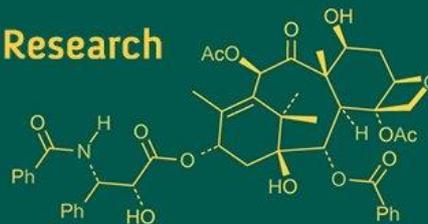
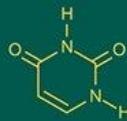
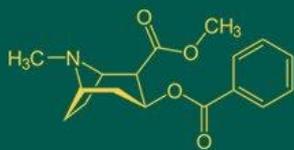


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Prognostic effect of serum estradiol hormone level in premenopausal and postmenopausal women with breast cancer

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Abstract

Aim: To evaluate serum estradiol levels in pre and postmenopausal women with breast cancer.

Method: The breast cancer female patients were recruited from OPD/IPD of Surgery and Oncology department of SMS Hospital, and evaluated serum estradiol. Patients were divided into two groups premenopausal and postmenopausal women with breast cancer.

Results: Serum estradiol levels are significantly high in postmenopausal women as compared to premenopausal women with breast cancer. The result was significantly higher ($p < 0.001$).

Conclusion: Serum Estradiol levels can predict breast cancer in postmenopausal women. The risk of breast cancer increases with an increase in estradiol levels in postmenopausal women.

Keywords: Estradiol, breast cancer, postmenopausal women

Introduction

Breast cancer is the formation of a malignant tumor that has developed from cells in the breast. The biological progression of breast cancer is based on the inability of differentiation, loss of contact inhibition, uncontrolled growth, the ability to migrate, invasion, angiogenesis, metastasis, and the ability to avoid immune control of tumor cells [1]. Lifetime risk of developing breast cancer in every woman in the United States is 12.4% or one in eight women [2]. Globally, breast cancer accounted for 2.08 million out of 18.08 million new cancer cases (incidence rate of 11.6%) and 626,679 out of 9.55 million cancer-related deaths (6.6% of all cancer-related deaths) in 2018 [3].

Estradiol (E2) is an estrogen steroid hormone and the major female sex hormone. It is also known as 17 β -estradiol. It is involved in the regulation of the estrous and menstrual female reproductive cycles. Estradiol is responsible for the development of female secondary sexual characteristics such as the breasts, widening of the hips, and a female-associated pattern of fat distribution and is important in the development and maintenance of female reproductive tissues such as the mammary glands, uterus, Vagina during puberty, adulthood and pregnancy [4]. The serum estradiol level is significantly lower in postmenopausal than in premenopausal women. Postmenopausal women have been consistent in E2 levels without variation according to the menstrual cycle. Estradiol in the blood is linked to an increased risk of breast cancer in women after menopause [5]. High estrogen levels in the serum or urine, and low levels of sex hormone binding protein (SHBG), resulting in high bioavailability of free estradiol also point to an important role of endogenous and exogenous estrogens in the risk of breast cancer [6]. In this study, we evaluate serum estradiol levels in pre and postmenopausal with breast cancer.

Material and Method

The present comparative study was conducted in the Department of Biochemistry, in association with the Department of Surgery and Oncology SMS Medical College and an attached group of Hospitals, Jaipur. A total of 90 subjects were included in this study and divided into two groups as follows: Group 1 included 45 premenopausal and Group 2 included 45 postmenopausal women with breast cancer. Female patients (age >20 years) diagnosed with breast cancer were included in this study.

Exclusion Criteria was taken to rule out other diseases which can alter the result of the study like patients having other cancer, previously diagnosed case of breast cancer who is taking chemotherapy or radiotherapy, history of OCP & pregnancy, and patients with benign breast diseases. Venous blood sample was withdrawn for investigations taking all aseptic precautions. Serum was separated and investigated for Estradiol (E2) by ELISA method [7].

Ethical approval and Informed consent

The Protocol was approved by the institutional ethics committee. Informed written consent was obtained from all study subjects.

Statistical Analysis

The data was analysed using SPSS version 20 (SPSS Inc., Chicago, Illinois, USA). Descriptive statistics were included in the computation of percentages, and means and standard deviations were calculated. The statistical tests applied for the analysis were one-way ANOVA. The confidence interval and p-value were set at 95% and ≤ 0.05 respectively.

Results

Table 1: Demonstrates serum estradiol mean value in pre and postmenopausal females with breast cancer groups. These were 229.53 ± 81.56 and 547.88 ± 209.61 respectively. The mean value of estradiol was higher in postmenopausal breast cancer women as compared with premenopausal breast cancer women. (Figure 1) The result was significantly higher. ($p < 0.001$)

Table 1: Serum Estradiol (ng/ml) level in premenopausal and postmenopausal women with breast cancer.

Estradiol	Menopausal-status	Case group		
		N	Mean	Std. Deviation
	Pre-menopause	45	229.5333	81.56303
	Post-menopause	45	547.8889	209.61873
t-value			-9.495	
p-value			0.001 (Sig.)	

Independent sample t-test

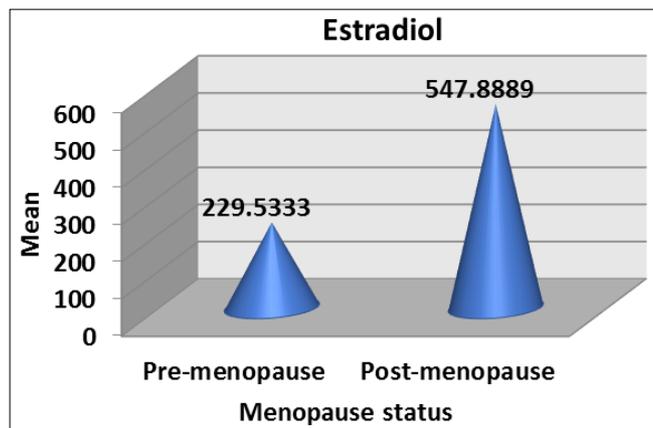


Fig 1: Serum Estradiol (ng/ml) level in premenopausal and postmenopausal women with breast cancer.

Table 2: Shows descriptive statistics of Estradiol levels in different stages of pre and postmenopausal women with breast cancer. The mean of Estradiol in premenopausal breast cancer stages I, II, III, and IV were 249.66 ± 83.44 , 227.38 ± 89.25 , 222.08 ± 75.98 & 229.28 ± 85.76 respectively.

(F-value 0.149, p-value 0.930) The mean of Estradiol in postmenopausal breast cancer stages I, II, III, and IV were 510.33 ± 98.19 , 547.16 ± 261.17 , 530.92 ± 209.05 & 599.45 ± 231.45 respectively. (f-value 0.331, p-value 0.803). No significant results of Estradiol were found in different stages of pre and postmenopausal women with breast cancer.

Table 2: Estradiol in different stages of premenopausal and postmenopausal women with breast cancer.

Character	Tumor Stage	N	Premenopausal	Postmenopausal
			Mean±SD	Mean±SD
Estradiol (ng/ml)	I	15	249.66±83.44	510.33±98.19
	II	25	227.38±89.25	547.16±261.17
	III	25	222.08±75.98	530.92±209.05
	IV	25	229.28±85.76	599.45±231.45
	F-value		0.149	0.331
	p-value		0.930	0.803

Test applied: One-way ANOVA

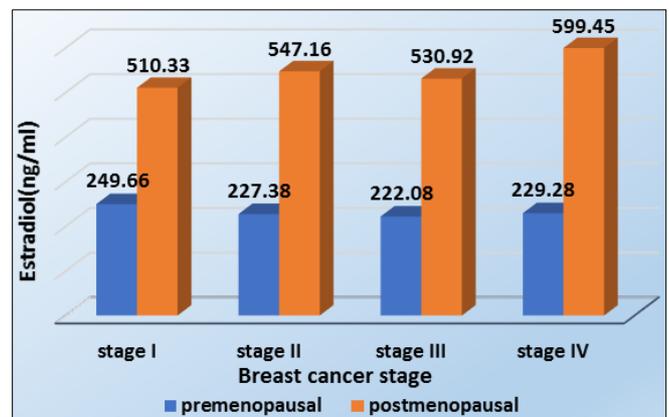


Fig 2: Estradiol in different stages of premenopausal and postmenopausal women with breast cancer.

Discussion

The findings of our study show Estradiol was higher in postmenopausal breast cancer women as compared with premenopausal breast cancer women. The result was significantly higher ($p < 0.001$). Our results are in agreement with the previous study of Hankinson SE [8]. Who also demonstrates the association between breast cancer and circulating levels of estradiol among postmenopausal women. Serum Estradiol did not show a significant association with premenopausal breast cancer risk which confirms by Kaaks *et al.* [9] finding. Estradiol is considered the most significant breast cancer risk factor because of its direct role in stimulation breast cell division or via its effects on other hormones and due its support of the growth of estrogen-responsive tumors [10]. Postmenopausal women with high plasma estrogen levels have twice the risk of developing breast cancer as women with low levels [11]. Our study results also show Estradiol levels in different stages of pre and postmenopausal women with breast cancer. No significant results of Estradiol were found in different stages of pre and postmenopausal women with breast cancer. A similar study conducted by Jouda J, *et al.* [12] observed Estradiol levels were significantly lower in-patient group stage 2 than those in stage 3. Although, no study has clearly demonstrated a relationship between breast cancer and estrogen levels in premenopausal women. This is largely due to variation in sex steroid hormone levels, particularly estrogen over the menstrual cycle.

Premenopausal women experience changes in their serum estrogen levels throughout their menstrual cycles [13]. In contrast, postmenopausal women have been more consistent in estradiol (E2) levels, because of the absence of the variability of hormone levels with the menstrual cycle. Therefore, analysis of the difference in prognosis, according to serum estradiol (E2) level in premenopausal women, a constant measure of estradiol (E2) in time is important [14]. Thus, further assessments are needed to evaluate the association between estradiol level and breast cancer risk among females.

Conclusion

Most breast cancer is detected after menopause in females. This suggests that most breast cancers have an enzyme system efficient enough to produce active estrogens in situ from circulating precursor enzymes modulating tissue steroid availability. These may play an important role in the initiation and progression of breast cancer. In our results, Estradiol levels increased in postmenopausal women with breast cancer while premenopausal women did not show any association between estradiol and breast cancer risk. Our findings are hypothesis suggesting that an estradiol rich microenvironment facilitates the progression of breast cancer in postmenopausal women. These findings could support the notion of altering estrogen metabolism through lifestyle modifications or chemo-preventive strategies as a means of breast cancer prevention.

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