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WBC and RBC Indicators among People with Hepatitis and Kidney Failure

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Abstract

The global pandemic of HBV and HCV infections produces liver insufficiency. This study examines blood markers in renal failure patients with and without viral hepatitis. The study included 90 blood samples from chronic renal failure patients (67 males and 23 females) undergoing hemodialysis (HD) in the unit. (HCV) and (HBV) were detected in patients' serum by ELISA, while WBC, RBC, lymphocyte, and neutrophil counts were measured using an automated hematology analyzer. This study assessed 90 CRF patients (67 men, 23 women). 22 men and 14 women (40%) had HBV and HCV; 60% (45 men and 9 women) did not. The HCV patient count was 20, and the HBV was 16. The average CRF patient had normal WBC levels ($5.29.10^9$/L). RBC counts were 3.25 x 10^{12}/L in 64.44% of 58/90 patients, 26 with hepatitis virus, below the typical range of 3.5–5.5. The mean neutrophil count was 70.13 % higher than 50–70, and 59/90 (65.55%). 22 patients had hepatitis, with the highest value being 82. Within the normal 20-40 range, the lymphocyte % mean was 20.99. No significant difference ($p>0.05$).

Keywords: Hepatitis, CRP, HCV, WBC, hematology.

Introduction

Significant morbidity and mortality are caused by viral hepatitis, making it a serious global public health concern (Parlak, 2019). At least five different viruses, including hepatitis A, B, C, D, and E, can cause viral hepatitis. Each virus is part of a different family, and the only thing they have in common is that they all attack the liver. Hepatitis B and C are chronic, progressive disorders that can lead to liver cancer and cirrhosis (Fujiwara et al., 2008).The prevalence of HBV and HCV varies from one region to the next. Two billion people are infected with HBV worldwide, and 350 million of them are persons with chronic HBV infection. More than 400 million people worldwide have chronic hepatitis B (CHB), with 75% of those persons living in Asia (Qirbi & Hall, 2001). In many parts of the world, hepatitis C infection is currently the leading cause of liver failure (“82 Chronic Hepatitis-C Infection and

Kidney Failure," 2023). After the advent of hepatitis B screening in blood banking and prior to the development of hepatitis C-sensitive screening laboratory technologies, this blood-borne infection was a common cause of post-transfusion hepatitis (Fabrizi & Messa, 2018). According to WHO estimates, up to 3% of the global population (170 million) is infected with HCV (Alavian et al., 2005). Peripheral blood cell count anomalies in patients with HCV infection have been linked to hypersplenism, antiviral medication, low thrombopoietin levels, and/or autoimmune processes (Weiner & Wingo, 1997). The presence of additional infections may be reasonably ruled out if a change in the blood count is detected. In addition to emphasizing the importance of a complete blood count for all patients with acute viral hepatitis, knowing the prevalence of hematological abnormalities can help pinpoint which patients will need to be followed up with or receive further treatment. The hematological features of viral hepatitis make it a pantropic disease. (Conrad et al., 1964)

Literature Review

The study identifies significant biochemical and hematological differences between hepatitis C virus (HCV) patients and healthy individuals, suggesting that these parameters can serve as early predictive biomarkers for diagnosing HCV infection. Key findings indicate that certain blood counts and ratios are strong predictors of HCV, which could aid in the early detection and prevention of liver damage and transmission. (Bagheri et al., 2024)

The study investigates the clinical efficacy, safety, and short-term prognosis of three artificial liver treatment methods—plasma exchange (PE), plasma perfusion combining PE (PP+PE), and dual-plasma molecular adsorption system combining PE (DPMAS+PE)—in patients with acute-on-chronic liver failure (ACLF). Results indicate that all three methods significantly improve liver, kidney, and coagulation functions, with DPMAS+PE showing the best outcomes in reducing mortality and adverse reactions. (Xiang et al., 2024)

This study developed and validated an interpretable machine learning model, specifically a survival gradient boosting machine (GBM), to predict the risk of hepatitis E virus-related acute liver failure (HEV-ALF) in hospitalized patients with acute hepatitis E. The GBM model showed superior performance with a Harrell's concordance index of 0.853 and was made accessible as a web-based tool to aid clinical decision-making. (Dong et al., 2025)

Research Method

Patients Study Group: Blood samples were taken from 90 patients (67 males and 23 females) with chronic renal failure who were undergoing HD at the hemodialysis unit between August 2021 and March 2022.

Collection of Blood Samples: Each patient had 6 ml of venous blood drawn; 2 ml were placed in EDTA tubs for hematological testing, and the remaining 4 ml were allowed to stand for 15 minutes before being centrifuged at 3000 rpm for 10 minutes. Before being employed in the serological assays, the serum was stored in the freezer at -4 ° C.

Hematological tests: An automated hematologic analyser (Sysmex model: K-1000, Japan) was used to directly measure the total count of white blood cells (WBCs), red blood cells (RBCs), lymphocytes, and neutrophils in a sample of blood.

Serological tests: HCV and HBV were identified in patients' serum by ELISA technology using a kit (ACON Laboratories, USA).

Statistical analysis: using SPSS (18) and Excel (2010) software. Statistical significance was ($P<0.05$).

Result and Discussion

In this study, 90 patients (67 males and 23 females) with chronic renal failure (CRF) were tested; 36 (40%) of them (22 males and 14 females) tested positive for either HBV or HCV. The remaining 54 patients (60%) tested negative for hepatitis. a higher incidence of CRF in males than females, which may be due to factors such as a higher prevalence of cardiovascular disease, which is more common in men than in women, a high-protein diet, uncontrolled high blood pressure, uncontrolled diabetes, smoking, anti-inflammatory medicines (Zhang & Rothenbacher, 2008) (Locatelli et al., 2002). While (Entedhar R. Sarhat et al., 2023) and (Shankar et al., 2006) found a higher CRF prevalence in females than in males. Although hepatitis C virus (HCV) endemicity is low in Iraq, the study found that dialysis patients have a higher than average prevalence of HCV infection, possibly due to machine contamination. Figure (1) shows that the number of HCV-infected patients was 20, whereas the number of HBV-infected patients was 16. This may correspond to the similar image that was observed by (Abdelnour et al., 1997).

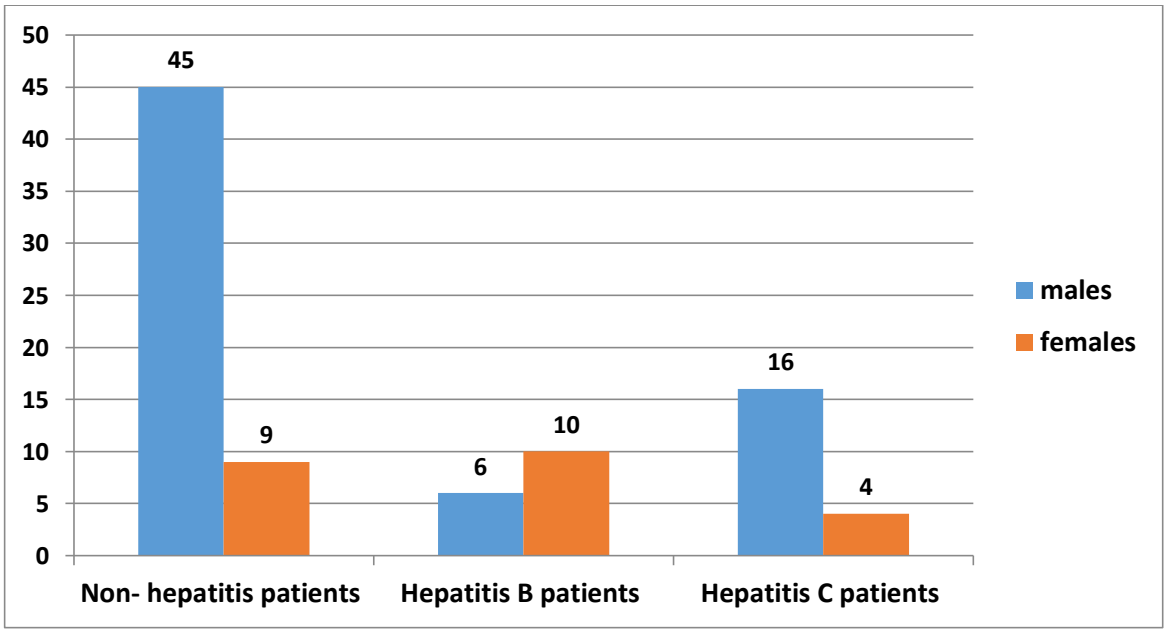

Fig (1): Distribution of study groups according to gender.

The comparative value of various blood indices in patients with CRF

The mean value for various blood indices (white blood cell count, red blood cell count, lymphocyte count, and neutrophil count) in CRF patients with and without hepatitis is shown in Tables (1) and (2).

Table (1): Measures of Blood Indices in CRF Patients with Hepatitis.

Blood Indices	Mean	Increased		Decreased		Normal		Total	
		No.	%	No.	%	No.	%	No.	%
WBC. 10*9/L	5.11	0	0	12	33.33	24	66.66	36	100
RBC.10*12/L	3.31	1	2.77	26	72.22	9	25	36	100
Lymphocyte %	19.5	0	0	15	41.66	21	58.33	36	100
Neutrophil %	71.28	22	61.11	0	0	14	38.88	36	100

Table (2): Measures of Blood Indices in CRF Patients without Hepatitis.

Blood Indices	Mean	Increased		Decreased		Normal		Total	
		No.	%	No.	%	No.	%	No.	%
WBC. 10^{*9}/L	5.41	3	5.55	16	29.62	35	64.81	54	100
RBC.10^{*12}/L	3.21	2	3.70	32	59.25	20	37.03	54	100
Lymphocyte %	21.98	1	1.85	34	62.96	19	35.18	54	100
Neutrophil %	69.37	37	68.51	2	3.70	15	27.77	54	100

Hypersplenism, antiviral medication, low thrombopoietin levels, and/or autoimmune processes are frequently cited as the causes of peripheral blood cell count anomalies in patients with HCV infection [4]. According to this study, most CRF cases had normal total WBC counts (4–10 x 109/L, mean 5.29.109/L). Bukhari and Zafar [11] showed that the total leucocyte count (HCV positive) is within a normal range; however, the total WBC count increased in 3 from 90 patients and decreased in 28/90 (31.11%), 12 of whom had hepatitis virus. These results could result from aberrant bone marrow function and a lack of hepatitis virus-induced inhibition of this component [12]. The average RBC count was (3.25 x 10*12/L) lower than the range that is considered normal (3.5-5.5 x 10*12/L). Of the 90 patients, 58 (64.44%) had a decreased RBC count, with 26 of those having hepatitis virus. The decreased count of RBC in hemodialysis may be caused by blood loss in frequent dialysis, and anemia of chronic disease (ACD) is almost always present in patients with chronic hepatitis due to a complex etiology that includes impaired iron reutilization, low-grade hemolysis, shortened red cell life span, hypo secretion of erythropoietin, and tissue hypo responsiveness to erythropoietin (Bukhari & Zafar, 2013), Venous blood loss during recurrent dialysis may be the cause of the decreased RBC count in hemodialysis (Muhsun et al., 2015).

The mean neutrophil % was 70.13, higher than the normal range of 50 – 70; the increased percentage was discovered in 59/90 patients (65.55%); 22 patients had hepatitis and the highest count was 82. as neutrophils are the most prevalent cell type seen in the early stages

of acute inflammation, the majority of cases of an increase in neutrophil count may be secondary to inflammation, particularly chronic hepatitis and cancer, either by growth factors secreted by the tumor or invasion of the bone marrow by cancer, increased destruction of cells in peripheral circulation can stimulate the bone marrow, stress-exercise, surgery, general stress, and medication-induced corticosteroids (Marks, 2013). In regard to lymphocyte % count, the mean was (20.99), falling within the normal range (20-40), and a lowered count was observed in 49/90 (54.44%) patients, 15 of whom had the hepatitis virus. The mean for these patients was 19.5. Infectious disorders such as viral hepatitis, chemotherapy, other drugs, kidney or bone marrow transplant, hemodialysis, kidney failure, severe burns, nutritional/dietary factors, alcohol addiction, and zinc deficiency are possible causes of the low count (Goldman & Schafer, 2012) Non- significant statistical differences were found at ($p<0.05$) between the two groups of the study, as shown in Table (3).

Table (3) a statistical comparison of the value of some blood indices among CRF patients in the present study.

Hematological tests	Mean ± SD of CRF patients without hepatitis (n=54)	Mean ± SD of CRF patients with hepatitis (n=36)	T-test	Degree of Freedom	P value
WBC.10^{*9}/L	5.41± 2.06	5.11± 1.82	-0.72	81	0.47
RBC.10^{*12}/L	3.21± 0.73	3.31± 0.83	0.59	68	0.55
Lymphocyte %	21.98±8.64	19.5±5.68	-1.64	88	0.10
Neutrophil %	69.37±8.28	71.28±3.86	1.46	80	0.14

Conclusions

The majority of the research patients were males, 67, while the females were 23, according to the study's findings. The results of the current study also showed that there were more HCV patients than HBV patients. Furthermore, 40% of patients had HCV and HBV infections. In a comparison of CRF patients with hepatitis and those without hepatitis regarding various hematological tests (WBC, RBC, lymphocyte, and neutrophil), a non-significant statistical difference (P 0.05) was found.

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