RESEARCH ARTICLE

Body Mass Index and Breast Cancer Risk among Thai Premenopausal Women: a Case-Control Study

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Abstract

Background: Breast cancer (BC) is the leading malignancy in women with high incidence and mortality worldwide. Obesity is one of several established risk factors for chronic diseases including cancer. The objective of this research was to determine the association of body mass index (BMI) with BC among Thai premenopausal women (TPW).

Materials and Methods: A case-control study was conducted among TPW attending the National Cancer Institute in Bangkok, with 257 cases and 257 controls in 2013-2014. Cases and controls were matched by age (± 5 years), residential area and duration of attending. Data were collected with a questionnaire comprising 2 parts: part 1 socio-demographic characteristics, and part 2 health risk behavior and reproductive factors and BMI. The obtained data were analyzed using descriptive and analytic statistics with a computerized statistical package. Results: The study participants were mainly 40-44 years old (60%) with an average age of 39 years. The major type of BC was the invasive ductal carcinoma (91.8%). On univariate analysis, risk factors for BC among the TPW were family history of BC, history of benign breast tumors, younger age at menarche, parity, miscarriage, contraceptive use, passive smoking, multivitamin use, and BMI (p<0.05). Multivariable conditional logistic regression analysis, controlling for possible confounding factors, revealed that a BMI 25-29.9 and ≥ 30 kg/m2 increased the risk of BC by a factor of 2.09 and 2.37 times, respectively (OR=2.09, 95%CI =1.09-3.97; OR=2.37, 95%CI =1.24-10.06). Conclusions: A surveillance system of obesity should be conducted in cooperation with information regarding physical activities and weight control among TPW as an essential measure to reduce BC risk.

Keywords: Body mass index- breast cancer- Thai premenopausal women

Introduction

At present, it is well established that BC is the most commonly diagnosed invasive cancer and the leading cause of cancer death among women worldwide including in Thailand (Siegel et al., 2015; National Cancer Control Committee, 2013; Bureau of Policy and Strategies, 2010; Bureau of Policy and Strategies, 2011; Bureau of Policy and Strategies, 2015). Currently, the Global BC statistics showed an increasing trend in most countries, including Europe, Latin America, Asia, and Africa (DeSantis et al., 2015). In Thailand, we found an increasing trend of BC death rate over 10 years, as shown in Figure 1 (Bureau of Policy and Strategies, 2010; Bureau of Policy and Strategies, 2015). Causes of being BC are likely to be multifactorial. The association between BMI and BC risk has been examined in numerous studies, mainly in western countries. Although the incidence of BC in the Asian population still remains lower than that in the Western population (Wada et al., 2014). However, these studies were comparatively few among Asian population. The effects of BMI on BC have remained unclear among premenopausal women. In Thailand, there are quite very few studies of this association among TPW. The present study was carried out to assess the association between BMI and BC occurrence among TPW.

Materials and Methods

Study Design, Sample Size and Sampling Technique

A hospital based matched case-control study (1:1) was performed at the National Cancer Institute in Bangkok during November 2013 - December 2014 to identify the effect of BMI and BC risk among TPW. A total of 257 BC cases and 257 controls were included in the study. The cases were newly diagnosed with breast cancer by pathologists. The controls were healthy TPW who had annual health check-up. Cases and controls were matched (1:1) by age (± 5 years), residential area and duration of attending. Of the 514 women were both premenopausal and aged <45 years at the time of study. Both cases and controls used the same questionnaire to obtain data.

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collection. The sample size was calculated by the formula (Lwanga and Lemeshows, 1991). Where Po(0.32) and P1 (0.68) were the proportions of exposure in controls and cases (Umpan, 2004); Za/2 = 1.96 at α = 0.05; Zβ = 0.84 at β = 0.20; and P = 0.5. The calculated sample size in each group was at least 256.

**Tool and Measurements**

Data collection was obtained by a self-administered questionnaire, any suspicion upon questionnaire items would be guided by research assistants. The questionnaire comprised socio-demographic factors, health risk behaviors, reproductive factors, obesity and cancer status. While BC information was collected by laboratory and pathological results, namely, TNM classification, stage of disease, hormone receptor test, and date of diagnosis with BC.

**Variable definitions**

TPW were defined as Thai women who aged ≤ 45 years and still having menstrual cycles at the time of study (Chaveepojnkamjorn et al, 2017).

BMI was calculated as (weight in kg)/(height in m)² and it was categorized according to the Asian’s criteria (Steering Committee, 2000).

BC was defined as code C50 according to the International Classification of Diseases and Health Related Problem, 10th Revision.

**Ethical Considerations**

The present study was reviewed and approved by the Ethics Committee for research of National Cancer Institute, Ministry of Public Health (148/2556) and the Ethics Committee for Research in Human Subjects of the Faculty of Public Health, Mahidol University (Ref No. MuPH 2014-090) and agreed with the Helsinki declaration. All participants are willing to participate in this study. Informed consent to participate in the study was obtained from participants after informing them the details of study. Information was collected by a self-administered questionnaire with the help and supervision of research assistants. Confidentiality was well kept throughout the study using anonymous technique (respondents were identified by code numbers to ensure confidentiality and the results were analyzed as a whole group).

**Statistical Analyses**

The data were analyzed with the statistical software STATA (Release 12, StataCorp LP, College Station, TX, Serial number: 4012044037). For better understanding, the information was tabulated by means of descriptive statistics, univariate analysis, and multivariate analysis. Categorical variables were given as a frequency and percentage, crude odds ratio, 95% confidence interval (CI) of OR and p-value. The numerical variables were expressed as mean, median, minimum and maximum, and standard deviation (SD). Univariable conditional logistic regression was performed to differentiate proportional exposures between BC patents and controls for categorical variables. Adjusted odds ratio and the 95% CI of OR were calculated from multivariable conditional logistic regression to examine associations between BMI and BC occurrence, adjusted for potential confounding factors of reproductive factors and health risk behaviors. A p-value of <0.05 was considered statistically significant in the analyses.

**Results**

**Demographic Characteristics of subjects at baseline**

A total of 514 TPW participated in the case-control study. The average age of subjects was 39 years. Table 1

| Table 1. General Characteristics of Cases and Controls |
|------------------------------------------------------|
| Characteristics | Cases | Controls | p-value* |
|-----------------|-------|----------|----------|
| Age gr. (yrs)   | No.   | %        | No.      | %        | 0.981 |
| ≤ 29            | 10    | 3.9      | 11       | 4.3      |
| 30-34           | 30    | 11.7     | 28       | 10.9     |
| 35-39           | 63    | 24.5     | 61       | 23.7     |
| 40-44           | 154   | 59.9     | 157      | 61.1     |
| Mean (SD)       | 39.20 (4.39) | 39.30 (4.41) |
| Min-Max         | 25-44 |          | 25-44    |          |
| Marital status  |       |          |          | 0.07     |
| Single          | 68    | 26.5     | 84       | 32.7     |
| Married         | 159   | 61.8     | 156      | 60.7     |
| Widowed/Divorced| 30    | 11.7     | 17       | 6.6      |
| Education       | 100   | 39.7     | 132      | 51.4     |
| No formal education | 10  | 3.9      | 8        | 3.1      |
| Primary school  | 67    | 26.1     | 52       | 20.2     |
| Secondary school| 78    | 30.3     | 65       | 25.3     |
| Higher education| 102   | 39.7     | 132      | 51.4     |
| Religion        | 68.1  |          |          |          |
| Buddhism        | 248   | 96.5     | 247      | 96.1     |
| Islam           | 7     | 2.7      | 6        | 2.3      |
| Christianity    | 2     | 0.8      | 4        | 1.6      |
| Residence       | 1     |          |          |          |
| North           | 1     | 0.4      | 1        | 0.4      |
| Northeast       | 11    | 4.3      | 11       | 4.3      |
| Central         | 176   | 68.5     | 176      | 68.5     |
| East            | 16    | 6.2      | 16       | 6.2      |
| West            | 48    | 18.7     | 48       | 18.7     |
| South           | 5     | 1.9      | 5        | 1.9      |
| Occupation      | 1     |          |          |          |
| Office employee | 92    | 35.8     | 87       | 33.8     |
| Entrepreneur    | 77    | 30       | 85       | 33.1     |
| Government officer | 73 | 28.4      | 75       | 29.2     |
| Agriculture     | 15    | 5.8      | 10       | 3.9      |
| Monthly family income (baht) | 0.066 |
| < 10,000        | 38    | 14.8     | 34       | 13.2     |
| 10,000-15,000   | 52    | 20.2     | 48       | 18.7     |
| 15,001-30,000   | 138   | 53.7     | 124      | 48.2     |
| ≥ 30,000        | 29    | 11.3     | 51       | 19.9     |
| Mean            | 22,740.08 | 24,174.32 |
| (SD)            | (9,311.92) | (13,541.38) |
| Min-Max         | 7,000-70,000 | 7,800-95,000 |

* Chi-square test
BMI and Breast Cancer Risk among TPW

Using a univariable conditional logistic regression analysis, we found that possible risk factors of developing BC among TPW were family history of BC, history of benign breast tumor, younger age at menarche, miscarriage, contraceptive use, passive smoking, multivitamin use and BMI (p<0.05), as shown in Table 2. Using a multivariable conditional logistic regression analysis, BMI showed the association with BC occurrence after controlling for possible confounding factors (family history of BC, history of benign breast tumor, younger age at menarche, miscarriage, contraceptive use, passive smoking, and multivitamin use), higher BMI was significantly associated with increased risk of BC.

### Table 2. Univariable Conditional Logistic Regression Analysis of Characteristics associated with BC among TPW

| Characteristics                  | Cases   | Controls | OR      | 95% CI     | p-value* |
|----------------------------------|---------|----------|---------|------------|----------|
|                                  | No.     | %        | No.     | %          |          |
| Family history of BC             |         |          |         |            |          |
| No                               | 211     | 82.1     | 249     | 96.9       | 1        |
| Yes                              | 46      | 17.9     | 8       | 3.1        | 6.43     | 2.89-14.25 | <0.001* |
| History of benign breast tumor   |         |          |         |            |          |
| No                               | 209     | 81.3     | 235     | 91.3       | 1        |
| Yes                              | 48      | 18.7     | 22      | 8.6        | 2.37     | 1.39-4.05  | 0.001*  |
| Age at menarche (yrs)            |         |          |         |            |          |
| ≥14                              | 83      | 32.3     | 140     | 54.5       | 1        |
| <14                              | 174     | 67.7     | 117     | 45.5       | 2.54     | 1.74-3.72  | <0.001* |
| Parity                           |         |          |         |            |          |
| No                               | 193     | 75.1     | 172     | 66.9       | 1        |
| Yes                              | 64      | 24.9     | 85      | 33.1       | 0.68     | 0.46-1.00  | 0.051   |
| Miscarriage                      |         |          |         |            |          |
| No                               | 186     | 72.4     | 214     | 83.3       | 1        |
| Yes                              | 71      | 27.6     | 43      | 16.7       | 1.93     | 1.24-3.00  | 0.003*  |
| Contraceptive use                |         |          |         |            |          |
| No                               | 90      | 35       | 162     | 63         | 1        |
| Yes                              | 167     | 65       | 95      | 37         | 3.32     | 2.22-4.96  | <0.001* |
| Active smoking                   |         |          |         |            |          |
| No                               | 248     | 96.5     | 251     | 97.7       | 1        |
| Yes                              | 9       | 3.5      | 6       | 2.3        | 1.5      | 0.53-4.21  | 0.437   |
| Passive smoking                  |         |          |         |            |          |
| No                               | 153     | 59.5     | 198     | 77.1       | 1        |
| Yes                              | 104     | 40.5     | 59      | 22.9       | 2.22     | 1.46-3.37  | <0.001* |
| Alcohol consumption              |         |          |         |            |          |
| No                               | 251     | 97.7     | 252     | 98.1       | 1        |
| Yes                              | 6       | 2.3      | 5       | 1.9        | 1.2      | 0.32-4.61  | 0.761   |
| Multivitamin use                 |         |          |         |            |          |
| No                               | 227     | 88.3     | 168     | 65.4       | 1        |
| Yes                              | 30      | 11.7     | 89      | 34.6       | 0.26     | 0.16-0.42  | <0.001* |
| BMI (kg/m2)                      |         |          |         |            |          |
| 18.5-22.9                        | 89      | 34.7     | 122     | 47.4       | 1        |
| 23.0-24.9                        | 44      | 17.1     | 54      | 21         | 1.18     | 0.71-1.97  | 0.531   |
| 25.0-29.9                        | 88      | 34.2     | 41      | 16         | 3.07     | 1.87-5.05  | <0.001* |
| ≥30.0                            | 26      | 10.1     | 10      | 3.9        | 3.68     | 1.64-8.25  | <0.001* |
| <18.5                            | 10      | 3.9      | 30      | 11.7       | 0.44     | 0.22-0.95  | 0.036*  |

* Univariable analysis performed on 257 matched pairs; BC, Breast Cancer; OR, crude odds ratio; CI, confidence interval; *, Significant at p-value <0.05.

To summarize majority of them were aged 40-44 years (59.9%, 61.1%), married (61.8%, 60.7), education higher than secondary school (39.7%, 51.4%), buddhism (96.5%, 96.1), living in central region (68.5%), office employee (35.8%, 33.8%), and had monthly family income between 15,000-30,000 baht (53.7%, 48.2%). As shown in Table 1, there was no significant difference regarding demographics at baseline among TPW (p>0.05).

**BC and Risk Factors**

Using a univariable conditional logistic regression analysis, we found that possible risk factors of developing BC among TPW were family history of BC, history of benign breast tumor, younger age at menarche, miscarriage, contraceptive use, passive smoking, multivitamin use and BMI (p<0.05).
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| Variables | OR<sub>c</sub> | 95%CI | OR<sub>adj</sub> | 95%CI | p-value |
|-----------|-------------|-------|-----------------|-------|---------|
| BMI (kg/m²)                        |      |       |                |       |         |
| 18.5-22.9                            | 1    | 1     |                |       |         |
| 23.24.9                               | 1.18 | 0.71–1.97 | 0.9           | 0.44–1.84 | 0.77   |
| 25.29.9                               | 3.07 | 1.87–5.05 | 2.09          | 1.09–3.97 | 0.025* |
| ≥30.0                                 | 3.68 | 1.64–8.25 | 2.37          | 1.24–10.06 | 0.018* |
| <18.5                                 | 0.44 | 0.20–0.95 | 0.3           | 0.09–1.08 | 0.065  |

OR<sub>c</sub>, crude OR; OR<sub>adj</sub>, Adjusted OR for family history of BC, history of benign breast tumor, age at menarche, miscarriage, contraceptive use, passive smoking, and multivitamin use; *, Significant at p-value <0.05.

Characteristics of BC Patients

Cases were the newly patients with BC diagnosed by pathological confirmation and laboratory testing during November 2013-December 2014 (incidence cases). Majority of them were weight 55-64 kg (40.5%) and height 150-159 cm (65.7%). Considering on body size, 60.7% showed overweight and obesity. Location of BC, mostly in both sides (52.2%). Most of study cases were diagnosed as IDC-NOS (91.8%) and duration of stage II (45.5%).

Discussion

Findings from the present study, TPW participants were mostly aged 40-44 years (60%). Socio-demographic characteristics of cases and controls were quite alike. When controlled by health risk behaviors and reproductive factors, obesity measurement by BMI and criteria for Asians (Steering Committee, 2000), found that obese group was risky being BC higher than normal group. Our findings indicated that women with BMI >25 kg/m² had a higher risk for BC. Obesity plays a major role in the etiology of BC. When considering for Asian premenopausal women, it showed positive association between BMI and BC (Wada et al., 2014; Suzuki et al., 2013; Iwasaki et al., 2007; Kuriyama et al., 2005; Wu et al., 2006). A study showed the BMI of higher than 27 kg/m² was the borderline-significant positive association between BMI and BC among premenopausal women (Wada et al., 2014). The results differed from the findings from western studies (Cheraghi et al., 2012; Renehan et al., 2008; Reeves et al., 2007; Lahmann et al., 2004; Michels et al., 2006; Tehard et al., 2004; World Cancer Research Fund/American Institute for Cancer Research, 2007) which showed a significant inverse association. Some studies found this association only in the postmenopausal women (Carpenter et al., 2003; Elissen et al., 2006; Mahoney et al., 2008; Emaus et al., 2014), while a study found the association in both pre and post menopausal women (Wada et al., 2014). The reason to support the association why obesity increased BC risk, it could explain that an increasing of BMI would enhance the risk of estrogen receptor and progesterone receptor-positive tumors (Enger et al., 2000; Ahm et al., 2006). Therefore, weight control is the crucial factor to reduce risk of BC, namely, dietary control with both quantity and quality, and proper physical activities level, it will support the cardiorespiratory function and improve vigor and vitality (Schmitz et al., 2005; Voegel et al., 2015). In addition, the benefits of regular physical exercise affect healthy body and mind, normal function, increase flexibility and quality of life (American Cancer Society, 2007; Kolden et al., 2002). WHO recommends persons aged 18-64 years should have physical activities in moderate (150 minute/wk) and vigorous intensity (75 minutes/wk). For Thais, campaign of women aged ≥ 20 years to examine by themselves, they should be aware of advantages and limitations of this technique, support breast feeding after give birth 6 months, reduce alcohol consumption and reduce obesity (National Cancer Control Committee, 2013). For women ≥ 40 years should be checked up with mammogram annually (Smith et al., 2003; American College of Radiology, 2013).

Advantages and limitation of the Study

There are some advantages of this case-control study. First, the National Cancer Institute is the specialized hospital for cancer patients. Second, they are easily identified, and provide sufficient numbers. Finally, cases are newly BC patients diagnosed and confirmed by pathologists, which lead to the reduction in classification bias. Some limitations of this study should be noted. First, the study was a hospital based matched case-control study, therefore, the representative of target population couldn’t be mentioned. Second, it was very difficult to select the suitable controls. However, we matched cases and controls by age, residence and duration of attending. In summary, it should be the surveillance system of obesity and campaign of proper regular exercise, healthy diet, weight control and basic methods for health lifestyle among risk groups (National Cancer Control Committee, 2013), it will minimize BC occurrence and reduce risks of developing BC extensively and wisely.

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References

Ahn J, Schatzkin A, Lacey JV Jr, et al (2006). Adiposity, adult weight change, and postmenopausal BC risk. *Int J Gynecol Cancer*, **16**, 569-75.

American cancer society. Physical activity and the cancer patient. Retrieved December 27, 2007. Available from http://www.cancer.org/docroot/MIT/content/MIT_2_3x_physical_activity_and_the_cancer_patient.asp?sitearea/MIT.

American college of radiology. ACR practice parameter for the performance of screening and diagnostic mammography: revised 2013. Available from http://www.acr.org/~/media/3484aca30845348359bad46844779d492d.pdf.

Bureau of policy and strategies, Ministry of public health (2010). Public health statistics 2010. Bangkok: The war veterans organization of Thailand.

Bureau of policy and strategies, Ministry of public health (2011). Thailand health profile 2008-2010. Bangkok: The war veterans organization of Thailand.

Bureau of policy and strategies, Ministry of public health (2015). Public health statistics 2014. Bangkok: The war veterans organization of Thailand.

Carpenter CL, Ross RK, Paganini-Hill A, Bernstein L (2003). Effect of family history, obesity and exercise on BC risk among post-menopausal women. *Int J Cancer*, **106**, 96–102.

Chaveepojnakom W, Pichainarong N, Thotong R, Sativapiew P, Pitikultang S (year?). Relationship between breast cancer and oral contraceptive use among Thai premenopausal women: a case-control study. *Asian Pac J Cancer Prev*, **18**, 1429-33.

Cheraghi Z, Poorolajal J, Hashem T, et al (2012). Effect of body mass index on breast cancer during premenopausal and postmenopausal periods: a meta analysis. *PloS One*, **7**, e51446.

DeSantis CE, Fedewa SA, Goding Sauer A, et al (2016). Breast cancer statistics, 2015: Convergence of incidence rates between black and white women. *CA Cancer J Clin*, **66**, 31-42.

Ellassen AH, Colditz GA, Rosner B, et al (2006). Adult weight change and risk of postmenopausal BC. *JAMA*, **296**, 193–201.

Emaus MJ, van Gils CH, Bakker MF, et al (2014). Weight change in middle adulthood and BC risk in the EPIC-PANACEA study. *Int J Cancer*, **135**, 2887-99.

Enger SM, Ross RK, Paganini-Hill A, Carpenter CL, Bernstein L (2000). Body size, physical activity, and BC hormone receptor status: results from two case-control studies. *Cancer Epidemiol Biomarker Prev*, **9**, 681-7.

Iwasaki M, Otani T, Inoue M, et al (2007). Body size and risk for BC in relation to estrogen and progesterone receptor status in Japan. *Ann Epidemiol*, **17**, 304–12.

Kolden GG, Strauman TJ, Ward Ann, et al (2002). A pilot study of group exercise training (GET) for women with primary BC: feasibility and health benefits. *Psychooncology*, **11**, 447-56.

Kuriyama S, Tsubono Y, Hozawa A, et al (2005). Obesity and risk of cancer in Japan. *Int J Cancer*, **113**, 148–57.

Lahmann PH, Hoffmann K, Allen N, et al (2004). Body size and BC risk: findings from the European Prospective Investigation into Cancer and Nutrition (EPIC). *Int J Cancer*, **111**, 762-71.

Lwanga SK, Lemeshow S (1991). Sample size determination in health studies: a practical manual. Geneva: World Health Organization.

Mahoney MC, Bevers T, Linos E, et al (2008). Opportunities and strategies for BC prevention through risk reduction. *CA Cancer J Clin*, **58**, 347–71.

Michels KB, Terry KL, Willet WC (2006). Longitudinal study on the role of body size in premenopausal BC. *Arch Intern Med*, **166**, 2395-402.

National cancer control committee, Department of health, ministry of public health (2013). National cancer control programmes 2013-2017. Bangkok: The agricultural cooperative printing of Thailand.

Reeves GK, Pirie K, Beral V, et al (2007). Cancer incidence and mortality in relation to body mass index in the Million Women Study: cohort study. *BMJ*, **335**, 1134.

Renehay AG, Tyson M, Egger M, Heller RF, Zwahlen M (2008). Body-mass index and incidence of cancer: a systematic review and meta-analysis of prospective observational studies. *Lancer*, **371**, 569-79.

Schmitz KH, Holtzman J, Courneya KS, et al (2005). Controlled physical activity trials in cancer survivors: a systematic review and meta-analysis. *Cancer Epidemiol Biomarkers Prev*, **14**, 1588–95.

Siegel RL, Miller KD, Jemal A (2015). Cancer statistics. *CA Cancer J Clin*, **65**, 5-29.

Smith RA, Saslow D, Sawyer KA, et al (2003). American cancer society guidelines for BC screening: update 2003. *CA Cancer J Clin*, **53**, 141–69.

Steering committee (2000). The Asia-Pacific perspective: Redefining obesity and its treatment. Melbourne: International diabetes institute.

Suzuki S, Koijima M, Tokudome S, et al (2013). Obesity/weight gain and BC risk: findings from the Japan collaborative cohort study for the evaluation of cancer risk. *J Epidemiol*, **23**, 139–45.

Tehad B, Lahmann PH, Riboli E, et al (2004). Anthropometry, breast cancer and menopausal status: use of repeated measurements over 10 years of follow-up results of the French E3N women’s cohort study. *Int J Cancer*, **111**, 264-9.

Umpan W (2004). Relation between oral contraceptive use and BC in women [Thesis]. Bangkok: Mahidol University.

Voege P, Bower JE, Stanton AL, Ganz PA (2015). Motivations associated with physical activity in young BC survivors. *Psychol Health Med*, **20**, 393-9.

Wada K, Nagata C, Tamakoshi A, et al (2014). Body mass index and BC risk in Japan: a pooled analysis of eight population-based cohort studies. *Ann Oncol*, **25**, 519–24.

World cancer research fund/American institute for cancer prevention of cancer: a global perspective. Washington, DC: International diabetes institute.

Majumdar AS, Terry KL, Willet WC (2007). Body size and BC risk in a cohort of11,889 women in a low-incidence area. *Int J Cancer*, **121**, 347–71.