

# Breast Cancer Knowledge Among University Female Students in Jordan: A cross-sectional study

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## Abstract

Breast cancer (BC) is common among younger Jordanian women. Early detection prolongs survival rate. This study investigated the degree of knowledge of Jordanian female university students about BC, risk factors, and potential sign and symptoms. It also examined the relation between selected sociodemographic parameters and the practice of BC health-protective behaviors. This cross-sectional study involved a convenient sample of 372 undergraduate female students at the end of 2019. Participants completed a self-administered questionnaire. Participants showed a moderate level of background knowledge (62.8% regarding BC). Knowledge about BC signs and symptoms ranged from 85.2% to 21.1%. Regarding the risk factors, the correct percent-age ranged from 86% to 32.8%. Statistically, there was a significant difference in the knowledge score between the nursing and law students ( $p=.001$ ), and the year of the study among participants; ( $p=.007$ ). There was also a significant negative correlation between the participants' practice of BC risky behavior and the level of BC knowledge ( $p<.003$ ). Female university students have a moderate level of knowledge about BC. Thus, improving the quality of this knowledge is critical. There should also be a planning practical-educational program to teach young females about BC and how to correctly perform the Breast self-examination technique.

**Keywords:** breast; cancer; awareness; undergraduate; female; Jordan

## 1. Introduction

Cancer of all types, and particularly breast cancer (BC) became a devastating health problem worldwide. In Jordan, BC is the most occurring cancer and the third most life-threatening type among women [1]. In 2020, BC recorded 20.8% of all cancers among men and women, and 38.5% of women cancers. It is also found that the age-specific incidence rate of BC is increasing among younger Jordanian women. Re-searchers report that 44.7% of women diagnosed with BC are below the age 49 [1].

There is growing evidence that prevention or / and early detection of BC is a promising option to improve the survival rate and to reduce the burden of the disease [2]. World Health Organization claimed that between 30 and 50% of cancers are preventable by avoiding risk factors and following updated evidence-based prevention strategies. The most modifiable risk factors of BC, claimed recently by American Cancer Society, prevail in the Jordanian community. These include high fat, low calcium, and low vitamin D intake; post-menopausal obesity; being inactive; and smoking. Many warning signs and symptoms are related to BC. Therefore, awareness of BC signs and symptoms and potential risk factors is a principal approach to enhancing women's early BC screening and avoiding or reducing exposure to the potential causative factors [3].

Several studies have been conducted to evaluate the BC level of knowledge among the Jordanian population [4-7]. However, few of these studies were done by university

students, and these studies recruited students who came from almost the same geographical area [8-10]. Therefore, our understanding of BC knowledge from female university students is faint. Moreover, the questionnaires of some previous studies miss many risk factors known to increase the BC risk (i.e. oophorectomy, use of oral-contraceptives, exposure to radiation, smoking, vitamin D deficiency). Also, not all possible signs and symptoms are present (i.e. painless breast lump, breast wrinkles).

Considering BC may occur at an early age in Jordan, undergraduate female students must be aware of and able to recognize the potential signs and symptoms of BC. That will increase students' internal focus on any new occurring sign or symptom and enhance motivation to pursue medical advice early. The National Jordanian Breast Cancer Awareness Program has been established in 2010 to increase awareness about BC [3]. Formerly, more efforts have been done to reach young females through the BC awareness activities (targeting undergraduate students) during the pink month of each year. So, the purpose of this study was to investigate the updated knowledge about BC, risk factors, and signs and symptoms among Jordanian female university students; and to find its correlation with selected demographics. In addition to that, to explore if the undergraduate female students have adopted health-protective behaviors that can minimize the risk of BC.

## 2. Materials and Methods

A cross-sectional study was conducted in Al-Hussein bin Talal University, Ma'an, Jordan from September 1, 2019, to December 1, 2019. Al-Hussein bin Talal University hosts more than seven thousand students who come from all governorates of Jordan. The inclusion criteria were undergraduate female students who are 17 years of age or older. The sample size was calculated using an online statistics calculator based on the formula:

$$n = N * X / (X + N - 1).$$

Using a margin of error: 5%, confident level: 95%, population size of 3500, and a sample proportion of 50%, we estimated the sample size as 347 students. Considering a non-responsive rate of 20% (70 students), 417 participants were needed, and 450 questionnaires were distributed.

The study tool is a structured questionnaire. It had developed by the researchers based on previously validated and published tools; the Champion health belief model scale and the Breast Cancer Awareness Measure (CAM) [11]. The questionnaire was designed in English and then translated to Arabic using the standard forward and backward translation. The content analysis had accomplished by a panel of 5 experts from different health disciplines. A pilot sample of 20 students other than the study participants was used to pretest the questionnaire for readability and clarity. Responses revealed that there is no need for substantial changes. The reliability of the aware-ness scale in this study has Cronbach's alpha of 0.793 (for the 40-item knowledge scale).

The questionnaire encompassed three sections. The first section contained socio-demographic data and medical history. The second section included items used to evaluate participants' knowledge regarding BC. Knowledge items were grouped into three categories: general knowledge about BC (6 items), potential risk factors (17 item), and signs and symptoms (17 items). Scoring answers are done based on the choice of one of the following three options: 'Yes' 'No' or don't know. The negative quoted sentences/questions followed reverse scoring for counting (True) answers. Each true answer was scored one, and false or don't know answers were scored zero. Missing questions were trace and were treated as a "No" answer. The total scores of 70% or above (28-40 true answers) were considered a good knowledge level, while 50 to 69% (21-27 true answers) were considered a medium knowledge level, and below 50% (20 or less true answers) were considered poor knowledge level.

After getting the approval for data collection, the primary investigator met re-search assistants and explained the study objectives and the data collection process. The study was then explained to the eligible participants and verbal consenting was taken before handling the questionnaire. The participants were asked to drop the questionnaire in a sealed boxes carried by the trained research assistants.

Processing, and the analysis of all data variables was

performed using a Statistical Package for Social Sciences (SPSS) version 25 for Windows. Descriptive statistics (frequencies and percentages) were used to describe socio-demographic characteristics. Dependent variables were presented as frequency, mean, and standard deviation (SD). Risk perception was also counted based on students' responses regarding the adoption of healthy behaviors and family history of BC and was also represented in frequency and percentages. The relationship between BC knowledge and selected socio-demographic variables (i.e., academic area, academic year, residence, menarche, smoking, sleep, fat consumption, stress, fear, physical exercise, and practice of BC risky-behavior) was evaluated using the one-way analysis of variance (ANOVA). In more than two category variables Tukey's post-hoc analysis was performed to find means that are significantly different. Independent sample t-test was used to explore the relationships between variables of binary type and the BC knowledge scores (i.e., family history, previous health counselling, breasts changes, heard about BSE and practicing BSE). A probability value less than 0.05 was considered statistically significant.

### 3. Results

#### 3.1. Socio-demographic characteristics and medical history data

A total of 372 participants completed the questionnaire out of 450 accessed students with a response rate of 82.6%. The average age of the participants was 19.7 years (range =17-27; SD = 1.54). Table 1 shows the sociodemographic and medical history data of the participants and the mean score of BC knowledge score for each category. Nursing students and health sciences represent the largest (38.2%) academic group among study participants. Most participants were either in their first (39.8%) or second academic year (28.8%). Participants came from the twelve governorates in Jordan. The southern region governorates of Jordan (Al-Karak, Tafilah, Maan, and Aqaba) represented 44.4% of the participants.

Whoever reported their first menstrual period at age 12-17, constituted 90.1%. The minority disclosed they were smokers (4.9%). Almost two thirds (66.3%) of the participants reported they had adequate sleep (6-8 hours a day), 51.6% consume fruits and vegetables daily, while 35.8 reported they often eat high fatty foods, and only 18.3% exercise frequently. The majority, 94.3% of participants reported they experienced some degree of recurrent stress. Two thirds (66.4%) reported their fear of BC. Also, 56.1% have had breast counseling before. Forty-five (12.1%) students mentioned that a change in the breast was observed in eleven of them. The noticed change was a mass in the breast. A positive family history of BC was reported by forty-four participants (11.8%). Aunts and mothers were among the most cited relatives (19 and 18 of the 45 respectively) who have had a diagnosis of BC.

**Table 1. Sociodemographic characteristics and medical history data of the participants and mean score of BC knowledge (n=372)**

Item	Category	Frequency	Percentages	Mean score of BC knowledge	Standard deviation
Academic area (college)	Nursing and Health Sciences	142	38.2	26.21	4.01
	Engineering	43	11.6	25.23	5.13
	Science	43	11.6	24.11	4.52

	Law	30	8.1	22.86	4.50
	Art	55	14.8	25.49	3.67
	Information Technology	17	4.6	24.41	3.57
	Business Management	22	5.9	24.04	3.65
Year of study	Education	20	5.4	23.55	4.38
	First year	148	39.8	24.29	4.13
	Second year	107	28.8	25.77	3.66
	Third year	71	19.1	25.47	5.02
	Fourth year	42	11.3	26.16	4.59
Residence	Fifth year	4	1.1	21.50	3.51
	Amman	102	27.4	25.12	4.29
	Aqaba	59	15.9	25.28	4.28
	Maan	47	12.6	24.45	4.81
	Tafileh	43	11.6	26.48	4.26
	Irbid	34	9.1	26.04	4.23
	Zarqa	20	5.4	23.41	3.33
	Madaba	20	5.4	24.10	4.65
	Karak	16	4.3	24.45	3.69
	Balqa	10	2.6	25.00	4.25
Heard about BC before	Mafrag	8	2.2	24.90	5.06
	Jerash	8	2.2	26.75	3.77
Presence of a family history of BC	Ajloun	5	1.3	24.37	3.33
	Yes	360	96.8	25.16	4.32
got breast counseling before?	No	12	3.2	24.00	3.51
	Yes	44	11.8	24.47	4.60
Noticed any change in breast?	No	328	88.2	25.21	4.25
	Often	69	18.5	26.05	4.12
	Sometimes	140	37.6	25.66	4.27
Menarche	Never	163	43.8	24.26	4.26
	Yes	47	12.6	25.29	4.67
	No	325	87.4	25.10	4.24
number of cigarettes per day	Before 12 years	28	7.5	26.14	3.23
	Between 12-17	336	90.3	25.07	4.38
	After 17 years	8	2.2	23.75	3.73
	0	353	94.9	25.10	4.29
consumption of fruit and vegetables	1-5	14	3.8	26.42	3.81
	5-10	3	.8	25.00	6.24
	>10	1	.3	17.00	.
	Missing	1	.3	22.00	.
	Each meal	22	5.9	25.86	4.67
daily sleeping hours	Daily	170	45.7	25.55	4.29
	Weekly	127	34.1	24.48	4.22
	Every 3 days	8	2.2	24.62	4.77
	Monthly/rarely	45	12.1	25.04	4.21
consumption of fatty foods	<6 hours	86	23.1	25.19	4.05
	6-8 hours	249	66.9	25.33	4.23
	>8 hours	37	9.9	23.54	5.00
feeling stress in daily life	Often	133	35.8	25.34	4.13
	Sometimes	223	59.9	25.11	4.33
	Never	16	4.3	23.43	5.03
fear of breast cancer	Often	156	41.9	25.37	4.32
	Sometimes	195	52.4	24.95	4.31
	Never	21	5.6	24.85	4.04
physical exercises	Often	74	19.9	25.32	4.30
	Sometimes	173	46.5	25.50	4.23
	Never	125	33.6	24.48	4.34
Heard about BSE?	Often	68	18.3	25.22	3.69
	Sometimes	198	53.2	25.23	4.37
	Never	106	28.5	24.86	4.53
Total Mean	Yes	295	79.3	25.44	4.36
	No	77	20.7	23.92	3.84
Total Mean		372	100	25.12	4.29

### 3.2. Knowledge of BC, risk factors, and signs and symptoms

The overall average knowledge score about BC in general, BC risk factors and BC signs and symptoms combined were 25.12 (SD: 4.29) out of 40 (ranged from 11 to 35), representing 62.8% (27.5 - 87.5%) of the total score. Students who answered true for 20 items or less comprised forty-two (11.3%), while 287 students (77.15%) and 43 students (11.55%) scored between 21-30, and between 31-35 respectively. The following three figures show the level of knowledge

among the participants regarding BC (Figure 1), risk factors (Figure 2), and signs and symptoms (Figure 3). These figures show the percentages of participants' correct responses to each item. Students show above average awareness regarding BC general knowledge (74.3%), risk factors (60.8%) and warning signs (65.7%).

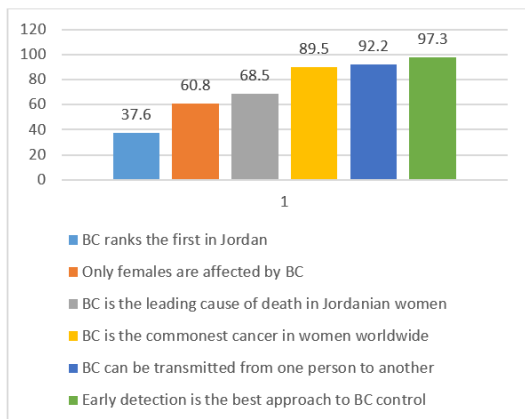


Figure 1. Participants' general awareness about breast cancer (BC) (Percentages of correct answers)

Participants' knowledge about BC risk factors ranged from 32.8% (never having a child) to 86% (exposure to radiation therapy during adolescence) (Figure 2). Seventy-three percent of participants believed that a woman with a family history of BC has a high risk of having the disease in the future. So, students are relatively aware of the role of heredity factors in the development of BC. Around 80% and 70% of the participants knew that there is a relationship between BC and the prolonged use of Hormone Replacement Therapy (HRT) and oral contraceptives, respectively. Linking vitamin D deficiency with BC was reported by 38.2% of the participants.

Figure 2. Participants' awareness about breast cancer (BC) risk factors (Percentages of correct answers)

Nine of 17 warning signs of BC were identified by 70% to 85.2% of the participants (Figure 3). The most correctly identified warning signs were "notable mass or bulging in the breast" (85.2%) and "mass under the armpit" (84.9%). More than 78% were not aware that change in breast size is a possible warning sign of BC. Moreover, changes in the blood vessels, breast redness and skin erosion as a potential sign and symptom was identified by only 46.8%, 59.1% and 60.2% respectively.

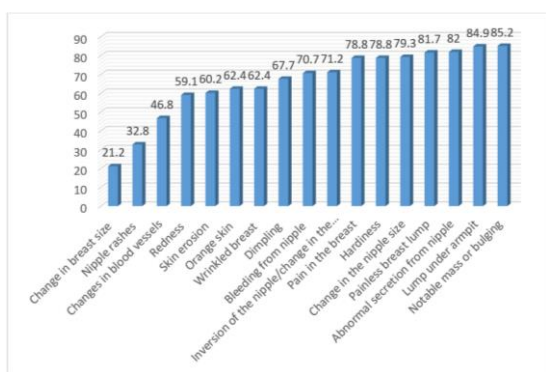


Figure 3. Participants' awareness about breast cancer (BC) signs and symptoms (Percentages of correct answers)

### 3.3. Association between breast cancer (BC) knowledge and selected variables

Table 2 shows whether there is any association between the total score of knowledge about BC and selected socio-demographic variables. The area of study, academic year, if they have ever heard about BSE, and BC risky behaviors were the only factors that had a significant positive association with the participants' total knowledge level about BC. There was a statistically significant difference in the knowledge score between nursing and applied sciences, and law students [F (7, 364) =3.704, p=.001].

The Law students recorded the lowest score (mean= 22.8 of 40) while the nursing and applied sciences students recorded the highest (26.2 of 40). A statically significant difference in BC knowledge level was noticed between the first- and second years' students [F (4, 367) =3.548, p=.007]. The mean score of knowledge about BC for the first year was (24.29, SD=4.13) compared with (25.77, SD=3.66) for students of the second year (Table 3). A significant difference in total knowledge level about BC was observed among those who had ever heard about BSE and who had not (t=2.785, p=.006). Noteworthy, there was a statistically significant weak negative correlation between those who had adopted a low BC risky behavior (healthy) compared with high BC risky behavior [r=-.155, n=372, p<.003] with a low risk of BC perception associated with high levels of BC knowledge.

Table 2: Effects of selected demographic factors on the undergraduate female students' BC knowledge level

Factor	r	t	f	p-value*
Age	.054			.295
College			3.704	.001*
Year of study			3.548	.007*
Residential area			1.637	.87
Family history of BC		-1.067		.287
Menarche			1.218	.297
Had any BC counseling previously		.634		.527
Noticed any change in breasts		-.292		.770
Smoking			1.354	.250
Fruit & vegetables consumption			1.315	.264
Sleep			2.856	.059
Fatty foods consumption			1.411	.245
Feeling stress in daily life			.464	.629
Fear of breast cancer			2.189	.114
Physical exercises			.267	.766
Heard about BSE?		2.785		.006*
Have ever practiced BSE		1.779		.076
BC unhealthy/risky behavior	-.155			.003*

\* P<0.5

Three hundred and sixty (96.8%) of the study sample claimed to have heard about BC. The majority of participants acknowledged various types of media (television, ra-dio and internet) as the main source of information about BC. Health care profession-als form the source of information for 25.5%, followed by printed resources (16.9 %) and relatives (7.8%). Health events and workshops represented a small fraction only (1.7%) (Figure 4).

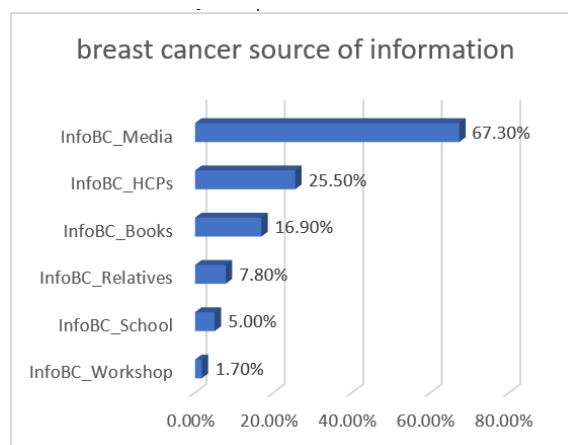


Figure 4. Sources of information about breast cancer (BC)

## 4. Discussion

This study was conducted in a Jordanian university located in the South of Jordan. However, the university holds students from various parts of Jordan. The aim was to assess the female students' awareness about BC in general, the risk factors and the warning signs of the disease. The degree of knowledge about BC is crucial in early detection and in the survival rate once the disease has been discovered. Awareness about (BC) helps in modifying risky behaviors and following a healthy lifestyle. Thus, decreases the chance of getting (BC) in the future [8].

Our study revealed that while the majority (58.3%) of the participants have moderate knowledge level about BC, only 30.4 % have well to excellent knowledge level. Participants scored 78.6%, 60.2% and 59.8% regarding BC general knowledge, risk factors and warning signs respectively. In the current study most, participants agreed that early detection is the best approach to control BC (97.3%). Consistent results were reported by Al-Mousa and colleagues [4], where they surveyed a sample of 1353 relatively educated women, and found that 95 % of the women believe that the disease is curable if detected early, 76 % knew that BC is the most common in Jordan, 53.7 % had an intermediate knowledge level of BC's risk factors, and 44% had well to excellent knowledge about signs and symptoms of the disease [4]. A recent study from Gaza in Palestine involved university students showed results also, close to ours, where good knowledge score ( $\geq 70\%$ ) regarding both risk factors and warning signs of BC and moderate level of knowledge (60.8%) regarding the general knowledge about the disease [11]. Almost, 11.3% of the participants in the current study still have poor knowledge level (<20 of 40 correct answers) about the disease. More than 60% of our participants believe that infertility, early menarche, and vitamin D deficiency are not a risk factors of BC.

Poor knowledge level regarding all aspects of BC were reported previously in Jordan; among university students [8, 10], and non-student women [4, 12]. A recent study surveyed the BC related knowledge among 236 university students in Jordan [8]. The students' scores were 45.5% for the total knowledge about BC, 55% about warning signs, and 27.9% about risk factors [8]. Moreover, researchers found that "Having a past history of BC" had the highest score (60.6%), and less than 20% of their surveyed students knew that "early menarche", "late menopause" and "not having children at all" for example are risk factors of BC. Researcher also found for example, that factors such as diet and being unmarried were cited by only 2.1%, and 3.2% respectively as a risk factors for BC [10]. In the recent study, the lowest identified risk factors were infertility (32.3%), early menarche (37.9%), and vitamin D deficiency (38.2%). This discrepancy in the identified risk factors among the two studies could be related to the differences in the listed items under the risk factors.

In the current study, participants were mostly aware that

exposure to radiation during adolescent (86%), use of HRT for a prolonged duration (79.8%), smoking (78.0%), and family history of BC (73.4%); increases the risk of BC. Similar result was reported by a study included 262 women attending 6 different primary Health Centers in Doha, Qatar [13]. The researchers found that the most identified risk factors for BC were smoking, family history, and exposure to radiation (72%, 67.7% and 63.8% respectively).

Most participants in the current study thought that change in breast size (78.8%) and nipple rashes (67.2%) are warning signs of BC. At the same time, while only 37.9% of participants cited that early menarche is a risk factor, 41.9% of participants thought that surgical excision of the ovaries is a risk factor too. These misconceptions are consistent with previous findings [8]. These poor responses should warrant the governments and health officials to increase the efforts to improve women's awareness about true warnings signs and risk factors of BC. Inadequate knowledge about BC risk factors, signs and symptoms, and screening is commonly reported elsewhere in neighboring countries; in Iraq [14], Iran [15] and UAE (6). Rahman and colleague for ex-ample found that only 38% of the female students were aware about the warning signs and symptoms of breast cancer among university students in Sharjah, UAE (6).

Although, the performance of the students in the current study was below the expectation, their overall knowledge level and knowledge scores per subgroup measures were better than the performance of their counterparts in the previous studies from Jordan [8, 10] which may be attributed to several factors. First, 38.2% of our participants are nursing and health sciences students whom they may exposed to BC related topics more than other students. The superiority of medical over non-medical students regarding the knowledge about BC was reported previously elsewhere [3, 15]. Second, the Jordan BC Program (JBPCP) may also play an important role through the multi-events about screening and early detection of BC that held across the country over the past years [16].

Education is the most cited predictive factor in knowledge about BC followed by, family history, having a job, married, and urban dwellers among other factors [4, 12, 14]. It is believed that educated women usually access and participate in discussions about health issues on the Internet and social media [16]. Therefore, it is important to increase the health education programs that forwarded to less educated and unemployed women, especially those who are residents of rural and remote areas.

Most of the participants in the current study heard about BSE, although only 18% of them claimed they ever practiced it. Lack of knowledge and Low performance rate of BSE were commonly reported in developing countries [11, 14, 15]; which contrasts with the situation in the developed countries [17]. There is strong evidence that health promotion activities tend to improve the outcome in terms of knowledge and practice of pre-screening of BC including BSE [2].

In the current study, media including internet and TV was cited the main source of information about the BC which is consistent

with previous studies [7, 10, 12]. While health events and workshops represent only 1.6% which is a result similar to findings among university students in Gaza [11] where workshop represents 1% of their information source. In contrast, in a recent study conducted in Saudi Arabia, the researchers found that 40% of the women got their information about BC from health education campaigns [18]. In the current study, more than half of the participants were in their first and second year. Nevertheless, second year students had significant improvement in the BC knowledge scores compared to first year students. Another significant difference was found in the knowledge levels about breast cancer in favor of health sciences students compared with law students. This might be related to the fact that law students came from literary track at high school compared with students of health sciences who came from scientific track.

## 5. Conclusions

Breast cancer is the most common occurring cancer in Jordan and a life-threatening tumor among Jordanian women. Evidence indicates that the disease is increasing overtime and younger women are affected. Moreover, inadequate knowledge and lack of compliance for pre-screening and avoidance of potential factors of the disease is the norm in the community. Awareness in public about sign and symptoms, risk factors, and screening method of BC is crucial to halt the increasing morbidity and mortality of the disease and improving the treatment outcome. Well planned health education programs that target diverse groups in the community, reach rural and remote areas and invest in different potential sources of information are needed. Research that aimed to find what is suitable with local culture and real needs of people should be encouraged. One of the limitations of this study is that the participants represent a convenient sample which may limit the generalizability of the results. Nevertheless, our participants came from all the Jordanians governorates. The second limitation is that the data collection based on closed-ended questionnaire which may rely on participants' recognition rather than recall which may not reflect their real response.

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