ORIGINAL CONTRIBUTION

Risk Factors for Breast Cancer among Japanese Women in Tokyo: A Case-Control Study

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To explore risk factors for female breast cancer, a hospital-based case-control study was conducted in Tokyo, from 1990 to 1991. Information on potential risk factors was obtained by a self-administered questionnaire from 5,084 out-patients. Of the patients, 300 incident breast cancer cases were recruited, and 900 age-matched controls were randomly selected. Following significant findings emerged: (a) A large number of livebirths was associated with a decreased risk in premenopausal women (relative risk (RR) for 3 or more births relative to none: 0.24; 95% confidence interval (CI): 0.08-0.65). (b) In premenopausal women, regular menstrual cycle increased the risk (2.50; 1.16-5.38). (c) Current smokers experienced an increased risk (1.63; 1.11-2.39). (d) Heavy weight was associated with a greater risk of postmenopausal breast cancer: RR for those weighing 70 kg or more relative to those weighing 50 kg or less being 4.82 (1.53-15.2). (e) The later the age at first livebirth, the higher the postmenopausal breast cancer risk (2.85; 1.16-6.99; 3.54; 1.03-12.2 for ages of 30-34 and 35 years and more, respectively). *J Epidemiol*, 1994; 4: 65-71.

breast cancer, risk factor, case-control study, Japan

Many epidemiological studies have found several risk factors incriminated for female breast cancer. They include family history of breast cancer¹⁻¹³, history of benign breast disease^{2,4,8,9,14,15}, early menarche^{2,10,16-21}, late menopause^{7-9,14-17,19,20,22}, late age at first birth/full-term pregnancy^{2,8-11,13,18,21,23-25} and low parity/a small number of full-term pregnancies^{2,11,13,16,18,19,23,24,26,27}. Obesity or heavy weight is also an established risk factor for breast cancer among postmenopausal women^{2,13,20,28-31}.

Some studies have reported that breast-feeding has a protective effect against breast cancer, independently of other reproductive episodes^{2,12,23}. Whether drinking^{3,5-8,10,11,13,15,21,22,27,32-35} and smoking^{1,3,8,13,27,33,35-40} habits are risk factors for this malignancy remains to be explored further.

In recent years, the incidence of female breast cancer has been increasing in Japan. The age-adjusted incidence (adjusted by World Population) was estimated to be 13.5

per 100,000 population in 1975⁴¹ and 24.3 in 1985⁴². This increase is conceivably ascribable to rapidly changing lifestyles among Japanese women. It is, therefore, of very importance and significance to explore the risk factors for breast cancer among Japanese women.

Nevertheless, a limited number of analytical epidemiological studies for breast cancer have recently been conducted in Japan^{3,13,35,43}. Then, we undertook a hospital-based case-control study of female breast cancer in Tokyo, and attempted to disclose risk factors in Japan.

MATERIALS AND METHODS

Information on potential risk factors was obtained by a self-administered questionnaire from all out-patients who visited Department of Breast Surgery, Cancer Institute, Tokyo from May 10, 1990, to May 31, 1991. Items surveyed were age, menopausal status, family history of breast

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Table 1. Age distribution of cases and controls by menopausal status.

Age	All women				Premenopausal				Postmenopausal			
	Cases		Controls		Cases		Controls		Cases		Controls	
	N	%	N	%	N	%	N	%	N	%	N	%
20-29	6	2.0	18	2.0	6	3.5	17	3.5	0	0.0	1	0.2
30-39	25	8.3	75	8.3	25	14.7	71	14.7	0	0.0	4	1.0
40-49	131	43.7	393	43.7	119	70.0	352	72.7	12	9.2	41	9.9
50-59	81	27.0	243	27.0	20	11.8	44	9.1	61	46.9	199	47.8
60-69	40	13.3	120	13.3	0	0.0	0	0.0	40	30.8	120	28.8
70-79	14	4.7	46	5.1	0	0.0	0	0.0	14	10.8	46	11.1
80-	3	1.0	5	0.6	0	0.0	0	0.0	3	2.3	5	1.2
Total	300	100.0	900	100.0	170	100.0	484	100.0	130	100.0	416	100.0

Table 2. Relative risks (RR) and 95% confidence intervals (CI) of risk factors for breast cancer by menopausal status (1).

	All women			Premenopausal			Postmenopausal		
	Cases/ Controls	RR	95% CI	Cases/ Controls	RR	95% CI	Cases/ Controls	RR	95% CI
Family history of breast cancer									
no	275 843	1.00		154 452	1.00		121 391	1.00	
yes	16 40	1.29	0.70-2.39	11 20	1.64	0.70-3.83	5 20	0.92	0.31-2.67
History of benign breast disease									
no	261 779	1.00		142 409	1.00		119 370	1.00	
yes	39 121	0.98	0.65-1.46	28 75	1.05	0.63-1.78	11 46	0.73	0.35-1.54
Age at menarche									
-12	64 181	1.00		50 141	1.00		14 40	1.00	
13	76 207	1.09	0.72-1.63	49 127	1.22	0.74-2.01	27 80	0.90	0.40-2.05
14	57 205	0.82	0.54-1.26	34 120	0.79	0.46-1.36	23 85	0.74	0.32-1.71
15-	99 294	0.94	0.63-1.42	35 89	0.93	0.53-1.65	64 205	0.85	0.40-1.77
test for trend			NS			NS			NS
Age at menopause									
-44							15 35	1.00	
45-49							32 104	0.65	0.29-1.45
50-54							54 195	0.63	0.30-1.36
55-							9 23	0.77	0.25-2.31
test for trend									NS
Regularity of menstrual cycle									
irregular				29 103	1.00				
regular				137 359	2.50	1.16-5.38			
Duration of menstrual cycle (days)									
-27				40 94	1.00				
28-29				56 162	0.80	0.47-1.34			
30-31				21 66	0.66	0.34-1.28			
32-				2 11	0.50	0.10-2.58			
test for trend						NS			
Age at first birth									
-24	47 176	1.00		26 91	1.00		21 85	1.00	
25-29	68 254	1.03	0.67-1.58	41 151	0.93	0.51-1.69	27 103	1.25	0.63-2.49
30-34	28 65	1.64	0.92-2.94	13 42	0.94	0.41-2.17	15 23	2.85	1.16-6.99
35-	10 18	2.17	0.91-5.20	4 9	1.08	0.28-4.18	6 9	3.54	1.03-12.2
test for trend			p<0.05			NS			p<0.05

All women : adjusted for age, menopausal status and other variables listed on the Table 2 and 3.

Premenopausal women and postmenopausal women : adjusted for age and other variables listed on the Table 2 and 3.

NS : not significant.

Table 3. Relative risks (RR) and 95% confidence intervals (CI) of risk factors for breast cancer by menopausal status (2).

	All women			Premenopausal			Postmenopausal		
	Cases/ Controls	RR	95% CI	Cases/ Controls	RR	95% CI	Cases/ Controls	RR	95% CI
Number of livebirths									
0	46 115	1.00		34 58	1.00		12 57	1.00	
1	46 125	0.85	0.44-1.64	24 65	0.52	0.21-1.32	22 60	1.68	0.57-4.98
2	110 357	0.78	0.43-1.44	68 223	0.40	0.17-0.95	42 134	1.74	0.62-4.88
3-	42 166	0.61	0.31-1.20	13 69	0.24	0.08-0.65	29 97	1.62	0.55-4.74
test for trend			NS			NS			NS
Lactation									
never	62 162	1.00		41 86	1.00		21 76	1.00	
ever	211 670	1.08	0.65-1.80	112 365	1.21	0.59-2.50	99 305	1.00	0.45-2.20
Smoking									
never smoked	221 694	1.00		123 364	1.00		98 330	1.00	
ex-smoker	15 52	0.91	0.49-1.70	10 29	0.96	0.42-2.20	5 23	0.80	0.28-2.32
current smoker	58 116	1.63	1.11-2.39	34 79	1.23	0.75-2.03	24 37	2.73	1.38-5.39
Alcohol drinking									
no	187 563	1.00		93 296	1.00		94 267	1.00	
yes (current)	109 306	1.04	0.77-1.39	76 180	1.36	0.92-2.00	33 128	0.71	0.42-1.19
Height (cm)									
<149	36 136	1.00		14 42	1.00		22 94	1.00	
150-154	102 311	1.22	0.78-1.92	46 159	0.77	0.37-1.62	56 152	1.81	0.98-3.34
155-159	90 283	1.13	0.70-1.82	58 180	0.71	0.34-1.49	32 103	1.51	0.76-2.98
160-	63 146	1.46	0.86-2.48	47 97	1.08	0.49-2.37	16 49	1.46	0.62-3.46
test for trend			NS			NS			NS
Weight (kg)									
<49	91 321	1.00		43 177	1.00		48 144	1.00	
50-59	140 421	1.18	0.86-1.62	90 225	1.77	1.12-2.80	50 196	0.77	0.47-1.26
60-69	43 120	1.32	0.84-2.08	23 63	1.59	0.82-3.05	20 57	1.09	0.54-2.21
70-	17 18	3.06	1.47-6.37	7 12	2.76	0.96-7.89	10 6	4.82	1.53-15.2
test for trend			p<0.05			p<0.05			NS

All women : adjusted for age, menopausal status and other variables listed on the Table 2 and 3.

Premenopausal women and postmenopausal women : adjusted for age and other variables listed on the Table 2 and 3.

NS : not significant.

cancer, history of benign breast disease, regularity and duration of menstrual cycle (for premenopausal women), ages at menarche and menopause, age at first birth, number of livebirths, episodes of lactation, smoking and drinking habits, height and weight. This information has been collected from all out-patients before examination, that is, prior to diagnosis.

Of the 5,084 female patients who visited the department during the study period, 314 were newly diagnosed as having breast cancer histologically. Of 314 breast cancer patients, we excluded 11 patients with missing information on menopausal status, one patient under 25 years old, and 2 patients with history of other malignant tumors. Thus, 300 incident patients were eligible cases for the present study.

Controls were randomly selected from the remaining 4,770 patients without breast cancer, excluding those with

missing information on menopausal status and/or with history of other malignant tumors. Three controls per case were randomly selected, matching each other for age (as nearest as possible). Almost all the controls (97.6%) were exactly matched for age, while 1.8% and 0.7% of them within $\pm 1-3$ and $\pm 4-6$ years, respectively. Table 1 shows the age distribution of the study subjects (300 cases and 900 controls) by menopausal status. The mean ages ($\pm$ standard deviations) of the cases and controls were 50.8 ± 10.7 and 50.7 ± 10.5 years, respectively.

All analyses were performed for premenopausal and postmenopausal women, separately or totally. The RRs by menopausal status were obtained using unconditional multiple logistic regression analysis⁴⁴⁾ adjusted for age and other variables potentially confounded, irrespective of the matching. Unconditional multiple logistic regression, not conditional one, was also applied to the analysis for all

Table 4. Relative risks (RR) and 95% confidence intervals (CI) for breast cancer according to number of cigarettes smoked per day by menopausal status.

	All women			Premenopausal			Postmenopausal		
	Cases/ Controls	RR	95% CI	Cases/ Controls	RR	95% CI	Cases/ Controls	RR	95% CI
Number of cigarettes smoked per day									
0	236 746	1.00		133 393	1.00		103 353	1.00	
1-19	35 74	1.67	1.06-2.63	21 54	1.21	0.67-2.19	14 20	3.11	1.37-7.10
20-	18 38	1.44	0.77-2.68	12 22	1.54	0.69-3.44	6 16	1.68	0.56-5.10
test for trend			p<0.05			NS			p<0.05

All women : adjusted for age, menopausal status and other variables listed on the Table 2 and 3.

Premenopausal women and postmenopausal women : adjusted for age and other variables listed on the Table 2 and 3.

NS : not significant.

women, because the age matching status was not completely uniform over the pairs. Tests for trend in the logistic analysis were obtained by categorizing the exposure variable and treating the scored variable as a continuous variable.

In the multivariate analysis, study subjects with missing information were also included as an additional category. The additional categories, in which missing information accounted for more than 10%, were proved not to be significantly associated with breast cancer risk ; indicating that such inclusions would not distort the RRs obtained substantially.

RESULTS

Table 2 and 3 summarize the RRs obtained by the logistic regression analyses.

Family history of breast cancer and history of benign breast disease were found neither to increase nor to decrease breast cancer risk, though family history demonstrated somewhat greater relative risk than unity (1.64) in premenopausal women.

Ages at menarche and menopause were not significantly associated with breast cancer risk, though regular menstrual cycle increased the risk in premenopausal women. Decreasing risk of breast cancer with increasing duration of menstrual cycle was also suggested.

Late age at first birth was positively associated with breast cancer risk in postmenopausal women ; the RR being 2.85 (95% CI : 1.16-6.99) for age of 30-34 years, and 3.54 (1.03-12.2) for that of 35 years or older. A large number of livebirths was associated with a decreased risk, particularly in premenopausal women ; the RR relative to none was 0.40 (95% CI : 0.17-0.95) for 2 livebirths and 0.24 (0.08-0.65) for 3 or more livebirths. "Ever lactated" was found neither to increase nor to decrease the risk.

Current smokers were found to be at an increased risk particularly for postmenopausal breast cancer (RR : 1.63 ; 95% CI : 1.11-2.39 for all women and 2.73 ; 1.38-5.39 for

postmenopausal women), though the dose-response relationship between the number of cigarettes smoked per day and the risk was not clear (Table 4). Current drinkers were likely to be at an increased risk in premenopausal women (RR : 1.36 ; 95% CI : 0.92-2.00).

Heavy weight was associated with a significantly greater risk, particularly for postmenopausal breast cancer ; the RR for those weighing 70 kg or more relative to less than 50 kg was 4.82 (95% CI 1.53-15.2). No significant association of height with breast cancer risk was detected.

DISCUSSION

When assessing our findings described above, one methodological limitation should be kept in mind.

Our control series might more prevalently include women with benign breast disease than general female population, because we selected, though randomly, the controls from women who sought for breast examination at the department of breast surgery and were later proved not to have breast cancer. Usually, definite diagnosis is not always made in the clinical practice when malignancy is not suspected. Therefore, we could not systematically exclude women with benign breast disease from our controls. However, patients with histologically confirmed benign breast disease are known to comprise less than 5% among all the patients without breast cancer in the department (unpublished data). Symptomatic (not biopsied) benign breast disease was also known not to be so related to the risk factors for breast cancer as biopsied one⁴⁵⁾. Since our control series were selected from the patients in the same department where the cases were identified, then study subjects shared similar demographic characteristics each other. The data collection before examination could reduce information biases such as recall one. Therefore, despite the limitation mentioned above, the present control series would be useful as a reference group.

Family history of breast cancer is consistently incriminated as a risk factor for female breast cancer¹⁻¹³⁾. Our

failure in finding an association with family history may be partly ascribable to excessive inclusion of women with benign breast disease in our control series, since family history of breast cancer is known to be positively associated with history of benign breast disease⁴⁵⁻⁴⁷.

Both early menarche^{2,10,16-21} and late menopause^{7-9,14-17,19,20,22} are well-established risk factors. In Japan, however, significant relevance of early menarche and late menopause to breast cancer risk has not always been detected^{13,35,43}, likewise our study.

Decreasing risk of breast cancer with increasing duration of menstrual cycle has been suggested in some studies^{2,48}, as did our study. We found a significant association of regular menstrual cycle with an increased premenopausal breast cancer risk, but this was not detected in previous studies^{17,35}. These two particular findings on menstruation may suggestively indicate that breast cancer risk appears to be directly related to the cumulative number of regular ovulatory cycles^{48,49}.

Many studies have demonstrated that late age at first birth/full-term pregnancy is linked to the risk of breast cancer^{2,8-11,13,18,21,23-25}. Our study also detected a larger RR for later age at first birth, particularly in postmenopausal women.

Several recent studies have noted that frequent full-term pregnancy or birth has a protective effect against breast cancer, independently of age at first birth/full-term pregnancy^{2,16,19,23,24,26}. In our study also, a large number of livebirths was independently associated with a decreased risk, particularly in premenopausal women. This finding may essentially indicate that a recently increasing breast cancer incidence in Japan is partly related to the rapidly declined birth rate⁵⁰.

Ever-lactated women were not at a significantly smaller risk of breast cancer, when the covariates were adjusted. Since almost studies, which detected the independent protective effect of breast-feeding, examined the relationship between lactation period and breast cancer risk^{2,12,23}, then further investigations focusing on the period of lactation would be required to assess the effect of lactation more properly.

An association of smoking habits with breast cancer risk still remains to be inconclusive. Most studies have found no clear association^{3,8,13,27,33,36-38,40}, while some investigators have suggested an unfavorable effect of smoking habits on breast cancer^{1,35,39}. In the present study, smoking habits were found to be associated with breast cancer risk, likewise a previous study conducted in Nagoya, Japan³⁵. In our study, we failed to detect clear dose-response relationship between the number of cigarettes smoked per day and breast cancer risk. Nevertheless, more detailed studies will be warranted on smoking habits, since our findings certainly indicate a positive association of smoking habits with breast cancer risk in females in Japan.

A positive association between alcohol consumption and breast cancer has been reported in many^{3,5,6,8,11,15,21,22,34}, but not all^{7,10,13,27,32,33,35}, epidemiological studies. The present study, however, did not show a significantly larger RR for current drinkers. Studies that take an amount of alcohol consumed into consideration will be required to assess this association more properly.

For anthropometric factors, we found women with heavy weight to be at significantly greater risk of postmenopausal breast cancer, which is in good agreement with previous findings^{2,13,28,30,31}. Several studies have reported a positive association between height and female breast cancer^{20,28,51}, but we did not find such an association.

In short, our study disclosed the following major findings. (a) A large number of livebirths was associated with a decreased risk, particularly in premenopausal women; (b) In premenopausal women, regular menstrual cycle significantly increased the risk, and its increasing duration suggestively decreased the risk; (c) Current smokers experienced a significantly larger RR, particularly in postmenopausal women; (d) Heavy weight was associated with a significantly greater risk of postmenopausal breast cancer; (e) The later the age at first livebirth, the higher the postmenopausal breast cancer risk; (f) Ages at menarche and menopause, lactation, drinking habits and height were not independently associated with female breast cancer risk.

REFERENCES

1. Brownson RC, Blackwell CW, Pearson DK, et al. Risk of breast cancer in relation to cigarette smoking. *Arch Intern Med*, 1988; 148: 140-144.
2. Yuan J-M, Yu MC, Ross RK, Gao Y-T, Henderson BE. Risk factors for breast cancer in Chinese women in Shanghai. *Cancer Res*, 1988; 48: 1949-1953.
3. Kato I, Tominaga S, Terao C. Alcohol consumption and cancers of hormone-related organs in females. *Jpn J Clin Oncol*, 1989; 19: 202-207.
4. Siskind V, Schofield F, Rice D, Bain C. Breast cancer and breastfeeding: results from an Australian case-control study. *Am J Epidemiol*, 1989; 130: 229-236.
5. Young TB. A case-control study of breast cancer and alcohol consumption habits. *Cancer*, 1989; 64: 552-558.
6. Toniolo P, Riboli E, Protta F, Charrel M, Cappa APM. Breast cancer and alcohol consumption: a case-control study in Northern Italy. *Cancer Res*, 1989; 49: 5203-5206.
7. Rosenberg L, Palmer JR, Miller DR, Clarke EA, Shapiro S. A case-control study of alcoholic beverage consumption and breast cancer. *Am J Epidemiol*, 1990; 131: 6-14.
8. Nasca PC, Baptiste MS, Field NA, et al. An epidemiological case-control study of breast cancer and alcohol consumption. *Int J Epidemiol*, 1990; 19: 532-538.
9. Segala C, Gerber M, Richardson S. The pattern of risk factors for breast cancer in a Southern France population. Interest for a stratified analysis by age at diagnosis. *Br J Cancer*, 1991; 64: 919-925.
10. Simon MS, Carman W, Wolfe R, Schottenfeld D. Alcohol consumption and the risk of breast cancer: a report from the

- Tecumseh Community Health Study. *J Clin Epidemiol*, 1991; 44: 755-761.
11. Ferraroni M, Decarli A, Willett WC, Marubini E. Alcohol and breast cancer risk: a case-control study from Northern Italy. *Int J Epidemiol*, 1991; 20: 859-864.
 12. Yoo K-Y, Tajima K, Kuroishi T, et al. Independent protective effect of lactation against breast cancer: a case-control study in Japan. *Am J Epidemiol*, 1992; 135: 726-733.
 13. Kato I, Miura S, Kasumi F, et al. A case-control study of breast cancer among Japanese women: with special reference to family history and reproductive and dietary factors. *Breast Cancer Res Treat*, 1992; 24: 51-59.
 14. Tao S-C, Yu MC, Ross RK, Xiu K-W. Risk factors for breast cancer in Chinese women of Beijing. *Int J Cancer*, 1988; 42: 495-498.
 15. Richardson S, de Vincenzi I, Pujol H, Gerber M. Alcohol consumption in a case-control study of breast cancer in Southern France. *Int J Cancer*, 1989; 44: 84-89.
 16. Ewertz M, Duffy SW. Risk of breast cancer in relation to reproductive factors in Denmark. *Br J Cancer*, 1988; 58: 99-104.
 17. Kvåle G, Heuch I. Menstrual factors and breast cancer risk. *Cancer*, 1988; 62: 1625-1631.
 18. Bouchardy C, Lê MG, Hill C. Risk factors for breast cancer according to age at diagnosis in a French case-control study. *J Clin Epidemiol*, 1990; 43: 267-275.
 19. Yu S-Z, Lu R-F, Xu D-D, Howe GR. A case-control study of dietary and nondietary risk factors for breast cancer in Shanghai. *Cancer Res*, 1990; 50: 5017-5021.
 20. Hsieh C-C, Trichopoulos D, Katsouyanni K, Yuasa S. Age at menarche, age at menopause, height and obesity as risk factors for breast cancer: associations and interactions in an international case-control study. *Int J Cancer*, 1990; 46: 796-800.
 21. Gapstur SM, Potter JD, Sellers TA, Folsom AR. Increased risk of breast cancer with alcohol consumption in postmenopausal women. *Am J Epidemiol*, 1992; 136: 1221-1231.
 22. Zaridze D, Lifanova Y, Maximovitch D, Day NE, Duffy SW. Diet, alcohol consumption and reproductive factors in a case-control study of breast cancer in Moscow. *Int J Cancer*, 1991; 48: 493-501.
 23. Layde PM, Webster LA, Baughman AL, et al. The independent associations of parity, age at first full term pregnancy, and duration of breastfeeding with the risk of breast cancer. *J Clin Epidemiol*, 1989; 42: 963-973.
 24. Ewertz M, Duffy SW, Adami H-O, et al. Age at first birth, parity and risk of breast cancer: a meta-analysis of 8 studies from the Nordic countries. *Int J Cancer*, 1990; 46: 597-603.
 25. la Vecchia C, Negri E, Franceschi S, Parazzini F. Long-term impact of reproductive factors on cancer risk. *Int J Cancer*, 1993; 53: 215-219.
 26. Leon DA. A prospective study of the independent effects of parity and age at first birth on breast cancer incidence in England and Wales. *Int J Cancer*, 1989; 43: 986-991.
 27. Schatzkin A, Carter CL, Green SB, et al. Is alcohol consumption related to breast cancer? Results from the Framingham Heart Study. *J Natl Cancer Inst*, 1989; 81: 31-35.
 28. Swanson CA, Brinton LA, Taylor PR, et al. Body size and breast cancer risk assessed in women participating in the Breast Cancer Detection Demonstration Project. *Am J Epidemiol*, 1989; 130: 1133-1141.
 29. Tretli S. Height and weight in relation to breast cancer morbidity and mortality. A prospective study of 570,000 women in Norway. *Int J Cancer*, 1989; 44: 23-30.
 30. Parazzini F, la Vecchia C, Negri E, et al. Anthropometric variables and risk of breast cancer. *Int J Cancer*, 1990; 45: 397-402.
 31. Sellers TA, Kushi LH, Potter JD, et al. Effect of family history, body-fat distribution, and reproductive factors on the risk of postmenopausal breast cancer. *N Engl J Med*, 1992; 326: 1323-1329.
 32. Chu SY, Lee NC, Wingo PA, Webster LA. Alcohol consumption and the risk of breast cancer. *Am J Epidemiol*, 1989; 130: 867-877.
 33. Meara J, McPherson K, Roberts M, Jones L, Vessey M. Alcohol, cigarette smoking and breast cancer. *Br J Cancer*, 1989; 60: 70-73.
 34. Howe G, Rohan T, Decarli A, et al. The association between alcohol and breast cancer risk: evidence from the combined analysis of six dietary case-control studies. *Int J Cancer*, 1991; 47: 707-710.
 35. Yoo K-Y, Tajima K, Kuroishi T, et al. Life-style in relation to the risk of breast cancer. *J Epidemiol (Suppl)*, 1992; 2: S155-S165.
 36. Rohan TE, Baron JA. Cigarette smoking and breast cancer. *Am J Epidemiol*, 1989; 129: 36-42.
 37. Schechter MT, Miller AB, Howe GR, et al. Cigarette smoking and breast cancer: case-control studies of prevalent and incident cancer in the Canadian National Breast Screening Study. *Am J Epidemiol*, 1989; 130: 213-220.
 38. London SJ, Colditz GA, Stampfer MJ, et al. Prospective study of smoking and the risk of breast cancer. *J Natl Cancer Inst*, 1989; 81: 1625-1631.
 39. Chu SY, Stroup NE, Wingo PA, et al. Cigarette smoking and the risk of breast cancer. *Am J Epidemiol*, 1990; 131: 244-253.
 40. Field NA, Baptiste MS, Nasca PC, Metzger BB. Cigarette smoking and breast cancer. *Int J Epidemiol*, 1992; 21: 842-848.
 41. The Research Group for Population-based Cancer Registration. Cancer incidence in Japan, 1975-1979. The Osaka Cancer Registry, Osaka, 1984: 20-21.
 42. Research Group for Population-based Cancer Registration in Japan. Cancer incidence and incidence rates in Japan in 1985—Estimates based on data from seven population-based cancer registries—. *Jpn J Clin Oncol*, 1990; 20: 212-218.
 43. Hirohata T, Shigematsu T, Nomura AMY, et al. Occurrence of breast cancer in relation to diet and reproductive history: a case-control study in Fukuoka, Japan. *Natl Cancer Inst Monogr*, 1985; 69: 187-190.
 44. Breslow NE, Day NE. Unconditional logistic regression for large strata. In: Davis W, ed. *Statistical Methods in Cancer Research*, vol 1. IARC, Lyon, 1980: 192-246.
 45. Hislop TG, Elwood JM. Risk factors for benign breast disease: a 30-year cohort study. *Can Med Assoc J*, 1981; 124: 283-291.
 46. Pastides H, Kelsey JL, Holford TR, LiVolsi VA. An epidemiologic study of fibrocystic breast disease with reference to ductal epithelial atypia. *Am J Epidemiol*, 1985; 121: 440-447.
 47. Berkowitz GS, Kelsey JL, LiVolsi VA, et al. Risk factors for fibrocystic breast disease and its histopathologic components. *J Natl Cancer Inst*, 1985; 75: 43-50.
 48. Olsson H, Landin-Olsson M, Gullberg B. Retrospective assessment of menstrual cycle length in patients with breast cancer, in patients with benign breast disease, and in women without breast disease. *J Natl Cancer Inst*, 1983; 70: 17-20.

49. Henderson BE, Ross RK, Judo HL, Krailo MD, Pike MC. Do regular ovulatory cycles increase breast cancer risk? *Cancer*, 1985; 56: 1206-1208.
50. Ministry of Health and Welfare of Japan. Vital Statistics of Japan 1991, vol 1. Kousei Toukei Kyokai, Tokyo, 1993: 80-81 (in Japanese).
51. Vatten LJ, Kvinnsland S. Body height and risk of breast cancer. A prospective study of 23,831 Norwegian women. *Br J Cancer*, 1990; 61: 881-885.