

**EVALUATING THE LEVELS OF SOME HORMONAL PARAMETERS IN WOMEN WITH BREAST CANCER****Alia Kareem Al-Kufee<sup>1</sup> and Dr. Saher Mahmood Jwad<sup>2</sup>**<sup>1</sup>Biology Department, Faculty of Education for Girls, University of Kufa., Iraq<sup>2</sup>Professor, Biology Department, Faculty of Education for Girls, University of Kufa., Iraq**ABSTRACT**

*Current study was conducted to diagnose the relationship between the levels of some hormonal parameters, represented by the hormones cortisol and prolactin, and the incidence of breast cancer, and the extent to which they can be adopted as biomarkers for early detection of breast cancer. The study was conducted in Najaf Governorate; the study period is from 12/1/2022 to 12/1/2023. The patients were divided into several groups based on age, body mass index, smokers and non-smokers, and those with and without high blood pressure. The study also included taking blood samples from (50) women who visited the Middle Euphrates Oncology Center and private oncology clinics in the governorate. Al-Najaf Al-Ashraf, who was diagnosed with breast cancer, and (40) healthy women as a control group. The ages of the women in both groups ranged between (30 - 70) years. The results showed a significant effect ( $P < 0.05$ ) of age groups on the levels of the hormones cortisol and prolactin. The results also revealed a notable impact ( $P < 0.05$ ) of body mass index on cortisol levels only, while no significant differences ( $P > 0.05$ ) appeared in prolactin levels to BMI. The study indicated a significant effect ( $P < 0.05$ ) of smoking on cortisol levels, while no significant changes ( $P > 0.05$ ) were observed in prolactin levels when comparing smoking and non-smoking women with breast cancer. There were no observable influences ( $P > 0.05$ ) of blood pressure on the levels of hormonal parameters.*

**CONCLUSION**

*Reading the results ( $P < 0.05$ ) indicated a significant increase in the levels of the hormonal parameters cortisol and prolactin in women with breast cancer compared to the control group.*

*Keywords: Breast cancer, Cortisol, Prolactin*

**INTRODUCTION**

Breast cancer is a malignant tumor that arises as a result of changes in the division, growth, and function of some cells that make up breast tissue without the ability to control it [1]. Breast cancer, like any other type of cancer, can spread to any other organ in the body [2]. It can arise in some places in the breast, such as the ducts (ductal carcinoma) or the cells of the lobules of the milk-producing gland (lobular carcinoma) [3,4]. Based on the site of tumor origin, breast cancer is classified into several types, but the most important classification is based on evaluating the ability of the tumor to invade, as this feature determines the degree of malignancy of the tumor [2,4]. Breast cancer is the most common malignant tumor among women around the world, and the second most common cause of death due to cancer after lung cancer in women [5]. It belongs to the five most deadly solid cancers (lung, stomach, liver, breast, and colon cancer) [6]. The majority of women who have one or more risk factors for breast cancer never develop the disease, while many women who suffer from cancer Breasts have no known risk factors, some risk factors are unchangeable, such as age and race, while other risk factors are related to cancer-causing agents in the environment or some personal behaviors [1]. Among the factors that increase the risk of breast cancer are age, gender, genetic predisposition, race, hormonal influences, exposure to radiation, smoking, and alcohol [1]. Breast cancer is more common in postmenopausal women, especially those who naturally have high levels of endogenous sex hormones, such as estrogen, progesterone, and prolactin [7,8]. Cortisol is one of the steroid hormones that belong to the glucocorticoid hormonal category. It is produced by the adrenal cortex and is released in response to stress and low blood sugar levels. Its secretion rates increase in cases of exposure to various types of stress, such as exposure to shocks of any kind, and infection with any

debilitating diseases such as cancer, and others [9]. In response to a cancer diagnosis, the body releases the hormone cortisol at levels higher than normal, and in the short term, these hormones are beneficial because they can increase a person's ability to respond to stress [10]. However, in the long term, when stress is chronic, as in cases of cancer, the body's production of stress hormones becomes irregular, which hinders returning to normal [11]. As for prolactin, it is a polypeptide hormone that is primarily produced and secreted in a pulsating manner from the lactotroph cells of the anterior lobe of the pituitary gland [12]. Prolactin stimulates breast cancer cells by strongly affecting the breast epithelium, whether normal or abnormal. This effect may be in coordination with ovarian hormones (estrogen, progesterone) or independently. It also complements the synthesis of the extracellular matrix by each of the normal epithelial cells. In addition, abnormal, which increases the risk of breast cancer and its spread [13].

## MATERIALS AND METHODOLOGY

Sterile medical syringes (Blood specimens collection syringes) were used to collect blood samples. A 5 ml sample was taken from venous blood for healthy women and those with breast cancer, and 1-2 ml was placed in anticoagulant tubes (ethylene diamine tetraacetate [EDTA]) to conduct a CBC blood test. The tubes containing the remaining amount of blood were placed in the centrifuge and centrifuged at a speed of (3000 - 3500) rpm to isolate the serum, which was kept in an Appenendrof-tube and frozen at (-20) degrees Celsius until it was used to complete the required tests.

The levels of the hormonal standards cortisol and prolactin were estimated according to the instructions of the American manufacturer of the test kit (Elabscience) and using an enzyme-linked immunosorbent assay (ELISA).

## RESULTS

### 1- Comparison of the levels of some hormonal parameters between women in the two groups of control and breast cancer patients

The results of the statistical analysis showed that there were significant differences ( $P=0$ ) in the levels of cortisol and prolactin, respectively, when comparing the two groups of control and breast cancer patients, as shown in Table (1).

**Table (1):** Comparison of levels of some hormonal parameters between women in the control groups and breast cancer patients

Variables	Mean $\pm$ SE		P-value
	Healthy control n=40	Patients n=50	
Cortisol (ng/ml)	16.33 $\pm$ 1.63	31.9 $\pm$ 1.68	0*
Prolactin (ng/ml)	11.71 $\pm$ 1.08	17.42 $\pm$ 0.66	0*

\*Indicates that there are significant differences at the probability level ( $P<0.05$ ) in the rates between the two study groups

### 2- The effect of age groups on some hormonal parameters in women with breast cancer

The results of the trial pointed to that there were significant differences ( $P=0$ ) and ( $P=0.02$ ) in the levels of cortisol and prolactin, respectively, when comparing age groups among women with breast cancer, as shown in Table (2).

**Table (2):** The effect of age groups on some hormonal parameters in women with breast cancer

Variables	Mean $\pm$ SE				P-value
	30-39 n=7	40-49 n=16	50-59 n=16	60-70 n=8	
Cortisol (ng/ml)	33.84 $\pm$ 4.8 A	19.57 $\pm$ 1.58 B	32.67 $\pm$ 1.88 A	37.2 $\pm$ 7.16 A	0*

Prolactin (ng/ml)	17.22 ± 1.42 A	13.85 ± 1.02 B	16.64 ± 0.64 A	16.2 ± 1.14 A	0.02*
*Indicates that there are significant differences at the probability level (P<0.05) when comparing between age groups of women with breast cancer – Similar letters indicate that there are no significant differences, and different letters indicate that there are significant differences at the probability level (P<0.05) when comparing between age groups of women with breast cancer					

### 3- Effect of body mass index on some hormonal parameters in women with breast cancer

The results of the study showed a noticeable impact of body mass index on cortisol levels (P=0.043). In contrast, no significant differences (P=0.438) appeared in prolactin levels to body mass index, as shown in Table (3).

**Table (3):** The effect of body mass index on some hormonal parameters in women diagnosed with breast cancer

Variables	Mean ± SE			P-Value
	(20-24.9) kg/m <sup>2</sup> n=8	(25-29.9) kg/m <sup>2</sup> n=29	(≤30) kg/m <sup>2</sup> n=13	
Cortisol (ng/ml)	26.88 ± 2.37 A	23.18 ± 1.63 A	33.32 ± 3.92 B	0.043*
Prolactin (ng/ml)	16.23 ± 0.96 A	14.61 ± 0.85 A	15.53 ± 0.84 A	0.438*
*Indicates that there are significant differences at the probability level (P<0.05) between the groups regarding the body mass index of women with breast cancer - Similar letters indicate that there are no significant differences, and different letters indicate that there are significant differences at the probability level (P<0.05) between the groups regarding the body mass index of women with breast cancer				

### 4- Effect of smoking on some Hormonal Parameters in Women with Breast Cancer

The study identified a significant effect (P=0.032) of smoking on cortisol hormone levels, while no significant differences (P=0.813) were observed in prolactin hormone levels when comparing smoking and non-smoking women with breast cancer, as shown in Table (4).

**Table (4):** The effect of smoking on some hormonal parameters in women with breast cancer

Variables	Mean ± SE		P-value
	Smokers n=6	Non-smokers n=44	
Cortisol (ng/ml)	32.72 ± 2.26	30.08 ± 1.2	0.032*
Prolactin (ng/ml)	16.88 ± 1.18	17.47 ± 0.71	0.813
*Indicates that there are significant differences at the probability level (P<0.05) in the rates when comparing women who smoke and non-smokers with breast cancer			

### 5- Effect of blood pressure on some Hormonal Parameters in women with Breast Cancer

No significant differences were observed (P=0.631) and (P=0.470) in the levels of cortisol and prolactin, respectively, when comparing women with and without high blood pressure who suffered from breast cancer, as shown in Table (5).

**Table (5):** The effect of blood pressure on some hormonal parameters in women with breast cancer

Variables	Mean $\pm$ SE		P-value
	with high blood pressure , n=9	Not Infected n=41	
Cortisol (ng/ml)	30.15 $\pm$ 5.25	32.28 $\pm$ 1.73	0.631
Prolactin (ng/ml)	16.39 $\pm$ 0.88	17.65 $\pm$ 0.78	0.470
*Indicates that there are significant differences at the probability level (P<0.05) in the rates when comparing women who smoke and non-smokers with breast cancer			

**DISCUSSION**

The data of serological tests showed a higher level of the hormone cortisol in women with breast cancer compared to controls. This result differed with some studies [14], while it agreed with many studies [15, 16]. The reason for the high level of the hormone cortisol in breast cancer patients may be attributed to breast cancer is associated with an overactive adrenal gland, which may be caused by physiological stress associated with the presence of a (small) malignant tumor or tumor cells in the blood circulation [17]. The results also diagnosed an increment in the level of the hormone prolactin in the serum of women with breast cancer compared to controls. This result did not agree with some studies [14, 18], while it agreed with other studies [13, 19]. The reason for this is attributed to the important role that prolactin plays influencing breast tissue, whether normal or not, as it stimulates the spread of tumor cells while reducing programmed cell death, which plays a major role in the origin and development of breast cancer [20, 21]. Prolactin also enhances tumor cell growth, migration, survival, and the formation of new blood vessels [20]. It was clear from the results of the study that there was no effect of age groups on the levels of the hormones cortisol and prolactin in the serum of breast cancer patients, and these results agreed with some studies [20, 22], as the severity of the disease is responsible for the high levels of these hormones [22, 23].

The data also showed a decrease in the levels of the hormones cortisol and prolactin in the same age group (40-49) years. This may be because the diagnosis of breast cancer in some patients affects the functioning of the adrenal-pituitary-hypothalamus axis [24], which may sometimes cause insufficiency of the pituitary gland, which negatively affects the secretion of its hormones, including prolactin and adrenal cortex-stimulating hormone (ACTH), which stimulates the adrenal cortex to secrete the hormone cortisol, causing a decrease in the levels of these hormones in the bloodstream, or pituitary gland insufficiency in some women may be caused by unknown causes [25]. The results of the study also indicated that there was no significant effect of body mass index on prolactin levels, while cortisol levels were higher in women who suffer from obesity. This result agrees with many studies [26, 27], which indicated that cortisol levels elevate with increasing body mass index. This may be because increased body fat may enhance the inflammatory state and affect the levels of hormones that stimulate pro-cancer events [28]. The results of the study also revealed that there was no effect of smoking on prolactin levels, while cortisol levels were higher in women who smoked compared to non-smokers, and this result agreed with some studies [29, 30]. The reason for high cortisol levels in women smokers is that smoking causes changes in the activity of hypothalamic - pituitary - adrenal (HPA) axis. Nicotine, which is the addictive component in tobacco, can stimulate (HPA) and lead to the release of cortisol [31,32].

The results also showed that there was no significant effect of blood pressure on the levels of the hormones cortisol and prolactin. This result differed with one study [33], while it agreed with another study [34]. This may be because cortisol levels are affected by blood pressure if Cushing's syndrome causes it. In this case, glucocorticoid medications cause high blood pressure, by retaining salt, as these medications control the reabsorption of sodium and the excretion of potassium by acting on the distal renal tubules and the accompanying reabsorption of water, which causes an increment in blood pressure [33].

**CONCLUSION AND RECOMMENDATIONS**

- Levels of the hormones cortisol and prolactin rise in the blood of women with breast cancer.
- There is no effect of age groups on the levels of the hormones cortisol and prolactin.
- High cortisol levels in women who suffer from obesity.
- Evaluating the levels of other hormones, such as T3 and T4 thyroid hormones, in women with breast cancer.

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