Original Article

Association of Pregnancy Loss with Breast Cancer in Babil Governorate's Women

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Abstract

Background: The most common type of cancer among females is breast cancer. Throughout 2016, 897 women died from that disease which is recorded as the first cause of cancer-related mortality among Iraqi females after bronchogenic cancer (Annual Statistical Report 2016); it has been proposed that an interrupted pregnancy might increase a woman's risk of breast cancer since breast cells could proliferate without the later protective effect of differentiation. Previous cross-sectional studies revealed a considerable lack of knowledge regarding the risk factors. **Objective:** The objective of this study is to investigate the possible significant association between female breast cancer and pregnancy loss in Babil governorate's women. **Materials and Methods:** This was a case–control study which was conducted at oncology unit in Merjan Teaching Hospital and Babylon Teaching Hospital for maternity and children. A sample of 50 patients with established breast cancer and 100 healthy women without breast cancer as the control study group. Data were collected by interviewing both groups using a questionnaire about sociodemographic characteristics, reproductive factors, and medical history of other disease. Data were analyzed using the SPSS software version 25, and $P \leq 0.05$ was considered statistically significant. **Results:** The most common type of breast cancer is invasive ductal carcinoma (48%) followed by ductal carcinoma *in situ* (34%) and then invasive lobular carcinoma (18%). Most of our patient diagnosed at Stage II and III (80%) with a mean age at the diagnosis 50.36 ± 5.84. Among all study variables, only early menopausal age is a risk factor for breast cancer in our patients; $P < 0.001$. There was no significant association between breast cancer and other reproductive factors, demographic characters, and chronic diseases. **Conclusion:** In Babil governorate's women, this study shows no statistically significant difference in pregnancy loss between breast cancer patients and healthy control group. The most common breast cancer is invasive ductal carcinoma, and most of the patients present at Stage II and III. Among the study variable, only early age of menopause is a risk factor for breast cancer.

Keywords: Breast cancer, Iraq, pregnancy loss, women

Introduction

In early pregnancy, progesterone, estrogen, and estradiol levels increase, leading to breast growth in preparation for lactation. If interruption occurs for this process by a miscarriage, then immature cells could be left in the breast than there were before the pregnancy. These breast cells (immature) could then be vulnerable to hormones and carcinogens over time, leading to increased breast cancer's risk. Depend on this hypothesis, studies done in animals proposed that the potential for terminal differentiation of breast cells is lower for a gestation terminated by miscarriage than for a full-term pregnancy, which protecting against cancer, but a miscarriage prevents this late breast cell differentiation, in this manner increasing the risk of breast cancer. This was first explored and proposed studies in the 1980s.[1]

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Breast tissue involves several segments each of them encompass many lobules. There are four types of lobules: Type 1 consists of 11 ductules (immature); Type 2 consists of 47 ductules (immature); Type 3 consists of 80 ductules (mature); and Type 4 are fully matured and contain breast milk (cancer resistant).

During early pregnancy, changes in estrogen and progesterone levels will occur leading to conversion of type 1 lobules to type 2 lobules quickly. While an increment of human placental

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lactogen causes maturation into type 3 lobules and then full maturation and differentiation to type 4. If an miscarriage disturb this order, then a higher ratio of type 2 lobules than be present before the pregnancy (the miscarriage–breast cancer hypothesis). Russo and Russo have explore that breast cells (mature) have extended time for repairing DNA with extended cell cycles, accounting for the somewhat decreased risk of breast cancer for multiparous women compared to the baseline risk for women who have not be pregnant at all.[1-3]

The aim of this study was to investigate the possible significant association between female breast cancer and pregnancy loss in Babil governorate's women.

Materials and Methods

Study design, setting and time

This case–control study was conducted at oncology unit in Merjan Teaching Hospital and Babylon Teaching Hospital for Maternity and Pediatric throughout the period between April and August 2020.

Study population

A sample of 150 participants was conveniently selected.

The study group included 50 women with confirmed breast cancer who were registered at the oncology unit in Merjan Teaching Hospital.

The control group included 100 women without breast cancer who attend Babylon Teaching Hospital for Maternity and Pediatric for any cause. Their ages were selected to match the age of case group.

The inclusion criteria included married women for case and control, uni or multipara women for case and control, and breast cancer for case group. The exclusion criteria included unmarried women and nulligravida.

Data collection

Data were collected by interviewing participants (both cases and control groups) using a structured pretested questionnaire which includes information about sociodemographic characteristics and obstetric data (parity, miscarriage, intrauterine death and still birth) and medical history (breast cancer type, stage and age at diagnosis). Women who use oral contraceptive pills for more than 1 year are considered (contraceptive users).

Ethical consideration

Approval of ethical committee in Babylon University College of Medicine was obtained. The acceptance of authorities of the teaching hospitals. Verbal consents of all participants were obtained after explaining the objective of the study, the privacy and confidentiality issues.

Pilot study

For pilot study and reliability of the questionnaire: A convenient sample of 5 breast cancer women who attended Merjan Teaching Hospital (Oncology Center) in Babylon governorate and a sample of 10 healthy control women attending Babylon Teaching Hospital for Maternity and Pediatric hospital for this preliminary study was conducted for the period from April 15, 2020, to April 30, 2020. The time required for each interview ranged about 30 min for each women.

Data analysis

Statistical analysis was carried out using the SPSS software version 25 (SPSS, IBM Company, Chicago, IL 60606, USA). Categorical variables were presented as frequencies and percentages. Continuous variables were presented as means ± standard deviation. Student's *t*-test was used to compare the means between two groups. The Chi-square test and Fisher's exact test were used to find the association between the categorical variables. $P \leq 0.05$ was considered statistically significant.

Ethical approval

The study was conducted in accordance with the ethical principles that have their origin in the Declaration of Helsinki. It was carried out with patients verbal and analytical approval before sample was taken. The study protocol and the subject information and consent form were reviewed and approved by a local ethics committee according to the document number 48 (including the number and the date in 26/11/2019) to get this approval.

Results

For those who had breast cancer, we found that the most common type of breast cancer is invasive ductal carcinoma (48%) followed by ductal carcinoma *in situ* (34%) and then invasive lobular carcinoma (18%). Furthermore, we found that the mean age at the diagnosis was 50.36 ± 5.84 (ranged from 39 to 63).

This study revealed that there was no significant difference between the study groups (patients with breast cancer and control group) and sociodemographic characteristics including (age, residence, occupation and body mass index), as shown in Table 1.

Regarding reproductive variables, this study shows that there was no significant difference between study groups and study variables including (history and duration of breast feeding, parity, mode of delivery, history of contraception, medical history, history and type of infertility and age at menarche), as shown in Table 2.

Regarding menopausal age, this study shows that there was a statistically significant difference between study groups $P < 0.001$, while there is no significant difference between study groups in the mean of study variables including (marriage age and age at first pregnancy), as shown in Table 3.

This study revealed that there was no significant difference between study group and history of miscarriage and still birth, as shown in Table 4.

This study shows no significant difference between study groups and type of miscarriage, time of miscarriage, and type of still birth, as shown in Table 5.

Table 1: Association between study group and sociodemographic characteristics

Sociodemographic characteristics	Study group		Total	*P*
	Breast cancer	Control group		
Age (years)				
40-44	3 (6.0)	6 (6.0)	9 (6.0)	1.000
45-49	8 (16.0)	16 (16.0)	24 (16.0)	
50-54	20 (40.0)	40 (40.0)	60 (40.0)	
55-59	15 (30.0)	30 (30.0)	45 (30.0)	
≥60	4 (8.0)	8 (8.0)	12 (8.0)	
Total	50 (100.0)	100 (100.0)	150 (100.0)	
Residence				
Urban	39 (78.0)	73 (73.0)	112 (74.7)	0.507
Rural	11 (22.0)	27 (27.0)	38 (25.3)	
Total	50 (100.0)	100 (100.0)	150 (100.0)	
Occupation				
Employee	10 (20.0)	30 (30.0)	40 (26.7)	0.192
Homemaker	40 (80.0)	70 (70.0)	110 (73.3)	
Total	50 (100.0)	100 (100.0)	150 (100.0)	
BMI (kg/m^2)				
Underweight (<18.5)	9 (18.0)	20 (20.0)	29 (19.3)	0.159 (F)
Normal (18.5-24.9)	17 (34.0)	49 (49.0)	66 (44.0)	
Overweight (25-29.9)	22 (44.0)	26 (26.0)	48 (32.0)	
Obese (≥30)	2 (4.0)	5 (5.0)	7 (4.7)	
Total	50 (100.0)	100 (100.0)	150 (100.0)	

*$P \leq 0.05$ was significant. *F*: Fisher's exact test, BMI: Body mass index

Discussion

In our study, which involve 150 participants (age-matched 50 patients and 100 control, Table 1], for those who had breast cancer, we found that the most common type of breast cancer is invasive ductal carcinoma (48%) followed by ductal carcinoma *in situ* (34%), and then invasive lobular carcinoma (18%). This result is similar to that of a study conducted in Al Kufa (invasive ductal carcinoma 43.5%, ductal carcinoma *in situ* 39%, and invasive lobular carcinoma 17.5%.[4] Furthermore, we found that the mean age at the diagnosis was 50.36 ± 5.84 (ranged from 39 to 63), which goes with age mentioned in Alwan study,[5] while other Iraqi studies that had been done earlier than 2018 show relatively young age at diagnosis.[6-9] Most of our patient diagnosed at Stages II and III (80%) is similar to the result of Alwan study.[5]

When we compare between case and control groups, among all study variables only early menopausal age is a risk factor for breast cancer in our patients; $P < 0.001$ [Table 3]. There are many studies that demonstrate that late menopausal age is a risk factor for breast cancer which against ours.[10-13] Our different result may be related to the fact that we compared between the mean of ages while other studies compared between the groups.

A meta-analysis done by Tomi F demonstrate that urban residence was associated with significant increase in breast cancer incidence,[14] while our study shows no effect of residence on occurrence of breast cancer; $P = 0.507$ [Table 1].

Regarding age at menarche, many studies show that it had no effect on occurrence of breast cancer which is consistent with ours; $P = 0.483$ [Table 2],[10,13,15-18] but it disagreed with a studies done in Eastern India and in Dhaka city.[12,19]

Regarding hormonal contraception use, this study show no significant difference between case and control group; $P = 0.247$ [Table 2], which goes linear with studies done in Bagdad and in Saudi Arabia and studies published by the American cancer society which revealed that its results were still uncertain about the role oral contraceptive pills might play in breast cancer,[13,15,20] while it disagree with a study done in Iran.[18]

Another study variable is the occupation which show no significant differences between two groups; $P = 0.192$ [Table 1], which goes linear with studies done in Saudi Arabia and Basra,[13,21] but disagree with studies done in Baghdad and Iran.[15,18]

Many studies all over the world study the relationship between BMI and breast cancer, which show that high BMI is a risk factor,[13,15,22] while our study show that it was not a risk factor; $P = 0.159$ [Table 1], which goes with a study done in Iran.[18]

Regarding breast feeding, this study show that breast feeding did not protect against breast cancer; $P = 0.123$ [Table 2], which agree with a study done in Bagdad,[15] in Basra,[23] and in Saudi Arabia,[13] while disagree with a study done in Iran.[18] Also our study show that there is no relation between duration of breast feeding and breast cancer; $P = 0.331$ [Table 2], which consistent with other studies.[24-26]

In our study there was no significant difference between the two groups regarding age at first pregnancy; $P = 0.53$ [Table 3], which is consistent with other published studied,[24-28] but disagree with studies done in Saudi Arabia and Iran.[13,18]

Table 2: Association between study group and study variables (history and duration of breast feeding, parity, mode of delivery, history of contraception, medical history, history and type of infertility and age at menarche)

Study variables	Study group		Total	*P*
	Breast cancer	Control group		
Breastfeeding				
Yes	32 (64.0)	76 (76.0)	108 (72.0)	0.123
No	18 (36.0)	24 (24.0)	42 (28.0)	
Total	50 (100.0)	100 (100.0)	150 (100.0)	
Duration of breastfeeding (years)				
≥2	15 (46.9)	28 (36.8)	43 (39.8)	0.331
<2	17 (53.1)	48 (63.2)	65 (60.2)	
Total	32 (100.0)	76 (100.0)	108 (100.0)	
Parity				
1-2	21 (42.0)	36 (36.0)	57 (38.0)	0.567
3-4	17 (34.0)	37 (37.0)	54 (36.0)	
5-6	11 (22.0)	20 (20.0)	31 (20.7)	
≥7	1 (2.0)	7 (7.0)	8 (5.3)	
Total	50 (100.0)	100 (100.0)	150 (100.0)	
Mode of delivery				
Cesarean section	12 (24.0)	30 (30.0)	42 (28.0)	0.44
Normal vaginal delivery	38 (76.0)	70 (70.0)	108 (72.0)	
Total	50 (100.0)	100 (100.0)	150 (100.0)	
History of contraception				
Yes	17 (34.0)	25 (25.0)	42 (28.0)	0.247
No	33 (66.0)	75 (75.0)	108 (72.0)	
Total	50 (100.0)	100 (100.0)	150 (100.0)	
Medical history				
Yes	14 (28.0)	27 (27.0)	41 (27.3)	0.897
No	36 (72.0)	73 (73.0)	109 (72.7)	
Total	50 (100.0)	100 (100.0)	150 (100.0)	
History of infertility				
Yes	4 (8.0)	7 (7.0)	11 (7.3)	1.000 (*F*)
No	46 (92.0)	93 (93.0)	139 (92.7)	
Total	50 (100.0)	100 (100.0)	150 (100.0)	
Age of menarche (years)				
>12	27 (54.0)	60 (60.0)	87 (58.0)	0.483
≤12	23 (46.0)	40 (40.0)	63 (42.0)	
Total	50 (100.0)	100 (100.0)	150 (100.0)	

*$P \leq 0.05$ was significant. *F*: Fisher's exact test

Table 3: The mean differences of study variables (marriage age and age at first pregnancy) according to the study group

Study variables	Study group	*n*	Mean±SD	*P*
Menopausal age (years)	Breast cancer	44	47.11±3.22	<0.001*
	Control group	69	49.77±2.89	
Marriage age (years)	Breast cancer	50	21.82±4.27	0.425
	Control group	100	22.42±4.36	
Age at first pregnancy (years)	Breast cancer	50	23.00±4.47	0.53
	Control group	100	23.53±4.29	

*$P \leq 0.001$ was statistically significant. SD: Standard deviation

There was no relation between parity number and breast cancer as its obvious in this study; $P = 0.567$ [Table 2], which agrees with Al Gamdi study and Musa study.[13,29] while it disagree with a study done in Iran.[18]

Regarding infertility there was no significant differences between the two groups; $P = 1$ [Table 2], which is agree with studies done in France, USA and Australia.[30-32]

Regarding mode of delivery and chronic disease which show no relation with breast cancer in our study; $P = 0.44$, 0.897, respectively [Table 2]. There is no similar study to compare our result with it.

A study done in Saudi Arabia showed that an early age of marriage or early sexual inter course is the strongest risk factor for breast cancer among Saudi women,[13] which disagree with the result of our study; $P = 0.425$ [Table 3] and that of Iranian study,[18] that age of marriage has no relation with breast cancer.

Table 4: Association between study group and history of miscarriage and still birth

Study variables	Study group		Total	*P*
	Breast cancer	Control group		
History of miscarriage				
Yes	7 (14.0)	12 (12.0)	19 (12.7)	0.728
No	43 (86.0)	88 (88.0)	131 (87.3)	
Total	50 (100.0)	100 (100.0)	150 (100.0)	
Still birth				
Yes	4 (8.0)	7 (7.0)	11 (7.3)	1.000 (*F*)
No	46 (92.0)	93 (93.0)	139 (92.7)	
Total	50 (100.0)	100 (100.0)	150 (100.0)	

*$P \leq 0.05$ was statistically significant. *F*: Fisher's exact test

Table 5: The association between study group and type of miscarriage, time of miscarriage, and types of still birth

Study variables	Breast cancer	Control Group	Total	*P*
Type of miscarriage				
Complete	1 (14.3)	3 (25.0)	4 (21.1)	0.713
Incomplete	3 (42.8)	5 (41.7)	8 (42.1)	
Missed	2 (28.6)	1 (8.3)	3 (15.7)	
Septic	0 (0.0)	0 (0.0)	0 (0.0)	
Recurrent	1 (14.3)	3 (25.0)	4 (21.1)	
Total	7 (100.0)	12 (100.0)	12 (100.0)	
Time of miscarriage				
First trimester	4 (57.1)	9 (75.0)	13 (68.4)	0.617
Second trimester	3 (42.9)	3 (25.0)	6 (31.6)	
Total	7 (100.0)	12 (100.0)	19 (100.0)	
Still birth				
IUD	4 (100.0)	7 (100.0)	11 (100.0)	-
Intrapartum	0 (0.0)	0 (0.0)	0 (0.0)	
Death total	4 (100.0)	7 (100.0)	11 (100.0)	

*$P \leq 0.05$ was significant. *F*: Fisher's exact test, IUD: Intra-uterine death

Regarding miscarriage, this study show that it had no effect on occurrence of breast cancer; $P = 0.728$ [Table 4], which agree with other published studies,[24,26-28,33,34] while disagree with a studies done in Baghdad and in North West bank[15,35] Also our study reveal that there was no association between type of miscarriage and breast cancer; $P = 0.713$ [Table 5], which is agree with study done in Tel-Aviv.[36] The time of miscarriage is also show no significant differences between the two groups; $P = 0.617$ [Table 5], which is disagree with studies done in California and in Sweden.[37,38]

In our study there was no significant differences between the two groups regarding still birth, $P = 1$ [Table 4], which is consistent with other published studied.[24,26-28,33,34] There are 3 limitations in our study: short study period, relatively small size sample and the presence of curfew because of corona virus disease.

Conclusion

This study shows no statistical significant difference in pregnancy loss between breast cancer patients and healthy control group. The most common breast cancer is invasive ductal carcinoma, and most of the patients present at stage II and III. Among the study variables, only early age of menopause is a risk factor for breast cancer.

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Conflicts of interest

There are no conflicts of interest.

References

1. Russo J, Russo I. Susceptibility of the mammary gland to carcinogenesis. II. Pregnancy interruption as a risk factor in tumor incidence". Am J Pathol 1980;100:497-512.
2. Russo J, Tay LK, Russo IH. Differentiation of the mammary gland and susceptibility to carcinogenesis. Breast Cancer Res. Treat 1982;2:5-73.
3. Russo J, Russo I. Biological and molecular bases of mammary carcinogenesis. Lab Invest 1987;57:112-37.
4. Ali H, Khursani A. Presentation and risk factors of female with breast cancer in najaf governorate. Kufa Med J 2008;11:260-76.
5. Alwan NA. Tumor characteristics of female breast cancer: pathological review of mastectomy specimens belonging to Iraqi patients. World J Breast Cancer Res 2018;1:1-3.
6. Alwan N. Iraqi initiative of a regional comparative breast cancer research project in the Middle East. J Cancer Biol Res 2014;2:1016-20.
7. Alwan NA. Breast cancer among Iraqi women: Preliminary findings from a regional comparative breast cancer research project. J Glob Oncol 2016;2:255-8.
8. Alwan NA, Tawfeeq FN, Maallah MH, Sattar SA. The stage of breast cancer at the time of diagnosis: Correlation with the clinicopathological findings among Iraqi patients. J Neoplasm 2017;2:1-10.
9. Alwan NA, Mualla F, Al Naqash M, Kathum S, Tawfiq FN, Nadhir S. Clinical and pathological characteristics of triple positive breast cancer among Iraqi patients. Gulf J Oncol 2017;1:51-60.
10. Baiee HA, Kizar ZF, Jasim HS, Jasim SS, Raheem LQ. Potential Risk Factors of Breast Cancer among Women Attending Teaching Hospitals in Babylon Province Medico-legal Update 2020;20:972-7.
11. Zannat KE, Karim N, Faruquee MH, Haque M. Risk factors for breast cancer among women attending in selected hospitals of Dhaka city. J Med Biol Sci Res 2015;1:162-16.
12. Das S, Sen S, Mukherjee A, Chakraborty D, Mondal PK. Risk factors of breast cancer among women in eastern India: A tertiary hospital based case control study. Asian Pac J Cancer Prev 2012;13:1-6.
13. Ibrahim G. Alghamdi, Issam I. Hussaina, Mohamed S. Alghamdic, Mohamed A. El-Sheemy. Early marriage is a potential risk factor for female breast cancer in the Eastern Region of Saudi Arabia. USA-J 2015;3:7.
14. Akinyemiju TF, Genkinger JM, Farhat M, Wilson A, Tiffany L. Gary-webband parisa tehranifar. Residential environment and breast cancer incidence and mortality: A systematic review and meta-analysis. BMC Cancer 2015;15:191-213.
15. Lafta RK, Saeed EQ, Isa SA. Risk factors of breast cancer among women. Iraqi J. Comm Med 2013;1:1-7.
16. Altaha MA, Al-ani HG. Reproductive factors and risk of breast cancer. Anb Med J 2013;11:17-26.
17. Bahir BH, Al-naqeeb AA, Mahmood S, Ch N. Risk factors for breast cancer in a sample of women. Iraqi J Comm Med 2012;20:4-8.
18. Maram RG, Tabatabaee ST. Risk factors for breast cancer among young women in Southern Iran. Int J Cancer 2011;129:1443-9.
19. Lee H, Li JY, Fan JH, Li J, Huang R, Zhang B-N, *et al*. Risk factors for breast cancer among Chinese women: A 10-year nationwide multicenter cross-sectional study. J Epidemiol 2014;24:67-76.
20. Hwang ES, Shiboski CS, Farrer G, Benz CC, Wresch M. Risk factors for oestrogen receptor-positive breast cancer. Arch Surg 2005;140;58-65.
21. AbdulSamad AA, AlKamil EA, Hamisodani A. Breast cancer and selected lifestyle variables: A case-control study. Bahrain Med Bull 2009;31:1-10

22. Cecchini RS, Costantino JP, Cauley JA, Cronin WD, Wickerham L, Stephanie R. Weissfeld, and Norman Wolmar body mass index and the risk for developing invasive breast cancer among high-risk women in NSABP P-1 and STAR breast cancer prevention trials. Aacr J 2012;5:583-92.
23. Dahooz ZK, AL-Hawaz MH. Changes in the Aetiological Factors Pattern of Breast Cancer in Basra, Board Thesis Submitted to Iraqi Council for Medical Specialization Department of Surgery, Basrah University; 2005.
24. Sharif Zadeh GH, Hosseini M, Kermani T, Ataiee M, Akhbari SH. Breast cancer and the related factors: A case control study. J Birjand Univ Med Sci 2011;18:191-9.
25. Newcomb PA, Egan KM, Ernstoff TL, Dietz TA, Greenberg ER, Baron JA, *et al*. Lactation in relation to postmenopausal breast cancer. Am J Epidemiol 1999;150:174-82.
26. Mehdiabad FJ, Esfahani MS, Mokaryan F, Kazemi A. Relationship between breastfeeding factors and breast cancer in women referred to seyed al-shohada hospital in Isfahan, Iran. Iran J Nurs Midwifery Res 2016;21:622-7.
27. Lodha RS, Nandeshwar S, Pal DK, Shrivastav A, Lodha KM, Bhagat VK, *et al*. Risk factors for breast cancer among women in Bhopal urban agglomerate: A case-control study. Asian Pac J Cancer Prev 2011;12:2111-5.
28. Gajalakshmi V, Mathew A, Brennan P, Rajan B, Kanimozhi VC, Mathews A, *et al*. Breastfeeding and breast cancer risk in India: A multicenter case-control study. Int J Cancer 2009;125:662-5.
29. Kana MA, Ari M, Solomon P, Lunet N. Association between parity and breast cancer among women in North central Nigeria: An exploratory case control analysis. Arquivos de Medicina 2015;29:132-4.
30. Gabriele V, Born GE, Ohl J, Akladios C, Mathelin C. Infertility and breast cancer .Gynecol Obstet Fertil 2016;44:113-20.
31. Marilie D. Gammon, W. Douglas Thompson, infertility and breast cancer: A population-based case-control study. Am J Epidemiol 1990;132:708-16.
32. Venn A, Watson L, Lumley J, Giles G, King C. Healy. Breast and ovarian cancer incidence after infertility and *in vitro* fertilization. Lancet 1995;346:995-1000.
33. Brian L, Strom M, Warshauer E, Paul D, Shapiro SS, *et al*. Induced and spontaneous abortion in relation to risk of breast cancer (United States). Cancer Causes Control 1997;8:841-9.
34. Anders P, Mikkelsen AP, Egerup P, Julie FM, Astrid EM, Henriette KS, *et al*. Pregnancy loss and cancer risk: A nationwide observational study. E Clin Med 2019;15:80-8.
35. Darweesh A. Risk Factors of Breast Cancer Among Palestinian Women in North West bank, Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Public Health, Faculty of Graduate Studies, An-Najah National University, Nablus, Palestine; 2009.
36. Gal I, Sadetzki S, Baruch RG, Moshe BO, Papa Z, Menachem T, *et al*. .Offspring gender ratio and the rate of recurrent spontaneous miscarriages in Jewish women at high risk for breast/ovarian cancer. Sci Direct J 2004;74:1270-5.
37. Pike MC, Henderson BE, Casagrande JT, Rosario I, Gray GE. Oral contraceptive use and early abortion as risk factors for breast cancer in young women. Br J Cancer 1981;43:72-6.
38. Harris BM, Eklund G, Meirik O, Rutqvist LE, Wiklund K. Risk of cancer of the breast after legal abortion during first trimester: A Swedish register study. Br Med J 1989;299:1430.