RESEARCH ARTICLE

Assessment of Biochemical Profiles in Premenopausal and Postmenopausal Women with Breast Cancer

Naval Kishor Yadav[1,2]*, Bibek Poudel[1,2], C Thanpari[1,3], Bidhan Chandra Koner[1,4]

Abstract

Objective: The study was conducted to assess biochemical profiles in premenopausal and postmenopausal women having breast cancer. Materials and Methods: A hospital based case control study was carried out at Manipal Teaching Hospital (MTH), Pokhara, Nepal. The analysed variables were age, metabolic profile including total cholesterol, triglycerides, HDL-C, LDL-C, blood sugar, insulin concentration, C-peptide, HbA1c and selenium. Descriptive statistics and testing of hypothesis were used for the analysis using EPI INFO and SPSS 16 software. Results: In premenopausal women, significant differences were noted for total cholesterol (*P* value <0.001), triglycerides (*P* value 0.002), HbA1c level (*P* value <0.001), insulin concentration (*P* value 0.030), C-peptide concentration (*P* value 0.001), and selenium (*P* value <0.001) between cases and controls. Insignificant results were found for HDL-C (*P* value 0.749), LDL-C (*P* value 0.933), blood sugar (*P* value 0.59) and BMI (*P* value 0.746). Similarly, significant difference in total cholesterol (*P* value <0.001), triglycerides (*P* value 0.001), LDL-C (*P* value <0.001), HDL-C (*P* value 0.025), blood sugar (*P* value <0.001), insulin concentration (*P* value <0.001), c-peptide concentration (*P* value <0.001), HbA1c level (*P* value <0.001) and selenium (*P* value <0.001) were observed for postmenopausal patients and controls. Conclusions: Assessing metabolic changes and their management may be important for control of breast cancer and increased survival.

Keywords: Breast cancer - premenopausal - postmenopausal - Nepal

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Introduction

Breast cancer is a worldwide major public health problem in women population, affecting both the developing as well as developed countries and comprising 18% of all female cancers (McPherson et al., 2000). More than 1.2 million cases are diagnosed every year, affecting 10-12% of the female population and accounting 500,000 deaths per year worldwide (Benson et al., 2009). Women with a first full-term pregnancy after age 30, and women who have never borne a child have about a two- to three-fold increased risk of breast cancer compared to women having a full-term pregnancy before age 20 (McPherson et al., 2000). It is well established that women having low-income and worse socioeconomic conditions are at increased risk to develop breast-cancer and have lower rates of survival in already exited breast cancer (Vona-Davis et al., 2009; Schootman et al., 2009).

Reporting of variation in incidence of breast cancer in different population of different parts of Asian continent may be due to multiple factors, including geographic variation, racial/ethnic background, genetic variation, lifestyle, environmental factors, socioeconomic status, the presence of known risk factors, utilization of screening mammography, stage of disease at diagnosis, and the availability of appropriate care (Hortobagyi et al., 2005). The increase in risk of breast cancer associated with positive family history (Kuru et al., 2002; Brant et al., 2010; Hadjisavvas et al., 2010) as well as smoking (Conlon et al., 2010; Sezer et al., 2011). Breast cancer is the second most common cancer among Nepalese women. It accounts for 6% of cancers in Nepal, in a higher of women aged less than 50 years, compared to older women in high income countries (Singh et al., 2009). Different types of metabolic changes have been associated with the breast cancers. To the best of our knowledge, changes in biochemical profiles in women having breast cancer has not been reported from our developing country Nepal so for. Thus the prime objective of our study was to undertaken the assessment of biochemical changes in premenopausal as well as postmenopausal women having breast cancer in our environments.

Materials and Methods

This study was carried out at Manipal Teaching Hospital (MTH), Pokhara, Nepal. The collected and analyzed variables were age, metabolic profile including total cholesterol, triglycerides, HDL-C, LDL-C, blood sugar, insulin concentration, C-peptide, HbA1c and

*[1]Department of Biochemistry, [2]Manipal College of Medical Sciences, Pokhara, [3]Nepalgunj Medical College, Chisapani, Banke, Nepal, [4]Maulana Azad Medical College, New Delhi, India *For correspondence: naval.rhythm@gmail.com*

selenium. Ethical approval for the study was taken from the institutional research ethical committee. All these biochemical parameters were analyzed using Human reagent kits on semi autoanalyser (Humalyser 3500, Germany). Basal insulin (Frier et al., 1981) and C-peptide (Horwitz et al., 1976) were measured with ELISA in the same sample and selenium by atomic absorption spectrophotometer. Laboratory standard operation procedures were maintained for all laboratory analysis. Internal quality control sera, both normal and pathological, were also run for each lot of the test, for the validation of the results. Inclusion criteria was confirmed cases of breast cancer by mammography and histological examination. Controls were persons without clinical cancer who were seen at the same hospital for an annual physical examination. Exclusion criteria were Patients suffering from any other cancer as well as diabetes mellitus and dyslipidaemia were excluded from our study. Difference for continuous variables was assessed by using the t-test. The data was analyzed using Excel 2003, R 2.8.0 Statistical Package for the Social Sciences (SPSS) for Windows Version 16.0 (SPSS Inc; Chicago, IL, USA) and the EPI Info 3.5.1 Windows Version.

Results

Among the 69 diagnosed cases of breast cancer, 25 were premenopausal women and 44 were postmenopausal women. The age group of subjects ranges from 25-70 years. A control group consisted of 25 premenopausal and 45 postmenopausal normal females with similar age group as the breast cancer patients.

Table 1 shows the comparison of biochemical profile (Mean±SD) in premenopausal women with breast cancer and controls. The data indicated significant difference in total cholesterol (*P* value <0.001), triglycerides (*P* value 0.002), HbA1c level (*P* value <0.001), insulin concentration (P value 0.030), C-peptide concentration (*P* value 0.001), and selenium (*P* value <0.001). Insignificant results were found in HDL-C (*P* value 0.749), LDL-C (*P* value 0.933), blood sugar (*P* value 0.59) and BMI (*P* value 0.746).

Table 1 shows the distribution of biochemical parameters among postmenopausal women with breast cancer as well healthy controls. The data showed significant difference in total cholesterol (*P* value <0.001), triglycerides (*P* value 0.001), LDL-C (*P* value <0.001), HDL-C (*P* value 0.025), blood sugar (*P* value <0.001), insulin concentration (*P* value <0.001), c-peptide concentration (*P* value <0.001), HbA1c level (*P* value <0.001) and selenium (*P* value <0.001) in patients and controls.

Discussion

The breast is an external symbol of beauty and womanhood, however cancer of the breast is responsible for the death of millions of women worldwide every year. Breast cancer is the most common type of cancer in women worldwide, with an estimated 1.4 million cases in 2008 (Cuzick, 2010). About half the Breast cancer cases and 60% of the deaths are estimated to occur in economically developing countries (Jemal et al., 2011) as well as it is major health problem in India (Datta et al., 2012). We found significantly increased level of total cholesterol in the breast cancer patients compared to the controls. Zielinski et al. found a relative increase in serum total cholesterol in patients with breast cancer (Zielinski et al., 1988). Some of the studies also reported the significantly increased in total cholesterol level in breast cancer patients (Qi et al., 1994; Chow et al., 2005; Juan-Bosco et al., 2008; Owiredu et al., 2009).

Table 1. Biochemical Parameters

Parameters	Premenopausal Women			Postmenopausal Women		
	Controls (Mean±SD)	Patients (Mean±SD)	*P* value	Controls (Mean±SD)	Patients (Mean±SD)	*P* value
Total cholesterol (mg/dl)	159.80±6.69	192.24±10.60	<0.001	155.16±6.74	180.64±7.76	<0.001
(95% CI)	(156.95-162.64)	(187.86-196.61)		(152.38-157.94)	(178.27-183.00)	
Triglycerides (mg/dl)	108.28±13.08	120.52±12.92	0.002	111.96±4.46	125.59±6.47	<0.001
(95% CI)	(102.87-113.68)	(115.18-125.85)		(110.10-113.82)	(123.62-127.56)	
HDL-Cholesterol (mg/dl)	46.12±4.08	45.76±3.82	0.749	44.32±2.54	42.93±2.35	0.025
(95% CI)	(44.43-47.80)	(44.18-47.33)		(43.27-45.37)	(42.22-43.65)	
LDL-Cholesterol (mg/dl)	111.80±24.44	112.24±8.55	0.933	108.84±9.02	122.57±6.03	<0.001
(95% CI)	(101.71-121.88)	(108.70-115.77)		(105.11-112.57)	(120.73-124.40)	
Blood sugar (mg/dl)	93.88±12.28	98.46±10.33	0.59	88.84±2.70	104.27±9.12	<0.001
(95% CI)	(88.81-98.95)	(93.41-102.94)		(87.72-89.96)	(101.50-107.05)	
Insulin (pmol/L)	43.48±5.59	29.60±4.16	< 0.001	43.48±5.59	34.05±3.07	<0.001
(95% CI)	(41.16-45.79)	(27.88-31.31)		(41.17-45.79)	(33.11-34.98)	
C-peptide (nmol/L)	0.52±0.18	1.14±0.18	< 0.001	0.60±0.21	1.51±0.25	<0.001
(95% CI)	(0.44- 0.59)	(1.06-1.22)		(0.50-0.69)	(1.43-1.58)	
HbA1c (%)	4.30±0.18	5.07±0.43	<0.001	4.46±0.22	5.21±0.38	<0.001
(95% CI)	(4.23-4.38)	(4.89-5.25)		(4.36-4.55)	(5.09-5.33)	
Selenium (μg/L)	92.16±1.54	80.44±1.19	<0.001	89.92±3.73	74.86±5.67	<0.001
(95% CI)	(91.52-92.79)	(79.94-80.93)		(88.38-91.46)	(73.14-76.59)	
BMI	23.28±2.37	23.48±2.14	0.746	23.84±1.99	24.41±1.35	0.163
(95% CI)	(22.30-24.25)	(22.77-23.99)		(23.02-24.66)	(24.00-24.82)	

Triglyceride levels were significantly higher in both pre and postmenopausal cancer patients than in controls in this study is consistent with the results of Owiredu et al. (2009). Bani et al and Abu-Bedair et al. reported significantly increased in triglycerides level in postmenopausal cancer patients (Bani et al., 1986; Abu-Bedair et al., 2003). However, Gooden et al have reported elevated serum triglyceride levels in premenopausal breast cancer patients (Gooden et al., 1997). Kokoglu et al were observed high serum triglycerides levels in breast cancer patients (Kokoglu et al., 1994). The high concentration of triglycerides may lead a decreased level of sex hormone-binding globulin, resulting in higher amount of free estradiol, which may likely to increase breast cancer risk (Takatani et al., 1991).

HDL-C levels were lower in both pre and postmenopausal cancer patients than in controls in this study. Ray et al reported significantly decreased in plasma HDL-C concentration in breast cancer patients (Ray et al., 2001). Owiredu et al showed unchanged in concentration of HDL-C in both pre and postmenopausal women with breast cancer (Owiredu et al., 2009). The low HDL-C is related to increased levels of several cancer-promoting hormones (e.g., androgens, estrogens, insulin, and IGF-I), the observed association may reflect the relative importance and mutual dependence of different disease pathways in malignant breast tumors. A higher risk of breast cancer associated with lower HDL-C concentrations was reported in at least 2 prospective studies (Hoyer et al., 1992; Furberg et al., 2004).

LDL-C level were significantly higher in postmenopausal women with breast cancer than controls in this study. Ray et al and Owiredu et al demonstrated that plasma total cholesterol, LDL-C and triglycerides were found to be significantly elevated among breast cancer patients as compared to the controls (Ray et al., 2001; Owiredu et al., 2009). The elevated serum LDL-C, which is more susceptible to oxidation, may result in high lipid peroxidation in breast cancer patients. This may cause oxidative stress leading to cellular and molecular damage thereby resulting in cell proliferation and malignant conversions.

Although in this study, the fasting blood sugar concentration was higher in pre and postmenopausal breast cancer patient comparison to controls, which were within normal range but significantly higher level found only in postmenopausal cancer patients. Postmenopausal women with breast cancer were found to have a significant degree of relative hyperglycaemia, although basal glycaemia was within the normal range, the values were higher than in normal control subjects (Mahabir et al., 2006). Breast cancer with diabetes was more likely to occur in old and postmenopausal women (Yancik et al., 2001; Liao et al., 2010).

Serum insulin concentration was lower in both premenopausal as well as postmenopausal women with breast cancer than in their respective controls and showed significant difference in both pre and postmenopausal breast cancer patients (P value <0.001). C-peptide concentration (P value <0.001) and HbA1c level were significantly elevated in both pre and postmenopausal breast cancer patients compare to the control groups. A 1-ng/mL increase in C-peptide was associated with a 31% increased risk of any death and a 35% increased risk of death as a result of breast cancer (Irwin et al., 2011).

In this study, selenium level were found decreased in both pre and postmenopausal breast cancer patients than the control groups, finding is supported by study conducted in breast cancer patients by Mannisto et al. (2006). Low level of selenium has been associated with a higher risk of cardiovascular diseases as well as cancer in humans (Charalabopoulos et al., 2006). In some studies, serum levels of selenium were found to be significantly lower in breast cancer cases compared to control group (Garland et al., 1995; Banu et al., 2003; Jasim, 2011).

BMI were higher in pre and postmenopausal breast cancer patients than controls but showed insignificant difference.

The diagnosis and early detection of breast cancer is easy at all the part of developed country in respect to the developing countries because of the availability of mammography and high literacy rate. Assessing of metabolic changes and managing the changes in breast cancer women would progress the survival rate.

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