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## Biochemical factors associated with breast cancer in Bangladeshi women

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### Abstract

Breast cancer is the commonest malignancy and principal cause of women's death. It is more common after menopause. The women are more likely to have biologically aggressive breast cancer, such as higher-grade tumors and more lymph node involvement, thus resulting in a poor prognosis, which results in increased mortality rates. In the study, thirty diagnosed breast cancer patients and thirty controls are selected. The information regarding all patients is taken in a data sheet. Breast cancer women have received chemotherapy treatment. The study reveals no significant difference ( $p>0.05$ ) in RBS (Random Blood Sugar), serum cholesterol and serum estrogen levels in the case and control group. ESR (Erythrocyte Sedimentation Rate), serum calcium, HDL (High Density Lipoprotein), LDL (Low Density Lipoprotein) and serum progesterone levels show a significant difference ( $p<0.05$ ) between female breast cancer patient and control group. Chemotherapy treatments may result in increasing or decreasing level of biochemical profile. The study of serum biochemical profile should be helpful tools in the monitoring of disease, metastasis, different treatment strategy and survival rates of breast cancer patients.

**Keywords:** Breast cancer, biochemical parameters, menopause, metastasis

### Introduction

Breast cancer is the foremost commonly happening cancer in women and overall second most common cancer. There are over 2 million new cases in 2018 [1]. Breast cancer starts from different parts of the breast. Usually arise in the ducts of breast that carry milk to the nipple (call ductal cancer). Some start in the glands that make breast milk (lobular cancers). There are also other types of breast cancer that are less common [2]. In Bangladesh, breast cancer rate is about 8.5% [3]. Major risks factor are closely related to this cancer are tobacco use, alcohol consumption, unhealthy diet and physical inactivity [4]. Breast cancer has no boundaries with age, race, religion and socioeconomic status, [5]. Inherited gene mutations (in BRCA1, BRCA2, and other breast cancer susceptibility genes), account for 5% to 10% of breast cancer cases [1].

The risk of breast cancer increases in advancing age, young women can also develop the condition. Nearly one third of women with breast cancer are diagnosed prior to menopause, and around 7% of breast cancers are diagnosed before the age of 40. Only nearby 1% of breast cancers occur before the age of 30 [6]. Approximately, 70% of deaths from cancer occur in low and middle income countries. Late stage presentation and inaccessible diagnosis and treatment are common. The economic effect of cancer is important and is raising [4]. It is assessed that nearly one half of the cases and over one-half of the cancer deaths in the world will occur in Asia in the year 2018, in part because close to 60% of the global population resides there [1].

In 2020, half a million of women died due to breast cancer in low & middle income countries. This situation is projected to get worse [7]. In most high income countries five years survival rates exceeds 80% after diagnosis. In comparison with India it is 66% and just 40% in South Africa. Unavailable or unaffordable breast cancer services result premature deaths and increase expenditures. For these, it leads to social disruption, impoverishment, family instability and orphaned children and also threatens economic growth [8].

Scientists in various IARC (International Agency for Research on Cancer) are studying the most effective methods of preventing breast cancer at the population level. They are searching the hindrance of early diagnosis and proper treatment [17]. The time interactions between the first exposure with the health system and the initiation of breast cancer treatment can be declined by prompt diagnosis of breast cancer [18].

The present papers deals with the determination of level of ESR, RBS and Serum calcium, total cholesterol, HDL, LDL, estrogen, progesterone in breast cancer patients compared to control individual. These biochemical parameters will effectively helpful for the diagnosed breast cancer patients involving regular health checkup, know the prognosis of the patients & the ultimate aim to improve the survival rate.

**Materials and Methods**

This study was carried out in Rajshahi Medical College Hospital, Rajshahi, Bangladesh in collaboration with New Haven Diagnostic Centre, Rajshahi. Ethical approval was taken from the Institutional Animal, Medical Ethics, Biosafety and Biosecurity Committee (IAMEBBC) of the Institute of Biological Sciences (IBSc), Rajshahi University. Thirty female breast cancer patients confirmed by clinical examination and histopathology report. Thirty female control patients participated in the study after exclusion of the disease by history and clinical examination. A questionnaire was used to collect information’s from breast cancer patients and control group. The written consent was taken from the patients and control before included into the study.

**Collection of blood sample**

With all aseptic precautions 5 ml venous blood was collected from ante-cubital vein of each study subjects in a disposable syringe. The needle was removed and blood was immediately transferred to a clean dry plain tube. The blood was allowed to clot. The sample was centrifuged and the serum was collected in an eppendorf tube, which was appropriately labeled and preserved (4 to 8 °C in refrigerator). The serum of all study subjects was collected and used for measurement of biochemical parameters. All these biochemical parameters analyzed in semi auto analyzer. The data was analyzed using Statistical Package for the Social Science (SPSS) for windows version 16.0.

**Laboratory procedure**

**Estimation of**

- Erythrocyte Sedimentation Rate by Westergren method.
- Random Blood Sugar level by Enzymatic Colorimetric method (Endpoint)
- Serum Calcium level by Total colorimetric method (Endpoint)
- Serum HDL-cholesterol level by Enzymatic Colorimetric test (Endpoint)
- Serum total cholesterol level Enzymatic Colorimetric method (Endpoint)
- Serum Estradiol level by Enzyme Immunoassay (Nova Tec GmbH)
- Serum Progesterone level by Enzyme Immunoassay (Nova Tec GmbH)

**Calculation of**

- Serum LDL-cholesterol level using Friedewald formula

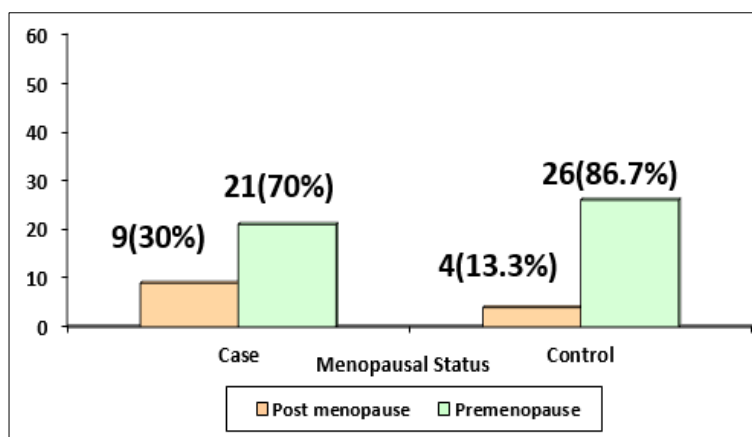
**Results**

The results of the measured different biochemical parameters in the research were listed below for breast cancer patients and control.

**Table 1:** Comparison of Biochemical profile (Mean ± SD) in woman with breast cancer and the control

Variables	Case (Mean ± SD)	Control (Mean ± SD)	p-value
Age	45.6±9.1	38±9.9	0.00
RBS	4.89±1.6	7.06±12.3	>0.05
S. Calcium	4.43±3.2	8.92±0.7	<0.05
S. Cholesterol	186.8±53.8	183.03±51.5	>0.05
S. HDL	59.67±56.6	43.63±6.05	<0.05
S. LDL	97.9±51.4	110.63±45.6	<0.05
S. Progesterone	4.6±5.6	6.63±8.5	<0.05
S. Estradiol	86.75±46.5	117.34±40.9	>0.05

The table- 1 shows a comparison of biochemical profiles in women with breast cancer and the control. The data indicated a significant difference ( $p<0.05$ ) in ESR (Erythrocyte Sedimentation Rate), Serum Calcium, Serum HDL (High Density Lipoprotein), Serum LDL (Low Density Lipoprotein) and Serum Progesterone level in between breast cancer patients and control. No significant difference ( $p>0.05$ ) found in RBS (Random Blood Sugar), Serum Cholesterol and Serum Estradiol level in breast cancer patients and control.



**Fig 1:** Shows Menopausal status in case and control

The menopausal status of the women is shown in Fig-1. They were divided into two groups, premenopausal and post-menopausal women. In cancer patient, twenty-one (70%) women were pre menopause and nine women (30%)

were post menopause. Twenty-six (86.7%) women were pre menopause and four (13.3%) women were post menopause in control patient.

**Table 2:** Comparison of Biochemical profile (Mean  $\pm$  SD) in pre-menopause woman with breast cancer and the control

Variables	Breast cancer premenopausal Mean $\pm$ SD N=21	Premenopausal control patient Mean $\pm$ SD N=26	p-value
ESR (mm in 1st hr)	51.19 $\pm$ 22.52	29.81 $\pm$ 10.34	0.021
RBS (mmol/L)	4.93 $\pm$ 1.91	4.96 $\pm$ 1.12	0.144
S. Calcium (mg/dl)	4.49 $\pm$ 3.62	8.88 $\pm$ 0.66	0.009
Total serum Cholesterol (mg/dl)	192.81 $\pm$ 55.49	177.04 $\pm$ 48.51	0.690
S. HDL (mg/dl)	50.00 $\pm$ 9.74	75.92 $\pm$ 62.21	0.000
S.LDL (mg/dl)	100.81 $\pm$ 52.18	107.23 $\pm$ 43.87	0.365
S. Progesterone (ng/ml)	5.69 $\pm$ 6.27	7.26 $\pm$ 8.98	0.910
S. Estradiol (pg/ml)	93.14 $\pm$ 53.69	120.23 $\pm$ 43.09	0.855

Table -2 shows comparison of biochemical profile (Mean  $\pm$  SD) in pre-menopause woman with breast cancer and the control. The data shows p-value 0.021 in ESR, p-value

0.009 in serum calcium & p-value 0.000 in serum High density lipoprotein level.

**Table 3:** Comparison of Age group in pre-menopause woman with breast cancer and the Control

Age group	Group		Total	p-value
	Breast cancer premenopausal	Premenopausal Control patient		
20-30 Years	1(4.8%)	9(34.6%)	10(21.3%)	P=0.011 df=2
31-40 Years	10(47.6%)	13(50.0%)	23(48.9%)	
41-50 Years	10(47.6%)	4(15.4%)	14(29.8%)	
Total	21(100.0%)	26(100.0%)	47(100.0%)	

Table-3 shows a comparison of age groups in pre-menopause with breast cancer & the control. According to the findings of our study 31-50 age group patients were more vulnerable (47.6%) for premenopausal cancer but in the control group only 31-40 age group were riskier (50%). There is a strong association between the study and control groups where  $p=0.011$ .

## Discussion

The study shows a statistically significant elevation of ESR level in breast cancer patients. Different types of cancer including breast shows poor prognosis with high ESR level [9]. Random blood sugar level shows no significant difference. The levels are within normal range in subjects. There is no significant association between diabetes mellitus and breast cancer illustrates in some study reports [10, 11]. An individual begins treatment for cancer contribute to the occurrence of an adverse events depends on level of glycemic control. The patients may develop infections, hospitalized during treatment and the chemotherapy treatment needs to reduce or stop [12].

The findings of serum calcium level show statistically significant differences. They develop hypocalcaemia. A case report indicated that metastasis to the parathyroid glands caused relative hypoparathyroidism, resulting in hypocalcaemia [13].

Serum total cholesterol level in breast cancer patients and control groups shows no significant difference. The ranges are within normal limit in these groups. The results of serum total cholesterol levels are not significantly increased [14]. The HDL (High Density Lipoprotein) levels are significantly increased in breast cancer patients. In a study shows increased HDL-C level significantly [15]. The HDL-C level before and after chemotherapy is increased in patients

shown by an investigator [16]. Low Density Lipoprotein level shows a significant difference. The levels are within normal range. The LDL-C cholesterol levels significantly decreased in patients [17] and in pre- and postmenopausal women treated with chemotherapy [18].

The concentration of serum progesterone levels shows significant difference in between case & control patients. The serum progesterone levels are significantly increased in both group, but the levels are more increased in the control group. In operable breast cancer, at the time of excision, a raised level of progesterone is associated with improved prognosis [19]. In a case-cohort study, there is a 16% increased risk of breast cancer is associated with elevated progesterone level in post-menopausal women [20]. The serum estradiol level shows no significant difference between case & control patients. The levels are within normal range compared to controls. Serum estradiol levels decrease in premenopausal patients who receive adjuvant chemotherapy [21]. Serum estradiol levels are unchanged in post-menopausal breast cancer patients [22].

## Conclusion

The present study has shown significant differences in the biochemical factors in breast cancer patients compared to the control group. Among the study population, 70% of women are premenopausal. The breast cancer patients received chemotherapy treatment. Breast cancer has high cure rates when detected early and treated according to best practices. The biochemical parameters in breast cancer patients will prove to be effective in the management plan of breast cancer patients & improves their survival rates.

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