RESEARCH ARTICLE

Knowledge and Practice Concerning Breast Cancer Risk Factors and Screening among Females in UAE

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Abstract

Breast cancer is considered the most dangerous cancer for women, driving the highest number of mortalities in women worldwide. According to the WHO 2020 report, breast cancer showed the highest five-year prevalence in the UAE, among other cancers. This research assessed breast cancer awareness, potential risk factors, screening approaches and practices, barriers to screening, and attitudes toward seeking medical help among UAE women. A cross-sectional community-based study was conducted through a web-based validated questionnaire. Data analysis was carried out using IBM SPSS version 27. The questionnaire was sent through social media platforms. The eligible completed were 616 responses. This study showed a prevalence of breast cancer of 3.1% among the study population. Regarding Breast cancer knowledge, most of the participants, 65.8% had moderate knowledge, 19% had poor knowledge, and only 7.6% had good knowledge. Breast cancer screening methods were the most recognized section at 76%, followed by knowledge of symptoms and while the least known section was the BC risk factors. Twenty-five percent of respondents had at least one breast cancer symptom. About 37.1% of women aged more than 40 years had never undergone mammography. In potential, most participants and 81.7% were having more than five of the BC risk factors had adequate knowledge about breast cancer with relatively higher knowledge scores for screening methods and symptoms. Participants who received information from healthcare providers or attended awareness events had a higher knowledge score. In contrast, insufficient mammography screening had been revealed. At the same time, potential risk evaluation revealed a high percentage of participants suffering from many potential risk factors.

Keywords: Breast cancer- risk factor- screening- mammography

Introduction

Breast cancer is the most common malignancy in women and the primary cause of cancer death worldwide. Two million breast cancer cases were registered in 2020, occupying first place in incidence, with 11.7% of the overall cancer cases worldwide (Sung et al., 2021). It is noteworthy that breast cancer incidence rates are higher in developed countries than in developing countries, attributed to humble screening programs and increased risk factors. Conversely, breast cancer patients have a higher mortality rate in developing countries than in developed ones (da Costa Vieira et al., 2017). Similarly, breast cancer in Arab countries is the most frequently diagnosed form of cancer in women. Statistics showed that breast cancer incidence in the Arab world has continuously grown since the early nineties. It is comparable to the global trend and is predicted to continue in the same direction in the following years (Taha and Eltom, 2018).

Interestingly, the breast cancer burden in Arab countries is lower than the global average (Hashim et al.,

2018). According to the MOHAP report, in 2014, 819 new cases were diagnosed with breast cancer in the UAE, among UAE and Non-UAE citizens, which formed about 32.16% of all female cancers in the UAE (Shelphai and El-Metwally, 2014). Recently, WHO statistics in 2020 showed that the percent of newly registered breast cancer cases among females in UAE was 38.8% out of all female cancer new cases and ranked breast cancer as first cancer that causes death with 12.4% of all cancer deaths, and it showed the highest five-year Prevalence in UAE among other cancers (IARC, 2020).

Ignorance of breast cancer screening and symptoms in communities leads to a delay in detecting breast cancer. Years ago, global healthcare organizations moved to implement preventive treatment as the first line to fight against cancer (McCready et al., 2005) by urging the practice of breast cancer screening programs. These programs, especially in developed countries, were a tangible influence noticed by reducing mortality rates (Niell et al., 2017). Moreover, modifiable breast cancer risk factors have been highlighted in the literature, estimating

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that 25% to 30% of breast cancer are preventive by modifying lifestyle and avoiding risk factors contributing to breast cancer (Harvie et al., 2015).

Simultaneously, breast cancer awareness in the middle east has been rising over the last few years, but unfortunately, there has been no significant increment in screening practice attributed to many factors such as lack of resources, embarrassment, and cultural beliefs (Salem and Daher-Nashif, 2020). Breast cancer awareness in the Arab region varies from one country to another. For instance, a recent study in Jordan revealed that 44% of respondents had good to excellent knowledge about breast cancer symptoms (Al-Mousa et al., 2020). Moreover, In Saudi Arabia, a study showed that the knowledge about breast cancer signs and symptoms among Saudi women was 50% (Al-Zalabani et al., 2018). A few studies highlighted breast cancer awareness among females in the UAE population, but none covered most of the UAE provinces or included the potential risk factor incidence (Abu Awwad et al., 2020) (Elobaid et al., 2014). This study aimed to evaluate breast cancer knowledge and the extent of screening practices and assess potential risk factors among UAE women.

Materials and Methods

Study Design

The study relied on a web-based questionnaire designed using the Monkey Survey application; it has been distributed through different social media platforms (WhatsApp, LinkedIn, Facebook, and Instagram). This self-administered questionnaire was in both languages, English and Arabic. Both versions were compared and checked for equivalency by bilingual research experts; more forward and backward translations were also undertaken by Arabic native-speaker oncologist minimal errors in translation were corrected before survey distribution. The questionnaire was designed based on a thorough analysis of available literature (Linsell et al., 2010;Wachira et al., 2017). A cover letter was shown to the participants on the first page of the survey, explaining the participant's right to withdraw, the purpose of the study, and the required time to complete the survey. The ethical research committee of Dubai pharmacy for girls' college approved the study.

The questionnaire included four sections. The first section was a sociodemographic question. The second part comprised questions about knowledge and prevalence of breast cancer risk factors and symptoms based on guidelines and information published by the center for diseases control and prevention CDC, the United Kingdom National Health Service and literature (CDC, 2021; Chiriac et al., 2018; Harvie et al., 2015; NHS, 2021), which included the following questions: Which of the following could be breast cancer symptom (select all apply): New lump in the breast or underarm, Thickening or swelling part of the breast, Irritation or dimpling of breast skin, Redness or flaky skin in the nipple area or the breast, Pulling in of the nipple or pain in the nipple area, Nipple discharge other than breast milk, including blood, Any change in the size or the shape of the breast,

Pain in any area of the breast. The second question was: Which of the following is considered a risk factor (increase the chance) of breast cancer: getting older, Big size of the breast, Dense breast tissue, Having a first-degree relative with breast cancer, Early Menarche (age <11 years old), Late menopause (after 55 years old), Stress, Not practicing Breastfeeding, Using hormonal replacement therapy, Obesity, Smoking, Passive smoking, Sleeping disturbances such as irregular sleeping pattern and short duration, High carbohydrate intake and food with the high glycemic index, low fibers intake. The third section included breast cancer screening knowledge and practice questions derived from the CDC and the national UAE guidelines (CDC, 2021; The National Guidelines For Breast Cancer Screening and Diagnosis, 2021) which covered breast self-examination, clinical breast examination, and mammography. The last section had questions about participants' attitudes toward attending breast cancer awareness events and their tendency of seeking help in case of suspicious finding related to breast cancer.

Study Population and Sampling

A convenience sample was recruited for this study's purposes. The questionnaires have been sent using different social media platforms (WhatsApp, LinkedIn, Facebook, and Instagram) targeting female groups in the UAE. The received responses were 746; The eligible and complete responses were 616.

Validation and reliability

Cronbach's alpha test was conducted to evaluate the internal validity of the survey. The questionnaire was sent to a group of professionals and healthcare providers to give their comments, all inputs were considered, and accordingly, modifications were made. A pilot study was conducted to evaluate the reliability of the survey; the form was sent to 30 female participants. The results were summarized in Excel sheets and analyzed by the IBM SPSS program. Questions with poor item-to-total correlations were discarded.

Inclusion And Exclusion Criteria

The inclusion criteria were females who live in the UAE regardless of the province or ethnic group. Exclusion criteria are females less than 18 years old and females not living in the UAE.

Data Analysis

Data were entered into an Excel spreadsheet, Version 2010, and analyzed using the Statistical Package for the Social Sciences (IBM.SPSS), version 27. Descriptive statistics were used to summarize the socio-demographic characteristics of subjects. Based on their normality distribution, numerical data are presented as mean (SD). Categorical data are presented as frequency (percentage) one-way ANOVA, Chi-square test, and multivariant regression used as an inferential statistic. P-value ≤ 0.05 was considered statistically significant at a confidence level of 95%.

The knowledge score was measured on a 0-1 scale

Knowledge and Practice Concerning Breast Cancer risk factors and Screening among Females in UAE

for each item, giving one point for each correct answer, whereas incorrect responses received zero points (the total points were 37). The overall knowledge score was categorized as very poor, poor, moderate, and good knowledge based on the ability to answer the knowledge questions correctly (less than 30%, 30%-50%, 50%-80%, and above 80%, respectively).

Results

Demographic Profile

The mean age of the 616 respondents was 35.83 ± 8.06 years. Most participants (78.6%) were aged between 26-45 years, while the minor contribution (2.4%) was by the age group of more than 55. The academic status for the majority (71.8%) was the first college degree followed by higher education degree. More than half of the participants (58.1%) were unemployed (Table 1). All participants were residents of the UAE from different nationalities.

Regarding the source of information about breast cancer, around 62.7% of women received their information from different social media platforms, whereas only 36.5% were from healthcare providers. The least utilized source was awareness events (25.8%).

Only 3.9% of participants had a cancer history, mainly breast cancer (3.1%). About a quarter of participants had a female relative with breast cancer, of which 14.6% were their aunts.

Breast Cancer Knowledge

Breast cancer knowledge was assessed based on three main groups of questions: knowledge of risk factors, symptoms, and screening methods. The total points were 37 in case all the questions were answered correctly. The results showed that the minimum obtained score was 4, and the maximum score was 37. The knowledge assessment results are categorized into four groups (Table 2). It was noticed that the highest percentage of participants fall into the moderate knowledge group (65.6%). Chi- square test showed a significance between the different knowledge and demographic groups (Table A).

Knowledge of Breast Cancer Risk Factors

The results showed that the most recognized breast cancer risk factor was breast cancer family history (81.7% of participants), while the least known factor was late menopause (14.1%). Among the modifiable risk factors, using hormonal replacement therapy was the most known among participants (57.1%), while risky food habits, such as increased intake of high glycemic index food and low fiber content diet, were acknowledged by 31.2% and 18.5%, respectively (Table 3).

Knowledge of Breast Cancer Symptoms

The most recognized symptom was the appearance of a new lump in the breast or armpit area 95.8%, followed by any changes in the size or shape of the breast 76%. The least known symptom at 52.6% was pulling in the nipple or pain in the nipple area (Table 4).

Table 1. Demographical Characteristics of Participants (n= 616)

| Variable	N (%)
Age group	
< 25	63 (10.2%)
26-35	252 (40.9%)
36-45	232 (37.7%)
46-55	54 (8.8%)
>55	15 (2.4%)
Education level	
School	32 (5.2%)
Undergraduate	442 (71.8%)
Postgraduate	142 (23.1)
Marital status	
Married	502 (81.5%)
Single	102 (16.6%)
Others	12 (1.9%)
Number of children you have	
Do not have children	148 (24 %)
1 – 4 Children	432 (70.1%)
> 5 children	36 (5.9%)
Nationality	
Emirati	63 (10.2%)
Arab	493 (80 %)
Asian	54 (8.76%)
Others	6 (0.97%)
Employment status	
Employed	258 (41.9%)
Unemployed	358 (58.1%)
Working sector	
Healthcare sector	100 (16.2%)
Non-healthcare sector	158 (25.6%)
Source of your information about Breast Cancer	
Books or magazine	167 (27.1%)
Social media	386 (62.7%)
Media (TV)	291 (47.2%)
Friends or relatives	201 (32.6%)
Health care provider	225 (36.5%)
Attending awareness events	159 (25.8%)
Do you have a cancer history	
Having cancer history	24 (3.9%)
Do not have a cancer history	592 (96.1%)
Cancer type	
Breast cancer	19 (3.1%)
Other cancers	5 (0.8%)
Have a breast cancer family history	150 (24.4%)
Do not have breast cancer family history	466 (75.6%)
Relative with breast cancer	
Mother	30 (4.9%)
Sister	8 (1.3%)
Daughter	0
Grandmother	34 (5.5%)
Aunt	90 (14.6%)
Others	21 (3.4%)
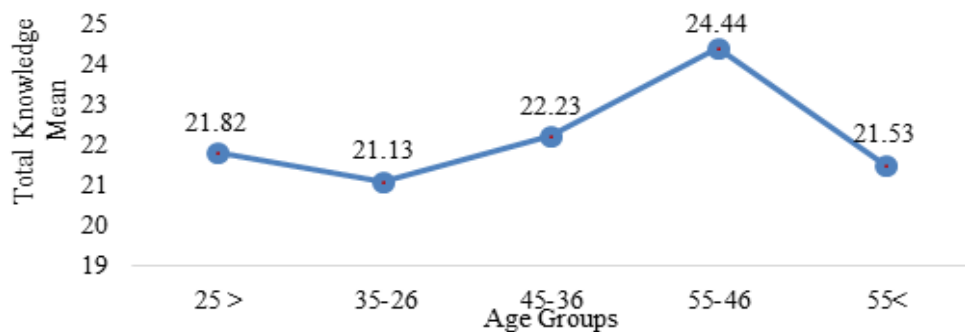
Figure 1. Breast Cancer Total Knowledge Mean with Age Groups

Table 2. Breast Cancer Knowledge Category Percentage

Knowledge Category	Percentage (n=616)
Very poor knowledge	48 (7.8%)
Poor knowledge	117 (19%)
Moderate knowledge	404 (65.6%)
Good knowledge	47 (7.6 %)

Table A. Comparison of Breast Cancer Knowledge Group with Demographics

variables	Knowledge groups N=616				P-value
	Very poor	poor	Moderate	Good	
Age group					
< 25	6	13	37	7	0.004
26-35	29	46	162	15	
36-45	9	51	157	15	
46-55	3	3	38	10	
>55	1	4	10	0	
Education level					
School	6	9	16	1	0
Undergraduate	36	94	286	26	
Postgraduate	6	14	102	20	
Working sector					
Unemployed	31	79	235	13	0
Non-healthcare sector	14	28	98	18	
Healthcare sector	3	10	71	16	
Source of your information about Breast Cancer					
Books or magazine	5	26	114	22	0.001
social media	30	78	249	29	0.8
Media (TV)	12	54	202	23	0.012
Friends or relatives	18	43	123	17	0.463
Health care provider	7	24	167	27	0
Attending awareness events	7	17	116	19	0

Chi-square test, P-value <0.05

Table 3. Breast Cancer Risk Factor Knowledge Percentage

Risk factor	% Of correct answers
Big size breast	551 (89.40%)
Family history of breast cancer	503 (81.70%)
Hormonal replacement	352 (57.10%)
Smoking	327 (53.10%)
Stress	288 (46.80%)
Not breastfeeding	282 (45.80%)
Increased age	252 (40.90%)
Obesity	250 (40.60%)
Dense breast tissue	222 (36%)
High glycemic index food	192 (31.20%)
Passive smoking	172 (27.90%)
Low fiber diet	114(18.50%)
Early menarche	91 (14.80%)
Late menopause	87 (14.10%)
Sleep disturbances	85 (13.80%)

that it should be done every two years. Sixty-four percent knew that women over 40 should undergo mammography.

Table 4. Breast Cancer Symptoms Knowledge

Breast cancer symptoms	% Of correct answers
New lump in the breast or underarm (armpit)	590 (95.80%)
Any change in the size or the shape of the breast	468 (76%)
Nipple discharge other than breast milk, including blood	430 (69.80%)
Irritation or dimpling of breast skin	379 (61.50%)
Thickening or swelling of part of the breast	37 (60.10%)
Redness or flaky skin in the nipple area or the breast	359 (58.30%)
Pain in any area of the breast	335 (54.40%)
Pulling in of the nipple or pain in the nipple area	324 (52.60%)

Knowledge of Breast Cancer Screening

The percentages of participant knowledge in breast cancer screening methods were 80.2% and 75% for mammography, and CBE, respectively. The role of mammography in the early detection of BC was recognized by 80% of participants. About 46.8% of the participants knew the correct mammogram frequency and

Table 5. Multivarient Regression Analysis of the Knowledge

Model	Beta	P	95.0% Confidence Interval for B	
			Lower Bound	Upper Bound
(Constant)		<0.001	13.961	19.696
Health care provider	0.21	<0.001	1.729	3.741
Education	0.166	<0.001	1.126	3.023
Attending awareness events	0.107	0.007	0.417	2.641
Books or magazine	0.086	0.029	0.121	2.296
Media (TV)	0.089	0.02	0.180	2.056
Employment	-0.084	0.032	-2.029	-0.094

Table 6. Potential Risk of Breast Cancer

Variable	N (%) Positive answers
Do you have a cancer history	24 (3.9%)
Do you have a breast cancer family history	150 (24.4%)
Do you have any of the following Risk factors	
Dense breast tissue	39 (6.3%)
Early menarche before 11 years old	37 (6 %)
Beginning menopause at an older age	3 (0.5%)
Not practicing Breastfeeding	88 (14.3%)
Using hormonal replacement therapy	49 (8%)
Sleeping disturbances such as irregular sleeping pattern	201 (32.6%)
Low fibers diet	114 (18.5%)
Food with high carbohydrate content and high glycemic index	188 (30.5%)
Obesity	128 (20.8%)
Smoking	74 (12%)
Passive smoking	57 (9.3%)
Stress	283 (45.9%)
Do you have any of these symptoms	
New lump in the breast or underarm (armpit)	56 (9.1%)
Thickening or swelling of part of the breast	7 (1.1%)
Irritation or dimpling of breast skin	9 (1.5%)
Redness or flaky skin in the nipple area or the breast	8 (1.3%)
Pulling in of the nipple or pain in the nipple area	9 (1.5%)
Nipple discharge other than breast milk, including blood	9 (1.5%)
Any change in the size or the shape of the breast	13 (2.1%)
Pain in any area of the breast	45 (7.3%)

On the other hand, the vast majority identified breast cancer as a treatable disease (96.6%). Moreover, about 97 % of the women knew that early diagnosis results in better healing outcomes and 90.l% knew that early diagnosis help in lowering mortality rates.

Breast Cancer Total Knowledge Mean ± SD with Demographic profile

One-way ANOVA test with post-hoc analysis, *P-value < 0.05, was applied to demographics and knowledge mean ± SD to confirm the significant difference among the demographic groups (Table B). The age groups 46 to 55 showed the highest knowledge means among other groups (Figure 1).

Multivariate regression analysis was performed to show the association between sociodemographic characteristics and knowledge level (Table 5). A significance (P <0.05) was noticed with all of the following groups: participants who were consulting health care providers, with higher education, and attending awareness events had a higher level of knowledge.

As shown in Table 5, The increase in knowledge score was 2.7 times for participants relying on healthcare providers as a source of information, two times for participants with higher education, and 1.5 times for those attending awareness events.

Breast Cancer Knowledge Sections Percentage

The analysis showed that the knowledge about breast cancer screening methods and their importance was high,

Table B. Comparison of Knowledge Mean ± SD with Demographics

Variable	Total Knowledge Mean ± SD	P-value
Age group		
< 25	21.82 ± 7.00	0.009
26-35	21.13 ±6.53	
36-45	22.23 ±5.60	
46-55	*24.44 ±6.08	
>55	21.53 ± 7.07	
Education level		
School	18.87 ± 6.75	0
Undergraduate	21.38± 6.13	
Postgraduate	*24.26 ±5.94	
Working sector		
Unemployed	21.07 ±6.02	0
Healthcare sector	*24.64 ±5.67	
Non-healthcare sector	22.10 ±6.70	

One- way Anova test with post-hoc analysis, *P-value < 0.05

with a mean value of 76.08%, followed by the knowledge of symptoms at 66.05%, and lastly came the risk factors knowledge, with a mean value of 37.3%.

Breast Cancer Screening Practice

The predominant participants, 70.2%, had never undergone mammography, while only 29.7% had it at least once. Among the participants aged more than 40 years (178 women), 62.9% underwent mammography at least once, whereas only 37.1% had never had mammogram screening. The highest value of mean knowledge (23.85) was for women who had undergone mammography more than once followed by women who did it once at (23.05) then who never practiced mamography mean knowledge was (19.53).

Breast Cancer Potential Risk

The presence of Risk factors and symptoms determined breast cancer potential risk, the maximum total points for both were 22, and the minimum was 0. About 81.66% of participants were at risk, while 18.34% did not have any of the mentioned risk factors or symptoms. The potential risk of participants was categorized by visual binning at cut-off points into low, moderate, and high risk. Most participants (72.6%) were at moderate risk, followed by 18.3% at low risk and 9.1% at high risk. The most frequent risk factors among respondents were stress at 45.9% and 30.5% for consuming food with a high glycemic index. Approximately 25.32% of respondents had at least one breast cancer symptom, and 56 women had a new lump in the breast or armpit area (Table 6).

Attitude and Barriers

Regarding the barriers to practicing breast cancer screening, the 37.1% who had never had mammogram screening attributed this to their belief that there is no need to do it for about 125 participants. Moreover, others attributed it to personal reasons such as the fears of

mammography procedures, feeling uncomfortable and shy, or worried about bad results, while a small number pointed to financial constraints as the main barrier.

According to The Medical help-seeking attitude, 82.4% of the participant would seek it if they noticed any abnormal findings, whereas 17% would delay seeking medical assistance, and just 0.6% would never ask for help. Furthermore, 63.3% of all respondents would like to participate in breast cancer awareness events.

Discussion

Breast cancer is the most common malignancy among women in UAE. More than one thousand cases diagnosed with breast cancer in the last few years formed more than 36% of all female cancers yearly. The majority of this study's participants, 78.6% aged between 26 and 45 years which aligned with the UAE population census, which indicated that women aged 25 to 54 form 55.47% of the female population in the UAE. Less than half of the participants, 41.9%, were employed; this value was lower by 10% of the female labor force in the UAE statics (United Arab Emirates Female Labor Force Participation, 2019).

Regarding the source of information about breast cancer, social media platforms are predominant over other sources. This ratio aligned with Mansour et al. study results concerning the role of social media in breast cancer awareness in the Gulf Cooperation Council (GCC) area, which revealed that social media raised breast cancer awareness and promoted breast cancer screening programs (Mansour et al., 2018). While healthcare providers as a source of information showed a higher percentage than older studies in this field (Rahman et al., 2019). The least utilized source of information was awareness events.

Few studies were conducted in the UAE to assess breast cancer awareness, resulting in different results based on the geographical area coverage and the targeted group. All previous studies showed a lower level of knowledge than ours, and an increment trend in the level of awareness over time was noticed. The majority of this study's participants, 65.6%, showed a moderate total knowledge, while older studies, such as Elobaid et al. survey, showed that only 5% of participants had good knowledge about breast cancer (Elobaid et al., 2014). Moreover, Prashanth Hegde et al. study targeted women who attended some hospitals in the northern emirates and showed that most participants had poor knowledge (Prashanth Hegde et al., 2012). Other Arab countries' studies showed a similar range of knowledge; one survey in Saudi Arabia revealed that about 50% of participants had appropriate knowledge (Al-Zalabani et al., 2018). Al-Mousa et al. research in Jordan revealed that 44% of respondents had good to excellent knowledge (Al-Mousa et al., 2020).

This study is relatively more comprehensive than the previously mentioned research in the UAE because it extensively evaluated breast cancer awareness, including risk factors, symptoms, screening approaches, and the importance of early diagnosis. In addition, this study included all females aged between 18 and 75 in most

UAE provinces.

The awareness of breast cancer risk factors plays a crucial role in breast cancer prevention since many of these factors are modifiable or can be avoided. Harvie et al. study revealed that breast cancer could be avoided by adjusting related risk factors (Harvie et al., 2015).

Regarding knowledge of breast cancer risk factors, our study results agreed with some other studies in our region, such as the one conducted in Iran, which found that the knowledge of risk factors was the weakest compared with different breast cancer knowledge sections, including both symptoms and screening. This study participant showed insufficient knowledge about breast cancer risk factors (Tazhibi and Feizi, 2014).

A breast with dense fibrous or glandular tissue and not much fat is defined as a dense breast. The high density of breast tissue means a higher risk of getting breast cancer, and the awareness of this risk factor had never been investigated in the UAE. This study showed that dense breast tissue was identified by 36% of participants.

Active and passive smoking had a moderate association with breast cancer. In our study, active smoking was identified by 53.1%, and it was less known than in other studies that included these risk factors. More debate was about the effect of secondhand smoking on breast cancer incidence; until Li et al. study showed a strong association between the total year of secondhand smoking exposure at home or work and breast cancer (Li et al., 2015). The awareness of this risk factor had not been investigated before among UAE women, while our study showed insufficient awareness of (27.9%) among the participants.

The link between stress and breast cancer is not well established, but many modules tried to explain the mechanism of physiological and emotional stress in causing breast cancer. Stress is correlated with many diseases, such as cardiovascular and autoimmune diseases [14]. Still, stress cannot be excluded as a risk factor (Chiriac et al., 2018). About 46.8% of participants believed that the association between breast cancer and stress was close to Blooshi et al.'s results (Blooshi et al., 2019).

Furthermore, several studies highlighted sleep disturbances as a breast cancer risk factor, especially long-term night shift work and sleeping for less than six hours (Wong et al., 2021). This study was the first to shed light on this risk factor awareness among UAE women; only 13.8% of participants identified sleep disturbances associated with breast cancer.

Dietary habits, including the type and quantity of different Nutrients, are also related to breast cancer incidence. Both low dietary fiber intake and food with a high glycemic index correlate with breast cancer. One study showed that increasing fiber intake could reduce the breast cancer risk by 12% (Chen et al., 2016). Furthermore, a meta-analysis of ten prospective cohort studies revealed an 8% increment in breast cancer risk with a high glycemic index diet (Dong and Qin, 2011). There was insufficient awareness of these two risk factors in this study population. The overall knowledge of breast cancer risk factors was inferior due to a shortage of awareness techniques and material regarding these risk factors.

Knowledge of symptoms and breast cancer screening methods is essential for the early detection of breast cancer, leading to a higher rate of cure and lower mortality rates. This study participant showed a higher level of breast cancer symptoms knowledge than in older studies which can be attributed to the intense implementation of awareness programs in the UAE.

Despite our group sample's remarkable improvement in screening knowledge compared to previous studies, there is still a gap in recognizing screening method technicalities such as the suitable age to start screening, frequency, and approaches.

This study showed a significant difference in knowledge levels among different demographic groups. The age group 46 to 55 showed the highest mean in total knowledge compared to other age groups, while the age group 26 to 35 showed the lowest point for both risk factors and screening knowledge. This piece of information cannot be ignored because if we tackle the literature, we will find that breast cancer in AYA women is more aggressive and diagnosed at a late stage (Murphy et al., 2019), and There is still no specific guideline or technique for screening for this age group. Women with postgraduate studies had a significantly higher mean of knowledge which aligned with other studies (Elobaid et al., 2014;Prashanth Hegde et al., 2012). This result highlights the impact of higher education on exposure to trustworthy sources of information. The least mean of knowledge accompanied the non-working participants, indicating the educational program's poor reach to this segment of the community.

This study measured the existence of breast cancer risk factors and symptoms among participants. The majority of participants, 72.6%, were at moderate risk of breast cancer, and 9.1% were at high risk. The most frequent risk factor among respondents was stress, sleep disturbances, and consuming food with a high glycemic index.

The correlation between the source of information and the level of knowledge indicated that women who rely on tertiary resources and healthcare providers and attend breast cancer awareness events obtained a better understanding. This result confirms the necessity of checking social media health information reliability; hence It is considered a substantial source of information, especially after the covid-19 pandemic, as indicated by Taru Saigal's study (Taru Saigal, 2020).

Out of all participants aged more than 40 years, 62.9% underwent mammography at least once, which was higher than in a study in 2014 (Elobaid et al., 2014). This result indicates an improvement in mammography's attitude and availability, but more awareness efforts are still needed to reach the desired percentage of screening.

Lack of awareness about the breast cancer clinical picture and screening approaches contributes mainly to the regular breast cancer screening practice. In this study, women who underwent mammography regularly showed a high mean total knowledge, while those who never underwent mammography showed a low mean knowledge. This result indicates how strongly the knowledge level can affect breast cancer screening practices and attitudes.

On the other hand, many knowledgeable women avoid

practicing breast cancer screening for various reasons. Some are personal barriers, others are cultural-social barriers, and the rest are related to health facility-service barriers.

Lack of timely performance of breast cancer screening is not the only genuine concern regarding the late diagnosis of breast cancer but the delay in seeking medical help. A systemic review showed that the delay of diagnosis by three months or more has negatively impacted five-year survival, and a longer than three months delay is attributed to advanced breast cancer (Caplan, 2014). Unfortunately, about 17% of the participants in our study indicated that they would delay seeking medical help if they noticed any abnormal findings, and 0.6% would never ask for help. Despite the low portion of participants who attended awareness events, about 63.3% of all respondents are willing to participate in breast cancer awareness events.

This study's Strengths were that it is the first study in the GCC region that highlighted the level of knowledge and prevalence of breast cancer risk factors and included a considerable number of participants. Some features of the monkey survey application (limitation on using the same IP address more than once) were utilized to prevent the duplication response. This study's limitation was that the sample did not reflect the UAE female society; hence, 80% of participants were Arabs, attributed to the utilized Arabic social media channels and pages. However, it was a self-administered questionnaire that may not reflect actual knowledge and attitudes in addition to the conflicts that may arise from cultural bias and other personal issues in answering the questions.

In conclusion, most participants had good knowledge about breast cancer with relatively high knowledge of screening methods and symptoms, although humble knowledge of breast cancer risk factors. Participants who received information from healthcare providers or attended awareness events had a higher knowledge level.

This study shed light on the insufficient practice of breast cancer screening among this study participants and the need to encourage mammography practices. Barriers to not performing breast cancer screening were mainly personal, while a small portion was related to financial constraints. Good attitude showed by most participants in attending breast cancer awareness events. Potential risk evaluation revealed that many participants suffer from many possible risk factors. The most frequent risk factors were stress, obesity, bad dietary habits, smoking, and never breastfeeding. Also, a considerable portion of the population had a potential symptom of breast cancer, which needs to be addressed.

This study calls stakeholders for intervention to improve knowledge of breast cancer among women in the UAE by recommending an Implementation of BC awareness events and educational programs which should target the highlighted community segments with weak knowledge, such as the age group younger than 25 or older than 55 years, and unemployed women. In addition to the importance of increasing awareness about BC risk factors, especially obesity, active and passive smoking, stress, sleeping disturbances, and dietary habits.

Furthermore, Healthcare authorities should address

social media's role in health education and use it as an effective educational tool; hence a considerable portion of the population relies on these platforms as the primary source of information. They consider affording reliable and trustworthy health information and imply more censorship of health information posts.

Author Contribution Statement

All authors contributed equally in this study.

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