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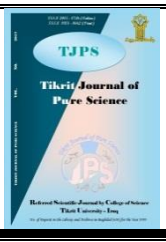

Study the Effect of Type and Duration of Treatment on Some Hematological and Biochemical Variables of Lymphoma Patients in Al-Muthanna Province, Iraq

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ABSTRACT

The term "malignant lymphoma" describes primary cancers of the lymphoreticular system, almost all of which begin as lymphocytes. This study aimed to assess the impact of therapy type and duration on several hematological and biochemical parameters in lymphoma patients. The study was conducted from July 2023 to October 2023. This study examined one hundred samples in total, fifty sample as control group and fifty sample as patients group. The age range of the participants was between 5 and 77 years old. Some hematological and biochemical tests were analyzed in the current study. The study showed a significant increase ($P<0.05$) according to type and duration of therapy in patient groups. The study indicated a significant decrease ($P<0.05$) in red blood cells(RBC), hemoglobin (Hb), lymphocyte and basophils compared with control groups, but indicated a significant increase ($P<0.05$) in white blood cells (WBC), neutrophils and platelets compared with control groups. Also, the study showed a significant increase ($P<0.05$) in urea, creatinine, alanine aminotransferase(ALT) and aspartate transaminase (AST) compared with control groups.

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دراسة تأثير نوع وفترة العلاج على بعض المعايير الدموية والكيموحيوية لمرضى سرطان الغدد اللمفاوية في محافظة المثنى– العراق

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الملخص

هدفت هذه الدراسة إلى تقييم تأثير نوع العلاج ومدته على العديد من العوامل الدموية والكيموحيوية لدى مرضى سرطان الغدد الليمفاوية. أجريت الدراسة في الفترة من يوليو 2023 إلى أكتوبر 2023. شملت الدراسة الحالية مئة عينة، خمسون عينة كمجموعة سيطرة وخمسون عينة كمجموعة مرضى. وتراوحت أعمارهم بين 5 و77 عاماً. تم اجراء بعض الفحوصات الدموية والكيموحيوية. اشارت الدراسة الى وجود انخفاض في عدد كريات الدم الحمراء، والهيموجلوبين ، والخلايا الليمفاوية والقاعدية مقارنة بمجموعات السيطرة، ولكنها أشارت إلى ارتفاع معنوي في خلايا الدم البيضاء، الخلايا المتعادلة والصفائح الدموية مقارنة مع مجموعات السيطرة. كما أظهرت الدراسة ارتفاعاً معنوياً في اليوريا والكرياتينين و انزيم ناقلة أمين الأسبارتات وانزيم ناقلة أمين الألانين مقارنة بمجموعات السيطرة .

Introduction

The term "malignant lymphoma" describes primary cancers of the lymphoreticular system, almost all of which begin as lymphocytes. There have been notable improvements in their care, despite the fact that the majority of them are fatal if left untreated [1]. Their actions differ greatly from one each other.The bulk of lymphomas begin in lymph nodes, while 30–40% can grow in extranodal sites including the stomach, even if almost any organ could be the main target. Upon presentation, they usually cause either regional or generalized lymph node enlargement as well as extensive lymphoreticular system involvement [2]. This previously described tendency represents the normal recirculating nature of lymphocytes. On the other hand, more aggressive lymphomas typically spread to neighboring nodes and remain localized for a while [3]. The complex web of physiological mechanisms that give rise to many lymphoid subsets with varying development lines (B, T, and NK) and levels of functional maturation is reflected in the diversity of lymphoma subtypes [4]. More than 40 categories of non-Hodgkin's lymphoma (NHL) and 5 categories of Hodgkin's lymphoma (HL) are described in the current World Health Organization (WHO) classification of lymphoid neoplasms [5]. Non-Hodgkin's lymphomas are initially classified according to the type of cell that originated (B, T, or NK cells), and then their clinical aspects are combined with morphological, immunophenotypic, genetic, and molecular criteria. A huge polymorphic reactive milieu made up of fibroblasts, collagen fibers, lymphocytes, plasma cells, eosinophils, and other cells is what defines HL. in this microenvironment, neoplastic cells typically make up only a small fraction (about 1%) [6]. For endometrial and uterine cervical cancer, radiotherapy is one of the main treatments. One of the most frequent side effects of pelvic radiation therapy is hematological toxicity (HT), which is made more likely by concomitant chemoradiotherapy. A number of issues are brought on by serious HT. First, chemotherapy prolongs treatment duration and influences oncological outcome, whereas HT reduces patient tolerance to radiation therapy [7]. Secondly, the use of hematopoietic growth factors, such as erythropoietin (EPO), thrombopoietin (TPO), interleukin-11 (IL-11), and granulocyte colony-stimulating factor (G-CSF), to treat myelosuppression not only increases the environmental burden on the patients but also may cause long-term radiation-induced bone marrow damage and accelerate the aging of hematopoietic stem cells. Third, HT raises the possibility of death and subsequent infection [8]. The aims of this study assess the impact of therapy type and duration on several hematological and biochemical parameters in lymphoma patients.

https://doi.org/10.25130/tjps.v29i4.1641

Materials and Method

Methods:

The study included 50 lymphoma patients (males 32 and 18 females) and 50 healthy individuals (males 30 and 20 females) who as the control group. None of the individuals in the control group were anemic or had a clear systemic disease. The hematological and biochemical tests were performed on the blood of all patients and healthy volunteers.. The patients were then divided based on the impact of various factors, including gender (males and females), age (<20, 20-49, and ≥50), location (urban and rural), type of therapy (radiation, chemotherapy, radiation and chemical), and length of treatment (>6 months, 6 -11 months, and ≥1 year). The ages of patients and healthy people ranged from 5 to 77 years' old. The current study was conducted in the period between July and October 2023.

Blood Samples:

Venous blood samples, five milliliters each, were taken from the patient and the healthy volunteers. The blood samples in current investigation for the current investigation were separated into three milliliters in EDTA polypropylene tubes, which were analyzed directly, and two milliliters of blood were placed in gel tubes. Complete blood counts (CBCs) were conducted using the blood in EDTA tubes. The blood serum tube was centrifuged for 10 minutes at 3000 rpm/min in order to separate the serum and store it in a new plastic screw-tip tube for biochemical parameter analysis.

Statistical Analysis

A statistical study was conducted to investigate variations among distinct groups using SPSS version 25. The data's mean was evaluated using ANOVA, and statistically significant differences were detected at a significance level of ($P \leq 0.05$).

Results and Discussion

Clinical features associated Lymphoma

The features accompanying lymphoma are shown in Table (1). The frequency distribution of patients according to type of therapy was as follows: 22 (44.0%) of patients have radiation therapy, 25 (50.0%) have chemotherapy therapy and only 3 (6.0%) have both radiation and chemotherapy therapy. The frequency distribution of patients according to the duration of therapy was as follows: 25 (50.0 %) have less than 6 months duration of therapy, 15 (30.0%) of cases have 6-11 months of therapy and only 10 (20.0 %) of cases with more than 1 year of therapy.

Table 1: Distribution of some clinical features in patient with lymphoma

Clinical features	Patients	
	N	%
Type of therapy		
Radiation, *n* (%)	22	44.0 %
Chemotherapy, *n* (%)	25	50.0 %
Radiation + Chemotherapy, *n* (%)	3	6.0 %
Duration of treatment		
< 6 months, *n* (%)	25	50.0%
6 -11 months, *n* (%)	15	30.0 %
≥ 1 years, *n* (%)	10	20.0 %
n: number of cases.		

The frequency distribution duration of therapy and type of therapy according to type of lymphoma are shown in Table 2 . The present results show a significant difference in frequency distribution duration of therapy and the type of therapy according to type of lymphoma .These results may be due to Examining the notable variations in frequency distribution length and therapy type according to lymphoma type may yield important information about treatment approaches for particular subtypes. For instance, lengthier treatment periods or particular treatment methods, such chemotherapy, immunotherapy, or targeted therapy, may be more effective for some lymphomas. Clinicians can optimize treatment strategies and improve patient outcomes by having a better understanding of these distinctions. Furthermore, it might clarify the fundamental biological distinctions among different kinds of lymphomas, resulting in improvements in customized medical strategies for lymphoma sufferers [9].

https://doi.org/10.25130/tjps.v29i4.1641

Table 2: The frequency distribution according to type of lymphoma

Characteristic	Hodgkin lymphoma *n* = 23	Non-Hodgkin lymphoma *n* = 27	*P –Value*
Duration of therapy			
< 6 months, *n* (%)	16 (69.6%)	9 (33.3%)	0.031 *S
6-11 months, *n* (%)	5 (21.7%)	10 (37.0%)	
≥ 1 year, *n* (%)	2 (8.7%)	8 (29.7%)	
Type of therapy			
Radiation, *n* (%)	22 (95.7%)	0	0.001 *S
Chemotherapy, *n* (%)	0	25 (92.6%)	
Both, *n* (%)	1 (4.3%)	2 (7.4%)	
n: number of cases ; S: significant at P <0.05.			

Effect of Lymphoma on Hematological parameters .

The comparison of some blood parameters in patients with lymphoma and control group has been carried out and the results were demonstrated in Table (3). Mean levels of White Blood Cells count were (6.85 ± 0.68) in patients with lymphoma and (5.65 ± 0.71) in control group; the level was higher in patients group comparison with healthy control group and the difference was significant (P = 0.043). The result agreement to [10]. The immune system of the body creates aberrant lymphocytes, or white blood cells, in cases of lymphoma, increased numbers of some white blood cell types, such as lymphocytes, may result from this, as well as a rise in the total white blood cell count. Thus, in cases of lymphoma, a high WBC count frequently indicates the body's reaction to the malignant cells [11].

But the mean levels of Red Blood Cells count were (4.36 ± 0.21) and (4.69 ± 0.19), in patients with lymphoma and healthy control group respectively; the level was lower in patients group comparison with healthy control group and the difference was significant (P=0.015). This result agreement with [12].

The study found that anemia which is defined by a drop in hemoglobin concentration and red blood cell count, also contributed significantly to the study's observed considerable decline in red blood cell levels. Anemia is a characteristic of bone marrow abnormalities and one sign for the diagnosis of infected cancer [13].

Also the mean levels Hemoglobin (Hb) were (11.75 ± 0.76) and (13.13 ± 0.59), in patients with lymphoma and healthy control group respectively; the level was lower in patients group comparison with healthy control group, and the difference was highly significant (P < 0.001). This result agreement with [14].

The primary role of red blood cells is the oxygenation of ferrous (FePÍ) ions in hemoglobin, which allows oxygen to be taken up from the lungs and delivered to the tissues. Only 2% of oxygen is transferred by plasma; the majority, or around 98%, is carried by red blood cells [15].

Because the red cell's diameter is larger than a capillary's, it must squeeze through it, which should improve the flow of oxygen from the erythrocyte to the tissues. By binding carbon dioxide as carbonate to the N-terminal end of the a-globin chain and releasing it as carbon dioxide in the lungs, red blood cells can also carry carbon dioxide from the periphery to the lungs. Nevertheless, only 15% of the carbon dioxide is carried by the red cell; the remaining 15% is carried by the plasma.

Deoxyhaemoglobin can help with peripheral tissue vasodilation since it also helps produce nitric oxide from nitrite. .Because regularly organized haemoglobin has an affinity for oxygen, oxygen can be taken up and delivered at a red cell count, hemoglobin concentration, and hemocrit that won't cause hyper viscosity. For the red cell to carry out its primary role of carrying oxygen, other conditions must be satisfied [15].

Also the mean levels of neutrophil count in patients with lymphoma(4.30 ± 0.31) was highly significantly higher than the mean levels of neutrophil count in healthy control group (2.40± 0.21), (P<0.001).While the mean levels of lymphocytes and Basophil were significantly lower in patients Reza with lymphoma compared with healthy control group, (P< 0.05). This results are agree with [12], this decline could be brought on by a somatic mutation in lymphoid progenitor cells, which alters the regulation of cell division, proliferation, and apoptosis (programmed cell death), it can also cause

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lymphocytes to accumulate in lymph nodes, spreading lymphadenopathy.

Regarding the mean levels of platelet count, the present results show the mean levels of platelet in patients with lymphoma (294.64 ± 13.12) versus the mean levels of platelet in healthy control group (266.38± 7.81) was non-significant (P=0.194). This result agreement with [12]. It is possible that the cancerous cells (lymphoma cells) will enhance platelet adhesion, which will interfere with normal platelet function. Despite having normal to high platelet counts, children with non-Hodgkin lymphoma were unable to react adequately when stimulated ex vivo, which may indicate a dysregulation or impairment of the different platelet activators [16].

Table 3: Effect of Lymphoma on Hematological parameters.

	Cases –control comparison		*P-Value*
	Patients *n* = 50	Healthy control *n* = 50	
White Blood Cells count			
Mean± SE	6.85 ± 0.68	5.65 ± 0.71	0.043 * S
Range	1.14 – 27.74	3.20- 9.50	
Red Blood Cells count (million/ µl)			
Mean± SE	4.36 ± 0.21	4.69 ± 0.19	0.015* S
Range	2.45 – 5.80	3.36- 5.64	
Hemoglobin (Hb) (g/dl)			
Mean± SE	11.75 ± 0.76	13.13 ± 0.59	< 0.001 * HS
Range	6.60 -14.70	12.00-14.70	
Lymphocytes count			
Mean± SE	1.47 ± 0.23	2.30± 0.19	0.003* S
Range	0.45 -5.45	1.20-3.90	
Neutrophil count			
Mean± SE	4.30 ± 0.31	2.40± 0.21	< 0.001*HS
Range	0.60 -25.65	1.20-4.30	
Basophil count			
Mean± SE	0.075 ± 0.0014	0.17 ± 0.011	< 0.001* HS
Range	0.001 -0.79	0.10-0.3	
Platelet Count (thousand/ µl)			
Mean± SE	294.64 ± 13.12	266.38± 7.81	0.194*NS
Range	27.00 -788.00	109.00-354.00	
n: number of cases; SE: standard error ; HS: Highly significant at P ≤ 0.001. NS: not significant at P > 0.05.			

Effect type of therapy on hematological parameters.

The comparison of some blood parameters levels according to type of therapy has been carried out and the results were demonstrated in table (4). Mean levels of White Blood Cells count were (7.03 ± 055), (7.11 ± 0.61) and (3.41 ± 0.11), in patients with radiation therapy, chemotherapy and both types of therapy, but the difference was non-significant (P = 0.432). Individuals receiving chemotherapy had greater mean white blood cell counts than individuals receiving radiation therapy or both forms of therapy. The cytotoxic effects of chemotherapy may be to blame for this, as they have the ability to inhibit bone marrow activity and increase the need for the generation of white blood cells as a component of the immune system [17]. Also the mean levels of lymphocytes and basophil were higher in patients with chemotherapy therapy in comparison with other groups, but the difference was non-significant (P >0.05). This study found that the results are similar to those of [18, 19, 21].

The higher lymphocyte rate may have something to do with the immune system because these cells are linked to the immune response against infection, and the results could be the result of a malfunction in bone marrow production [18]. This suggests that oxidative stress brought on by therapy may have contributed to the decrease in TWB count in our investigation, even if more research is needed to understand the processes underlying treatment's induction of hematopoiesis change. As in the earlier research, BC patients who finished the third cycle of chemotherapy treatment had a marked decrease

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in neutrophil count. Past research indicates that the most frequent side effect experienced by patients receiving systemic chemotherapy is neutropenia. The observed decrease in neutrophils in this investigation may be related to compromised hematopoiesis. Anticancer medications produce intra- and interstrand cross-links in bone marrow DNA by binding covalently with the DNA molecule. These cross-links can cause damage to DNA during replication and disrupt protein function [19]. The treatment group's lymphocyte count was noticeably lower. Prior research also demonstrated the decrease in lymphocytes. This result from our study suggests that chemotherapy also has negative effects on non-target organs and alters immune responses, as has been documented in other research. Through lymph depletion, the therapy affects the hematopoietic compartment's homeostasis, impairing both the innate and adaptive immune responses. Cells' ability to replicate hematopoietic DNA is compromised. White blood cell production is reduced and immune cell death is caused by the progressive depletion of hematopoietic stem cells in the bone marrow, which inhibits cell proliferation [21]. But the mean levels of RBC count and hemoglobin were lower in patients with both types of therapy in comparison with other groups. This study found that the results are similar to those of a study conducted by [17,18]. These red cell indices may have decreased as a result of treatment-induced oxidative stress, which can lead to erythropoiesis failure and mature cell death. Hemoglobin synthesis issues result from blocking iron's integration into hemoglobin owing to disruptions in the hemoglobin molecules' bio-generation structure and oxidation of irons [20]. These findings could be explained by the hemoglobin compound, which may also be responsible for the decline in red platelet counts [22].

Table 4: Effect type of therapy on hematological parameters.

	type of therapy			
	Radiation n=22	*Chemotherapy* n=25	*Both* *n=3*	*P value*
White Blood Cells count				
Mean± SE	7.03 ± 0.55	7.11 ± 3.01	3.41 ± 0.11	0.432 NS
Red Blood Cells count (million/ µl)				
Mean± SE	4.69 ± 0.21	4.44 ± 0.19	4.26 ± 0.14	0.442 NS
Hemoglobin (Hb) (g/dl)				
Mean± SE	12.20 ± 0.49	11.82 ± 0.60	11.61 ± 0.53	0.831 NS
Lymphocytes count				
Mean± SE	1.63 ± 0.12	1.95 ± 0.17	0.89 ± 0.021	0.094 NS
Neutrophil count				
Mean± SD	4.57 ± 0.31	4.31 ± 0.27	2.21 ± 0.19	0.183 NS
Basophil count				
Mean± SD	0.084± 0.0011	0.181 ± 0.0019	0.046 ± 0.0013	0.189 NS
Platelet Count (thousand/ µl)				
Mean± SD	314.13± 12.8	281.0 ± 11.14	265.33 ± 14.5	0.724 NS
n: number of cases; SE: standard error ; NS: not significant at P < 0.05.				

Effect duration of therapy on hematological parameters .

The comparison of some blood parameters levels according to duration of therapy has been carried out and the results were demonstrated in table (5). Mean levels of WBC count were (6.20 ± 0.55), (6.87 ± 0.49) and (8.46 ± 0.61), in less than 6 months, 6-11 months and more than 1 years duration of therapy respectively. The average levels were more significant in patients on therapy for more than 1 year compared to other groups, but the difference was not statistically significant (P = 0.446). The results are consistent with [23]. Also the mean levels of RBC,

https://doi.org/10.25130/tjps.v29i4.1641

Hemoglobin, Lymphocytes, Neutrophil, basophil and platelet count were higher in patients with more than 1 years duration of therapy in comparison with other groups, but the difference was non-significant (P < 0.05). This study found the results are similar to a study conducted by [24]. Also. because decrease of Hb through treatment is a strong prognostic factor for treatment failure [25].

Table 5: Effect duration of therapy on hematological parameters.

	Duration of therapy			
	< 6 months n=25	*6-11 months* n=15	*≥ 1 year n=10*	*P value*
White Blood Cells count				
Mean± SE	6.20 ± 0.55	6.87 ± 0.49	8.46 ± 0.61	0.446 NS
Red Blood Cells count (million/ µl)				
Mean± SE	4.11 ± 0.22	4.32 ± 0.18	4.49 ± 0.28	0.271 NS
Hemoglobin (Hb) (g/dl)				
Mean± SE	11.48 ± 0.71	11.68 ± 0.67	12.24 ± 0.49	0.424 NS
Lymphocytes count				
Mean± SE	1.54 ± 0.12	1.91 ± 0.16	1.96 ± 0.21	0.403 NS
Neutrophil count				
Mean± SE	3.81 ± 0.41	4.12 ± 0.26	5.78 ± 0.34	0.179 NS
Basophil count				
Mean± SE	0.073 ± 0.0012	0.157 ± 0.0024	0.17 ± 0.0031	0.341 NS
Platelet Count (thousand/ µl)				
Mean± SE	230.30 ± 15.5	280.20 ± 16.7	329.04 ± 13.44	0.206 NS
n: number of cases; SE: standard error ; NS: not significant at P <0.05.				

Effect of Lymphoma on Biochemical parameters.

The comparison of some biochemical parameters in patients with lymphoma and healthy control group has been carried out and the results were demonstrated in Table (6),. Mean levels of blood urea was (24.89 ± 1.63) and (29.27±1.79), in patients with lymphoma and healthy control subject respectively; the level was non-significant in patients group in comparison with healthy control subject.

Blood urea levels in lymphoma patients and healthy control persons differ, possibly for a number of reasons. Increased blood urea levels can result from kidney function being impacted by lymphoma. Furthermore, renal function may also be impacted by medications like chemotherapy. Medication use, food habits, and dehydration are a few more variables that may be involved. It would need more research to pinpoint the precise reason for the discrepancy [26].

Also the mean levels of serum creatinine was (0.62 ± 0.012) and (0.99 ± 0.023) , in patients with lymphoma and healthy control group respectively; the level was higher in patients group in comparison with healthy control subject and the difference was highly significant (P<0.001).

were consistent with previous studies because they rely on serum creatinine, current kidney function testing techniques have limitations when applied to cancer patients. Serum creatinine is influenced by low protein intake, liver illness, malnutrition, muscle atrophy, and hydration abnormalities - all of which are prevalent in cancer patients. Clinical importance arises from the failure to identify decreased kidney function [27].

Regarding the mean levels of Alanine transaminase, the present results show the mean levels of ALT in patients with lymphoma was highly significant higher than the mean levels of ALT in healthy control subject, (38.06 ± 3.21)

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versus (14.20 ± 30.89) respectively, (P<0.001). Also the mean levels of Aspartate aminotransferase (AST) in patients with lymphoma was highly significantly higher than the mean levels of AST in healthy control subject, (35.25 ± 2.38) versus (16.40 ± 1.16) respectively, (P <0.001).

The result are agreement with [12]. This result was in line with earlier research that found patients with leukemia, liver cirrhosis, and viral hepatitis had significantly higher levels of these enzymes in their blood serum. stated that a vitamin B12 deficit is common in cases of anemia, and that the liver attempts to absorb the maximum amount of this vitamin. Thus, the liver experiences transient hypertrophy, which affects these enzymes' effectiveness [28].

Liver enzymes like alanine aminotransferase (ALT) and aspartate aminotransferase (AST) are linked to various cancer types as well as the onset and prognosis of hepatocellular carcinoma and liver metastases. Raised ALT levels in hepatitis C virus-infected patients are thought to constitute a separate risk factor for hepatocellular cancer .Elevated liver function tests were strongly connected with gallbladder cancer, [29] According to a recent study Patients diagnosed with intrahepatic cholangiocarcinoma had a poor prognosis when their serum liver enzyme levels, including γ-glut amyl trans peptidase, total and direct bilirubin, and alkaline phosphatase, were elevated [30].

Table 6: Effect of Lymphoma on Biochemical parameters.

	Cases –control comparison		*P- value*
	Patients *n* = 50	Healthy control *n* = 50	
Blood Urea			
Mean± SE	59.10 ± 2.86	29.27 ± 1.79	< 0.001* HS
Range	32.76 – 80.00	19.20- 45.0	
Serum Creatinine			
Mean± SE	2.62 ± 0.013	0.99 ± 0.023	< 0.001* HS
Range	0.90 – 3.60	0.60-1.40	
Alanine transaminase (ALT)			
Mean± SE	38.06 ± 3.21	14.20 ± 0.89	< 0.001 * HS
Range	11.00 -126.00	8.0- 20.0	
Aspartate aminotransferase (AST)			
Mean± SE	35.25 ± 2.38	16.40 ± 1.16	< 0.001*HS
Range	11.54 -124.0	9.0 – 24.0	

n: number of cases; SE: standard error ; HS: Highly significant at P ≤ 0.001. NS: not significant at P > 0.05.

Effect type of therapy on Biochemical parameters .

The comparison of some biochemical parameters levels according to type of therapy has been carried out and the results were demonstrated in table (7). Mean levels of blood urea were (28.20 ± 1.81), (22.43 ± 1.93) and (21.46 ± 1.48), in patients with radiation therapy, chemotherapy and both types of therapy. The mean levels were greater in patients who received both types of therapy in comparison to the other groups; nevertheless, the difference between the two groups was not statistically significant (P = 0.108). could be due to several reasons First, the combined effects of radiation therapy and chemotherapy may have a synergistic impact on the body, leading to greater physiological stress and potentially affecting kidney function, which can result in higher blood urea levels. Additionally, certain chemotherapy drugs may directly contribute to kidney damage or dysfunction, further exacerbating the elevation of blood urea levels in patients undergoing both types of therapy. Furthermore, the underlying conditions for which patients are receiving both types of therapy may also play a role in the observed differences in blood urea levels. Overall, the combination of radiation therapy and chemotherapy may lead to a more pronounced increase in blood urea levels compared to each therapy alone [18]. Also, the mean levels of serum creatinine were higher in patients with both types of therapy in comparison with other groups, but the difference was non-significant (P >0.05). The results are agreement with [3]. It is possible that malnutrition or low muscle mass are the cause of the non-significant decrease in creatinine levels. It has been demonstrated that chemotherapy can cause kidney cells to necrotize. The clinical manifestation of this

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injury is elevated creatinine levels. On the other hand, earlier research revealed that creatinine levels dramatically rose during chemotherapy as a result of either reduced urine production or elimination [32, 33]. But, the result disagreement with [34]. Since there is a reciprocal relationship between cancer and the kidneys—chronic kidney disease can raise the risk of cancer, and patients with cancer frequently experience renal impairment as a result of associated factors—the high percentage of creatinine in the serum of cancer patients may be the result of kidney injury. Radiation therapy has a more focused effect on cells that are unique to the organ where the carcinoid tumor has affected when there is illness or damage from the treatments used by cancer patients. Thus, compared to chemotherapy, radiation causes stronger and faster cell lysis. Regarding ALT and AST, the present results show the mean levels of ALT and AST were higher in patients with both types of therapy in comparison with other groups, but the difference was non-significant ($P < 0.05$). The result agreement with [34]. Radiation therapy has detrimental consequences on the liver. Patients with venous obstructive liver disease and cirrhosis are associated with treatments. liver disease brought on by radiation (RILD). Additionally, oxidative stress and reactive oxygen species generation are brought on by radiation therapy, which can lead to It causes immediate inflammatory reactions, liver cell apoptosis, and increases the vulnerability of central hepatocytes (also known as "centrilobular" hepatocytes, or "HCs") to treatment-induced apoptosis, which ultimately results in hepatocyte mortality and degeneration. Studies have shown that the quality and regimen of chemotherapy have a significant impact on the severity of liver injury. Additionally, chemotherapy induces a variety of tissue changes in the liver, such as fatty degeneration, steatohepatitis linked to chemotherapy, and sinus obstructive syndrome for sinus infection. [34]. During chemoradiotherapy, the levels of AST (aspartate aminotransferase) and ALT (alanine aminotransferase) may increase compared to chemotherapy or radiotherapy alone due to the combined effects of both treatments on liver function. Chemotherapy drugs and radiation therapy can both cause liver damage, leading to higher levels of these enzymes in the bloodstream [34]. The liver plays a crucial role in metabolizing drugs and detoxifying the body, so any insult to the liver can lead to increased AST and ALT levels. Additionally, certain chemotherapy drugs are more hepatotoxic than others, further contributing to elevated liver enzyme levels during chemoradiotherapy. Regular monitoring of AST and ALT levels is important to assess liver function and adjust treatment accordingly [35].

Table 7: Effect type of therapy on Biochemical parameters.

	type of therapy			
	Radiation n=22	*Chemotherapy* n=25	*Both n=3*	*P value*
Blood Urea				
Mean± SE	48.20 ± 2.93	52.43 ± 2.79	61.46 ± 3.40	0.108 NS
Serum Creatinine				
Mean± SE	2.44 ± 0.12	2.65 ± 0. 11	2.71 ± 0.14	0.809 NS
Alanine transaminase (ALT)				
Mean± SE	38.33 ± 3.41	36.91 ± 83.68	45.33 ± 2.99	0.257 NS
Aspartate aminotransferase (AST)				
Mean± SE	33.89 ± 2.41	35.04 ± 3.89	46.37 ± 3.01	0.154 NS
n: number of cases; SE: standard error ; NS: not significant at $P < 0.05$.				

Effect duration of therapy on Biochemical parameters .

The comparison of some biochemical parameters levels according to duration of therapy has been carried out and the results were demonstrated in table (8). Mean levels of blood urea were (24.68 ± 2.89), (25.13 ± 1.99) and (25.08 ± 2.01) , in less than 6 months, 6-11 months and more than 1 years duration of therapy respectively. The mean levels were more significant in patients who had been receiving therapy for less than six months in comparison to other groups; nevertheless, the

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difference between the two groups was not statistically significant (P = 0.989), the results of this study are consistent with [36]. The average blood creatinine levels are more significant in patients who receive treatment for less than six months compared to other groups. However, the difference between these groups was not statistically significant (P < 0.05).

The result agreement with [37]. In cancer treatment, hyperuricaemia leads to renal impairment as a result of rapid cell turnover (tumour lysis syndrome). The observed creatinine among our participants was due to an increase that was not significant enough to warrant any influence on renal function. The breadth of this study is limited by its brief length and the small sample size that was used. The mean levels of ALT and AST were found to be greater in patients who had participated in therapy for a length of less than six months when compared to other groups. However, the difference between these groups was not statistically significant (P < 0.05). The result agree with [38, 39].

There are a few possible explanations for this discovery. Overlapping ranges of ALT and AST readings between the groups could result from variations in how each patient responds to therapy. The intricacy of interpreting liver enzyme values in individuals receiving medication has been highlighted by comparable findings from other research. The kind and dosage of the medicine, underlying liver disease, concomitant medications, and unique patient features are all potential influences on the levels of ALT and AST[40].

Table 8: Effect duration of therapy on Biochemical parameters

	Duration of therapy			
	< 6 months n=25	*6-11 months* n=15	*≥ 1 year n=10*	*P value*
Blood Urea				
Mean± SE	60.08 ± 3.03	55.13 ± 2.53	54.68 ± 3.16	0.989 NS
Serum Creatinine				
Mean± SE	2.71 ± 0.12	2.68 ± 0.13	2.54± 0.015	0.175 NS
Alanine transaminase (ALT)				
Mean± SE	45.17 ± 3.52	31.17 ± 3.01	30.65 ± 1.54	0.102 NS
Aspartate aminotransferase (AST)				
Mean± SE	38.98 ± 82.14	29.31 ± 2.59	34.60 ± 3.68	0.218 NS
n: number of cases; SE: standard error; NS: not significant at P < 0.05.				

Conclusions

There is a statistical difference between patient and healthy control for blood parameters (RBC, Hb, WBC and diffrential WBC) and biochemical parameters such as (urea level, creatnin, ALT and AST) but there is non- significant difference in platelets counts. Also, there is not a statistical difference according type and duration of therapy in lymphoma for blood parameters (RBC, HB, WBC, platelets counts, diffrential WBC) and biochemical parameters Kidney function and liver function test.

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