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Research paper
**SERUM MAGNESIUM LEVELS IN WOMEN WITH
BREAST CANCER IN BENIN CITY, NIGERIA**

Abstract

The purpose of the present study was to compare the serum magnesium levels of patient with breast cancer and those without the disease. Venous blood was obtained from participants and serum magnesium levels was determined using standardized laboratory methods. Results showed that there's a statistical reduction ($P<0.05$) in serum magnesium levels of patients with breast cancer compared to the control.

Key words: serum magnesium, breast cancer.

Introduction

Breast cancer is the commonest malignancy among females worldwide¹. The exact cause of breast cancer is unknown but however some risk factors include age, family history, life style (alcohol consumption, hormone use), obesity, reproductive and other factors. Researchers at the University of North Dakota are suggesting that analysis may be ignoring a more important factor – magnesium.

Aleksandrowicz et al also reported in Poland that inadequacy of magnesium and antioxidants are important risk factor in predisposing to leukemia².

Studies have shown that 46% of patients admitted to an ICU (intensive care unit) in a tertiary cancer center presented with hypomagnesemia and they concluded that the incidence of hypomagnesemia in critically ill cancer patients is high³. The incidence rises to as high as 60 to 65% in patients in all intensive care setting in which nutrition, diuretics, hypoalbuminemia, and aminoglycosides may play important roles^{4,5,6}.

Over 300 enzymes systems that influences the metabolism of carbohydrate, amino acids, nucleic acid and protein and ion transport, requires magnesium^{7,8}. The role of magnesium in fatty acid and phospholipids acid metabolism, that affect permeability and stability of membrane, are being elucidated^{9,10,11}.

It has been proposed that magnesium is central in the cell cycle, and that its deficiency is an important conditions in pre cancerous cell transformation^{12,13,14}. Magnesium deficiency would therefore lead to physiological decline in cells setting the stage for cancer.

It is known that carcinogenesis induces magnesium distribution disturbance, which cause magnesium mobilization through blood cells and magnesium depletion in non-neoplastic tissue. Magnesium deficiency seems to be carcinogenic and in case of solid tumours a high level of supplemented magnesium inhibits carcinogenesis¹⁵.

The objective of this study is to evaluate and compare serum magnesium levels of patients with breast cancer with those without the disease.

Patients and methods

A total of 60 participants were recruited for this study from the female surgical ward central hospital Benin City from 1st July 2011 through 31st October 2012 (15 months). 30 of these women (50%) had breast cancer and 30 women (50%) without the disease were control.

The study was approved by the management of the hospitals and participation was voluntary.

Biochemical analysis was done at the department of chemical pathology, university of Benin Teaching Hospital.

Sample collection and preparation

Venous blood was obtained from participant, allowed to clot and retract and then centrifuged at 3000 RPM for 15mins. The sera were harvested and stored frozen at -20⁰c until analysis was carried out.

Data analysis

Data analysis was conducted using the general linear model of SAS (Statistics for agric and science), 2004 model. The result of the study was expressed as mean $\pm$ standard error of mean.

Analysis of variance was used to test for difference in the group. Duncan's multiple range tests was employed to separate the mean that show significant difference.

Assay method

Serum magnesium levels were assayed for using the direct spectrophotometric method. In the reaction, magnesium forms a coloured complex with calmagite in alkaline medium to produce a red complex that is measured spectrophotometrically at 539 nm. EGTA (ethylene glycol tetra acetic acid) serves to complex and prevent calcium interference, and a surfactant eliminates the effect of protein. The colour produced is proportional to the magnesium concentration¹⁶.

The concentration of magnesium is obtained from the equation

$$\frac{\text{Absorbance of sample}}{\text{Absorbance of standard}} \times \frac{\text{concentration of standard}}{\text{concentration of sample}}$$

Using this method, the normal range for serum magnesium was 1.3 – 2.5m Eq/L.

Result

Participants were menopausal and post menopausal. Patient with breast cancer mean age group was 55 ± 1.6 (range 45 to 65) years and the mean age of the control was 51 ± 1.4 (range 42 to 66)

Serum magnesium level of the participant with CA breast was 1.095 ± 0.007 and the control was 2.520 ± 0.053 ($P < 0.05$).

Findings below is an histogram of serum magnesium levels of breast cancer patients vs control



This is an histogram showing serum magnesium level of breast cancer patient vs control

Key

Control

Breast Cancer Patient

Discussion

The findings from this study showed reduced serum magnesium level in breast cancer patient compared to the control.

Studies have showed that 4% of breast cancer women in the United kingdom are due to alcoholic consumption. It was showed that women who had one or two drinks a day increased their risk of developing breast cancer by 10%, while those that had more than three drinks a day raised their risk by 30%. This probably may be due to the fact that alcohol causes a reduction in magnesium levels. According to Dr. Russell Blaylock, low magnesium level is associated with dramatic increase in free radical generation as well as glutathione depletion and this is implicated in infection and cancer¹⁷.

Studies have shown an increase cancer rate in region with low magnesium level in soil and drinking water. School of public health at the Kaohsiuny medical college in Taiwan, found that magnesium also exerts a protective effect against gastric cancer¹⁸. Pretreatment hypomagnesemia has been reported in young leukaemic children, 78% of whom have history of anorexia, and have excessive gut and urinary loss of magnesium.

Study from Sweden reported that women with the highest magnesium intake had a 40% lower risk of developing cancer than those with the lowest intake of mineral²⁰. Research also reported from the school of public health at the University of Minnesuta have just concluded that diet rich in magnesium reduced the occurrence of colon cancer²¹.

It has also been reported that cancer patient receiving chemotherapy may be at high risk for developing hypomagnesemia due to side effects such as diarrhea that can deplete magnesium stores²².

Conclusion

We have demonstrated from this present study that the participant with breast cancer have reduced serum magnesium level compared to the control and it is advisable to add magnesium as an adjuvant therapy in their management. Magnesium should also be routinely assayed for in patients with breast cancer as a baseline investigation and during the course of chemotherapy.

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