Jordan Journal of Nursing Research, Volume **2**, No. **4**, **2023**
DOI: https://doi.org/10.14525/JJNR.v2i4.07

Jordan Journal of Nursing Research

www.jjnr.just.edu.jo

Evaluating Nutrition-related Knowledge, Attitudes, and Practices for the Prevention of Breast Cancer among Women in Jordan

Baraah Ajlouni, MSc [1]; Anas Al-Nabulsi, PhD [1]; Saqer N. Issa, MD, JBS [2]; Rana Abu Farha, PhD [3];

Wafa'a Ta'an, RN, PhD [4]; Salma Abu Saleh, MSc [1]; Rania Itani, PhD [5];

Rawan Tawalbeh, RN, PhD [6,7]; Tareq Mukattash, PhD [8*]

1 Department of Nutrition and Food Technology, Faculty of Agriculture, Jordan University of Science and Technology, Irbid, Jordan.
2 General Surgery Department, King Hussein Hospital, Royal Medical Services, Amman, Jordan.
3 Department of Clinical Pharmacy & Therapeutics, Applied Science Private University, Amman, Jordan.
4 Department Community and Mental Health Nursing, Faculty of Nursing, Jordan University of Science and Technology, Irbid, Jordan.
5 Faculty of Pharmacy, Beirut Arab University, Beirut, Lebanon.
6 California School of Health Sciences, Oklahoma State University, Anaheim, CA, USA.
7 Faulty of Applied Medical Sciences, Jordan University of Science and Technology, Irbid, Jordan.
8 Department of Clinical Pharmacy, Faculty of Pharmacy, Jordan University of Science and Technology, Irbid, Jordan.
** Corresponding Author. Email: tlmukattash@just.edu.jo*

ARTICLE INFO

Article History:
Received: May 22, 2023
Accepted: November 12, 2023

ABSTRACT

Background: A healthy diet plays a significant role in preventing and treating various diseases, including colon and breast cancer. ***Purpose***: This study aims to evaluate knowledge, attitudes, and practices related to nutrition in breast cancer prevention and to explore the relationship between demographic characteristics and nutrition practices for breast cancer prevention. ***Methods***: A cross-sectional web-based survey was conducted to assess the level of knowledge, attitudes, and practices concerning breast cancer among 1511 women in Jordan. The survey underwent content validation and received IRB approval from King Abdullah University Hospital. ***Results***: A total of 1511 participants completed the survey. Knowledge levels, with a mean score of 12, significantly varied based on education level (ρ-value = 0.04), field of education (ρ-value $\leq$ 0.001), and physical activity (ρ-value $\leq$ 0.001). The mean scores for attitudes and practices toward nutrition-related breast cancer prevention factors were 21.5 and 37, respectively. ***Conclusion***: The study found that education level, family history, physical activity patterns, and sleep habits were factors associated with nutrition knowledge and positive practices, potentially reducing the risk of breast cancer. However, increasing nutrition knowledge alone was not sufficient to change dietary behavior. ***Implications for Nursing***: Risk reduction strategies can be enhanced by incorporating evidence-based practices, such as those identified in this study. Additionally, current prevention and treatment options, including education, counseling, and psychosocial support, should be further developed to increase nutrition-related knowledge, attitudes, and practices for breast cancer prevention.

Keywords: Breast cancer, Nutrition, Knowledge, Attitude, Practice, Awareness, Lifestyle.

What does this paper add?

1. It adds insights into the levels of knowledge, attitudes, and practices related to nutrition in breast cancer prevention among women in Jordan.
2. It explores the relationship between demographic characteristics and nutritional practices for breast cancer prevention.
3. It offers valuable insights for healthcare

professionals, policymakers, and researchers working in this critical area of public health.

Introduction

Breast cancer (BC) is the most frequently diagnosed and the second most common cancer (Bray et al., 2018). Globally, it ranks as the fifth leading cause of cancer-related deaths (Fahad Ullah, 2019). In 2020, an estimated 2.3 million people were diagnosed with breast cancer, and approximately 685,000 lost their lives as a result of it (Sung et al., 2021). By 2070, the number of breast cancer cases is projected to rise to 4.4 million cases (Soerjomataram & Bray, 2021). It is noteworthy that the majority of breast tumors occur in women (Chen et al., 2013). Globally, the incidence of BC varies among countries and ethnicities, with 46.3 cases per 100,000 females (Bray et al., 2018). In the Middle East, Lebanon has the highest incidence rate at 106 cases per 100,000, followed by Algeria and Syria with rates of 57 and 21 per 100,000, respectively (Shatila et al., 2021). In Jordan, cancer ranks as the second most significant health issue, following cardiovascular diseases, and is the leading cause of death (Jordan Ministry of Health, 2012). BC accounts for 37.3% of all newly diagnosed cases in females (Abdel-Razeq et al., 2015).

Breast cancer has non-modifiable risk factors, including older age (>65 years), genetic predisposition (including DNA mutations and a family history of BC), early menarche (<12 years), late menopause (>55 years), age at first pregnancy over 30 years, infertility and nulliparity, use of contraceptives, hormonal treatment after menopause, and no history of breastfeeding (Sun et al., 2017; Zare et al., 2013). Lifestyle factors, such as obesity, dietary choices, and the use of oral hormonal contraceptives, are modifiable risk factors for BC (Giles et al., 2012).

Healthy dietary patterns play a significant role in treating and preventing various disorders, such as cancer and cardiovascular diseases (Banikazemi et al., 2018)). Previous studies have indicated that cancer-related deaths can be reduced by approximately 35% through the adoption of an appropriate diet (Danaei et al., 2005). Conversely, an unhealthy dietary pattern increases the risk of breast cancer (Xiao et al., 2019). One of the reasons for the elevated risk of developing breast cancer is the tendency to adopt a "westernized" diet (Fararouei et al., 2019).

Knowledge, attitudes, and practices (KAP) regarding a disease can significantly influence healthcare-seeking behavior and prevention. Recognizing the dietary risk factors associated with a higher risk of breast cancer can lead to positive changes in dietary habits aimed at preventing breast cancer incidence.

Notably, there has been no previous study on nutrition-related breast cancer prevention KAP in Jordan. This study was conducted to assess the KAP of Jordanian women concerning breast cancer by evaluating their KAP regarding the role of nutrition in breast cancer prevention. Such assessments are essential for planning public health programs aimed at preventing breast cancer risk factors among women. Additionally, the study aimed to examine the relationship between demographic characteristics and nutrition-related KAP for breast cancer prevention.

Methods

Study Design

A cross-sectional, web-based survey was conducted to assess the level of KAP regarding breast cancer among women in Jordan. The survey took place between March 20, 2022 and August 1, 2022. A link to the Google Form survey was disseminated through various social networking platforms and groups on Facebook, WhatsApp, Twitter, and Instagram in Jordan. A total of 1511 Jordanian women completed the survey. The inclusion criteria were females aged from 18 to 70 years who had not been previously diagnosed with breast cancer.

Study Instruments

The research questionnaire was self-administered and provided in two languages, English and Arabic. The questionnaire included questions on socio-demographic and health information, nutrition knowledge, attitudes of participants toward preventing breast cancer, and practices related to breast cancer prevention. This study used the KAP questionnaire developed by Lahiji and colleagues based on the recommended review in the relevant previous study. The questionnaire consisted of 28 items, including 13 questions on knowledge, 9 on attitudes, and 12 on practices (Raji Lahiji et al., 2019). The questionnaire was previously translated and used in Arabic language. The current study also evaluated the internal reliability indices for the scales which will be presented below.

Knowledge Questionnaire

This questionnaire aimed to assess participants' nutritional knowledge. Scores were assigned based on the answers: a score of 1 was given for a correct answer, false answers were scored as -0.3, and a score of 0 was assigned to responses indicating "I don't know." Final scores were calculated for each participant, with higher scores indicating a better understanding of nutrition in breast cancer prevention. Knowledge scores below the mean level were classified as "poor," while scores above the mean were classified as "good." In our study, Cronbach's α coefficient for the knowledge scale was equal to 0.73.

Attitude Questionnaire

Each attitude question used a 5-point Likert scale, where the points ranged from 0 to 4. These points indicated the level of agreement, with "strongly disagree" corresponding to 0 and "strongly agree" corresponding to 4. It is important to note that this scale was reversed compared to other scales, where 0 represented "strongly agree" and 4 represented "strongly disagree."

Total scores were calculated for each participant, with scores ranging from 0 to 36. Higher scores indicated stronger agreement with the role of nutrition in breast cancer prevention. Attitude scores below the mean score were categorized as “negative”, while scores at or above the mean were considered “positive”. The Cronbach's α coefficient for the attitude scale was 0.69.

Practice Questionnaire

This part assessed how often the participants consumed various items, such as fruit, vegetables, fish, red meat, offal (e.g. liver, kidney, heart), high-fat meals, high-fat dairy products, fast foods, chocolate, refined carbohydrates, sweets, soft drinks, butter, and cream during the past month. Each item was assessd on a scale ranging from 0 (never) to 5, where 1 corresponds to (1 to 3 times per month), 2 (once a week), 3 (more than once a week), 4 (once a day), and 5 (more than once a day).

The total score for the practice questions for each participant ranged from 0 to 60. Higher scores indicated better dietary practices. Practice scores below the mean were classified as “poor”, while scores at or above the mean were categorized as “good” practice. The Cronbach's α coefficient for the practice scale was 0.71.

Statistical Analysis

Data analysis was conducted using the 25th version of the Statistical Package for Social Sciences, (SPSS). Descriptive statistics, including the mean ± standard deviation (±SD) for continuous variables and frequency and percentage for categorical variables, were employed to summarize the characteristics of the study population. Linear regression was utilized to predict the level of KAP, and independently associated variables with KAP were identified. Statistical significance was defined as $P \leq 0.05$.

Ethical Considerations

The study protocol received approval from the Institutional Review Board of King Abdullah University Hospital, University of Science & Technology, Irbid, Jordan. Participation in the study was voluntary, and the study's purpose was explained to the participants before they accessed the questionnaire. Electronic informed consent was obtained from all participants, and the anonymity of respondents was strictly maintained.

Results

A total of 1511 completed forms were obtained from Jordanian women. The mean age of participants was 32.29 ± 10.12 years. A half of the participants were married. The majority of the participants (91.9%) had a higher education level. Approximately 42.3% had an ideal body mass index, while 31.8% were overweight, and 19.8% were obese. About 20% of the participants had a family history of cancer, and 14% of those family members who had a history of cancer were specifically diagnosed with breast cancer. Moreover, it was found that 31.6% of the participants did not engage in any physical activity for at least 3 days a week, and 36.1% typically slept for 7-8 hours a day. More details regarding the participants' demographic and health information are presented in Table 1.

Questions regarding nutrition knowledge related to breast cancer prevention are presented in Table 2, which shows the percentage of participants providing correct answers. The mean Knowledge score was 12.8 (range: -5.40-24). Approximately 75.8% of the participants believed that breast cancer can be reduced. The results indicated that approximately a half of the participants did not know that "hormonal therapy," "overweight and obesity," and "low physical activity" are risk factors for breast cancer, along with "suitable intake of olive oil,"

"avoiding fast foods," and "consuming a low amount of red meat" as factors for breast cancer prevention. About 25.1% of the participants did not correctly understand the potential association between cooking methods and breast cancer prevention.

Table 1. Socio-demographic and lifestyle characteristics of participants (N=1511)

Variable	Mean	SD
Age	32.29	10.12
Variable	**Frequency**	**Percentage (%)**
Marital status		
Single	639	42.2
Married	813	53.8
Divorced	40	2.6
Widowed	19	1.3
Level of education		
Not-education	2	0.1
School	120	7.9
University-student	295	19.5
University-degree	747	49.5
Post-graduation	347	22.9
Education field		
Medical	497	32.9
Non-medical	874	57.8
Didn't complete education	140	9.3
Employment status		
Unemployed	525	34.7
Field job	221	14.6
Desk job	355	23.5
Retired	51	3.4
Student	359	23.8
Menopausal status		
Pre-menopausal	1301	85.9
Post-menopausal	210	13.9
Smoking		
No	871	57.6
Yes	201	13.3
A member of my family	439	29.1
Taking any supplement to reduce the risk of BC		
No	990	65.5
No need	102	6.7
Yes	420	27.8
Family history of BC		
No	1206	79.8
Yes	305	20.2
BMI		
Underweight	90	6
Normal	633	42.3
Overweight	476	31.8
Obesity	296	19.8

Doing physical activity for 30 min. at least 3 times/week		
Never	477	31.6
Sometimes	711	47.1
Usually	225	14.9
Always	98	6.5
Routinely sleeping 7-8 hours/day		
Never	149	9.9
Sometimes	570	37.7
Usually	543	35.9
Always	249	16.5

Table 2. Knowledge questionnaire and responses for participants in the study

Item	Knowledge question	% true response
K1	Is it possible to reduce breast cancer occurrence risk?	75.8%
K2	What are the risk factors for breast cancer?	91.4%
K3	How likely do nutritional factors affect the occurrence of breast cancer?	16.4%
K4	What are some of the main risk factors for breast cancer?	
K4.1	-Hormonal therapy and contraceptive pills	54.4%
K4.2	-Early menarche	16.5%
K4.3	-Overweight and obesity	55%
K4.4	-Vitamins deficiency (D&C)	39.1%
K4.5	-Sedentary lifestyle (setting for long periods)	46.9%
K4.6	-Low physical activity (sport)	55.3%
K4.7	-Smoking	75.5%
K4.8	-Alcohol consumption	70%
K5	Which of the following practices is effective in reducing the risk of breast cancer?	
K5.1	-Avoiding consuming chicken with skin	30.2%
K5.2	-Adequate intakes of olive oil per day (about two tablespoons)	50.7%
K5.3	- Avoiding fast food consumption	79.5%
K5.4	- Avoiding consuming sweet foods or sugar (more than once a time in a week)	78.2%
K5.5	-Adequate vegetable intake (4 units/day =4 cupful's of raw vegetables)	83.3%
K5.6	-Cooking method (boiling, frying, barbecuing)	74.9%
K5.7	- Avoiding having smoked foods	50.4%
K5.8	- Avoiding consuming saturated oil (animal or plant)	71.6%
K5.9	-Taking probiotic dairies like in yogurt (probiotics and friendly bacteria that can improve your health)	60.7%
K5.10	-Avoiding high-fat dairy (more than four times per week)	46.1%
K5.11	-Having whole-grain pasta	39.9%
K5.12	-Adequate consumption of fish (at least 2-3 portions of fish a week)	67.9%
K5.13	- Avoiding consumption of a high amount of red meat (more than three times a week)	52.6%

The mean attitude score was 21.5 (range: 5-33). The results from the attitude section indicate that 64.1% of Jordanian women believe that breast cancer can be prevented. Furthermore, 77% held a positive attitude toward preventing breast cancer, even in the absence of a family history of this cancer. Two-thirds of the participants displayed a positive attitude towards adopting a diet that reduces the risk of breast cancer for future generations. More than a half of the participants correctly understood that breast cancer could also affect men, underscoring the importance of adhering to healthy dietary patterns. Only 17.3% of the participants preferred enjoying food over following a diet to prevent breast cancer.

The mean score for nutrition practices was 37 (range: 7-56). We found that 45.1% of the participants consumed fruit and vegetables at least once a day. Additionally, 46.9% of the participants ate fish 1-3 times a month. Approximately 43.1% and 33.1% of the participants consumed fast food and high-fat meals 1-3 times a month, respectively. Furthermore, 45% of them consumed chocolate and cocoa once a day or more.

The results of multiple linear regression (Table 3) revealed that the age of the participants was a predictor of nutrition practices ($\beta = 0.110$, $p = 0.004$), with increasing age associated with significant improvements in practices. Additionally, the participants' education level and field of study were associated with nutrition knowledge and practices. Having a higher education level and having a background in the medical field were significant predictors of breast cancer prevention knowledge. Lifestyle factors, such as physical activity and sufficient sleep, were also associated with the participants' nutrition practices and attitudes toward breast cancer prevention.

Table 3. Multiple linear regression models for total knowledge, attitude, and practices

	Total knowledge			**Total attitude**			**Total practices**		
Model summary	**R**	**Adj. R^2**	**F**	**R**	**Adj. R^2**	**F**	**R**	**Adj. R^2**	**F**
	0.41	0.48	6.8**	0.28	0.50	14**	0.29	0.40	5.5**
	B	**SE**	**β**	**B**	**SE**	**β**	**B**	**SE**	**β**
Age	0.014	0.019	0.026	-0.034	0.013	0.081**	-0.078	0.027	0.110**
Education level	0.482	0.234	0.073*	0.510	0.138	0.102**	0.168	0.237	0.020**
Education field	1.83	0.30	0.156**	1.095	0.204	0.154**	0.098	0.341	0.08
Employment status	0.058	0.103	0.016	-0.045	0.078	-0.013	1.501	0.410	0.102**
Smoking	0.090	0.158	0.014	0.259	0.120	0.053*	0.407	0.205	0.050
Physical activity	0.551	0.167	0.085**	0.522	0.128	0.103**	0.798	0.220	0.95
Sleeping 7-8hrs/day	0.245	0.164	0.039	0.389	0.125	0.079**	0.553	0.214	0.068
Family history of BC	0.119	0.348	0.09	1.045	0.520	0.085*	0.725	0.453	0.04*

*** p-value <0.05.**

**** p-value <0.01.**

Discussion

In this study, we investigated the nutrition knowledge, attitude, and practice concerning breast cancer prevention among Jordanian women. Our findings revealed that 75.8% of the participants believed that breast cancer can be reduced. Moreover, over 50% of the participants recognized smoking, overweight and obesity, and low physical activity as risk factors for breast cancer incidence. The majority of participants also acknowledged that avoiding the consumption of fast food is one of the dietary factors that can reduce the incidence of breast cancer.

These findings align with previous studies, which have shown that nutrition knowledge can vary by age (Harnack et al., 1998; Hendrie et al., 2008) and educational level (Cotugna et al., 1992). Age is a well-established risk factor for breast cancer, with the incidence rate increasing significantly with age, peaking at menopause, and then gradually decreasing or stabilizing (Kim et al., 2015; Thakur et al., 2017). In a case-control study, it was found that being over 50 years old was associated with a higher incidence rate of breast cancer (Mahouri et al., 2007). Interestingly, our study revealed that older individuals tended to have more negative attitudes toward the role of nutrition in breast cancer prevention.

It's worth noting that while a substantial percentage of participants in our study recognized key risk factors and preventive measures, there is still room for improvement in enhancing knowledge, attitudes, and practices related to breast cancer prevention through nutrition. Further efforts in public health education and awareness campaigns may play a crucial role in bridging these knowledge gaps and encouraging positive

attitudes and practices toward breast cancer prevention.

Some women are at more risk of developing breast cancer, such as those with a positive family history (Bravi et al., 2018; Metcalfe et al., 2009); therefore, they should take additional preventive measures to enhance their general health condition. The current study revealed that individuals with a family history of breast cancer displayed significantly higher positive attitudes toward the role of nutrition in breast cancer prevention, which is consistent with findings from previous studies (Beagan & Chapman, 2004; Raji Lahiji et al., 2019).

The World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR) lifestyle recommendations advocate for a healthy lifestyle to prevent cancer. This includes maintaining a normal body weight, engaging in regular physical activities, daily consumption of fruits, vegetables, whole grains, poultry, and fish, while limiting the consumption of red meat, refined foods, sweets, and high-fat dairy products (World Cancer Research Fund, 2018). In our study, 69.3% and 79.1% of the participants reported consuming one or more servings of fruits and vegetables per day, respectively. These results may be attributed to the fact that the traditional diet in Jordan includes a variety of vegetables and fruits that are readily available in abundance and at reasonable prices, encouraging women to include them in their diets. However, it is worth noting that the consumption of fast food and sweet snacks was also prevalent, with 39.4% of the participants reporting consuming sweet snacks more than once a week. These dietary habits may contribute to an increased cancer risk (Chajès et al., 2008).

Physical activities are one of the important controllable factors that can help reduce the risk of developing breast cancer (McTiernan et al., 2003). This study demonstrated a significant association between physical activity and nutrition-related KAP for preventing breast cancer. Previous research has consistently shown that increasing physical activity is associated with a reduced risk of breast cancer (Alsolami et al., 2019; Holick et al., 2008). Specifically, studies have indicated that physical activity after a breast cancer diagnosis might decrease the risk of death due to the disease (Holick et al., 2008; Johnson et al., 2019; Kim et al., 2015). Additionally, other factors such as short sleep duration, poor sleep quality, and late bedtimes can influence dietary patterns and potentially increase the risk of disease (Frank et al., 2017; Spaeth et al., 2013).

Strengths and Limitations

This study represents the first report of nutrition-related breast cancer prevention KAP among Jordanian women. It sheds light on the importance of raising the awareness about nutrition knowledge, attitudes, and practices to mitigate potential risk factors contributing to breast cancer morbidity and mortality among women. Some limitations should be acknowledged. The study used a cross-sectional design, and future longitudinal studies are recommended. Also, the study used a self-reported questionnaire which poses the risk of social desirability. The study also used a sample of Jordanian women; therefore, the replication of this study in different countries can enhance its generalizability and comparability.

Conclusion

In conclusion, nutrition-related KAP regarding breast cancer prevention was found to be influenced by factors, such as age, education level, field of education, occupation, and family history of breast cancer, as well as the participants' patterns of physical activity and sleep. These results underscore the importance of providing individuals with accurate nutritional knowledge to improve their dietary practices and, ultimately, reduce the risk of nutrition-related cancers, including breast cancer. These findings should inform the development of breast health education programs by nurses and other healthcare professionals.

Implications for Nursing

Risk reduction strategies can be strengthened by incorporating evidence-based practices, including insights from the present study. Specifically, individuals with lower levels of education would benefit from educational programs focused on nutrition-related knowledge, attitudes, and practices to raise the awareness of breast cancer prevention. Implementing training programs by nurses in healthcare centers and hospitals for the general public can play a pivotal role in enhancing knowledge and promoting better practices related to breast cancer prevention. Furthermore, there is a pressing need to bolster existing prevention and treatment options by offering education, counseling, and psycho-social support to further augment nutrition-related knowledge, attitudes, and practices aimed at mitigating the risk of breast cancer.

Funding or Sources of Financial Support

The study received no financial support from any source.

Conflict of Interests

All authors declare no conflict of interests.

REFERENCES

Abdel-Razeq, H., Attiga, F., & Mansour, A. (2015). Cancer care in Jordan. *Hematology/Oncology and Stem Cell Therapy*, *8* (2), 64-70. https://doi.org/10.1016/j.hemonc.2015.02.001

Alsolami, F.J., Azzeh, F.S., Ghafouri, K.J., Ghaith, M.M., Almaimani, R.A., Almasmoum, H.A., Abdulal, R.H., Abdulaal, W.H., Jazar, A.S., & Tashtoush, S.H. (2019). Determinants of breast cancer in Saudi women from Makkah region: A case-control study (breast cancer risk factors among Saudi women). *BMC Public Health*, *19* (1), 1554. https://doi.org/10.1186/s12889-019-7942-3

Banikazemi, Z., Haji, H.A., Mohammadi, M., Taheripak, G., Iranifar, E., Poursadeghiyan, M., Moridikia, A., Rashidi, B., Taghizadeh, M., & Mirzaei, H. (2018). Diet and cancer prevention: Dietary compounds, dietary MicroRNAs, and dietary exosomes. *Journal of Cellular Biochemistry*, *119* (1), 185-196. https://doi.org/10.1002/jcb.26244

Beagan, B.L., & Chapman, G.E. (2004). Family influences on food choice: Context of surviving breast cancer. *Journal of Nutrition Education and Behavior*, *36* (6), 320-326. https://doi.org/10.1016/s1499-4046(06)60402-8

Bravi, F., Decarli, A., & Russo, A.G. (2018). Risk factors for breast cancer in a cohort of mammographic screening program: A nested case-control study within the FR iCaM study. *Cancer Medicine*, *7* (5), 2145-2152. https://doi.org/10.1002/cam4.1427

Bray, F., Ferlay, J., Soerjomataram, I., Siegel, R. L., Torre, L. A., & Jemal, A. (2018). Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA: A Cancer Journal for Clinicians*, *68* (6), 394-424. https://doi.org/10.3322/caac.21492

Chajès, V., Thiébaut, A.C., Rotival, M., Gauthier, E., Maillard, V., Boutron-Ruault, M.C., Joulin, V., Lenoir, G. M., & Clavel-Chapelon, F. (2008). Association between serum trans-monounsaturated fatty acids and breast cancer risk in the E3N-EPIC study. *American Journal of Epidemiology*, *167* (11), 1312-1320. https://doi.org/10.1093/aje/kwn0699

Chen, X., Liu, X., Zhang, L., Li, S., Shi, Y., & Tong, Z. (2013). Poorer survival of male breast cancer compared with female breast cancer patients may be due to biological differences. *Japanese Journal of Clinical Oncology*, *43* (10), 954-963. https://doi.org/10.1093/jjco/hyt116

Cotugna, N., Subar, A.F., Heimendinger, J., & Kahle, L. (1992). Nutrition and cancer prevention knowledge, beliefs, attitudes, and practices: The 1987 National Health Interview Survey. *Journal of the American Dietetic Association*, *92* (8), 963-968.

Danaei, G., Vander Hoorn, S., Lopez, A.D., Murray, C.J., Ezzati, M., & Comparative Risk Assessment Collaborating Group (Cancers). (2005). Causes of cancer in the world: comparative risk assessment of nine behavioural and environmental risk factors. *Lancet (London, England)*, *366* (9499), 1784-1793. https://doi.org/10.1016/S0140-6736(05)67725-2

Fahad Ullah, M. (2019). Breast cancer: Current perspectives on the disease status. *Advances in Experimental Medicine and Biology*, *1152*, 51-64. https://doi.org/10.1007/978-3-030-20301-6_4

Fararouei, M., Iqbal, A., Rezaian, S., Gheibi, Z., Dianatinasab, A., Shakarami, S., & Dianatinasab, M. (2019). Dietary habits and physical activity are associated with the risk of breast cancer among young Iranian women: A case-control study on 1010 premenopausal women. *Clinical Breast Cancer*, *19* (1), e127-e134. https://doi.org/10.1016/j.clbc.2018.10.011

Frank, S., Gonzalez, K., Lee-Ang, L., Young, M.C., Tamez, M., & Mattei, J. (2017). Diet and sleep physiology: Public health and clinical implications. *Frontiers in Neurology*, *8*, 393. https://doi.org/10.3389/fneur.2017.00393

Giles, E.D., Wellberg, E.A., Astling, D.P., Anderson, S.M., Thor, A.D., Jindal, S., Tan, A.C., Schedin, P.S., & Maclean, P.S. (2012). Obesity and overfeeding affecting both tumor and systemic metabolism activates the progesterone receptor to contribute to postmenopausal breast cancer. *Cancer Research*, *72* (24), 6490–6501. https://doi.org/10.1158/0008-5472.CAN-12-1653

Harnack, L., Block, G., Subar, A., & Lane, S. (1998). Cancer prevention-related nutrition knowledge, beliefs,

and attitudes of US adults: 1992 NHIS cancer epidemiology supplement. *Journal of Nutrition Education, 30* (3), 131-138. https://doi.org/10.1016/S0022-3182(98)70303-6

Hendrie, G. A., Coveney, J., & Cox, D. (2008). Exploring nutrition knowledge and the demographic variation in knowledge levels in an Australian community sample. *Public Health Nutrition, 11* (12), 1365-1371. https://doi.org/10.1017/S1368980008003042

Holick, C.N., Newcomb, P.A., Trentham-Dietz, A., Titus-Ernstoff, L., Bersch, A. J., Stampfer, M.J., Baron, J.A., Egan, K.M., & Willett, W. C. (2008). Physical activity and survival after diagnosis of invasive breast cancer. *Cancer Epidemiology, Biomarkers & Prevention: A Publication of the American Association for Cancer Research.* Cosponsored by the American Society of Preventive Oncology, *17* (2), 379-386. https://doi.org/10.1158/1055-9965.EPI-07-0771

Johnson, M.J., Nemeth, L.S., Mueller, M., Eliason, M.J., & Stuart, G.W. (2016). Qualitative study of cervical cancer screening among lesbian and bisexual women and transgender men. *Cancer Nursing, 39* (6), 455-463. https://doi.org/10.1097/NCC.0000000000000338

Jordan Ministry of Health. (2012). Annual incidence of cancer in Jordan. http://www.moh.gov.jo/Echobusv3.0/SystemAssets/c602eda7-0c36-49cd-bea1-3484e46c0b97.pdf

Kim, Y., Yoo, K.Y., & Goodman, M.T. (2015). Differences in incidence, mortality and survival of breast cancer by regions and countries in Asia and contributing factors. *Asian-Pacific Journal of Cancer Prevention: APJCP*, *16* (7), 2857-2870. https://doi.org/10.7314/apjcp.2015.16.7.2857

Mahouri, K., Dehghani Zahedani, M., & Zare, S. (2007). Breast cancer risk factors in south of Islamic Republic of Iran: A case-control study. *Eastern Mediterranean Health Journal*, *13* (6), 1265-1273. https://doi.org/10.26719/2007.13.6.1265

McTiernan, A., Kooperberg, C., White, E., Wilcox, S., Coates, R., Adams-Campbell, L. L., Woods, N., Ockene, J., & Women's Health Initiative Cohort Study. (2003). Recreational physical activity and the risk of breast cancer in postmenopausal women: The Women's Health Initiative Cohort Study. *JAMA, 290* (10), 1331-1336. https://doi.org/10.1001/jama.290.10.1331

Metcalfe, K.A., Finch, A., Poll, A., Horsman, D., Kim-Sing, C., Scott, J., Royer, R., Sun, P., & Narod, S.A. (2009). Breast cancer risks in women with a family history of breast or ovarian cancer who have tested negative for a BRCA1 or BRCA2 mutation. *British Journal of Cancer*, *100* (2), 421-425. https://doi.org/10.1038/sj.bjc.6604830

Raji Lahiji, M., Dehdari, T., Shokouhi Shoormasti, R., Hosseini, A.F., Navaei, M., & Zarrati, M. (2019). Nutrition knowledge, attitudes, and practice towards breast cancer prevention among the female population of Iran University of Medical Science students. *Nutrition and Cancer*, *71* (8), 1355-1364. https://doi.org/10.1080/01635581.2019.1607410

Shatila, H., Fatfat, Z., Talhouk, R., Naalbandian, S., Forman, M.R., Nasr, R., & Naja, F. (2021). Nutrition and breast cancer research in Arab countries: Gaps, opportunities, and recommendations. *Nutrition and Cancer*, *73* (11-12), 2113-2129. https://doi.org/10.1080/01635581.2020.1823435

Soerjomataram, I., & Bray, F. (2021). Planning for tomorrow: Global cancer incidence and the role of prevention 2020-2070. *Nature Reviews. Clinical Oncology*, *18* (10), 663-672. https://doi.org/10.1038/s41571-021-00514-z

Spaeth, A.M., Dinges, D.F., & Goel, N. (2013). Effects of experimental sleep restriction on weight gain, caloric intake, and meal timing in healthy adults. *Sleep*, *36* (7), 981-990. https://doi.org/10.5665/sleep.2792

Sun, Y.S., Zhao, Z., Yang, Z.N., Xu, F., Lu, H.J., Zhu, Z.Y., Shi, W., Jiang, J., Yao, P.P., & Zhu, H.P. (2017). Risk factors and preventions of breast cancer. *International Journal of Biological Sciences*, *13* (11), 1387-1397. https://doi.org/10.7150/ijbs.21635

Sung, H., Ferlay, J., Siegel, R.L., Laversanne, M., Soerjomataram, I., Jemal, A., & Bray, F. (2021). Global cancer statistics 2020: GLOBOCAN estimates of Incidence and mortality worldwide for 36 cancers in 185 countries. *CA: A Cancer Journal for Clinicians*, *71* (3), 209-249. https://doi.org/10.3322/caac.21660

Thakur, P., Seam, R. K., Gupta, M. K., Gupta, M., Sharma, M., & Fotedar, V. (2017). Breast cancer risk factor evaluation in a Western Himalayan state: A case-control study and comparison with the western world. *South-Asian Journal of Cancer*, *6* (3), 106-109. https://doi.org/10.4103/sajc.sajc_157_16

World Cancer Research Fund. (2018). Third expert report on "diet, nutrition, physical activity, and cancer: A global perspective". https://www.wcrf.org/dietandcancer/breast-cancer

Xiao, Y., Xia, J., Li, L., Ke, Y., Cheng, J., Xie, Y., Chu,

W., Cheung, P., Kim, J.H., Colditz, G. A., Tamimi, R. M., & Su, X. (2019). Associations between dietary patterns and the risk of breast cancer: A systematic review and meta-analysis of observational studies. *Breast Cancer Research: BCR, 21* (1), 16. https://doi.org/10.1186/s13058-019-1096-1

Zare, N., Haem, E., Lankarani, K.B., Heydari, S.T., & Barooti, E. (2013). Breast cancer risk factors in a defined population: Weighted logistic regression approach for rare events. *Journal of Breast Cancer*, *16* (2), 214-219. https://doi.org/10.4048/jbc.2013.16.2.214