BJMHR
British Journal of Medical and Health Research
Journal home page: www.bjmhr.com

Assessment of Plasma Calcium, Phosphorous and Magnesium Levels in Patients with Benign and Malignant Breast Tumor

Ebtehal Mohamed Fawzi Osman[1]*, AbdElkarim A. Abdrabo[1]
1.Department of Clinical Chemistry, Faculty of Medical laboratory Sciences- Al-Neelain University.

ABSTRACT

Significant differences occurs in the normal distribution of the trace elements in patients with breast cancer, this may play an important role in carcinogenic process. In this study we compared plasma elements in patients with benign and malignant breast tumor to find any relation may have a prognostic and predictive value. This was descriptive cross sectional study which conducted in Soba teaching hospital in Khartoum State during the period from September to December 2016. Blood samples from 60 women were divided in 2 groups; 30 subjects with benign and 30 malignant breast tumors. Blood sample was drawn in heparinized container then centrifuged at 3000 RPM for 3 minute to obtain plasma. Hemolyzed samples were excluded from study, and then 3.0 ml plasma samples were preserved at -20ºC prior to processing. Plasma Calcium (Ca), Phosphorus (Po_4) and Magnesium (Mg) were measured using full automated analyzer (cobass, c311, ROCHE GERMAN).The mean concentration of plasma caalcium (mg/L) levels were significantly decreased in patients with malignant breast tumor compared with benign tumor *P-value* ($P < 0.05$). In contrast magnesium and phosphorus mean levels were not significant changed *P-value* ($P > 0.05$). Duration of cancer significantly affect the plasma levels of magnesium. In conclusion, patients with breast cancer have lower levels of serum calcium and phosphate compared to benign breast tumor, while no changes observed in magnesium levels.

Keywords: benign and malignant breast tumor, trace element.

*Corresponding Author Email: abdrabokarim@hotmail.com
Received 2 January 2017, Accepted 27 February 2017

Please cite this article as: AbdElkarim AA *et al*., Assessment of Plasma Calcium, Phosphorous and Magnesium Levels in Patients with Benign and Malignant Breast Tumor. British Journal of Medical and Health Research 2017.

INTRODUCTION

Breast cancer is the commonest malignancy among females worldwide.[1]The exact cause of breast cancer is unknown; however some risk factors include age, family history, life style (alcohol consumption, hormone use), obesity and post menopausal women with Hypercholesterolemia. Breast cancer is the leading cause of cancer related death in women overseas. In the United States, breast cancer is the most frequent female cancer, the second most common cause of mortality rate in women after lung cancer and represents the main cause of mortality in women ages 20 to 59 years.[2, 3]berast cancer originates from the terminal ductallobular unit of breast tissue and has two different growth types: invasive or non-invasive. Most breast cancers are invasive at the time point of diagnosis.[4]

In Sudan a study revealed that 74% of the women were <50 years old or premenopausal. Invasive ductal carcinoma was the most common pathology (82%) and women presenting with stage III or higher tumors that had already metastasized, while ductal carcinoma in situ was the least prevalent (0.5%) finding. [5]Another recent study showed that breast cancer represents 20% of all cancer cases reported in the National Cancer Institute (NCI), University of Gezira, Sudan.[6]

The relation between plasma Ca and breast cancer risk remains argumentative. An inverse relation between dietary calcium intake and breast cancer risk was reported due to anti-proliferative and pro-differentiation effects on mammary cells. [7, 8]

Serum magnesium deficiency (Mg) has a noticed role in cell proliferation, DNA mutations resulting carcinogenesis changes but the role of Mg in tumor development and in tumor pathology is complicated.[7]

There are many reports that showed increased level of phosphorus in the blood as indication for the existence of unidentified cancerous tumor.[9]

MATERIALS AND METHOD

In this cross-sectional study, 60 subjects were enrolled, 30 diagnosed as benign breast tumor and 30 malignant tumor patients aged from (20 to 66) years from Soba teaching hospital were included; Random (5ml) vein puncture blood specimen was collected. Plasma was obtained by centrifugation of blood at 3000 rpm for10 min and stored at -20°C till used ,then measured and analyzed of plasma Ca, Po and Mg by using full automation (Cobas, c311, ROCHE GERMAN).

The study has been approved by the local ethics committee of Al-Neelain University. All participants in the study were given their written informed consent considering the aims of the study, sample and clinical information's were used anonymously.

Statistical analysis

The student's t-test was employed to compare differences between the mean concentration of study parameters and person's correlation for association between study variables. P-value 0.05 was considered statistically significant. Data were analyzed by SPSS (Version 16.0; SPSS Inc).

RESULTS AND DISCUSSION

A total of 60 individual participants in this study .There were categorized into two groups the first group consist of 30 women confirmed diagnosis with breast cancer. The second group consists of 30 women confirmed diagnosis with benign breast cancer. There was statistically significant decrease of Ca (mg/dl) level in breast cancer compared to benign breast cancer with p –value (0.000). On the other hand, there were no statistically significant differences of $PO_4$and Mg (mg/dl) among study groups with p –value (0.081, 0.352) respectively (Table 1).

There was no statistically significant effect of the duration of cancer on the level of Ca and PO_4 (mg/dl). Moreover, the mean level of Mg (mg/dl), Was significant decrease in the women having breast cancer for less than 5years compared to those having breast cancer for more than 5years showing in Table 2.

There was no statistically significant effect of duration of cancer on the trace element level in women with benign breast cancer (Table 3).

The mean level of trace element showed no statistically significant of breast cancer patients according to cancer staging as showing in (Table 4).

The mean level of trace element showed no statistically significant of breast cancer patients according to types of therapy as showing in (Table 5).

Table 1: Association between trace element in breast cancer and benign tumor

Element	Breast cancer		Benign breast cancer		P .value
	Mean (mg/dl)	SD	Mean(mg/dl)	SD	
Calcium	7.63	1.81	9.35	0.66	0.000
Phosphate	3.10	0.83	3.44	0.66	0.081
Magnesium	1.78	0.19	1.83	0.16	0.352

Table 2: correlation of trace element according to duration of breast cancer

Less 5Years			More 5 Years		
element	Mean	SD	Mean	SD	P. value
Ca	7.5273	1.77393	7.9125	2.01950	.616
Po_4	3.1500	.83138	2.9625	.87331	.594
Mg	1.7409	.18168	1.9125	.18851	.031

Table 3: correlation of trace element according to duration of benign cancer

Less 5Years			More 5 Years		
Trace element	Mean	SD	Mean	SD	P. value
Ca	9.4889	.68332	9.1417	.60821	.166
Po_4	3.5000	.69282	3.3667	.65412	.602

Mg	1.8111	.14096	1.8583	.18809	.438

Table 4: association of trace element according to breast cancer staging

Trace element	stage	Mean	SD	P. value
Ca	II	7.5833	1.67920	.983
	III	7.7083	2.06726	
	IV	7.5667	1.86297	
Po_4	II	3.1083	.81068	.934
	III	3.0417	.95485	
	IV	3.2000	.73485	
Mg	II	1.7833	.17495	.709
	III	1.8167	.22496	
	IV	1.7333	.19664	

Table 5: association of trace element according to types of therapy

Trace element	Treatment	Mean	SD	P. value
Ca	Chemotherapy	7.8318	1.59892	.322
	surgery	8.3500	1.34350	
	Chemo/surgery	6.6500	2.54224	
Po_4	chemotherapy	3.1909	.78188	.244
	surgery	3.5500	1.20208	
	Chemo/surgery	2.6167	.87044	
Mg	chemotherapy	1.7818	.20151	.704
	surgery	1.7000	.14142	
	Chemo/surgery	1.8333	.20656	

DISCUSSION

Breast cancer rates are much higher in developed nations compared to developing ones. There are several reasons for this, with possibly life expectancy being one of the key factors. Breast cancer is more common in elderly women; women in the richest countries live much longer than those in the poorest nations. The different lifestyles and eating habits of females in rich and poor countries are also contributory factors, experts believe. Breast cancer is the most common invasive cancer in females' worldwide.[10-12]

The relation between plasma Ca and breast cancer risk remains argumentative. An inverse relation between dietary calcium intake and breast cancer risk was reported due to anti-proliferative and pro-differentiation effects on mammary cells.[7, 8]

The result of present study showed that, calcium significantly lower in breast cancer compared to benign breast tumor with p- value(> 0.05), In contrast to our finding Siddiqui. et al. have reported a higher Calcium level in blood of malignant breast tumor than in those of their benign breast tumor[13].

Serum magnesium deficiency (Mg) has a noticed role in cell proliferation, DNA mutations resulting carcinogenesis changes but the role of Mg in tumor development and in tumor pathology is complicated.[7], the present study observed significant decrease in mean

magnesium level of malignant breast cancer less than 5 year to those more than 5 years this may exaggerate the cellular damage due to reactive oxygen specious.

There are many reports that showed increased amount of phosphorus in the blood as indication for the existence of unidentified cancerous tumor,[9] but based on our results both groups had normal blood phosphorus concentration.

In this study, there are no correlations detected between stage and treatment used with serum levels of trace element.

CONCLUSION

Serum levels of calcium and phosphate were significantly lower in patients with breast cancer compared to benign tumors of the breast and there is no effect of stage and treatment on these minerals level.

REFERENCES

1. Parkeh DM, Piscani P, Ferlay J. Estimates of the worldwide incidence of 25 cancer ch 1990. Intl. J. Cancer. 1999;80:827–841
2. **2**.Siegel R, Naishadham D, Jemal A. Cancer statistics, 2013.CA Cancer J Clin. 2013; 63(1):11-30.
3. Silva MP, Soave DF, Ribeiro-Silva A, et al. Trace elements as tumor biomarkers and prognostic factors in breast cancer: a study through energy dispersive x-ray fluorescence. BMC Res Notes. 2012 Jul 6; 5:194.
4. Simpson PT, Reis-Filho JS, Gale T, et al. (2005). Molecular evolution of breast cancer. J Pathol; 205:248-54.
5. Elgaili EM, Abuidris DO, Rahman M, Michalek AM, Mohammed SI.Breast cancer burden in central Sudan. International Journal of Women's Health. (2010) 2:77-82.
6. Elhaj AM, Abdalsalam A I, Abuidris A O, Eltayeb A A. Overall survival of females with breast cancer in the National Cancer Institute, University of Gezira, Sudan, Sudan Med Monit. (2015)10:1-6.
7. Sahmoun AE, Singh BB. Does a higher ratio of serum calcium to magnesium increase the risk for postmenopausal breast cancer? Med Hypotheses. 2010 Sep; 75(3):315-8.
8. Sprague B, Skinner H, Trentham-Dietz A, et al. Serum Calcium and Breast Cancer Risk in a Prospective Cohort Study. Ann Epidemiol. 2010 Jan; 20(1):82-5.
9. Papaloucas CD, Papaloucas MD, Kouloulias V, Neanidis K, Pistevou-Gompaki K, Kouvaris J, et al. Measurement of blood phosphorus: A quick and inexpensive method for detection of the existence of cancer in the body. 2014 Jan; 82(1):24-5.
10. Carvalho ML, Magalhães T, Becker M, et al. Trace elements in human cancerous and healthy tissues: A comparative study by energy dispersive X-ray fluorescence(

EDXRF),Proton induced X-ray emission (TXRF), synchrotron radiation and Total reflection X-ray fluorescence(PIXE). Spectrochimica Acta Part B: Atomic Spectroscopy. 2007; 62(9):1004–11.

11. Rehman S, Husnain SM. A probable risk factor of female breast cancer: study on benign and malignant breast tissue samples. Biol Trace Elem Res. 2014; 157(1):24-9.
12. Yigit E, Gönüllü G, Yücel I, et al. Relation between hemostatic parameters and prognostic/predictive factors in breast cancer. Eur J Intern Med. 2008; 19(8):602-7.
13. Siddiqui MK, Singh S, Mehrotra PK, et al. Comparison of some trace elements concentration in blood, tumor free breast and tumor tissues of women with benign and malignant breast lesions: an Indian study. Environ Int. 2006; 32(5):630-7