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Original Research

Evaluation of serum beta-2 microglobulin levels in breast cancer patients

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ABSTRACT:

Background: The present study was conducted for evaluating serum beta-2 microglobulin levels in breast cancer patients. **Materials & methods:** A total of 50 breast cancer patients and 50 healthy controls were enrolled in the present study. Patients diagnosed with clinically and histologically confirmed cases of breast cancer above 25 years of age were included while patients with history of treatment of malignancy were excluded. All the patients included in the study signed a consent form. To estimate serum beta-2 microglobulin, specimens were collected in a 5 ml syringe from ante cubital vein. Blood was then allowed to clot and the serum was separated by centrifugation. The serum was analyzed for levels of beta-2 microglobulin by enzyme-linked immunosorbent assay. **Results:** Mean serum levels of beta-2 microglobulin among patients with breast cancer was 4.23 mg/L while among healthy controls, it was found to be 1.38 mg/L. While comparing the results statistically, significant results were obtained. **Conclusion:** Beta-2 microglobulin levels are significantly altered in breast cancer patients highlighting their role in the pathogenesis of the disease.

Key words: Beta-2 microglobulin, Breast cancer patients

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INTRODUCTION

The incidence of breast cancer in Europe parallels the American data. Despite significant incremental advances in diagnosis and treatment in the past generation, the specter of breast cancer is as haunting now as it was in the middle of the 20th century. When screening mammography should begin has been a contentious subject and currently varies from country to country as well as from city to city. In the USA, annual mammography after age 40 is the recommendation of many cancer specialists and cancer organizations. When a breast biopsy, however performed, proves the diagnosis of cancer, its clinical stage should be determined. The most commonly used staging system is that promulgated by the American Joint Committee on Cancer (AJCC) and is based upon the assessment of tumor size, local findings in breast (T) and axilla (N), and presence of overt metastatic disease (M).¹⁻³

Beta-2 microglobulin is synthesized in all nucleated cells and forms the light chain subunit of the major

histocompatibility complex class I antigen. Free soluble beta-2 microglobulin can be detected in blood, urine, and cerebrospinal fluid, following its release from the cell surface or cytoplasm. Specifically, measurement of serum beta-2 microglobulin is essential for baseline work up of patients with malignant neoplasms.⁴⁻⁷ Hence; the present study was conducted for evaluating serum beta-2 microglobulin levels in breast cancer patients.

MATERIALS & METHODS

The present study was conducted for evaluating serum beta-2 microglobulin levels in breast cancer patients. A total of 50 breast cancer patients and 50 healthy controls were enrolled in the present study. Patients diagnosed with clinically and histologically confirmed cases of breast cancer above 25 years of age were included while patients with history of treatment of malignancy were excluded. All the patients included in the study signed a consent form. To estimate serum beta-2 microglobulin, specimens were collected in a 5

ml syringe from ante cubital vein. Blood was then allowed to clot and the serum was separated by centrifugation. The serum was analyzed for levels of beta-2 microglobulin by enzyme-linked immunosorbent assay. All the results were recorded in Microsoft excel sheet followed by statistical analysis using SPSS software. Student t test was used for evaluation of level of significance.

RESULTS

Mean age of the subjects of breast cancer group and healthy controls was 48.8 years and 45.1 years respectively. Mean BMI among patients of breast cancer group and healthy controls was 26.7 Kg/m² and 25.2 Kg/m² respectively. Majority of subjects of both the study groups were of rural residence. Mean serum levels of beta-2 microglobulin among patients with breast cancer was 4.23 mg/L while among healthy controls, it was found to be 1.38 mg/L. While comparing the results statistically, significant results were obtained.

Table 1: Demographic data

Variable	Breast cancer patients	Healthy controls
Mean age	48.8	45.1
Mean BMI (Kg/m ²)	26.7	25.2
Rural residence	28	30
Urban residence	22	20

Table 2: Comparison of serum beta-2 microglobulin levels

Serum beta-2 microglobulin	Breast cancer patients	Healthy controls
Mean (mg/L)	4.23	1.38
SD	1.23	0.84
p- value	0.0078 (Significant)	

DISCUSSION

Despite advances in the diagnosis and treatment of human malignancy, cancer remains among the leading causes of morbidity and mortality worldwide, with 7.5 million deaths attributed to cancer in 2008. Breast cancer is now the most frequently diagnosed cancer and the leading global cause of cancer death in women, accounting for 23% of cancer diagnoses (1.38 million women) and 14% of cancer deaths (458,000 women) each year. Although breast cancer has a markedly higher incidence in developed countries, half of new breast cancer diagnoses and an estimated 60% of breast cancer deaths are now thought to occur in the developing world. Metastatic disease, or the spread of tumor cells throughout the body, is responsible for the vast majority of cancer patient deaths and represents the central clinical challenge of solid tumour oncology.⁸⁻¹⁰

Mean age of the subjects of breast cancer group and healthy controls was 48.8 years and 45.1 years respectively. Mean BMI among patients of breast cancer group and healthy controls was 26.7 Kg/m² and 25.2 Kg/m² respectively. Majority of subjects of both the study groups were of rural residence. In a previous study conducted by Daver A et al, authors expressed the expression of beta2-Microglobulin in cancer patients. Cancerembryonic antigen (CEA) and beta2-microglobulin (beta2m) have been measured in cancer patients and patients with benign diseases. Of 168 patients with intestinal cancer, almost 90% had increasing concentrations of either CEA or beta2m or both. In 29 patients at different stages of pancreatic cancer there was a high incidence of increased values in the more severe cases. In 60 patients with histologically classified colorectal cancer the

TNomegaMomega group of 19 patients had 47% and 42% of elevated beta2m and CEA respectively. A significant correlation of beta2m or CEA to extension of disease was noted. In benign intestinal disease like cirrhosis and pancreatitis both beta2m and CEA is commonly elevated. Of 26 breast cancer patients, seven had elevated CEA and five had elevated beta2m values before treatment. In the patients with extraganglionic metastasis almost 90% had high beta2m or CEA or both. Of 40 patients with uterine cancer, 26 were found to have increased values of beta2m or CEA or both. Finally, 140 colorectal cancer patients, 62 patients with breast cancer and 10 patients with uterine cancer have been followed longitudinally.¹⁰

Mean serum levels of beta-2 microglobulin among patients with breast cancer was 4.23 mg/L while among healthy controls, it was found to be 1.38 mg/L. While comparing the results statistically, significant results were obtained. In a study conducted by Nulder H et al; of 19 patients with breast cancer serum beta 2 microglobulin (beta 2 mu) was evaluated as a tumour marker. Serum beta 2 mu did not correlate with tumour stage, survival time, or histological differentiation grade. Nor did a change of serum beta 2 mu reflect a change of tumour mass. Additionally, serum beta 2 mu lacks specificity and sensitivity, as only 21% of our patients had an increased serum beta 2 mu.¹¹ Serum beta2-microglobulin levels have been measured in a previous study conducted by Teasdale C et al, in 210 cancer and control patients to assess the significance of this investigation in cancer patients. Subjects studied included patients with breast and gastrointestinal cancer, corresponding control patients in both categories, and healthy volunteers. The

composition of these groups allowed an assessment of the relative importance of changes related to cancer, benign disease, age and sex. A significant rise in serum beta2-microglobulin levels with advancing age was demonstrated in the control subjects. Mean levels were also consistently higher in females than in males in each patient group. After statistical correction for these age and sex effects, mean values remained significantly higher in each of the various cancer groups than in their controls. Patients with more advanced breast cancer had higher levels than those with 'early' disease, as did patients with stomach cancer compared to those with colo-rectal cancer.¹²

CONCLUSION

It can be inferred that beta-2 microglobulin levels are significantly altered in breast cancer patients highlighting their role in the pathogenesis of the disease.

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