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International Journal of Current Research
Vol. 6, Issue, 11, pp.10258-10260, November, 2014

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

THE ROLE OF DEVELOPING BREAST CANCER IN ALTERATION OF ESTROGEN LEVEL IN SUDANESE WOMEN

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ARTICLE INFO

Article History:
Received 20th August, 2014
Received in revised form
23rd September, 2014
Accepted 17th October, 2014
Published online 30th November, 2014

Key words:
Breast cancer,
Estrogen,
Sudan,
Women.

ABSTRACT

This study was carried to determine the concentration of serum estrogen in women with breast cancer using enzyme linked immunosorbent assay. Among 150 breast cancer female patients and 80 healthy females (control), venous blood samples were collected sera were separated to be used in estrogen measurements. The results showed that developing breast cancer decreased the estrogen level significantly less than the control. The age grouping showed significant effects on estrogen levels, in which women below 20 years and those above 50years showed the least levels while women in 30-39 years showed the highest levels. The estrogen level in women with breast cancer was decreased by increasing the number of pregnancy showing the minimum level in those with pregnancy of more than 5 times and the maxim level in those who were not get pregnant. Some other disorders associated with breast cancer made significant changes in estrogen level. The diabetes mellitus lowering the level significantly, hypertension increasing the level significantly, but those with no history showed highest level (significantly).

INTRODUCTION

The hormone estrogen works as a chemical messenger in the body. It is essential for normal sexual development and functioning of female organs important for childbearing like the ovaries and uterus. Estrogen also helps regulate a woman's menstrual cycles. It is necessary for the normal development of the breast. It also helps maintain the heart and healthy bones (Zhang *et al*., 2014). The name comes from the Greek οἶστρος (oistros), literally meaning "gadfly" but figuratively sexual passion or desire (Greek Word Study Tool, 2011). The ovaries release sex hormones estrogen and progesterone, which control all kinds of female reproductive mayhem from period regulation to baby making (Heiman *et al*., 2011). Improving estrogen metabolism can be of benefit in women with various conditions and family histories, including a family history of breast, uterine, or ovarian cancer. Beneficial modulation of estrogen metabolism can be accomplished through dietary and lifestyle modifications such as increasing phytestrogen intake, losing weight, and increasing exercise. In addition, many nutrients effectively reduce estrogen load by support in. Preferred pathways of estrogen metabolism and detoxification includes B vitamins, magnesium, and anti-oxidants (Wu *et al*., 2009).

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The actions of estrogen are mediated by the estrogen receptor (ER), a dimeric nuclear protein that binds to DNA and controls gene expression. Like other steroid hormones, estrogen enters passively into the cell where it binds to and activates the estrogen receptor. Since estrogen enters all cells, its action is dependent on the presence of the ER in specific tissues including the ovary, uterus and breast (Nelson *et al*., 2013). While estrogens are present in both men and women, they are usually present at significantly higher levels in women of reproductive age. They promote the development of female secondary sexual characteristics, such as breasts, and are also involved in the thickening of the endometrium and other aspects of regulating the menstrual cycle. In males, estrogen regulates certain functions of the reproductive system important to the maturation of sperm (Jankowska *et al*., 2009). In women, estrogen controls growth of the uterine lining during the first part of the menstrual cycle, causes changes in the breasts during adolescence and pregnancy and regulates various other metabolic processes, including bone growth and cholesterol levels (Zierau *et al*., 2012).

The breast cancer (malignant breast neoplasm) is a type of cancer originating from breast tissue, most commonly from the inner lining of milk ducts or the lobules that supply the ducts with milk (Sariego., 2010). Physicians divide cancer into four main stages. Most physicians use the American Joint Committee on Cancer staging system.

Stage I breast cancer: The tumor is no more than 2 centimeters (cm), there are no cancer cells in the lymph nodes in the armpit, and the cancer has not spread anywhere else.

Stage II breast cancer: The lymph nodes under the arm contain cancer and the cancer has not spread and the lymph nodes under the arm contain cancer but the cancer has not spread.

In the stage 2A the tumor is less than 2 cm while in the stage 2B the tumor is about 2-5 cm.

Stage III breast cancer: Although no tumor is seen in the breast, the lymph nodes under the arm contain cancer cells and they are stuck together or stuck to other structures, but there is no sign of cancer spread.

Stage IV breast cancer: The tumor can be measured any size, the lymph nodes may or may not contain cancer cells, and the cancer has spread (metastasised) to other parts of the body such as the lungs, liver or bones (Lacroix *et al*., 2006).

So, this study was designed to evaluate the alteration of estrogen status due to breast cancer in Sudanese women.

MATERIALS AND METHODS

Study design: This study was designed as across-sectional study.

Study area: This study was carried in Khartoum state, in Al-Amal hospital, hospital of the Radiation and Isotopes Center Khartoum (RICK) and Khartoum teaching hospital.

Study population: The study was carried on women with breast cancer with clinical and histopathological evidence. Pre-prepared questionnaire including data concerning patients and their breast cancer information (such as age, menstrual cycle, type of treatment, and number of pregnancies) was used. The patients those take drugs affect on estimation and/or with major hormonal disorder and those who refused to participate in this study were excluded.

Study size: The study included 150 female patients with breast cancer and 80 normal healthy volunteers as control group.

Study period: The study was carried between October 2011 and September 2013.

Sampling: 3ml venous blood samples were obtained from each female using standard venipuncture technique. Serum specimens were collected in plane container after centrifugation at 3000 rpm for 5 minutes. The serum stored at -20°C until analysis.

Method of estrogen estimation: The method used was delayed competitive enzyme immunoassay using Commercial Estradiol Immunoassays as described by Daniel (Daniel *et al*., 2011).

Statistical analysis: Statistical analysis was performed using statistical package for social sciences (SPSS). Statistical significance and differences from control and test values were evaluated by student t-test, at which the p value of less than 0.05 considers the significance.

Ethical consideration

This study will approved by the Omdurman Islamic University under the control of Khartoum teaching hospital.

RESULTS

As in Table 1, estrogen levels of females with breast cancer were significantly decreased when compared with the control group.

Table 1. Effect of breast cancer on estrogen compared to control

	Estrogen (pg/ml)	P value
Breast cancer	43.18	0.00
Control	117.88	

As in Table 2, the estrogen levels of females with breast cancer were significantly changed when comparison was carried by ages. The age group of 30-39 years showed the highest results and age group of less than 20 years and that of more than 50years showed the lowest results.

Table 2. Estrogen in breast cancer patients according to ages

Years	Estrogen (pg/ml)	P value
<20	1	0.021
20-29	70	
30-39	46.46	
40-49	38.33	
>50	1	

As in Table 3, the estrogen levels of females with breast cancer were significantly changed when comparison was carried by historical diseases. The highest results were in patient with no history, and the lowest results were in diabetes mellitus.

Table 3. Estrogen in breast cancer patients as associated with other disease

Historical disease	Estrogen (pg/ml)	P value
Diabetes mellitus	1	0.001
Hypertension	23.33	
Irregular menstrual cycle	18	
No history	47.52	

As findings in Figure 1, estrogen levels of females with breast cancer were significantly changed (p value=0.00) when the comparison was carried by the number of pregnancy. The highest results were found in patient with no pregnancy and pregnancy >5 showed the lowest results.

DISCUSSION

Estrogen is suspected to be responsible for development of human breast cancer, and also helps regulate a woman's menstrual cycles.

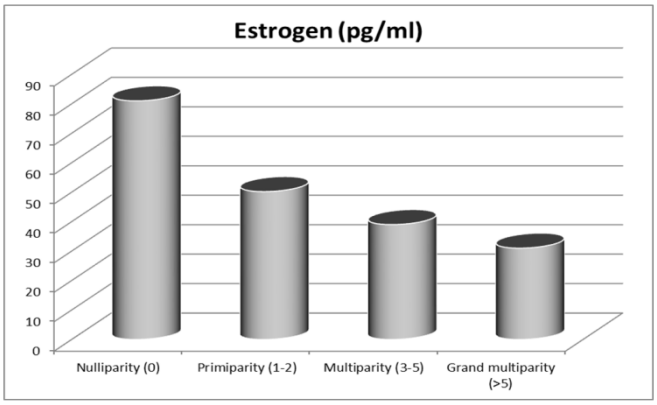

Figure 1. Estrogen in breast cancer patients according to number of pregnancy

In this study, the mean serum estrogen concentration in breast cancer woman (43.18pg/ml) showed significant decreasing (p value=0.00) when compared to the control group (117.88pg/ml). These results were found to be similar to the report of Abdalsalam (2010). Also, the study showed that the estrogen level was significantly affected by age (P value=0.021). The patients of ages below 20 years and above 50years showed the least levels (1 pg/ml), while women in ages between 30-39 years old showed the highest levels (46.46 pg/ml). These finding were found to be inline with that report of Sariego (2010). In this study, when evaluated serum estrogen levels according to association with other disease, the result showed significant variations (p value 0.001). Diabetes mellitus, Hypertension and Irregular menstrual cycle showed 1, 23.33 and 18 pg/ml respectively. While the patients with only breast cancer showed 47.52pg/ml. These findings were in agreement with that report of Pritchard (2009). The serum estrogen levels were significantly affected when evaluated by the number of pregnancy (p value=0.001). The estrogen level in women with breast cancer was decreased by increasing the parity were 81, 50.2, 39, 31 pg/ml in nulliparity, primiparity, multiparity and grand multiparity respectively. These finings consisted with the report of López-García *et al*. (2013).

In conclusion, the breast cancer decreased estrogen levels significantly; the women with breast cancer and diabetes mellitus showed much decreasing in estrogen rate.

Acknowledgement

We would like to thank Mr. Balola A M and Mr. Ali M A for their valuable assistance for the completion of this study.

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