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# Risk and Protective Factors for Female Cancer Breast in Al- Dakahleya, Egypt

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## ABSTRACT
**Background:** Breast cancer is the most prevalent cancer globally, accounting for 2,296,840 new cases of breast cancer in 2022. In Egypt, breast cancer constitutes 33% of female cancer diagnoses, with over 22,000 new cases annually.
**Objective:** To identify possible risk and protective factors for breast cancer among women in Al Dakahleya Governorate, Egypt.
**Subjects and methods:** A case-control design was employed, involving 200 breast cancer cases and 200 controls recruited from Mansoura Cancer Institute. Data were collected through questionnaires addressing sociodemographic, medical, and lifestyle factors.
**Results:** The results indicated significant risk factors for breast cancer, including older age, unemployment, obesity (BMI > 30 kg/m²), and prolonged hormonal contraceptive use. Protective factors included maintaining a healthy BMI and a higher number of pregnancies.
**Conclusion:** These findings highlighted the importance of public health strategies focusing on obesity prevention, contraceptive education, and promoting a healthy lifestyle to mitigate breast cancer risk in this population.
**Keywords:** Protective, Risk, factors, Cancer, breast, Al Dakahleya.

## INTRODUCTION

Breast cancer is characterized by the uncontrolled growth of cells within the breast [(1)]. The specific type of breast cancer depends on the cells involved [(2)].

Breast cancer remains the most prevalent form of cancer among women worldwide, contributing to roughly 2.3 million new diagnoses each year, which corresponds to around 11.7% of all cancer cases globally. It is also a major cause of cancer mortality in women, with substantial impacts in both high-income and low- to middle-income countries. This disease is marked by the abnormal and uncontrolled growth of breast cells, driven by a combination of genetic, hormonal, and environmental influences. The frequency of breast cancer varies across regions, with the highest incidence rates seen in North America and Western Europe, while lower rates are observed in Asia and Africa. These regional differences are likely influenced by varying lifestyles, reproductive health factors, and disparities in access to screening and early detection programs. [(3,4)].

Breast cancer is the number one cancer in women, there were 2,296,840 new cases of breast cancer in 2022 among women [(5)], and in Egypt, it constitutes 33% of all female cancer cases, with over 22,000 new diagnoses annually [(6)]. Despite extensive research, the exact causes of breast cancer are not fully understood, which makes it challenging to pinpoint why some women develop the condition while others do not.

## OBJECTIVE

To identify possible risk and protective factors for breast cancer among women in Al Dakahleya Governorate, Egypt.

## SUBJECTS AND METHODS

**Patients:** In this case-control study a representative sample of 400 participant, a case group containing 200 females with cancer breast and a control group containing an equal number of healthy females. Patients were recruited from Oncology Center of Mansoura University from residents of Al Dakahleya Governorate, and controls from females residing in the same governorates who sought for screening for cancer breast in the last 6 months and found to be free from cancer breast, Open Epi I program was used to calculate the suitable sample size, at confidence interval of 95% and power of 80%. The ability to detect a difference of at least 15% in risk and protective factors between the case and control groups was wanted; so, the minimum required number of participants in each group was 150 participants.

**Inclusion criteria:** Females from community-dwellers, from any age, diagnosed with cancer breast for case group and free from cancer breast for control group.

**Exclusion criteria:** Patients with other types of cancer, male cancer breast cases and cancer breast cases residing outside Al Dakahleya.



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**Tools:** A pretested questionnaire about socio-demographic and other possible risk and protective factors of cancer breast to be filled by subjects included in the study in presence of a researcher, with commitment of the highest levels of confidentiality, to evaluate association between these factors and cancer breast.

**Pilot Study for reliability and validity testing of the questionnaire:** A pilot study was conducted with 40 participants to test the reliability and validity of a pre-designed questionnaire. The questionnaire focuses on identifying risk and protective factors for breast cancer in females. The participants were randomly selected, and their responses were analyzed using statistical software to assess both reliability and validity of the questionnaire.

**1. Data cleaning and preparation:**

- First, the collected data from the 40 participants were organized and cleaned by checking for any missing values, outliers, or erroneous entries in responses.

**2. Descriptive statistics:**

Descriptive statistics of the data, included (Table 1):

- Means and standard deviations for continuous variables (e.g., BMI, age).
- Frequency distributions for categorical variables (e.g. marital status, family history of breast cancer).

Table (1) represented the descriptive statistics of data of participants in the pilot study included numerical variables, which were expressed as mean, standard deviation and range. While, categorical data were expressed as numbers and frequencies.

**Table (1):** Descriptive statistics of data of participants in the pilot study (no=40)

| Numerical Variable | Mean | Standard Deviation | Range |
|---|---|---|---|
| Age (years) | 45.2 | 10.3 | 28-65 |
| BMI | 26.5 | 4.8 | 18-35 |
| Pregnancies | 2.1 | 1.1 | 0-5 |
| Categorical Variable | | Number and Frequency (%) | |
| Work status | | Working 29 (72.5%) | |
| Family history of breast cancer | | Yes: 15 (37.5%) | |
| Residence | | Rural: 20(50%) | |
| Marital Status | | Married: 30 (75%) | |
| History of radiation exposure | | Yes: 8 (20%) | |
| Smoking | | Yes: 1 (2.5%) | |
| Contraceptive use (5+ years) | | Yes: 10 (25%) | |
| Unhealthy diets | | Yes: 15 (37.5%) | |
| Alcohol | | Yes: 0(0%) | |
| Dense breast | | Yes: 8 (20%) | |
| History of other types of cancer | | Yes: 5 (12.5%) | |
| History of breast plastic surgery | | Yes: 1 (2.5%) | |

**3. Reliability analysis (Cronbach's Alpha):**

To assess internal consistency and reliability of the questionnaire, we calculated Cronbach's Alpha. The reliability for the questionnaire as a whole is acceptable, with Cronbach's Alpha= 0.78 (An alpha score > 0.7 is generally considered acceptable).

**4. Validity testing: (Content Validity):**

Content validity involved ensuring that the questionnaire comprehensively covers all aspects of the construct being measured, in this case, risk and protective factors for breast cancer. This was done through expert review of the questionnaire items. A panel of experts in oncology and public health reviewed the questionnaire items, to assess whether the items reflect relevant risk and protective factors for breast cancer.

- A content validity index (CVI) was calculated based on expert ratings, with items rated for relevance and clarity
- The mean CVI score for each item was above 3.5, which is typically considered good content validity.

## METHOD

**Recruitment and data collection:** The researcher attended Oncology Center of Mansoura University where meetings with candidate patients were arranged to explain research objectives. Informed consent forms were offered to patients who accept the participation invitation to be signed and the questionnaire to be filled. Simultaneously, we followed more or less similar procedures for recruitment of the control group from females residing in the same governorates who sought for screening for cancer breast in the last 6 months and found to be free from cancer breast. 200 cases and 200 controls were assigned by simple random sampling technique, and the study was conducted in 13 months from November 2022 to December 2023. The study objectives and design were explained thoroughly by a team member to every candidate then offered an informed consent to be signed in case of acceptance before beginning of the study to ensure complete satisfaction.

***Statistical Analysis***

Collected data were revised, coded, tabulated and introduced to a PC using Statistical package for Social Science (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, version 25.0. Armonk, NY: IBM Corp.). Normality of data: Kolmogorov-Smirnov test was used as a test of normality, if the significance level was greater than 0.05, then normality is assumed. Descriptive statistics: Mean ± standard deviation (SD) were used for parametric numerical data, while median, and range were used for non-parametric numerical data. Frequency and percentage were used for non-numerical data.

***Analytical statistics***

Student t-test was used to assess the statistical significance of the difference between two independent study groups with parametric data. Mann Whitney test (U test) was used to assess the statistical significance of the difference between two independent study groups with non-parametric data. Chi-square test for comparison of 2 or more groups. Monte Carlo test as correction for Chi-square test when more than 25% of cells have count less than 5 in tables (>2*2).

**Regression analysis:** Univariate and multivariate regression analysis were used to assess the presence of dependent and independent risk predictors of categorical outcome.

**Level of significance:** Significance test results are quoted as two-tailed probabilities. For all the above-mentioned tests, the level of significance was tested, expressed as the probability of (p-value) and the results were explained as follows: non-significant if the p value is > 0.05. Significant if the p value is ≤ 0.05. Highly significant if the p value ≤ 0.001.

**Ethics approval and consent to participate:** A prior ethical approval from IRB, Faculty of medicine, Al Azhar University was obtained. The study objectives and design were explained thoroughly by a team member to every candidate then she signed an informed consent in case of acceptance before beginning of the study to ensure complete satisfaction. All methods were performed in accordance with the relevant guidelines and regulations, and principles of Declaration of Helsinki.

**RESULTS**

Table (2) compared the socio-demographic characteristics of 200 female breast cancer cases and 200 controls. Significant differences were observed in age, employment status, and BMI. Age: The mean age of the cases group (51.62 years) was significantly higher than that of the control group (40.84 years), with a P-value of <0.001, indicating a potential association between older age and breast cancer risk. Employment Status: The vast majority (96%) of cases were unemployed compared to 62% in the control group. This finding was statistically significant (P < 0.001) and suggested that unemployed women were at higher risk of breast cancer. BMI: Obesity was significantly higher in the cases group. 42% of cases had a BMI over 30 kg/m² compared to only 10% of controls (P < 0.001). This indicated a strong association between obesity and breast cancer risk. No significant differences were found in residence (urban vs. rural) and marital status. These factors do not appear to be directly associated with breast cancer risk in this population.

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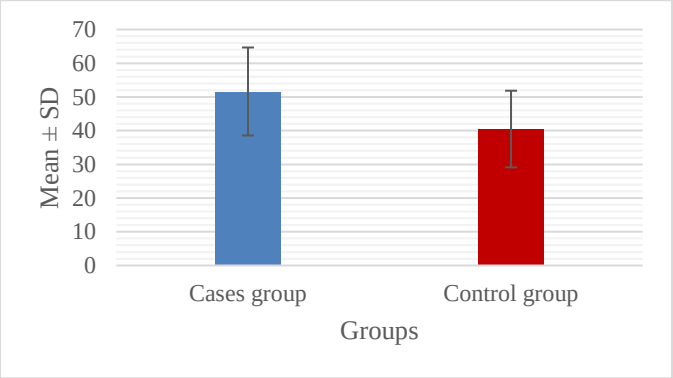
**Table (2):** Comparison of the socio-demographic data in the two study groups

| | Groups | | Test of significance | P value |
|---|---|---|---|---|
| | Cases group (n= 200) | Control group (n= 200) | | |
| Age (Years) | 51.62 ± 13.05 | 40.84 ± 11.36 | t= 4.406 | < 0.001* |
| Working state | | | | |
| Unemployed | 192 (96%) | 124 (62%) | FET= 17.420 | < 0.001* |
| Working | 8 (4%) | 76 (38%) | | |
| BMI (Kg/m2) | | | | |
| Less than 18 Kg/m2 | 20 (10%) | 52 (26%) | MC= 34.215 | < 0.001* |
| 18- 25 Kg/m2 | 32(16%) | 116 (58%) | | |
| 25 – 30 Kg/m2 | 64(32%) | 12 (6%) | | |
| More than 30 Kg/m2 | 84 (42%) | 20 (10%) | | |
| Residence | | | | |
| Urban | 72 (36%) | 96 (48%) | $\chi2$ = 1.478 | 0.224 |
| Rural | 128 (64%) | 104 (52%) | | |
| Marital status | | | | |
| Single | 12 (6%) | 4 (2%) | MC= 4.352 | 0.113 |
| Married | 148(74%) | 180 (90%) | | |
| Widow | 40 (20%) | 16 (8%) | | |

P: probability Quantitative data expressed as mean ± SD/ Categorical data expressed as Number (%) $\chi2$: Chi-square test t: Independent samples t-test MC: Monte-Carlo test/ FET: Fischer's exact test *: significant value < 0.05

Figure (1) visualized the significant difference in age between the breast cancer cases and the control group. The breast cancer group tended to be older, with the majority of cases being over 50, while the control group was concentrated in the younger age range. This supports the well-documented correlation between increased age and breast cancer risk.




. **Figure (1):** Age of the cases in the two study groups.

Figure (2) highlighted the disparity in employment status between the two groups, showing that unemployment is much higher among breast cancer patients. This might suggest a socioeconomic dimension to breast cancer risk, as unemployed women may have limited access to healthcare or preventive measures.

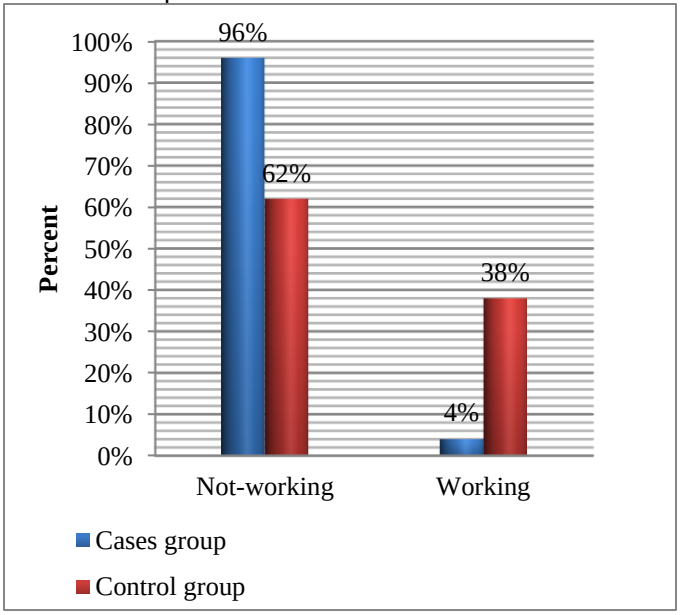



**Figure (2):** Working state in the two study groups

Figure (3) showed that higher BMI is more prevalent in the cases group. The percentage of women with a BMI over 30 was strikingly higher in breast cancer patients. This reinforced the link between obesity and increased breast cancer risk.

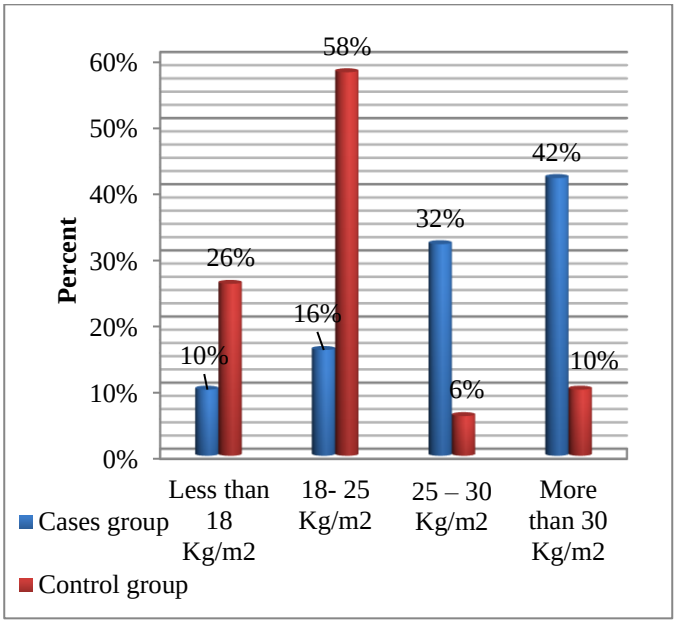



**Figure (3):** BMI in the two study groups.

Table (3) explored the obstetric history of the cases and control groups. Key observations include:
Number of pregnancies where women in the control group had a higher median number of pregnancies (3) compared to the cases group (2), with a statistically significant difference ($P < 0.001$). This suggested that a higher number of pregnancies might be protective against breast cancer. Age at first pregnancy showed no significant difference between the groups regarding the age of first pregnancy ($P = 0.268$), implying that this factor may not have a major impact on breast cancer risk in this population.

**Table (3):** Comparison of the obstetric history in the two study groups

| | Groups | | Test of significance | P value |
|---|---|---|---|---|
| | Cases group (n= 200) | Control group (n= 200) | | |
| Number of pregnancies | 2 (0-5) | 3 (0-9) | z = - 4.651 | < 0.001* |
| First pregnancy | (n= 172) | (n=196) | | |
| Before the age of 20 years | 56(32.6%) | 76 (38.8%) | $\chi 2$= 2.540 | 0.268 |
| ≥ 20 years | 116 (67.4%) | 120 (61.2%) | | |

P: probability. Quantitative data expressed as median (Range)/ Categorical data expressed as Number (%) $\chi 2$: Chi-square test/ z: Mann-Whitney u-test. *: significant value < 0.05

Table (4) evaluated various risk factors for breast cancer. Key findings included: Unhealthy diets where a significantly higher percentage of controls (28%) reported unhealthy diets compared to only 8% of cases (P = 0.009), contradicting the typical expectation of high-fat diets being a risk factor for breast cancer. Dense breasts: 56% of cases had dense breast tissue compared to 10% of controls that showed a statistically significant difference (P < 0.001). This suggested that dense breasts are a major risk factor for breast cancer. There were no significant differences in smoking or alcohol consumption between the groups, indicating that these factors may not contribute to breast cancer risk in this sample.

**Table (4):** Comparison of the risk factors in the two study groups

| | Groups | | Test of significance | P value |
|---|---|---|---|---|
| | Cases group (n= 200) | Control group (n= 200) | | |
| Unhealthy diets (Diets high in polyunsaturated fat) | | | | |
| No | 184 (92%) | 144 (72%) | FET= 6.775 | 0.009* |
| Yes | 16 (8%) | 56 (28%) | | |
| Alcohol | | | | |
| No | 200 (100%) | 200 (100%) | | |
| Yes | 0 (0%) | 0 (0%) | | |
| Smoking | | | | |
| No | 196 (98%) | 200 (100%) | FET= 1.010 | 0.315 |
| Yes | 4 (2%) | 0 (0%) | | |
| Dense breast | | | | |
| No | 88 (44%) | 180 (90%) | $\chi 2$= 23.926 | < 0.001* |
| Yes | 112 (56%) | 20 (10%) | | |

P: probability. Categorical data expressed as Number (%). $\chi 2$: Chi-square test. t: Independent samples t-test. MC: Monte-Carlo test, *: significant value < 0.05

Figure (4) showed that unhealthy diets were more common in the control group, contradicting the typical expectation of high-fat diets being a risk factor for breast cancer. On the other hand, the higher prevalence of dense breasts in the cases group strongly supports this as a significant risk factor.

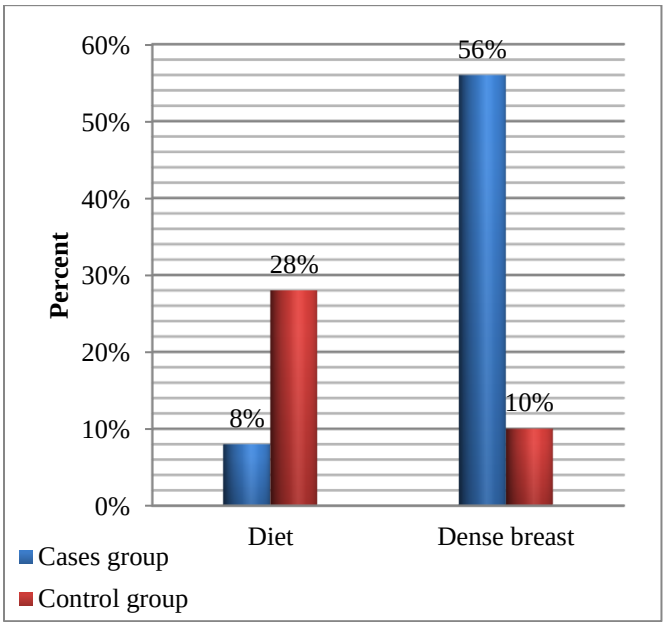



**Figure (4):** Unhealthy diets (Diets high in polyunsaturated fat) and dense breast in the two study groups.

Table (5) compared past medical history and family history in both groups. Notable findings included: Exposure to radiation: 18% of breast cancer cases had previous radiation exposure compared to none in the control group (P = 0.002), suggesting this as a significant risk factor. Contraceptive and hormone therapy use: 52% of cases had a history of contraceptive use for more than 5 years compared to only 12% in the control group (P < 0.001), indicating long-term hormone use as a risk factor. Family history: No significant difference was observed in family history of breast cancer or other cancers, suggesting that genetic factors may not be a primary risk factor in this population.

Table (5): Comparison of past and family history in the two study groups

| | Groups | | Test of significance | P value |
|---|---|---|---|---|
| | Cases group (n= 200) | Control group (n= 200) | | |
| **Previous exposure to radiation therapy** | | | | |
| No | 164 (82%) | 200 (100%) | FET= 9.890 | 0.002* |
| Yes | 36 (18%) | 0 (0%) | | |
| **History of other types of cancer** | | | | |
| No | 188 (94%) | 196 (98%) | FET= 1.042 | 0.307 |
| Yes | 12 (6%) | 4 (2%) | | |
| **Family history of breast cancer** | | | | |
| No | 160 (80%) | 168 (84%) | $\chi^2$ = 0.271 | 0.603 |
| Yes | 40 (20%) | 32 (16%) | | |
| **Family history of other types of cancer** | | | | |
| No | 144 (72%) | 152 (76%) | $\chi^2$ = 0.208 | 0.642 |
| Yes | 56 (28%) | 48 (24%) | | |
| **History with contraceptive pills or any other hormonic drugs (therapy) intake for ≥ 5 years** | | | | |
| No | 96 (48%) | 176(88%) | $\chi^2$ = 18.382 | < 0.001* |
| Yes | 104(52%) | 24 (12%) | | |
| **History of breast plastic surgery** | | | | |
| No | 196 (98%) | 200(100%) | FET= 1.010 | 0.315 |
| Yes | 4 (2%) | 0 (0%) | | |

P: probability. Categorical data expressed as Number (%), $\chi^2$: Chi-square test, t: Independent samples t-test, MC: Monte-Carlo test, *: significant value < 0.05

Figure (5) showed a significant difference between groups in History of previous exposure to radiation therapy and use of contraceptive pills or any other hormonic drugs (therapy) intake for more than 5 years this reinforces that they may play a role in breast cancer risk among this population.

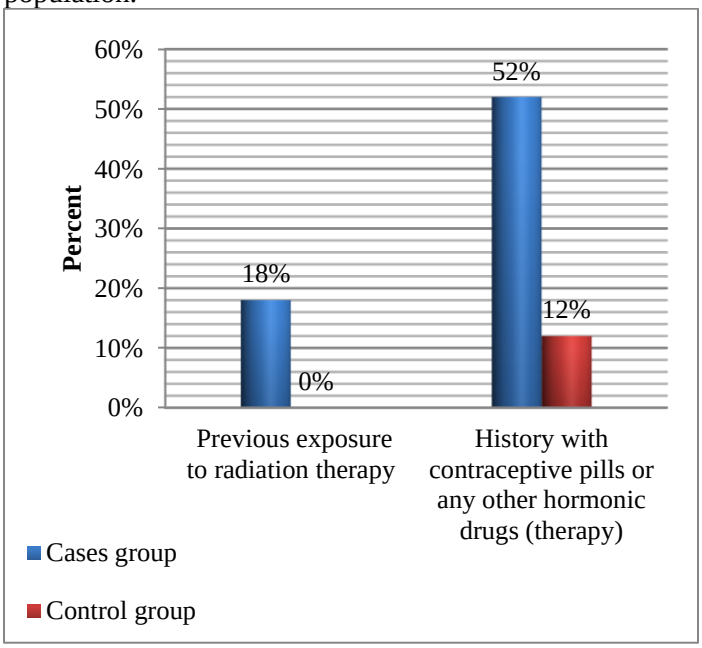



**Figure (5):** history of previous exposure to radiation therapy and use of contraceptive pills or any other hormonic drugs (therapy) intake for more than 5 years

Table (6) presented the regression analysis of various factors. According to the univariate analysis, advanced age, unemployment, obesity, dense breasts, and hormone use were identified as significant risk factors for breast cancer. While, ideal BMI and a higher number of pregnancies were protective.

In the multivariate analysis, the same variables remained significant predictors of breast cancer. This highlighted that obesity, dense breasts, and hormone use as the strongest independent risk factors for breast cancer in this population, while ideal body weight and more pregnancies continue to show a protective effect.

Table (6): Univariate and multivariate regression analysis for prediction of breast cancer

| Predictors | Univariate regression | | | | Multivariate regression | | | |
|---|---|---|---|---|---|---|---|---|
| | P value | Odds ratio | 95% C.I. for odds ratio | | P value | Odds ratio | 95% C.I. for odds ratio | |
| | | | Lower | Upper | | | Lower | Upper |
| Age | <0.001* | 1.079 | 1.036 | 1.123 | <0.001* | 3.715 | 2.172 | 4.122 |
| Occupation(Unemployment) | <0.001* | 4.710 | 3.200 | 7.620 | 0.001* | 2.875 | 1.889 | 3.534 |
| BMI Less than 18 Kg/m2 | R | | | | | | | |
| 18- 25 Kg/m2 | 0.001* | 0.092 | 0.022 | 0.379 | 0.005* | 0.483 | 0.230 | 0.846 |
| 25 – 30 Kg/m2 | 0.766 | 1.174 | 0.622 | 1.572 | | | | |
| More than 30 Kg/m2 | <0.001* | 1.570 | 1.264 | 2.117 | <0.001* | 2.364 | 1.11 | 3.78 |
| Urban residence | R | | | | | | | |
| Rural residence | 0.225 | 0.609 | 0.274 | 1.357 | | | | |
| Single | R | | | | | | | |
| Married | 0.888 | 1.200 | 0.094 | 5.260 | | | | |
| Widow | 0.078 | 0.329 | 0.095 | 1.135 | | | | |
| Number of pregnancies | <0.001* | 0.466 | 0.325 | 0.668 | 0.001* | 0.546 | 0.238 | 0.762 |
| Non pregnancy | R | | | | | | | |
| Before the age of 20 years | 0.045 | 0.105 | 0.012 | 0.956 | | | | |
| ≥ 20 years | 0.078 | 0.138 | 0.016 | 1.193 | | | | |
| Unhealthy Diets | 0.014* | 1.472 | 1.355 | 1.755 | 0.214 | 1.23 | 0.71 | 1.46 |
| Smoking | 0.882 | 0.716 | 0.128 | 1.487 | | | | |
| Dense breast | <0.001* | 1.030 | 1.087 | 1.257 | 0.006* | 2.147 | 1.479 | 2.436 |
| Previous exposure to radiation therapy | 0.153 | 1.240 | 0.823 | 1.636 | | | | |
| History of other types of cancer | 0.331 | 0.320 | 0.032 | 3.184 | | | | |
| Family history of breast cancer | 0.603 | 0.762 | 0.273 | 2.125 | | | | |
| Family history of other types of cancer | 0.532 | 1.254 | 0.630 | 1.245 | | | | |
| History of at least 5 years contraceptive pills or any other hormonic drugs (therapy) intake | <0.001* | 1.648 | 1.255 | 2.187 | <0.001* | 0.740 | 0.425 | 0.907 |
| History of breast plastic surgery | 0.452 | 1.327 | 0.580 | 1.397 | | | | |

CI: Confidence interval OR: Odd's ratio.

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## DISCUSSION

**Key Findings of the Study:**

1. **Risk factors for breast cancer:**
   - Age: Women of advanced age were found to have a significantly higher risk of developing breast cancer.
   - Unemployment: A higher prevalence of breast cancer was observed among unemployed women compared to those who were employed.
   - Obesity: Women with a BMI over 30 kg/m² showed a markedly higher risk of breast cancer, suggesting a strong association between obesity and the disease.
   - Dense breast tissue: Women with dense breasts were significantly more likely to develop breast cancer.
   - Long-term use of hormonal contraceptives: A history of using contraceptive pills or other hormonal drugs for more than five years was associated with a higher breast cancer risk.
2. **Protective factors against breast cancer:**
   - Ideal body weight: Maintaining a healthy BMI was associated with a reduced risk of breast cancer.
   - Multiple Pregnancies: Having more pregnancies was found to lower the risk of developing breast cancer.

The findings of this study indicated that advanced age was a significant risk factor for breast cancer, which is in agreement with the results of research of **Sun *et al.*** [7] which highlighted that, aside from gender, aging is a primary contributor to breast cancer risk, as the incidence rises with age. In 2016 in the U.S., over 99% of breast cancer deaths occurred in women over 40 with the

majority being over 60. Therefore, timely mammography screening is vital for women starting at age 40.

Additionally, our research showed that unemployment was linked to a higher risk of breast cancer. This finding is consistent with the study by **Boraka *et al.*** [8], which emphasized the role of regular physical activity in preventing chronic illnesses, including breast cancer. Similarly, the research of **Grey *et al.*** [9] demonstrated that jobs involving higher levels of physical activity are associated with a reduced risk of breast cancer.

This study also confirmed that obesity, particularly a BMI above 30 kg/m², was a significant risk factor for breast cancer. These results align with the findings of **Elkum *et al.*** [10], which revealed that women with a BMI ≥ 25 had a significantly higher incidence of breast cancer compared to their healthy counterparts, and the study of **Abdelsamea GA *et al.*** [11] which reports negative impact of obesity on various aspects of women health. This finding reinforced the notion that obesity is a major risk factor for breast cancer, particularly in Arab women.

Our research identified a higher prevalence of unhealthy diets particularly those high in polyunsaturated fats intake in control group. This finding is in contrast with the study by **Kotepui** [12], which showed a relationship between high dietary fat intake and increased breast cancer risk.

In addition, this study found that dense breast tissue was a significant risk factor for developing breast cancer. This aligns with the results reported by **Lo *et al.*** [13]. They observed that postmenopausal women with dense breasts were approximately three times more likely to be diagnosed with breast cancer compared to those with less dense tissue.

Moreover, our findings showed that prolonged use of contraceptive pills or hormonal therapies particularly for periods of five years or more elevates the risk of breast cancer. This conclusion is supported by the study of **White *et al.*** [14] who noted that modern hormonal contraceptive formulations are associated with a roughly 20% increase in breast cancer risk, particularly among women who used them for extended durations. This increased risk persists for up to five years after the cessation of contraceptive use.

Furthermore, our study showed that maintaining an ideal body weight acts as a protective factor against breast cancer. This is consistent with the findings of **Ballard-Barbash *et al.*** [15]. They emphasized the importance of sustaining a healthy body weight to reduce breast cancer risk and improve the prognosis in women diagnosed with the disease.

Finally, we found that a greater number of pregnancies serve as a protective factor against breast cancer. This observation mirrors the findings of **Kelsey *et al.*** [16], which revealed that multiple full-term pregnancies lower the likelihood of developing breast cancer, especially for diagnoses occurring after the age of 40, regardless of when a woman has her first child.

## CONCLUSIONS

This study identified key risk factors for breast cancer in Al Dakahleya Governorate, including older age, unemployment, obesity, dense breast tissue, and long-term contraceptive use. Protective factors such as maintaining a healthy BMI and having multiple pregnancies were also observed. Public health initiatives should prioritize addressing modifiable risk factors through preventive measures like contraceptive awareness. These efforts can contribute to reducing breast cancer incidence, particularly in high-risk populations such as those in Egypt. Screening programs and public education should target women at higher risk, emphasizing the importance of regular monitoring and lifestyle adjustments.

### What's New in This Study?

1. Focus on Al Dakahleya Governorate population: This study provided new insights into breast cancer risk and protective factors specifically in Al Dakahleya Governorate, Egypt, where breast cancer accounts for a significant portion of female cancers.
2. Comprehensive examination of sociodemographic and lifestyle factors: The study highlighted the importance of sociodemographic factors, such as employment status and obesity, along with lifestyle choices and hormonal contraceptive use, in relation to breast cancer risk.
3. Protective role of pregnancy and weight management: The study emphasized the protective role of maintaining an ideal body weight and having multiple pregnancies, adding to the existing literature on modifiable factors that can reduce breast cancer risk.
4. Clear identification of dense breast tissue as a major risk factor: The study reinforced the role of dense breast tissue as a significant risk factor for breast cancer, particularly in postmenopausal women, which can help inform breast cancer screening practices in similar populations.

These findings offer targeted insights for breast cancer prevention strategies, especially in high-risk populations like those in Egypt.

### Implications of the Study:

1. **Public Health Interventions:**
   - Targeting modifiable risk factors: The study highlighted obesity, and long-term use of hormonal contraceptives as key modifiable risk factors for breast cancer. Public health programs should focus on promoting healthy eating habits, weight management,

and awareness of the risks associated with long-term hormonal contraceptive use.

- Socioeconomic factors: The study's finding that unemployment is associated with higher breast cancer risk suggests the need for programs that address economic empowerment and healthcare accessibility for unemployed women. Tailored interventions should ensure that unemployed women have access to preventive care and cancer screening services.

2. **Screening and Early Detection:**
   - Focus on high-risk groups: Given the significant association between advanced age, dense breast tissue, and breast cancer, screening programs in Egypt, especially in the Al Dakahleya Governorate, should focus on older women and those with dense breasts. Mammography and other screening tools should be widely accessible for early detection in these high-risk populations.
   - Customized screening guidelines: The study underscores the importance of customized breast cancer screening protocols based on individual risk factors, including age, breast density, and hormonal contraceptive use, to improve early diagnosis rates.
3. **Healthcare policy and resource allocation:**
   - Resource prioritization: The identification of dense breast tissue and obesity as key risk factors for breast cancer could lead to prioritization of resources in screening and prevention programs, particularly in underserved areas. Policymakers should allocate healthcare resources effectively to tackle these prominent risk factors and enhance early detection efforts.
   - Promoting family planning education: As long-term hormonal contraceptive use is associated with higher breast cancer risk, family planning services should incorporate education on alternative contraceptive methods and the potential risks of prolonged hormonal use. Women should be informed and empowered to make decisions that reduce their cancer risk.
4. **Community awareness and education:**
   - Raising awareness on protective factors: Public awareness campaigns should highlight the protective benefits of maintaining a healthy weight and having multiple pregnancies in reducing breast cancer risk. Promoting family health and supporting maternal well-being can serve as long-term strategies to reduce breast cancer incidence.
   - Education on dense breast tissue: Educating women on the importance of breast density as a risk factor could improve understanding of the need for regular and specialized breast cancer screening such as 3D mammography or ultrasound for women with dense breasts.
5. **Further Research:**
   - Localizing risk factors: This study provided a foundation for more localized breast cancer research in Egypt and other regions with similar demographic and lifestyle characteristics. Future studies could explore the genetic and environmental factors influencing breast cancer risk in Egypt, as well as potential interventions that are culturally and regionally appropriate.
   - Interventions on unemployment and healthcare: Research into the link between socioeconomic factors, particularly unemployment, and breast cancer could inform future interventions aimed at reducing healthcare disparities and improving cancer outcomes among unemployed women.

The study had significant implications for breast cancer prevention and management, emphasizing the importance of tailored public health strategies that focus on modifiable risk factors and improving access to screening and early detection for at-risk populations.

**List of Abbreviations:**

- **BMI:** Body Mass Index.
- **OR:** Odds Ratio.
- **RR:** Relative Risk.

## DECLARATIONS

- **Consent for publication:** The authors provided a consent for publication of this manuscript in this journal.
- **Availability of data and materials:** The data that support the findings of this study are available from the corresponding author upon reasonable request through email: amirsoliman0004@gmail.com.
- **Competing interests:** The authors declared no competing interests nor conflict of interest.
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## REFERENCES

1. **National Cancer Institute (1980):** Breast cancer. U.S. Department of Health and Human Services. https://www.cancer.gov/types/breast
2. **Centers for Disease Control and Prevention (2022):** Breast cancer. U.S. Department of Health and Human Services. https://www.cdc.gov/cancer/breast/basic_info/what-is-breast-cancer.htm
3. **World Health Organization (2022):** Cancer fact sheets. https://www.who.int/news-room/fact-sheets/detail/cancer
4. **Sung H, Ferlay J, Siegel R *et al.* (2021): Global Cancer Statistics 2020:** GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. CA Cancer J Clin., 71(3):209-249. doi: 10.3322/caac.21660.

5. **World Cancer Research Fund International (2023):** Breast cancer statistics. https://www.wcrf.org/cancer-trends/breast-cancer-statistics/
6. **Centers for Disease Control and Prevention (CDC) (2023):** Breast cancer. https://www.cdc.gov/cancer/breast/basic_info/prevention.htm
7. **Sun Y, Zhao Z, Yang Z *et al.* (2017):** Risk factors and prevention of breast cancer. International Journal of Biological Sciences, 13 (11): 1387-1397. https://doi.org/10.7150/ijbs.21635
8. **Boraka Ö , Klintman M, Rosendahl A *et al.* (2022):** Physical activity and long-term risk of breast cancer associations with time in life and body composition in the prospective Malmö Diet and Cancer Study. Cancers (Basel), 14 (8): 1960. https://doi.org/10.3390/cancers14081960
9. **Gray J, Rasanayagam S , Engel C *et al.* (2017):** State of the evidence 2017: an update on the connection between breast cancer and the environment. Environmental Health, 16 (1): 94. https://doi.org/10.1186/s12940-017-0287-4
10. **Elkum N, Al-Tweigeri T, Ajarim D *et al.* (2014):** Obesity is a significant risk factor for breast cancer in Arab women. BMC Cancer, 14: 788. https://doi.org/10.1186/1471-2407-14-788
11. **Abdelsamea G, Amr M, Tolba A *et al.* (2023):** Impact of weight loss on sexual and psychological functions and quality of life in females with sexual dysfunction: A forgotten avenue. Front. Psychol. 14:1090256. doi: 10.3389/fpsyg.2023.1090256
12. **Kotepui M (2016):** Diets and risk of breast cancer. Contemporary Oncology (Poznań), 20 (1): 13-19. https://doi.org/10.5114/wo.2014.40560
13. **Lo C, Chai X, Ting S *et al.* (2020):** Density of breast: an independent risk factor for developing breast cancer—a prospective study at two premium breast centers. Cancer Medicine, 9 (9): 3244-3251. https://doi.org/10.1002/cam4.2821
14. **White N (2018):** Hormonal contraception and breast cancer risk. American Journal of Lifestyle Medicine, 12 (3): 224-226. https://doi.org/10.1177/1559827618754833
15. **Ballard-Barbash R, Hunsberger S, Alciati *et al.* (2009):** Physical activity, weight control, and breast cancer risk and survival: clinical trial rationale and design considerations. Journal of the National Cancer Institute, 101 (9): 630-643. https://doi.org/10.1093/jnci/djp068
16. **Kelsey J, Gammon M, John E (1993):** Reproductive factors and breast cancer. Epidemiologic Reviews, 15 (1): 36-47. https://doi.org/10.1093/oxfordjournals.epirev. a036115.