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Examine the impact of chemical therapies on the biochemical parameters of cancer patients in Thi-Qar Governorate

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Abstract
This research aimed to investigate chemotherapy's influence on the biochemical alterations of cancer patients in Thi-Qar Governorate. The study comprised 138 volunteers and 46 breast cancer patients divided into 23 samples collected (1-5 doses) and 23 samples taken more than 5 doses. 46 healthy people, 23 men, and 23 women. Paclitaxel and carboplatin were used in the therapy, and 46 males with liver cancer were divided into 23 samples taken (1-5 doses) and 23 samples taken more than 5 doses. Doxorubicin was used as a therapy. The research was carried out at Al-Haboubi Hospital's Department of Oncology. The liver enzymes. We notice changes and an increase in these enzymes when taking chemotherapy. There is a significant difference between the group that took (1_5 dose) and the group that took more than five doses. For females with breast cancer, males notice an increase in liver enzymes, and we notice a difference significant in ALT. As for lipids, it is noted that there are evident changes, an increase in cholesterol and TG, and a decrease in HDL, and there is no significant difference between the females who took (1-5 doses) and the group that took more than 5 doses, As for males, we notice an increase in cholesterol, LDL, TG, and a decrease in HDL. For males, we notice a clear decrease in testosterone and FSH of the hormones compared to o the normal level. For the hormones E2 and LH, we notice a clear decrease in the value of the hormones compared to o the normal level.

Keywords: Chemotherapy, breast cancer, liver cancer, doxorubicin, paclitaxel and carboplatin

Introduction
Cancer is a group of neoplastic diseases with similar characteristics and behavior patterns that arise from a single somatic cell. When this cell becomes abnormal, it grows and multiplies without control and deviates from the line of normal growth and reproduction. Instead of dying in their final phase, these cells continue to grow and multiply quickly and irregularly, producing new abnormal cells. This cell cancer transformation does not occur instantly or overnight [1]. This transformation occurs due to exposure to several carcinogens [2]. Cancerous tumors are dangerous because, in addition to their aberrant shape and development, their cells can enter and harm essential tissues or organs, whether local or distant, and may lead to their destruction [1].
The most prevalent application of chemotherapy is to treat systemic illnesses. It is an antineoplastic medicine used to treat cancer by interfering with cell function, causing cancer cells to die or inhibit their multiplication [3]. Chemotherapeutic chemicals are often administered in sessions, with patients receiving a rest period between sessions to regain their strength [4].
Anemia, infection Vomiting and nausea, Changes in appetite, Irritable bowel syndrome, Diarrhea, etc. Chemotherapy's most prevalent adverse effects are (fatigue and hair loss). Bruising and bleeding are common. Sores in the mouth, tongue, and throat, as well as difficulty swallowing. Numbness, tingling and pain are symptoms of peripheral neuropathy or other nerve diseases. Urine and bladder changes and renal problems, weight fluctuations, mood swings, changes in libido and sexual function and reproductive challenges are other indications of peripheral neuropathy or other nerve disorders [5].

Materials and Methods
Sample collection
Three ml of blood were collected from the patient for each pre-selected group.

Serum Preparation
We take 3 ml of the complete sample and place it in a gel tube to begin the coagulation process, which isolates the serum from the blood. First, we centrifuged the gel tube at 4000 rpm for five minutes to collect the serum.

Lipid Profile
Cholesterol
Principle: Enzymatic method outlined by Allain *et al*. [6].

Calculation

$$\text{Result} = \frac{\text{Abs (Assay)}}{\text{Abs (Standard)}} \text{ x Standard concentration}$$

Triglycerides
Principle: The Fossati and Principe approach is linked to the Trinder reaction [7]. The absorbance at 500 (480-520) nm is proportional to the triglyceride content of the samples.

Procedure

Calculation

$$\text{Result} = \frac{\text{Abs (Assay)}}{\text{Abs (Calibrator)}} \text{ X Calibrator concentration}$$

High. Density. Lipoprotein
Principle: Total Cholesterol reagent is used to quantify HDL-cholesterol in supernatant after centrifugation.

Procedure: Allow the reagent and specimens to stand at

Calculation

$$\text{Result} = \frac{\text{Abs (Assay)}}{\text{Abs (Calibrator)}} \text{ X Calibrator concentration}$$

Low Density Lipoprotein LDL
Principle
It is possible to calculate the level of LDL through an equation.

LDL= cholesterol-HDL-VLDL.

Very Low-Density Lipoprotein VLDL
Principle
It is possible to calculate the level of VLDL through an equation developed for this purpose.

Procedure
VLDL = Triglycerides/5.

Liver Enzymes
Aspartate Aminotransferase AST-GOT
Principle
Tonhazy, White and Umbreit created a colorimetric approach Reitman and Frankel adopted to determine serum activity [8].

Procedure
Reagent R2 (1 mL) Incubate for 5 minutes at 37 °C. Append: Serum (200 L). Then combine, and incubate at 37 °C for exactly one hour. After that, combine 1 mL of the

Procedure
Manual Method: The blending of (reagent, blank, standard, control, or specimen). Allow the reagent and specimens to stand at room temperature. Allow 10 minutes to stand at room temperature or 5 minutes at 37 °C. Take absorbance measurements at 500 nm (480-520) against a reagent blank. The color remains steady for 1 hour.

Manual method: Allow the reagent and specimens to stand at room temperature.
Blending. Measure the absorbance at 500 nm (480-520) compared to a reagent blank. Allow 5 minutes to stand at 37 °C or 10 minutes at room temperature. The color remains steady for 1 hour.

room temperature.
Blending. Measure the absorbance at 500 nm (480-520) compared to a reagent blank. Allow 5 minutes to stand at 37 °C or 10 minutes at room temperature. The color remains steady for 1 hour.

Reagent R3 and wait 20 minutes for it to reach room temperature. Append: NaOH 0.4 N (10 mL). After 5 minutes, measure absorbance at 505 nm against water.

Calculation
Calculate the outcome as enclosed Standard Curves (batch dependent).

Alanine Aminotransferase ALT-GPT
Principle
Tonhazy, White and Umbreit devised a colorimetric technique Reitman and Frankel adopted to determine serum activity [8].

Procedure
Reagent R2 (1 mL) Incubate for 5 minutes at 37°C. Then combine, and incubate at 37 °C for exactly one hour. After that, combine 1 mL of the Reagent R3 and wait 20 minutes for it to reach room temperature. Append: Serum (200 L). Append: NaOH 0.4 N (10 mL). Allow to stand for 5 minutes, then measure the absorbance at 505 nm against water.

Calculation
Calculate the outcome as enclosed Standard Curves (batch dependent).

Female hormone

Component of Estradiol Hormone Kit

Test Procedure

All test materials, including reagents, serum reference calibrators and controls, should be at room temperature (20-27 °C) before use. Serum calibrators, controls, and patient samples should all have duplicate wells in the microplate. A serum reference calibrator, control or specimen should be pipetted into the well at a concentration of 0.025 mL (25 L). Estradiol Biotin Reagent (0.050 mL; 50 l) should be added to each well. Spin the microplate for 20-30 seconds to combine the ingredients. Cover and let sit at room temperature for 30 minutes. Estradiol Enzyme Reagent (0.050 mL) should be added to each well. The chemicals placed in the various wells should be poured on top. Set aside for 90 minutes, covered, at room temperature. Decantation or aspiration can be used to remove the contents of the microplate. Wipe the plate dry with absorbent paper after decanting.

Buffer (see Section on Reagent Preparation). This process should be carried out three [3] times. A substrate solution of 0.100 mL (100l) should be poured into each well. Reagents should be added in the same sequence to provide consistent reaction times across wells. Do not shake the plate after adding the substrate. Twenty [20] minutes of incubation time at room temperature is recommended. Stop solution should be added to each well and gently mixed for 15 to 20 seconds. Take a standard absorbance reading at 450 nm (620-630 nm) in each well. Fifteen [15] minutes after applying the stop solution, the results should be read.

Calculating Results

A dosage response curve determines the estradiol content in unknown specimens.

Male hormones

Component of testosterone hormone Kit

Test Procedure

All test materials should be at room temperature (20-27 °C) before use. Get the microplate wells set up for duplicate serum reference, control, and patient sample testing. Fill the appropriate well with 0.010 mL (10L) with the applicable serum reference, control, or specimen. Add 0.050 mL (50l) of the ready-to-use Testosterone Enzyme Reagent to each well. Spin the microplate slowly for 20 to 30 seconds to mix the ingredients. Each well needs 0.050 mL (50l) of the Testosterone Biotin Reagent. Spin the microplate slowly for 20 to 30 seconds to mix the ingredients. Cover and set aside for 60 minutes at room temperature. Remove the contents of the microplate using decantation or aspiration. When decanting, wipe the dish dry with absorbent paper. Aspirate or decant 0.350ml (350l) of wash buffer (see Reagent Preparation Section). Repeat this procedure twice more for three [3] washes. Fill each well with a working substrate solution of 0.100 mL (100l). Once the substrate has been added, DO NOT SHAKE THE PLATE. Allow it to sit at room temperature for fifteen [15] minutes. Stop solution should be added to each well and gently mixed for 15 to 20 seconds. Take an absorbance reading at 450 nm from each well (a reference wavelength of 620-630 nm can be used in a microplate reader to rule out any good flaws). After stopping with the appropriate solution, results should be read within 30 minutes.

Calculating Results

A dosage response curve determines the quantity of Testosterone Hormone in unknown specimens.

Results and Discussion

Table 1: Estimation liver function parameters in breast cancer women according to dose number

Breast Cancer Liver Function	1-5 doses No. 23	Above 5 doses No. 23	P. Value
	Mean ± SD		
ALT	39.0 ± 2.71	41.0 ± 3.59	0.048*
AST	36.9 ± 3.58	39.7 ± 3.45	0.010*

The current results showed an increase in liver enzymes for women with breast cancer who receive Taxol and carboplatin treatment in both groups, the first group (1-5 doses) and the second group (more than 5 doses), despite slight differences in enzymes, the reason for this is the difference in body mass, diet and other factors [9].

This rise is due to hepatotoxicity resulting from chemotherapy, and the specific hepatotoxicity of carboplatin is unknown. However, it is likely due to a mediator in metabolism [10]. Paclitaxel is metabolized mainly by the cytochrome P450 system, in particular CYP 2C8 and, to a lesser extent, CYP 3A4. This is because Paclitaxel directly affects microtubular function [11].

Table 2: Estimation of lipid profile parameters in breast cancer women according to dose number

Breast Cancer Lipid Profile	1-5 doses No. 23	Above 5 doses No. 23	P. Value
	Mean ± SD		
CHOL	213.2 ± 3.57	214.7 ± 4.12	0.188NS
TG	189.2 ± 3.88	187.7 ± 3.92	0.206NS
HDL	29.6 ± 1.49	29.6 ± 1.72	0.526NS
LDL	145.5 ± 2.93	147.5 ± 2.19	0.025*
VLDL	37.9 ± 0.74	37.5 ± 0.78	0.056NS

Except for a drop in HDL-C, cholesterol climbed dramatically throughout chemotherapy. Furthermore, our earlier research [12] indicated that the rise in blood cholesterol levels in chemotherapy patients may be connected to increased thyroid hormone levels after chemotherapy. Cancer patients' lipid abnormalities may be caused by cytokine release by inflammatory cells around the tumor or the tumor cell itself [13]. An experimental investigation shows breast cancer cells utilize cholesterol to increase cell growth and proliferation [14]. Although adjuvant chemotherapy increases overall and disease-free survival in breast cancer patients, there is growing evidence that chemotherapy might produce major alterations in a cancer patient's metabolic condition [14].

Table 3: Estimation of hormone in breast cancer women according to dose number

Breast Cancer Hormones	1-5 doses No. 23	Above 5 doses No. 23	P. Value
	Mean ± SD		
E_2	22.8 ± 3.79	21.3 ± 4.32	0.230NS
LH	0.86 ± 0.08	0.87 ± 0.09	0.695NS

The current study showed a decrease in estrogen E2 and LH in women with breast cancer who receive chemotherapy in both groups, both the first group (1_5 dose) and the second group that receives (more than 5 doses).

Moreover, the reason for this is the effect of chemotherapy on menopause.

Menopause is when your ovaries stop producing estrogen and progesterone hormones throughout your life. During this period, the size of your ovaries also becomes smaller, and your menstrual cycle becomes irregular due to these changes and eventually stops altogether [17].

When women undergo cancer treatment, early menopause begins. According to 2011 research, chemotherapy prophylaxis can cause vasomotor symptoms such as hot flashes and night sweats, similar to menopause. VMS symptoms are caused by the narrowing and dilation of blood vessels [18].

And the reason for the effect of chemotherapy on early menopause

Chemotherapy targets cells that are growing and dividing rapidly. It also kills off healthy cells that your body uses to grow hair [19]. This side effect of chemotherapy also affects your reproductive organs, including your ovaries, along with the levels of hormones in your body. An imbalance in the estrogen levels in your body may occur due to how chemotherapy affects the endocrine system [20]. Cell damage and hormonal imbalances caused by chemotherapy can cause menopausal symptoms and may cause your period to stop [21].

And that the females with breast cancer in this study are over 45 years old, so the level of hormones is already low, and their menstrual cycle has been interrupted or is irregular

Table 4: Estimation of liver function in liver cancer men according to dose number

Liver cancer liver function	1-5 doses No. 23	Above 5 doses No. 23	P. Value
	Mean ± SD		
ALT	45.2 ± 1.88	47.8 ± 3.51	< 0.01**
AST	99.8 ± 3.33	98.5 ± 3.52	0.220NS

ALT is present primarily in the liver. Table (1-4) shows a significant increase in the ALT enzyme. This indicates a leakage of liver cells that have been destroyed due to inflammation or death of these cells. Muscles and red blood cells contain AST as well [22].

The ALT enzyme is the first enzyme to rise in the blood in the event of any hepatitis because the largest concentration of this enzyme is found in the cytoplasm of the hepatic cell, unlike AST, which is present in a low concentration in the cytoplasm, while its greatest concentration is in the mitochondria [22].

Table 5: Estimation of lipid profile in liver cancer men according to dose number

Liver Cancer Lipid Profile	1-5 doses No. 23	Above 5 doses No. 23	P. Value
	Mean ± SD		
CHOL	217.8 ± 5.18	216.9 ± 5.16	0.572NS
TG	192.2 ± 3.90	191.3 ± 4.26	0.453NS
HDL	29.9 ± 1.53	29.8 ± 1.54	0.924NS
LDL	149.3 ± 3.31	148.8 ± 3.22	0.629NS
VLDL	38.4 ± 0.78	38.2 ± 0.85	0.453NS

There are still unknowns about how particular lipids influence the metabolic landscape in liver disorders. Chemotherapy affects lipids through different, but not yet known mechanisms, but one of the mechanisms reached by [15] Doxorubicin was linked to reduced ABCA1 mRNA transcription. Doxorubicin-treated cells had increased cholesterol in research comparing them to a mouse model. Overall, doxorubicin impairment led to a dose-dependent 20-30% cholesterol efflux in their cell model.

Table 6: Estimation of hormones in liver cancer men according to dose number

Liver Cancer Hormones	1-5 doses No. 23	Above 5 doses No 23	P. Value
	Mean ± SD		
Testosterone	1.76 ± 0.25	1.76 ± 0.22	0.903NS
FSH	0.84 ± 0.08	0.81 ± 0.08	0.240NS

The current results in Table 1-6 showed decreased testosterone and FSH in males treated with doxorubicin chemotherapy. Moreover, the reason for the decrease in these hormones is the effect of chemotherapy on the nature of the endocrine glands, so chemotherapy is known to attack the body's cells fiercely to get rid of abnormal cells and tissues developing in the body. Chemotherapy may cause problems and disorders in some glands, so it may contribute to a deficiency in the production of some glands for hormones and damage to the tissues of some glands [23]. Clinically identifying testosterone deficiency in a cancer patient is difficult since various causes for signs and symptoms of testosterone insufficiency, such as increased body fat, decreased muscle size and poor quality of life, may exist [24]. Moreover, age is one of the main reasons for these hormones' decline. The ages of the patients in the study were between 49 to 70 years, and it is normal for the percentage of testosterone in the body to decrease by 1% annually after the man reaches the age of thirty, and this case is represented With a set of symptoms that appear due to the body's inability to produce testosterone in sufficient quantities due to a health problem in the testicles or the pituitary gland [25].

Conclusion

The current results of this research indicate that chemotherapy, despite the benefit of this treatment in reducing and eliminating cancerous tumors, its an effect on liver functions and enzymes. (AST, ALT, ALP) in addition to its effect on the lipid profile (cholesterol, triglycerides, HDL, LDL, and VLDL) and hormones. The reason for this is that chemotherapy is a systemic treatment that attacks cancer cells and normal cells as well.

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References

1. Wong MCS, Huang J, Lok V, Wang J, Fung F, Ding H, *et al*. Differences in Incidence and Mortality Trends of Colorectal Cancer Worldwide Based on Sex, Age and Anatomic Location. Clin. Gastroenterol. Hepatol; c2020.

2. Ursons J. A gene signature predicting natural killer cell infiltration and improved survival in melanoma patients. Cancer Immunol. Res. 2019;7:1162-1174.
3. Tashima T. Possibilities of Cancer Chemotherapy Based on Transporter-Conscious Drug Design, Journals of Carcinogenesis & Mutagenesis. 2016;6(4):2157-2518.
4. Generaal JD, Lansdorp CA, Boonstra O, Van Leeuwen BL, Vanhauten HAM, Stevenson MG, *et al*. Hyperbaric oxygen therapy for radiation-induced tissue injury following sarcoma treatment: A retrospective analysis of a Dutch cohort PLoS One. 2020;15(6):e023-4419.
5. Szok D, Tajti J, Nyári A, Vécsei L. Therapeutic approaches for peripheral and central neuropathic pain. Behav Neurol; c2019. p. 868-5954.
6. Allain CC, *et al*., Clin. Chem. 1974;20(4):470-475.
7. Fossati P, Prencipe L. Clin. Chem. 1982;28:2077-2080.
8. A colorimetric method for the determination of serum GOT and GPT, Reitman S. and Frankel S., Amer. J Clin. Path. 1957;28:56-63.
9. Bailey HH, Alberti DB, Thomas JP, Mulkerin DL, Binger KA, Gottardis MM, *et al*. Phase I trial of weekly Paclitaxel and BMS-214662 in patients with advanced solid tumors. Clin Cancer Res. 2007;13:3623-9.
10. Tareen SA, Rodriguez B, Bolos D. Retrospective analysis of HER2+ breast cancer outcomes at a county hospital: do published outcomes hold up in the real world? Cureus. 2020;12:e79-37.
11. Wellstein A, Giaccone G, Atkins MB, Sausille EA. Taxanes. Cytotoxic agents. Chemotherapy of neoplastic diseases. In, Brunton LL, Hilal-Dandan R, Knollman BC, eds. Goodman & Gilman's the pharmacological basis of therapeutics. 13th ed. New York: McGraw-Hill, (Textbook of pharmacology and therapeutics); c2018, p. 1187-9.
12. Abdel-Qadir H, Austin PC, Lee DS, Amir E, Tu JV, Thavendiranathan P, *et al*. A Population-Based Study of Cardiovascular Mortality Following Early-Stage Breast Cancer. JAMA Cardiol. 2017;2(1):88-93.
13. Xu J, Qiu X, Li Y, Sun N, Zhang Y, Shu J. Hyperlipoproteinemia (a) is associated with breast cancer in a Han Chinese population. Medicine (Baltimore). 2020;99(38):e22-037.
14. Lu Y, Wang P, Lan N, Kong F, Abdumijit A, Tu S, *et al*. Metabolic Syndrome Predicts Response to Neoadjuvant Chemotherapy in Breast Cancer. Front Oncol. 2022;12:899-335.
15. Sharma M, Tuaine J, McLaren B, *et al*. Chemotherapy agents Alter plasma lipids in breast Cancer patients and show differential effects on lipid metabolism genes in liver cells. PLoS One. 2016;11(1):e014-8049.
16. Chowdhury FA, Islam MF, Prova MT, Khatun M, Sharmin I, Islam KM, *et al*. Association of hyperlipidemia with breast cancer in Bangladeshi women. Lipids Health Dis. 2021;20(1):52.
17. Soares CN. Depression and Menopause: An Update on Current Knowledge and Clinical Management for this Critical Window. Med Clin North Am. 2019 Jul;103(4):651-667.
18. Thurston R, Christie I, Matthews K. Hot flashes and cardiac vagal control: A link to cardiovascular risk? Menopause. 2010;17(3):456-461.
19. Lark SM. Integrative Medicine: Yoga for Menopause [webpage on the internet] Health World Online; c2014. Available from: http://www.healthy.net/scr/article.aspx?ID=1370.
20. Vishwakarma G, Ndetan H, Das DN, Gupta G, Suryavanshi M, Mehta A, *et al*. Reproductive factors and breast cancer risk: A meta-analysis of case-control studies in Indian women. South Asian J Cancer. 2019 Apr-Jun;8(2):80-84.
21. Caruso D, Masci I, Cipollone G, Palagini L. Insomnia and depressive symptoms during the menopausal transition: theoretical and therapeutic implications of a self-reinforcing feedback loop. Maturitas. 2019 May;123:78-81.
22. Serin A. Assessment of serum alkaline phosphatase levels on the risk of presence hepatocellular carcinoma in the liver transplantation patients. Annals of Medical Research. 2021;27(1):0194-0198. Retrieved from: https://annalsmedres.org/index.php/aomr/article/view/563
23. Gebauer J, Higham C, Langer T, Denzer C, Brabant G. Long-Term Endocrine and Metabolic Consequences of Cancer Treatment: A Systematic Review. Endocr Rev. 2019;40(3):711-67. EPUB: 2018/11/27. PMID: 30476004.
24. Sklar CA, Antal Z, Chemaitilly W, Cohen LE, Follin C, Meacham LR, *et al*. Hypothalamic-Pituitary and Growth Disorders in Survivors of Cancer: An Endocrine Society Clinical Practice Guideline. J Clin Endocrinol Metab. 2018;103(8):2761-84. EPUB: 2018/07/10.29982476.
25. Erenpreiss J, Fodina V, Pozarska R, Zubkova K, Dudorova A, Pozarskis A. Prevalence of testosterone deficiency among aging men with and without morbidities. Aging Male; c2019.

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