMC Public Health. 2020;20(1):1–12.
53. Tackett S, Young JH, Putman S, Wiener C, Deruggiero K, Bayram JD. Barriers to healthcare among Muslim women: A narrative review of the literature. Womens Stud Int Forum. 2018;69(February):190–4. Available from: https://doi.org/10.1016/j.wsif.2018.02.009
54. Ganle JK. Why Muslim women in Northern Ghana do not use skilled maternal healthcare services at health facilities: A qualitative study. BMC Int Health Hum Rights. 2015;15:10. Available at https://doi.org/10.1186/s12914-015-0048-9class=oxedel_1id=oxe_del_1_1759139283196_8211257781619445user=RichardGyanAboagye
55. Martin MB. Perceived discrimination of Muslims in health care. J Muslim Ment Health. 2015;9(2):41–69.
56. Nuche-Berenguer B, Sakellariou D. Socioeconomic determinants of cancer screening utilisation in Latin america: A systematic review. PLoS ONE. 2019;14(11):1–18.
57. Black E, Richmond R. Improving early detection of breast cancer in sub-Saharan africa: why mammography May not be the way forward. Global Health. 2019;15(1):1–11.
58. Camillus B, Nyinaku P, Mingle D, Adiasani C. I want to live for them'; determinants of uptake of clinical breast examination: A qualitative inquiry. Rwanda J Med Heal Sci. 2022;5(1):85–98.
59. Castaldi M, Smiley A, Kechejian K, Butler J, Latifi R. Disparate access to breast cancer screening and treatment. BMC Women's Health. 2022;22(1):1–10. Available from: https://doi.org/10.1186/s12905-022-01793-z
60. Opoku SY, Benwell M, Yarney J. Knowledge, attitudes, beliefs, behaviour and breast cancer screening practices in Ghana, West Africa. Pan Afr Med J. 2012;11:28.

Publisher's note