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Research Article

SERUM HORMONAL PROFILE AND ITS CLINICAL UTILITY IN BREAST CANCER PATIENTS AMONG TAMIL WOMEN

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ABSTRACT

Breast cancer is mostly hormone dependent. The present research work was aimed to investigate the hormonal profile and its clinical significance among breast cancer patients of Tamil women. This study comprises of 75 breast cancer patients divided into 3 stages namely, non-metastatic, metastatic and post-treatment groups. Three sex steroid hormones namely Estradiol (E2), progesterone and testosterone; three Gonadotrophins namely, Follicle stimulating hormone (FSH), Leutenising hormone (LH) and human chorionic gonadotrophin (β - hCG) and one peptide hormone, prolactin was estimated. Significant elevation was found in the level of estradiol, progesterone and testosterone in non-metastatic and metastatic groups. Among gonadotrophins, human chorionic gonadotrophin (β- hCG) has shown marked elevation in metastasis. Prolactin (PRL) was also significantly elevated in non-metastatic and metastatic groups. In post treatment group, reduction was observed in the levels of almost all hormones with estrogen and prolactin being predominant. Since marked variation was found in the level of estrogen before and after treatment, it may serves as a powerful predictive parameter of breast cancer and in disease prognosis. β- hCG may be used as an indicator of metastasis. PRL level may be used to predict the disease response to therapy.

Keywords: Gonadotrophins, Prolactin, Metastasis, Estrogen

1. INTRODUCTION

Breast cancer is the most common cancer in women worldwide and its incidence is increasing. In spite of the advances made in early diagnosis and treatment, the disease is thought to have increased because of changes in reproductive pattern and more recently because of increased screening [1]. The incidence of breast cancer in women varies with age, mammary gland mass and exposure to endogenous and exogenous hormones. Experimental data strongly suggests that estrogens have a role in the development and growth of breast cancer [2]. An association between female hormones and breast cancer is important because female hormones are used for contraception or menopause treatment by reproductive age and post-menopausal women respectively. Risk of hormones use among post-menopausal women will be particularly important in the future, given the worldwide trend to an increase in the number of older women in the population. This study was carried out to analyze the serum concentration of various hormones in breast cancer patients and to explore their significance in disease progression and treatment.

2. MATERIAL AND METHODS

2.1. Patients

In this prospective study, female breast cancer patients belonging to the age group 30-70, from various hospitals of Tamil Nadu were included. Patients were excluded if any other malignancy was known from their past history.

2.2. Experimental groups

Patients were divided into 4 groups

Control (Group I): consisted of members of the public with no prior history of breast cancer or other cancer related disorders (n=25).

Group II: non- metastatic group comprising of breast cancer patients with no evidence of metastasis (n=25).

Group II: metastatic group consisted of breast cancer patients who at the time of diagnosis revealed evidence of distant metastases (n=25).

Group IV: Post treatment group comprising of patients who had undergone either chemotherapy/ radiotherapy or hormone therapy for their disease (n=25).

Clinical details of patients were given in Table 1. Informed consent was obtained from every patient.

2.3. Sample Collection

Blood samples were collected by venous arm puncture into heparinised tubes and serum was separated by centrifugation at 3000 rpm for 15 minutes. It was stored at 4°C for further use.

2.4. Estimation of Hormones

Among steroid hormones, Estrogen (Estradial, E2), Progesterone and Testosterone were estimated by competitive ELISA as per the method of Elder and Lewis [3]. Three gonadotrophins namely FSH, LH and β- hCG and one peptide

hormone Prolactin were all estimated by Chemiluminescence Immunoassay (CLIA) according to the method of Uotila *et al.* [4].

2.5. Statistical Analysis

The data obtained in the present study was subjected to statistical analysis by SPSS version 14. Values are expressed as mean values. Standard deviation was done to obtain accuracy. Analysis of Variance (ANOVA) was used to compare the significance of means, between various groups. Values are considered significant at 5% level.

Table 1. Clinical details of the study population of breast carcinoma patients

S. No.	Parameter	Numbers
1.	Age range in patients	30-70 yrs
2.	Age at menarche	12-16 yrs
3.	Menopausal status of patients	
	Pre menopausal	45 Nos
	Post menopausal	30 ,,
4.	Clinical status of patients	
	Non- metastatic breast carcinoma	25 ,,
	Metastatic breast carcinoma	25 ,,
	Post-treatment group	25 ,,

3. RESULTS AND DISCUSSION

3.1. Sex Steroid Hormones

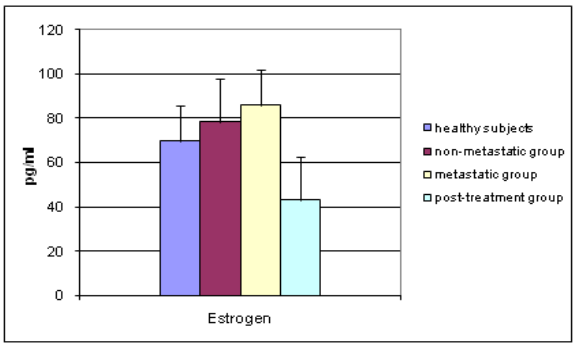

Fig. 1 Serum levels of Estrogen in healthy subjects and breast carcinoma patient

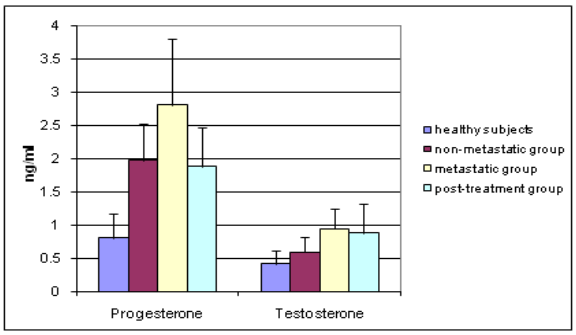

Fig. 2 Serum levels of Progesterone and Testosterone in healthy subjects and breast carcinoma patients

Figure 1 & 2 shows the serum levels of sex steroid hormones in healthy subjects and breast cancer patients. All the three hormones namely, estradiol, progesterone and testosterone showed a significant elevation in non-metastatic (78.20±19.65pg/ml; 1.98±0.55ng/ml; 0.60±0.23ng/ml) and metastatic breast cancer patients (85.65±16.47pg/ml; 2.81±0.99ng/ml; 0.95±0.30) respectively when compared with the healthy subjects (69.60±16.31pg/ml; 0.81±0.37ng/ml; 0.42±0.19ng/ml). In post-treatment group, a significant reduction was observed in the level of estrogen, when compared with non-metastatic breast cancer patients (43.39±19.47pg/ml vs 78.20±19.65 pg/ml). Several workers have reported elevated concentrations of these hormones [5-7]. Several endocrine-associated risk factors are regularly associated with an increased relative risk of breast cancer in postmenopausal women. One of these factors is elevated blood level of circulating estrogen [8]. An increased relative risk is also associated with higher-than-normal blood levels of androstenedione and testosterone, androgens that can be directly converted by aromatase to the estrogens namely estrone and estradiol, respectively [9]. Progesterone (P) metabolites produced within breast tissues might be independently active hormones functioning as cancer-promoting or -inhibiting regulatory agents. The maintenance of normalcy or progression to neoplasia would depend on the ratios of pro- to anti-cancer P metabolites in the local breast tissue microenvironment [10]. High serum testosterone was related to the presence of metabolic syndrome and this was strong with breast cancer progression [7]. Elevated serum levels of testosterone remained associated with breast cancer in premenopausal and postmenopausal women [11]. In post treatment group, estrogen level was significantly decreased, whereas progesterone and testosterone levels were significantly elevated than the healthy subjects. Anti-estrogen treatments are effective in preventing breast cancer recurrence and have further established the role of estradiol (E2) in breast cancer prognosis [7].

3.2. Gonadotrophins

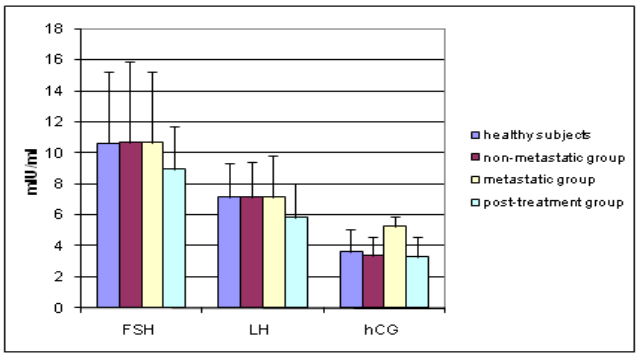

Fig.3 Serum levels of Gonadotrophins- FSH, LH, hCG in healthy subjects and breast carcinoma patients

Figure 3 shows the serum levels of Gonadotrophins- FSH, LH, hCG in healthy subjects and breast carcinoma patients.

Among gonadotrophins no significant change was observed in levels of FSH and LH between healthy subjects and breast cancer patients (10.63±4.61 vs10.68± 5.22 mIU/ml and 7.13±2.24 vs 7.13±2.26 mIU/ml) which coincides with the study of Abu-Bedair *et al*. [12]. No significant alteration was noted in β - hCG between healthy subjects and non-metastatic group (3.60± 1.48 vs 3.34± 1.27 mIU/ml) whereas a significant elevation was found in the level of β - hCG in the metastatic group (5.24±0.70 mIU/ml). Similar elevation was observed by in β-hCG, in metastatic breast cancer by Douglass *et al*. [13]. In post-treatment group marked reduction was found in the level of all three hormones FSH, LH and β - hCG than that of the normal subjects (8.94±2.80 vs 10.63±4.61 mIU/ml; 5.85±2.21 vs 7.13±2.24 mIU/ml; 3.29±1.31 vs 3.60±1.4 mIU/ml). The reduction in the level of these hormones in post treatment stage may be due to the action of chemotherapeutic drugs. Chemotherapeutic drugs cytostatics plus depot buserelin caused downregulation of FSH and LH [14]. Contrary to this study, Gunasegaram *et al*. [15] reported an elevated concentration of LH in all stages of disease.

3.3. Prolactin

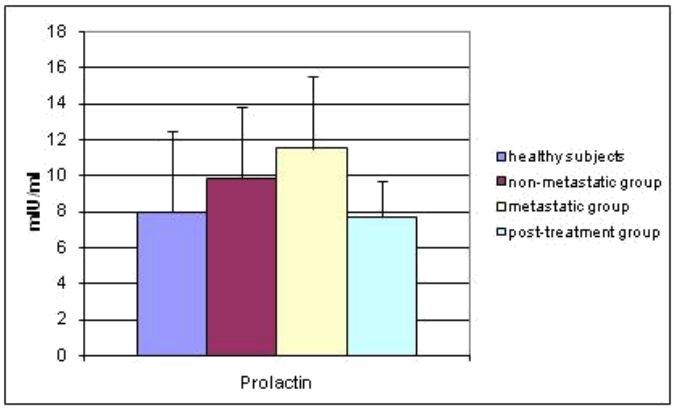

Fig. 4 Serum levels of Prolactin in healthy subjects and breast carcinoma patients

In this study, significant elevation was found in the level of Prolactin in non-metastatic group and metastatic group when compared with that of the normal subjects (9.86±3.92 and 11.51±3.99 vs 8.0±4.51 mIU/ml). In post-treatment group significant reduction was observed in serum PRL concentration than the normal value (7.72±1.94 vs 8.0±4.51 mIU/ml) as shown in fig. 4. Similar elevation has been reported by Gunasekaram *et al.* [15]. In this study, marked elevation found in metastatic group indicates that patients with metastatic breast disease were hyperprolactinemic during the course of the disease. Higher prolactin levels were found to be associated with a more than two-fold increase in the risk of breast cancer [15]. In post treatment group significant decrease was observed in the level of prolactin when compared with the normal subjects. Previous studies have documented an abrupt decrease in PRL level following hormonal therapy or chemotherapy in patients with breast cancer [16].

4. CONCLUSION

Serum hormonal profile was investigated in breast cancer patients of Tamil Nadu. Estradiol was found to play a key role in breast cancer development as its concentration is positively associated with disease progression. Higher concentrations of circulating β-hCG in serum seem to indicate metastasis. Prolactin may be used to predict the disease response to therapy. Further investigation is required to establish the use of these hormones as markers in appropriate stages of the disease.

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