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Assessment of Awareness Regarding Genetic, Hormonal, and Biochemical Factors Associated with Breast Cancer Among a Sample of the Iraqi Community

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ABSTRACT

Background: Breast cancer is the most common cancer among women worldwide, and awareness of its risk factors is important for prevention and early detection. This study assessed awareness of selected breast cancer risk factors (family history, age, hormonal and reproductive factors, smoking, diet, and breastfeeding) among a convenience sample of young adults, mainly university students, in Iraq.

Methods: A descriptive cross-sectional study was conducted between 2 December 2025 and 1 February 2026. A total of 684 participants aged 18–40 years were recruited by convenience sampling through paper-based questionnaires (university and hospital settings) and an online questionnaire distributed via social media. The questionnaire was adapted from the Breast Cancer Awareness Measure (Breast-CAM). Each correct response scored 1 point, and incorrect or "Not sure" responses scored 0. Total scores were classified as high (80–100%), moderate (60–79%), or low (<60%). Data were analyzed using descriptive statistics.

Results: Most participants were undergraduate students (94.3%) and aged 18–25 years (74.6%). Overall, 46.8% had moderate awareness, 31.3% high, and 21.9% low. Family history was the most frequently recognized risk factor (90.1%), followed by prolonged oral contraceptive use (41.8%), increasing age (40.4%), and smoking (39.0%). Awareness was considerably lower for first childbirth after age 30 (14.5%), low fruit and vegetable intake (14.5%), and the protective role of breastfeeding (2.2%).

Conclusions: In this sample of young, predominantly undergraduate participants, overall awareness was moderate. Awareness of family history was high, whereas important gaps were observed for hormonal, reproductive, dietary, and protective factors. These findings cannot be generalized to the wider Iraqi population; however, they identify knowledge gaps that could inform the design of educational programs, whose effectiveness would need to be evaluated in future studies.

KEYWORDS: Breast cancer; Awareness; Risk factors; Family history; Hormonal factors; University students; Iraq

1. Introduction

Breast cancer is the most common malignancy among women worldwide and a leading cause of cancer-related mortality in females (1). More than two million women are diagnosed with breast cancer each year worldwide (2). According to global estimates for 2020, approximately 19.3 million new cancer cases and nearly 10 million cancer-related deaths occurred, with breast cancer accounting for 11.7% of all new cancer diagnoses (3). In addition, the COVID-19 pandemic disrupted breast cancer screening, diagnosis, and treatment, which may have contributed to delayed detection (4).

Breast cancer is a multifactorial disease influenced by genetic, hormonal, reproductive, and lifestyle factors (5). Inherited mutations in BRCA1 and BRCA2 substantially increase lifetime risk, and a positive family history is an independent risk factor even in women without detectable BRCA mutations (7,8). Prolonged exposure to endogenous estrogen and the use of hormone replacement therapy have also been associated with increased risk (6,9). In addition, metabolic pathways such as insulin and insulin-like growth factor-1 (IGF-1) signalling have been implicated in breast cancer development (10,11).

Public awareness of risk factors may support healthy behaviors and participation in screening. To our knowledge, data on awareness of breast cancer risk factors among young adults in Iraq are limited.

Therefore, this study aimed to assess awareness of selected breast cancer risk factors, including family history, age, hormonal and reproductive factors, smoking, diet, and breastfeeding, among a convenience sample of young adults, mainly university students, in Iraq. The findings are intended to provide baseline information for this group.

2. Materials and Methods

2.1 Study Design and Participants

A descriptive cross-sectional study was conducted between 2 December 2025 and 1 February 2026. A total of 684 participants were recruited using convenience sampling. Adults aged 18–40 years who agreed to participate and gave informed consent were included. Only fully completed questionnaires were included in the analysis. The online questionnaire was distributed through a single link; because no personal identifiers were collected, duplicate submissions could not be formally excluded, and this is acknowledged as a limitation.

Paper-based questionnaires were distributed in person at the University of Samarra, Tikrit University, and Samarra General Hospital. The online questionnaire was disseminated through social media platforms to university students in several governorates, including Baghdad, Mosul, Kirkuk, and southern Iraq. Both modes were used to reach participants from different governorates. Participation in either mode was voluntary.

2.2 Research Instrument

The risk-factor items used in this study were adapted from the original, validated Breast Cancer Awareness Measure (Breast-CAM) developed by Cancer Research UK (12). Only the concept of assessing awareness of individual risk factors was drawn from Breast-CAM; the original symptom-recognition, help-seeking, and screening items were not used. The ten risk-factor statements presented here were newly worded for this study, with "Yes", "No", and "Not sure" response options, and this adapted ten-item questionnaire has not itself been validated. The psychometric properties reported for the original Breast-CAM (12) therefore do not extend to the adapted instrument used in the present study. The questionnaire was administered in English. The adapted questionnaire was not formally pilot-tested or assessed for reliability in this study, which is acknowledged as a limitation.

The questionnaire had two parts. Part I collected demographic information: age group (18–25, 26–30, 31–35, or 36–40 years), educational level (bachelor's, master's, or PhD degree), and health status (with or without a chronic disease). Part II contained ten statements: (1) increasing age, (2) family history of breast cancer, (3) smoking, (4) low consumption of fruits and vegetables, (5) first child after the age of 30 years, (6) early menarche (before 12 years of age), (7) late menopause, (8) long-term use of oral contraceptive pills, (9) large breast size, and (10) not breastfeeding, each phrased as increasing the risk of breast cancer. The same wording is used in the text and tables.

Statement 9 ("Large breast size increases the risk of breast cancer") describes a factor that is not an established risk factor and was included as a distractor item to check whether participants were responding accurately rather than agreeing with every statement. For the nine established risk-factor items, responses were recorded and scored as "Yes" (correct, 1 point) versus "No" or "Not sure" (incorrect, 0 points), consistent with Section 2.3. For this distractor item, individual "No" and "Not sure" responses were not retained as separate categories in the analysis records; only the number of participants who answered "Yes" was tabulated. Accordingly, this item was scored as "Yes" (incorrect, 0 points) versus any other response, i.e., "No" or "Not sure" combined (credited as correct, 1 point). This item is included in the total awareness score using this procedure, but because it does not reflect an actual risk factor and its scoring differs from the other nine items, it is reported separately in the Results rather than alongside the established risk factors in Table 3. This difference in how responses to the distractor item were recorded is acknowledged as a limitation in Section 4.3.

2.3 Awareness Scoring

Each awareness statement was answered as "Yes", "No", or "Not sure". For the nine established risk-factor items, a "Yes" response scored 1 point, and "No" or "Not sure" scored 0 points. For the distractor item (Section 2.2), any response other than "Yes" (i.e., "No" or "Not sure") scored 1 point, and "Yes" scored 0 points, because individual "No" and "Not sure" responses were not retained separately for this item in the analysis records. The total awareness score was calculated by summing the points across all ten awareness statements, including the distractor item, and expressing the sum as a percentage of the maximum possible score. Participants were classified as having high (80–100%), moderate (60–79%), or low (<60%) awareness. These cut-offs correspond to the modified Bloom's cut-off points commonly used in knowledge, attitude, and practice (KAP) studies (13). Because these thresholds are conventional rather than clinically validated, the classification should be interpreted as a descriptive grouping.

2.4 Ethical Considerations

The study was approved by Samarra University (approval number 1025, dated 2 October 2025). Participation was voluntary, informed consent was obtained from all participants before completing the questionnaire, and no personally identifiable information was collected. Responses were treated confidentially and used only for research purposes.

2.5 Statistical Analysis

Data were analyzed using IBM SPSS Statistics for Windows (IBM Corp., Armonk, NY, USA). Frequencies and percentages were used to summarize participant characteristics, the overall awareness level, and awareness of each risk factor. No inferential tests were performed.

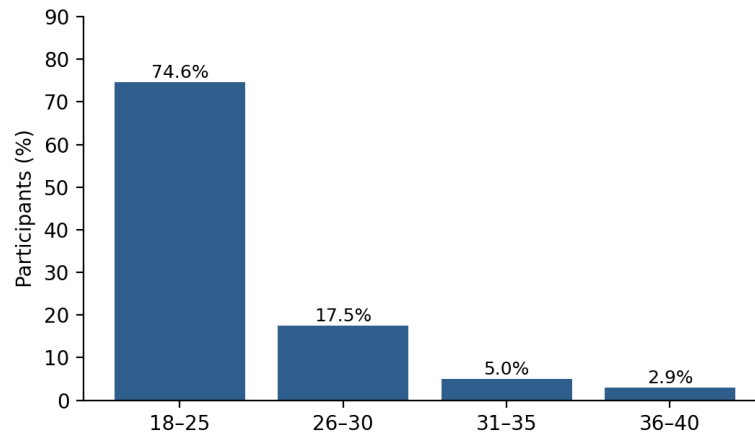
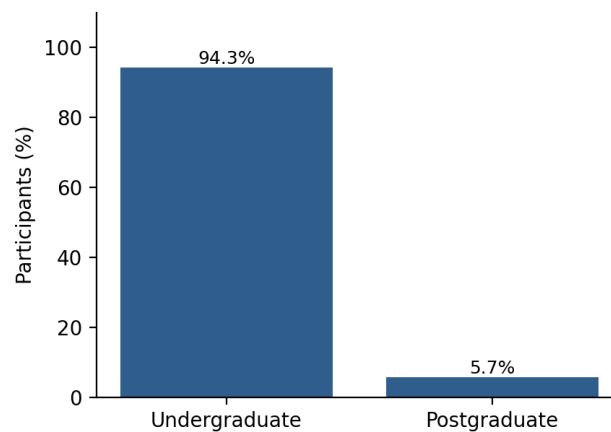
3. Results

3.1 Characteristics of the Participants

A total of 684 participants were included (age range 18–40 years). Most were aged 18–25 years (74.6%), and 94.3% were undergraduate students (Table 1, Figures 1 and 2).

Table 1. Demographic characteristics of the participants (N = 684).

Variable	Category	n	%
Age group (years)	18–25	510	74.6
	26–30	120	17.5
	31–35	34	5.0
	36–40	20	2.9
Educational level	Bachelor's (undergraduate)	645	94.3
	Postgraduate (Master's/PhD)	39	5.7
Health status (self-reported)	No chronic disease	650	95.0
	Chronic disease	34	5.0

**Figure 1. Age distribution of the participants (N = 684).****Figure 2. Educational level of the participants (N = 684).**

3.2 Overall Awareness Level

Overall, 46.8% of participants had moderate awareness, 31.3% high awareness, and 21.9% low awareness (Table 2).

Table 2. Overall awareness level of breast cancer risk factors (N = 684).

Awareness level	n	%
High (80–100%)	214	31.3
Moderate (60–79%)	320	46.8
Low (<60%)	150	21.9
Total	684	100.0

3.3 Awareness of Individual Risk Factors

Family history was the most frequently recognized risk factor (90.1%). Awareness was lower for oral contraceptive use (41.8%), increasing age (40.4%), and smoking (39.0%), and lowest for early menarche (12.6%), late menopause (15.8%), first childbirth after age 30 (14.5%), low fruit and vegetable intake (14.5%), and recognition that not breastfeeding increases risk (2.2%) (Table 3, Figure 3). For the distractor item ("Large breast size increases the risk of breast cancer"), 77 participants (11.4%) answered "Yes" (scored as incorrect, 0 points), the lowest endorsement rate among all ten items; the remaining 607 participants (88.6%) were recorded collectively as "No"/"Not sure" (scored as correct, 1 point), as described in Section 2.3.

Table 3. Participants correctly identifying each breast cancer risk factor (N = 684).

Risk factor (as worded in the questionnaire)	Correct (%)
Family history of breast cancer	90.1
Long-term use of oral contraceptive pills	41.8
Increasing age	40.4
Smoking	39.0
Late menopause	15.8
First child after the age of 30 years	14.5
Low consumption of fruits and vegetables	14.5
Early menarche	12.6
Not breastfeeding	2.2

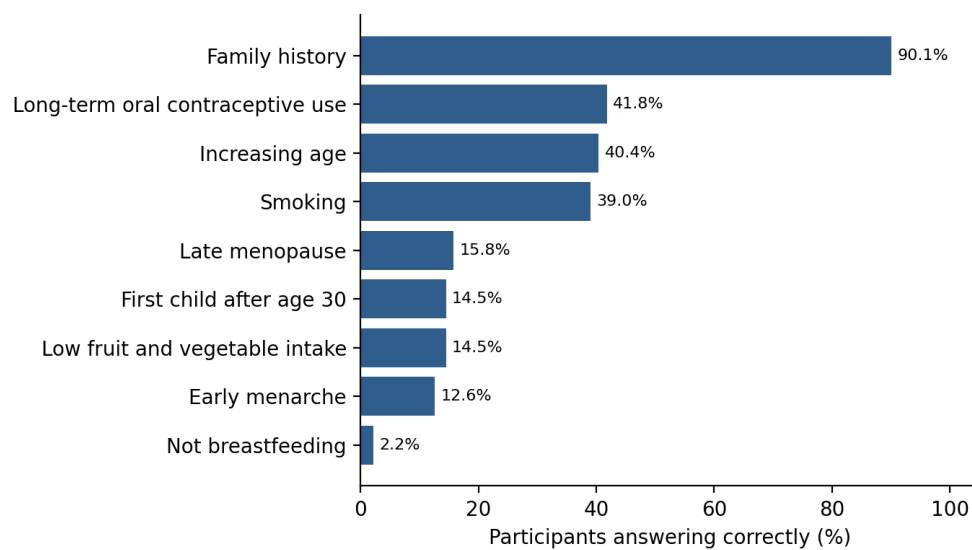


Figure 3. Percentage of participants who correctly identified each breast cancer risk factor (N = 684).

4. Discussion

4.1 Interpretation of the Main Findings

In this sample of young, mostly undergraduate participants, overall awareness of breast cancer risk factors was moderate, with clear differences between factors. The high recognition of family history (90.1%) is consistent with reports from China (15) and from US women aged 15–44 years (16). This may reflect that hereditary risk, including BRCA1/BRCA2 mutations (14), is the most widely publicized risk factor, although this explanation was not examined in the present study.

Awareness of increasing age (40.4%) was lower than that of family history, even though age is among the strongest predictors of incidence (17). Awareness of smoking (39.0%) was also limited; tobacco smoke contains carcinogens that can damage DNA (18). For oral contraceptives (41.8%), evidence suggests a small increase in risk with long-term use that varies by duration and individual characteristics (19).

Awareness of reproductive factors was particularly low: early menarche (12.6%), late menopause (15.8%), and first childbirth after age 30 (14.5%). These factors are associated with longer cumulative estrogen exposure (20,21). A possible explanation is that hormone-related mechanisms are more complex and receive less emphasis in public health messaging; this was not tested here.

Only 14.5% recognized low fruit and vegetable intake as a risk factor, although diets rich in fruits and vegetables have been associated with lower risk (22). Awareness of the protective effect of breastfeeding was the lowest (2.2%). Breastfeeding has been consistently associated with reduced breast cancer risk (23). The finding of very low awareness for a well-established protective factor identifies a clear knowledge gap in this sample. The wording of these items may also have influenced the low percentages, and this was not assessed.

4.2 Possible Implications

The gaps identified in hormonal, reproductive, dietary, and protective factors suggest that educational activities for young adults could usefully address these topics. This study did not evaluate any intervention, so it cannot show that education would improve prevention, screening participation, or early detection; this should be tested in future interventional research.

4.3 Limitations

This study has several limitations. First, convenience sampling was used, which limits representativeness and introduces possible selection bias. Second, the sample was dominated by undergraduate students (94.3%) and young adults (74.6% aged 18–25 years), and participants were recruited through universities, a hospital, and social media; therefore, the results should not be generalized to the wider Iraqi population, including older, less educated, or rural groups. Third, the responses were self-reported and may be affected by recall or social desirability bias. Fourth, combining paper-based and online questionnaires may have introduced differences in who responded and how they answered, and results were not compared between modes. Fifth, the ten-item questionnaire used in this study was adapted from the original Breast-CAM but was not itself formally validated, piloted, or assessed for reliability, and the 60% and 80% cut-offs are conventional rather than clinically validated. Sixth, for the distractor item ("Large breast size increases the risk of breast cancer"), individual "No" and "Not sure" responses were not retained separately in the analysis records, so these two response categories could not be distinguished; this item was therefore scored and reported using a "Yes" versus combined "No"/"Not sure" distinction, unlike the three-category scoring used for the nine established risk-factor items, and the specific proportion of participants who correctly answered "No" to this item cannot be determined from the available records. Seventh, no inferential analyses of differences between participant subgroups were performed. Finally, the cross-sectional design does not allow causal inference.

5. Conclusion

Among this convenience sample of young adults, mainly undergraduate students in Iraq, overall awareness of breast cancer risk factors was moderate. Family history was widely recognized, whereas awareness of hormonal, reproductive, dietary, and protective factors was low. Because of the sampling method and sample characteristics, the findings apply to the surveyed group only. Educational programs addressing the identified gaps may be considered, and their effect should be evaluated in future studies with more representative samples.

Ethics Approval and Consent

The study was approved by Samarra University (approval number 1025, dated 2 October 2025). Informed consent was obtained from all participants.

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