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Prolonged breastfeeding reduces risk of breast cancer in Sri Lankan women: A case–control study

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ABSTRACT

Goal: To assess the association between duration of breastfeeding and the risk of breast cancer in Sri Lankan women. *Methods*: We conducted a case–control study in women aged 30–64 years in selected health care facilities in the Western province. A total of 100 recent cases of breast cancer (histologically confirmed) and 203 controls (age and parity matched) were included. Detailed information regarding breastfeeding, menstruation, reproductive factors, passive smoking and other confounders was collected using a structured questionnaire. Adjusted odds ratios and 95% confidence intervals were calculated using multiple logistic regressions. *Principle results*: Multivariate analysis found that those women who breastfed for ≥24 months during lifetime had significantly lower risk of breast cancer than those who breastfed for less than 24 months (OR = 0.40; 95%CI = 0.22, 0.73). Compared to 0–11 months of lifetime breastfeeding, there was a 66.3% reduction in breast cancer risk in women who breastfed for 12–23 months, 87.4% reduction in 24–35 months and 94% reduction in 36–47 months categories. The mean duration of breastfeeding per child for ≥12 months was also associated with reduced risk of breast cancer (OR = 0.52; 95%CI = 0.28, 0.94). The significant factors associated with increased risk of breast cancer were: post-menopausal women (OR = 1.74; 95%CI = 1.01, 3.01); having an abortion in the past (OR = 3.42; 95%CI = 1.75, 6.66) and exposure to passive smoking (OR = 2.96, 95%CI = 1.53, 5.75). *Major conclusions*: Prolonged breastfeeding significantly reduces the risk of breast cancer and this protective effect was supported by a dose–response relationship. Risk due to passive smoking should be emphasized in anti-smoking programmes.

1. Introduction

Breast cancer is the commonest malignancy among women in the world as well as in Sri Lanka. Available data indicate that approximately 4.7 deaths per 100,000 Sri Lankan women were due to breast cancer [1]. According to the national cancer registry, the reported cases of breast cancer in the country has increased from 4.6 per 100,000 women in 1985 to 9.8 in 2005 [1]. Even though Sri Lanka reported a lower risk of breast cancer compared to many developed countries, the rapid rise in incidence has caused serious public health concerns necessitating sustainable preventive strategies in the community.

The hypothesis of prolonged lactation reducing the risk of breast cancer has been investigated by epidemiological studies in many parts of the world [2–22]. Several case–control studies, predominantly in pre-menopausal women, have reported a reduced risk of breast cancer associated with prolonged breastfeeding [6,7,9,10,12,14,15,17,18], while, some studies have failed to show such an association [3,4,8,11,16,23]. A meta analysis using 47 epidemiological studies from 30 different countries revealed that 1 year of breastfeeding reduces the relative risk of breast cancer by 4.3% [24]. The effects of various aspects of lactation, including the role of ever having breastfed, number of children breastfed, duration of breastfeeding, age at first lactation, age at most recent lactation and duration of amenorrhea during lactation, on the risk of breast cancer have been studied by various research groups. In general, many of such studies found that breastfeeding exert a protective effect on the risk of breast cancer [5,6,9,10,12,15,17,24–26] and women who breastfed at younger ages have a reduced risk of developing breast cancer [14,18]. With regard to milk insufficiency in breastfed women, a recent meta analysis concluded that there was no consistent evidence for an effect of insufficient milk supply on breast cancer risk [27].

Prevention of breast cancer is especially important in the Sri Lankan setting where mammography is not widely available for routine screening of women. Identification of modifiable risk

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factors is a prerequisite for planning and implementing sustainable preventive programmes. The breastfeeding practices are relatively better in Sri Lanka and the lifestyle, socio-economical and environmental characteristics are also quite different from the developed world. For example, the proportion of children below 5 years of age who were ever breastfed was 99%, and the median duration of breastfeeding in children under 3 years of age was 33 months [28]. However, the effect of breastfeeding on reducing risk of breast cancer has not been examined in Sri Lanka. Currently there is paucity of knowledge regarding reproductive and other factors associated with breast cancer in Sri Lanka. This case–control study aims to assess the association between duration of breastfeeding and the risk of breast cancer in Sri Lankan women. It also aims to identify the reproductive and other factors associated with breast cancer risk in the study population.

2. Materials and methods

2.1. Study population

We conducted a case–control study in selected health care facilities in the Western province of Sri Lanka from January to December 2007. The cases were selected from three tertiary care hospitals: the Cancer Institute Maharagama, the National Hospital of Sri Lanka and the Colombo North Teaching Hospital. The Cancer Institute Maharagama is the only referral hospital for cancer in Sri Lanka, and provides care for the majority of cancer patients in the country. The National Hospital of Sri Lanka and the Colombo North Teaching Hospital also provide diagnostic facilities and initial treatment for selected cancers, i.e., surgery for breast cancer.

A 'case' of breast cancer was defined as a woman who was newly diagnosed to have invasive breast cancer either by fine needle aspiration (cytological) or core/excision biopsy (pathological), with or without a positive mammogram (radiological), together with clinical diagnosis. The sample was restricted to women aged 30–64 years and admitted to the surgical units of the above mentioned hospitals. Among the excluded were those having more than a 3-year delay between diagnosis and admission for surgery, secondary deposits in the breast where the primary malignancy was at another site and critically ill patients. All the women who satisfied the above mentioned criteria were enrolled in the study as 'cases' until the required sample size was fulfilled.

The control group was selected from Well Women Clinics conducted in five Medical Officer of Health divisions in the Western province, namely Pitakotte, Nugegoda, Wattala, Ragama and Ja-ela. The Well Women Clinics offer screening services including clinical examination of breasts and PAP smear test for cervical cytology for apparently healthy women in the community. However, these clinics do not provide mammographic screening facilities for breast cancer. The controls were matched to the cases by the respondent's age group (5-year age groups) and parity, since these 2 variables were well recognized risk factors, which would otherwise confound the hypothesized association between breast cancer and breastfeeding. Once a case was identified, two controls comparable to the index case were selected from the immediate Well Women Clinic out of the 5 clinic centers. Those women who were having a palpable breast lump or symptoms and signs suggestive of breast cancer were excluded from the controls.

2.2. Sample

The sample size was calculated by the formula for case–control studies described by Schlesselman [29]. The main exposure variable was the proportion of women who have breastfed for more than 24 months, and we assumed that it was 50% in the population [30]. The study was expected to detect an odds ratio (OR) of 0.46 for risk of breast cancer due to the exposure, with the power of 80% and alpha error of 0.05 [21]. Since case-to-control ratio was 1:2, the expected sample size was approximately 300, which comprised of 100 cases and 200 controls.

2.3. Data collection

The data were collected by interviewing women by the trained interviewers using a pre-tested, structured questionnaire. All eligible women could speak the native language, despite different ethnicities. The questions were focused to collect details of breastfeeding and other potential confounding factors for breast cancer. The lactation history was obtained for each live birth separately, including details regarding duration of breastfeeding, period of amenorrhea during breastfeeding, age at first lactation and at most recent lactation. The total duration of breastfeeding was calculated by summing up the number of months of breastfeeding per each child. In addition, information was collected on level of education, employment, family history of breast cancer, menstrual and reproductive history, exposure to passive smoking, use of alcohol and daily activity level. Anthropometric measurements (weight and height) of the participants were taken using the standard instruments and techniques.

Of the eligible women with breast cancer, 96 percent (100 out of 104) agreed to participate in the study, and the available basic characteristics of the non-participants were similar to the participants. Of the eligible controls, 95 percent (203 out of 213) agreed to participate in the study.

2.4. Data analysis

Data were collected in such a manner that there would be 2 matched controls per case. But, only in few instances, there were more than 2 controls per case resulting in 203 controls per 100 cases. We analyzed data from all 100 cases and 203 controls. The main exposure variable 'the duration of breastfeeding' was expressed in 3 different forms: (1) Lifetime duration of breastfeeding for 24 months or more (reference group—less than 24 months); (2) Mean duration of breastfeeding per child for 12 months or more (reference group less than 12 months); (3) Lifetime duration of breastfeeding by 12-month categories 12–23, 24–35, 36–47, and $\geq$48 months (reference group 0–11 months). In the bivariate analyses, comparisons were made between cases and controls in the proportion of women who breastfed $\geq$24 months lifetime, breastfed $\geq$12 months per child etc. Majority of the independent variables were originally in the categorical form, and the remaining continuous variables were also categorized considering either high risk groups or service target groups, so that the results may be useful for programme managers. Unadjusted Odds Ratios were estimated for each independent variable. Selected variables were entered in the multiple logistic regression models using stepwise backward method to estimate the adjusted odds ratios and 95% confidence interval (CI) for the risk of breast cancer. Risk reduction was calculated for each 12-month category of lifetime breastfeeding by subtracting the respective adjusted odds ratio from 1.00, and expressed as a percentage.

2.5. Ethics clearance

Ethics clearance was obtained from the Ethics Review Committee of the Faculty of Medicine, University of Colombo (reference no. EC/06/121). Data collection was initiated after obtaining permission from all health care settings under study. Informed verbal consent was obtained from both breast cancer cases and controls prior to the interview by the principal investigator.

Table 1
Characteristics of breast cancer cases and controls participated in the study.

Characteristic	Cases (n = 100)		Controls (n = 203)	
	n	(%)	n	(%)
Age group				
<35 years	5	(5.0)	11	(5.4)
35–49 years	52	(52.0)	109	(53.7)
50–59 years	33	(33.0)	67	(33.0)
≥60 years	10	(10.0)	16	(7.9)
Parity				
Nulliparous	7	(7.0)	10	(4.9)
1	19	(19.0)	34	(16.7)
2	38	(38.0)	84	(41.4)
3	23	(23.0)	50	(24.6)
≥4	13	(13.0)	25	(12.3)
BMI (kg/m^2)[a]				
<23	35	(35.0)	72	(35.5)
≥23	65	(65.0)	131	(64.5)
Education				
Primary	6	(6.0)	15	(7.4)
Secondary	15	(15.0)	44	(21.7)
O/L	45	(45.0)	84	(41.4)
A/L and above	34	(34.0)	60	(29.6)
Employment				
Yes	27	(27.0)	57	(28.1)
No	73	(73.0)	146	(71.9)
Age at menarche				
<13 years	23	(23.0)	51	(25.1)
≥13 years	77	(77.0)	152	(74.9)
Menopause				
Yes	55	(55.0)	82	(40.4)
No	45	(45.0)	121	(59.6)
Ever become pregnant				
Yes	91	(91.0)	193	(95.1)
No	9	(9.0)	10	(4.9)
Age at 1st full-term pregnancy				
Nulliparous	11	(11.0)	10	(4.9)
<20 years	10	(10.0)	17	(8.4)
20–29 years	76	(76.0)	164	(80.8)
≥30 years	3	(3.0)	12	(5.9)
Past history of abortions				
No	67	(67.0)	178	(87.7)
Yes	33	(33.0)	25	(12.3)
Hormonal contraceptives				
Used <5 years	91	(91.0)	168	(82.8)
Used ≥5 years	9	(9.0)	35	(17.2)
Hormonal replacement therapy use				
Yes	2	(2.0)	6	(3.0)
No	98	(98.0)	197	(97.0)
Family history of breast cancer				
Yes	16	(16.0)	17	(8.4)
No	84	(84.0)	186	(91.6)
Passive smoking				
Yes	29	(29.0)	28	(13.8)
No	71	(71.0)	175	(86.2)
Ever consumed alcohol				
Yes	9	(9.0)	37	(18.2)
No	91	(91.0)	166	(81.8)
Previous breast problems				
Yes	15	(15.0)	21	(10.3)
No	85	(85.0)	181	(89.2)
Daily activity level				
Light work	68	(68.0)	121	(59.6)
Moderate work	31	(31.0)	80	(39.4)
Heavy work	1	(1.0)	1	(0.5)
Ever breastfed				
Yes	89	(89.0)	191	(94.1)
No	11	(11.0)	12	(5.9)
Breastfed more than 12 months				
Yes	71	(71.0)	181	(89.2)
No	29	(29.0)	22	(10.8)
Breastfed more than 24 months				
Yes	55	(55.0)	153	(75.4)
No	45	(45.0)	50	(24.6)
Breastfed duration in 12 months groups				
0–11	29	(29.0)	22	(10.8)
12–23	16	(16.0)	28	(13.8)
24–35	8	(8.0)	40	(19.7)
36–47	5	(5.0)	39	(19.2)
≥48	42	(42.0)	74	(36.5)

[a] BMI = body mass index (kg/m^2).

3. Results

Selected characteristics of breast cancer cases and controls are presented in Table 1. Age was a matched variable in the sample, thus distribution of participants by age groups were similar between cases and controls. Women's parity was also considered in matching, however, there were minor differences in the proportions between cases and controls. For example 7% of cases compared to 5% of controls were nulliparous women. Cases and controls were comparable with respect to baseline characteristics of education, body mass index and daily activity levels.

The lifetime duration of breastfeeding was significantly associated with a reduced risk of breast cancer for those women who breastfed for ≥24 months when compared with those who breastfed for less than 24 months as shown in Table 2 (adjusted OR = 0.40; 95%CI = 0.22, 0.73). Post-menopausal women had an increased risk of having breast cancer when compared with the pre-menopausal women (adjusted OR = 1.74; 95%CI = 1.01, 3.01). The risk of breast cancer was associated with women's age at first full-term pregnancy, with significantly lower risks at older age at first pregnancy than pregnancies before 20 years of age (20–29 years adjusted OR = 0.39; 95%CI = 0.19, 0.79; >30 years adjusted OR = 0.37; 95%CI = 0.15, 0.90). Having a previous abortion was significantly related to an increased risk of breast cancer (adjusted OR = 3.42; 95%CI = 1.75, 6.66). There was a highly significant association between exposure to passive smoking and increased risk of breast cancer (adjusted OR = 2.96; 95%CI = 1.53, 5.75). Adjusted odds ratios for a positive family breast cancer history was approximately 2.0, however the odds ratio was insignificant in the present analyses. Employed women reported to have a lower risk (adjusted OR = 0.52; 95%CI = 0.27, 1.00 than unemployed women. According to the present analysis, risk of breast cancer was not associated with women's age at menarche, use of hormonal contraceptives for more than 5 years, body mass index (BMI), and level of education.

Table 3 illustrates the risk of breast cancer associated with mean duration of breastfeeding per child. After making adjustment for potential confounders, it was found that women who breastfed for a duration of 12 months per child, had a significantly reduced risk of developing breast cancer (adjusted OR = 0.52; 95%CI = 0.28, 0.94).

When the present analysis was further extended to test the dose–response relationship between the risk of breast cancer and varying durations of breastfeeding (Table 4 and Fig. 1) it was found that longer the duration of breastfeeding the protective effect against breast cancer was greater. In comparison to women who breastfed for 0–11 months, adjusted odds ratios for women who breastfed for 12–23, 24–35 and 36–47 months were 0.34

Table 2
Risk of breast cancer associated with lifetime duration of breastfeeding ≥24 months and other factors.

	Unadjusted			Adjusted		
	OR	95%CI	*P*-Value	OR	95%CI	*P*-Value
Breastfeeding						
Breastfed 24 months or more						
No	1.00			1.00		
Yes	0.40	(0.24–0.66)	0.000	0.40	(0.22–0.73)	0.003
Reproductive factors						
Parity groups						
0	1.00					
1	0.80	(0.23–2.81)	0.692			
2	0.65	(0.40–1.42)	0.407			
3	0.66	(0.20–2.22)	0.446			
>4	0.74	(0.20–2.28)	0.620			
Age at 1st pregnancy						
<20	1.00			1.00		
20–29	0.54	(0.27–1.09)	0.086	0.39	(0.19–0.79)	0.009
30+	0.82	(0.36–1.87)	0.643	0.37	(0.15–0.90)	0.028
Non-pregnant	1.55	(0.54–4.47)	0.415			
Age at menarche						
<13	1.00					
13+	1.12	(0.64–1.97)	0.686			
Menopaused						
No	1.00			1.00		
Yes	1.80	(1.11–2.92)	0.017	1.74	(1.01–3.01)	0.047
Past history of abortions						
No	1.00			1.00		
Yes	3.51	(1.94–6.33)	0.000	3.42	(1.75–6.66)	0.000
Hormonal contraceptives use						
Used <5 years	1.00					
Used >5 years	0.47	(0.20–1.08)	0.060			
Other factors						
Age regroup						
<35	1.00					
35–49	1.05	(0.35–3.18)	0.932			
50–59	1.08	(0.35–3.38)	0.890			
>60	1.37	(0.37–5.15)	0.636			
BMI (kg/m^2)						
<23	1.00					
23 +	1.02	(0.62–1.69)	0.936			
Highest education level						
Primary	1.00			1.00		
Secondary	0.71	(0.25–1.99)	0.510	0.63	(0.19–2.15)	0.464
O/L	0.60	(0.29–1.24)	0.167	1.44	(0.47–4.41)	0.523
AL and above	0.95	(0.54–1.65)	0.843	1.85	(0.56–6.08)	0.313
Employed						
No	1.00			1.00		
Yes	0.95	(0.55–1.62)	0.844	0.52	(0.27–1.02)	0.056
Family history						
No	1.00			1.00		
Yes	2.08	(1.00–4.32)	0.049	2.06	(0.88–4.83)	0.096
Passive smoking						
No	1.00			1.00		
Yes	2.55	(1.42–4.60)	0.002	2.96	(1.53–5.75)	0.001

(No. of cases = 100; controls = 203).

(95%CI = 0.13, 0.85), 0.13 (95%CI = 0.04, 0.36) and 0.06 (95%CI = 0.02, 0.20), respectively. There was a 66.3% reduction in breast cancer risk in women who breastfed for 12–23 months relative to 0–11 months of breastfeeding including those that had never breastfed. When breastfeeding duration was further prolonged the percentage risk reduction increased, i.e., 87.4% among those who breastfed for 24–35 months and 94% in the 36–47 months group. However, the percentage reduction in those who breastfed for 48 months or above (65.2%) was similar to that of the group who breast fed for 12–23 months.

4. Discussion

In the present study we observed a significant inverse association between duration of breastfeeding and risk of breast carcinoma, together with a dose–response relationship of decreasing breast cancer odds ratios with an increasing duration of breastfeeding. The significant risk reduction was found both with lifetime duration of breastfeeding and average duration of breastfeeding per child. In comparison to women who breastfed 0–11 months life time, the risk reduction of women who breastfed

Table 3
Risk of breast cancer associated with mean duration of breastfeeding per child ≥12 months and other factors.

	Unadjusted			Adjusted		
	OR	95%CI	*P*-Value	OR	95%CI	*P*-Value
Breastfeeding						
Average duration of breastfeeding per child						
<12 months	1.00			1.00		
≥12 months	0.49	(0.30–0.81)	0.006	0.52	(0.28–0.94)	0.030
Reproductive factors						
Parity groups						
0	1.00					
1	0.80	(0.23–2.81)	0.692			
2	0.65	(0.40–1.42)	0.407			
3	0.66	(0.20–2.22)	0.446			
≥4	0.74	(0.20–2.28)	0.620			
Ever become pregnant						
No	1.00					
Yes	0.52	(0.21–1.33)	0.175			
Age at 1st pregnancy						
<20	1.00		0.061	1.00		
20–29	0.54	(0.27–1.09)	0.086	0.36	(0.18–0.75)	0.006
≥30	0.82	(0.36–1.87)	0.643	0.40	(0.17–0.99)	0.048
Non-pregnant	1.55	(0.54–4.47)	0.415			
Age at menarche						
<13	1.00					
≥13	1.12	(0.64–1.97)	0.686			
Menopaused						
No	1.00			1.00		
Yes	1.80	(1.11–2.92)	0.017	2.93	(1.27–6.76)	0.012
Abortions in the past						
No	1.00			1.00		
Yes	3.51	(1.94–6.33)	0.000	3.37	(1.73–6.55)	0.000
Hormonal contraceptives use						
Used <5 years	1.00					
Used ≥5 years	0.47	(0.20–1.08)	0.060			
Other factors						
Age regroup						
<35	1.00			1.00		
35–49	1.05	(0.35–3.18)	0.932	0.58	(0.17–1.99)	0.390
50–59	1.08	(0.35–3.38)	0.890	0.29	(0.07–1.25)	0.098
≥60	1.37	(0.37–5.15)	0.636	0.34	(0.06–1.82)	0.205
BMI (kg/m^2)						
<23	1.00					
≥23	1.02	(0.62–1.69)	0.936			
Highest education level						
Primary	1.00			1.00		
Secondary	0.71	(0.25–1.99)	0.510	0.76	(0.22–2.62)	0.666
O/L	0.60	(0.29–1.24)	0.167	1.77	(0.57–5.53)	0.324
A/L and above	0.95	(0.54–1.65)	0.843	2.04	(0.61–6.83)	0.248
Employed						
No	1.00			1.00		
Yes	0.95	(0.55–1.62)	0.844	0.55	(0.28–1.06)	0.074
Family history of breast cancer						
No	1.00			1.00		
Yes	2.08	(1.00–4.32)	0.049	2.05	(0.89–4.72)	0.093
Passive smoking						
No	1.00			1.00		
Yes	2.55	(1.42–4.60)	0.002	2.90	(1.49–5.63)	0.002

(No. of cases = 100; controls = 203).

12, 24 and 36 completed months were 66%, 87% and 94%, respectively. Similar dose–response relationship between lifetime duration of breastfeeding and breast cancer was found in both pre- and post-menopausal women according to a study conducted in Israel [31]. The possible mechanisms for reduction of risk of breast cancer by prolonged breastfeeding have been discussed in the previous literature [5,11,17,18,21,32,33].

The protective effect of prolonged lactation on breast cancer risk was consistent in many previous studies [6,9,21,26,33–37], however certain studies failed to demonstrate such association [3,8,11,16,23,32,38]. Effects similar to the current study were observed in a study from China, where both lifetime duration and average duration of lactation per child were found to be protective against breast cancer [21]. A large, multicenter case–control study

Table 4
Risk of breast cancer and percent risk reduction associated with varying degrees of lifetime duration of breastfeeding: a dose–response relationship.

Breastfed duration (months)	Unadjusted OR		Adjusted OR[a]		Risk reduction[b]	
	OR	95%CI	OR	95%CI	Percent	95%CI
0–11	1.00		1.00		0.0	
12–23	0.43	(0.19, 0.99)	0.34	(0.13, 0.85)*	66.3	(15.3, 86.6)
24–35	0.15	(0.06, 0.39)	0.13	(0.04, 0.36)***	87.4	(63.8, 95.6)
36–47	0.10	(0.03, 0.29)	0.06	(0.02, 0.20)***	94.0	(80.5, 98.2)
48+	0.43	(0.22, 0.84)	0.35	(0.16, 0.75)**	65.2	(25.1, 83.8)

[a] Adjusted for all other characteristics as in Table 2.
[b] Based on adjusted OR and 95%CI.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

conducted in 5 cities in USA between 1994 and 1998 also found associations supportive of our results [19]. According to this study from USA, the lifetime duration of lactation was inversely associated with a reduced breast carcinoma risk among younger, parous, white and African-American women. When compared with the US and Chinese studies, our study found lower odds ratios, indicating that protective effect of duration of breastfeeding was more pronounced in Sri Lankan women.

Our findings will have implications for breastfeeding promotion programmes for infants and young children in Sri Lanka and similar settings. The Ministry of Health has a well established programme for the promotion of breastfeeding, and we suggest emphasizing prolonged breastfeeding too as a key message to further increase continuation of breastfeeding for 2 years.

Our study found that passive smoking was strongly associated with increased risk of breast cancer (Odds ratio = 2.96). This finding supports a recent study conducted in China that revealed passive smoking as a significant risk factor for breast cancer, with an odds ratio of 1.5 [39]. The active smoking rate of Sri Lankan women was 0.6%, and men was 27.8% [40]. Though the actual figures were not available a significant higher percentage of women have been exposed to varying degree of passive smoking for long periods. Thus, we recommend educating the public regarding the effect of passive smoking on breast cancer. The current legislation regarding smoking at public places in the country should be further strengthened while measures being taken to prevent smoking inside home. We also suggest further research to establish the dose–response effect between passive smoking and breast cancer.

Another important finding from our study was the significant positive association with presence of previous abortion and breast cancer. Having an abortion was a controversial risk factor for breast cancer, some studies have revealed a positive association [41–48] while others had not [49–55]. The possible reasons were: (1) Abortion interrupts the process of breast tissue proliferation and differentiation under the influence of high level of oestrogen and that may leave the proliferated, undifferentiated breast tissue at higher risk of carcinogenesis [41]. (2) Recall bias may have played a role. It would be helpful to analyze abortions in greater detail including the number of abortions, nature of the abortion, period of amenorrhoea, and its complications to come to a conclusion regarding its association. Women with breast cancer has a strong first degree family history, and our study findings were also towards this direction even though it was not statistically significant in the multivariate analysis. Later age at first pregnancy reduced the risk of breast cancer compared to younger age, probably because, they expose to lesser number of ovulatory cycles during the late life reducing the exposure of breast cells to cyclical hormone change and so the chance of acquiring errors in cyclical proliferation is minimal.

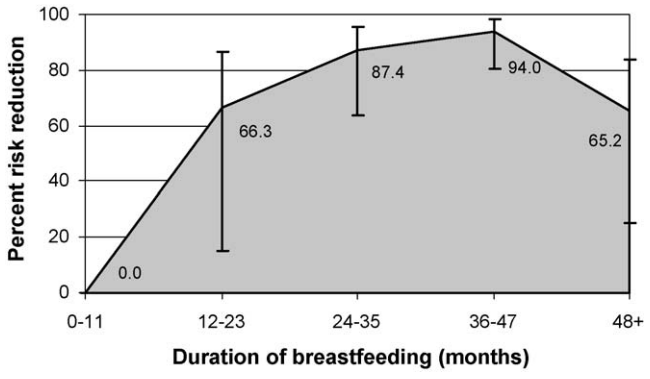

Fig. 1. Percent risk reduction of breast cancer associated with increasing lifetime duration of breastfeeding: a dose–response relationship (cases:controls = 100:203).

According to the present analysis, risk of breast cancer was not associated with age at menarche, BMI, level of education and use of hormonal contraceptives for more than 5 years. Though already established risk factors, women's age and parity were not recognized as risk factors in our study, merely because these two were the matched variables in the design.

The strengths of the current study include 1:2 case–control design, the standardized questionnaire, and obtaining wider information including socio-demographic, reproductive and anthropometry, etc. There were several limitations. Firstly, the cases were selected from hospitals while controls from clinic settings. Some of the information was based on recall, for example breastfeeding details, menarche, and smoking history. There is a possibility that some potential unmeasured confounders such as diet and physical activity may partially explain the association between breastfeeding and breast cancer.

In conclusion, our study observed a significant inverse association between both lifetime duration of breastfeeding and average duration per child and risk of breast carcinoma. The findings were supported by dose–response relationship, with increasing duration of breastfeeding the risk of cancer risk is reduced. The other factors significantly associated with higher risk of breast cancer were: post-menopausal women, having a previous abortion, having a family history of breast cancer and exposure to passive smoking. The factors associated with lower risk of breast cancer were: later age at first full-term pregnancy and employed women. Study did not identify hormonal contraceptive use for more than 5 years as a significant risk factor.

Conflict of interest

None declared.

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