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Original Research

Clinical Significance of Serum PSA in Diagnosis of Carcinoma Breast: A CrossSectional Observational Study

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ABSTRACT

Introduction: Breast cancer remains a significant global health challenge and a leading cause of female mortality, prompting ongoing exploration for novel biomarkers and therapeutic options. Prostate-specific antigens (PSA) have been identified in female tissues regulated by steroid hormones, with trace amounts consistently present in female serum.

Methods: This observational study involved 128 individuals admitted to surgical and oncology wards. Serum PSA levels were analysed preoperatively and postoperatively in 64 breast cancer patients and 64 controls, including premenopausal and postmenopausal individuals, and distinguishing between early and locally advancedbreast carcinoma.

Results: Preoperative PSA levels in breast cancer patients (0.273+/- 1.80) did not significantly differ from controls (0.051+/_ 0.058, p=0.328). No significant PSA level variations were observed among age groups or menopausal statuses within the study or control groups. Comparison of pre- and postoperative PSA levels within breast cancer patients revealed no significant differences (p=0.311).

Discussion: Although previous research suggests PSA's potential as a prognostic indicator, this study found no substantial correlation between serum PSA levels and breast cancer diagnosis, both preoperatively and post- operatively. Larger scale, randomised trials are needed to determine its diagnostic significance in female serum.

Key Word- Breast cancer, Prostate-specific antigen, Modified Radical Mastectomy, Diagnostic marker.

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INTRODUCTION

Breast cancer represents a formidable global health challenge and stands as a leading cause of female mortality worldwide. Despite notable progress, especially among women aged 40 to 49, evident by declining death rates since 1990, survival rates remain unsatisfactory, necessitating continuous exploration for novel biomarkers and treatment avenues. Research has unveiled the presence of prostate-specific antigens (PSA) in female tissues like breast and endometrial epithelium, regulated by steroid hormones. Since steroid hormone receptor positive breast tumor cell lines T-47D and BT-474 are stimulated by glucocorticoids, mineralocorticoids, progestins, and androgens, PSA gene expression in breast malignancy has been discovered to be under hormonal control. As a result, some PSA will always be present in female serum in the range of 0.1-0.9 ng/L. Breast cancer stands as the most prevalent site-specific cancer in women, annually claiming approximately 519,000 lives and diagnosing 900,000 new cases globally. It contributes to 26% of all female malignancies that are newly diagnosed and accounts for 15% of all cancer-related deaths in females. For men, the incidence of breast cancer is 0.26 per 100,000, compared to 20.01 per 100,000 for women. Males die from breast cancer at a rate of 1.20 per 100,000, while females die at a rate of 4.32 per 100,000. Every country has seen an increase in breast cancer mortality rates over the past 60 years, and one in 22 Indian women is at risk of developing the

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disease. India faces a concerning rise in breast cancer incidence, surpassing cervical cancer as the country's second most common cancer. The escalation is more pronounced in urban areas, with numerous cases in rural regions going unreported due to lack of awareness. Late symptom presentation is prevalent, leading to advanced disease stages upon diagnosis. Moreover, breast cancer, typically prevalent in older individuals, manifests a decade earlier in India. [1-6] This study's objective is to examine the serum PSA levels of individuals with breast cancer and determine how they relate to one another.

PATIENT AND METHODOLOGY

Primary Objective: To determine the mean difference in serum prostate specific antigen levelpreoperatively instudy and control groups

Secondary Objective: To determine the mean difference in serum prostate specific antigen level in study groups,preoperatively and postoperatively.

This was a hospital based cross sectional observational study. The study population consisted of patients admitted in surgical wards, surgical oncology wards and radiotherapy wards of our hospital for carcinoma breast, after taking written informed consent. The sample size was determined as 64 in each group, calculated at 95% confidence interval & 80% power to verify the expected difference 0.012_+ 0.024 ng/ml in serum PSA level in between study group and control group.

INCLUSION CRITERIA:

For study group: Patients presenting with a lump in the breast which was proven to be carcinoma through tissue diagnosis.

For control group: Patients of the similar age admitted in female surgical ward with diseaseother than breast, ovarian and uterine pathology.

EXCLUSION CRITERIA:

For study group:

1. Patients with a lump in the breast which was proven to be benign through tissue diagnosis.
2. Patients associated ovarian and uterine pathology.
3. Pregnant woman
4. Patient of PCOD.
5. Females taking OCPs.

METHODOLOGY:

Patients presenting with clinical features of lump over breast, who got admission as inpatient in the wards of our hospital were enrolled in our study. Serum prostate specific antigen (PSA), sonography study of breast, tissue diagnosis of lump was done. Serum prostate specific antigen level was compared in between control groups and in patients proven to be carcinoma breast through tissue diagnosis. Observations were tabulated according to the pre-designed proforma. A prior informed consent from the participants was taken. The investigations undertaken were:

1. Blood investigation - routine blood examination including complete blood count, differential leucocyte count, PT INR.
2. BIOCHEMISTRY - Serum PSA LEVEL, RBS (Random blood sugar), S.Urea, S.Creatinine, S.Electrolyte, S.Bilirubin, SGOT , SGPT, Alkaline phosphatase, S.Amylase, S.Lipase.
3. Radiological- Chest x ray, ultrasonography bilateral breast with axilla
4. Electrocardiogram (ECG)

OBSERVATION AND RESULTS

The study was conducted among 128 patients out of which 64 patients were included in study group who underwent Modified Radical Mastectomy (MRM) whereas other 64 subjects were taken as controls for PSA values. 38 patients underwent surgery primarily, whereas 26 patients received neoadjuvant chemotherapy and then underwent surgery. Total number of patients in premenopausal and postmenopausal age groups were 36 and 28, respectively. [Table 1]

Among the carcinoma breast patients in study group 38 patients had early breast carcinoma and 26 patients were diagnosed with locally advanced breast carcinoma (LABC). All the 38 patients with early breast carcinoma underwent primary MRM whereas 26 patients with LABC were given neoadjuvant chemotherapy prior to MRM.[Table2]

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The preoperative mean PSA values in study group was 0.273+/- 1.80 and in controls was 051+/_ 0.058 which was statistically insignificant with p value of 0.328. Preoperative mean PSA value in patients less than 50 years in study group was 0.048 +/- 0.016 and in controls was 0.054 +/- 0.067 which was statistically not significant with p value of 0.324.

Table 1: Distribution of study subjects according to age

Age group (years)	Case		Control		Total	
	N	%	N	%	N	%
<50	48	75	48	75	96	75
>50	16	25	16	25	32	25
Total	64	100	64	100	128	100
Mean ± SD	45.31 ± 12.88		45.02 ±11.5			

The preoperative mean PSA values in study group with age < 50years was 0.048+/-0.016 and in age group >50 years was 0.946 +/- 0.60 which is statistically insignificant with p value 0.084. The preoperative mean PSA values in control group with age < 50years was 0.054 +/-0.067 and in age group >50 years was 0.042+/- 0.012 which was statistically insignificant with p value 0.461. [Table 3]

Table 2: Distribution of study subjects Carcinoma cases according to stage ofmalignancy

Stage	N	Percentage
T1N0M0	6	9.4
T1N1M0	2	3.1
T2N0M0	8	12.5
T2N1M0	21	32.8
T2N1MO	1	1.6
T3N1M0	20	31.3
T4N1M0	2	3.1
T4N2M0	4	6.3
Total	64	100

PSA level in the premenopausal case group was 0.047+/- 0.016 and in control group was 0.043 +/- 0.013 which was statically insignificant with p value 0.274. PSA level in postmenopausal age case group was 0.562 +/-2.72 and in control group 0.061+/-0.087 which was statically insignificant with p value 0.335.

Table 3: Comparison of PSA level (ng/dl) among study groups

Group	N	Mean ± SD	Median (Range)
Case	64	0.273 ± 1.80	0.05 (0.01 – 14.46)
Control	64	0.051 ± 0.058	0.04 (0.01 – 0.5)
t = 0.982 with 126 degrees of freedom; P = 0.328			

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In study group, premenopausal group PSA level was 0.047+/- 0.016 andpostmenopausal group PSA level was 0.562+/- 2.72, which was statically insignificant with p value 0.260. [Table 4]

Table 4: Comparison of PSA level (ng/dl) in relation to menstrual status

Menstrual status	Case	Control	P value#
Pre-menopausal	0.047 ± 0.016	0.043 ± 0.013	0.274
Post menopausal	0.562 ± 2.72	0.061 ± 0.087	0.335
P value *	0.260	0.225	

PSA level before MRM surgery was 0.427+/- 2.34 and after MRM was 0.041 +/- 0.014, which is statically insignificant with p value 0.311. [Table 5]

Table 5: Comparison of PSA level (ng/dl) in relation to MRM (Modified Radical Mastectomy) among patients in study group

	Before	After	P value
MRM	0.427 ± 2.34	0.041 ± 0.014	0.311

DISCUSSION

Prostate specific antigen [PSA] is a tumor marker used widely for the diagnosis and monitoring of prostatic adenocarcinoma. Recent studies provided evidence that PSA may also be produced by breast tumor tissue. Study conducted at department of gynecology oncology, university of Turin, Italy showed that PSA concentration in the 200 breast cancer Patients ranged from 0 to 8.8 ng/mg with a median of 0.020 ng/mg. The PSA Positivity rate was 28% in the group of all cancer patients. 33% in patients under the age of 50 and 26% in patients at the age of 50 or older. PSA positive tumor were found in 34% of stage I, 24% of stage II, 18% of stage III and stage IV disease. These findings suggest that PSA production in these tissues may be regulated by mechanism which involve derangement of balance between the various steroid hormone and their receptors and also expression of nonfunctional receptors or deranged post-receptor pathway. Based on the information presented, PSA can now be regarded as a molecule secreted by tissue in malignant diseases. Studies showed that PSA concentration in cytosol extract has a favorable prognostic indicator in breast cancer. [7] YU et al. clinical studies shown that PSA in breast cancer is associated with presence of progesterone receptor and patients with PSA-positive tumors have a lower risk of recurrence and death in comparison with patients whose tumors are PSA negative, thus PSA is a new candidate favorable prognostic indicator in female breast cancer. [8] No study has yet been published examining whether serum PSA concentrations are higher in women with breast cancer than in healthy controls or whether the PSA levels in breast tumor affects the PSA concentration in the serum. Currently there is no established diagnostic value of PSA measurement in female serum. PSA is found in 60% of breast cancer cytosols, it is worthwhile examining if PSA is also present in the serum of breast cancer patients and if the serum level have any clinical implication. This study conducted in an attempt to know, if serum PSA measurement in female serum have any diagnostic value. Serum PSA level of breast cancer patients were compared with control group S.PSA level & pre surgical and post-surgical levels are also been compared. In the current study among 64 cases there is no significant correlation between S.PSA level and carcinoma breast. [9] There is no significant difference between Pre surgical and post-surgical serum PSA level in carcinoma breast. There is no significant relation of premenopausal and post-menopausal condition of carcinoma breast patients with S.PSA level. In prostate, PSA enters the circulation by physical diffusion. Factors that affect the transport of PSA from tissue to blood may also be considered at this point. [10, 11] The current study with 64 case sample size cannot be generalized to entire population, hence bigger studies

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with greater sample size is required for the assessment of role of serum PSA as a diagnostic marker in carcinoma breast.

CONCLUSION

This study conducted in an attempt to know, if serum PSA measurement in Female patients with carcinoma breast have any diagnostic value. Serum PSA level of breast cancer patients were compared with control group S.PSA level and pre surgical and post-surgical levels are also been compared. After statistical analysis, the conclusion made that, there is no significant correlation between serum PSA level and carcinoma breast and also no significant difference between Pre surgical and post-surgical serum PSA level in patients with carcinoma breast.

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