Middle East Research Journal of Microbiology and Biotechnology
ISSN: **2789-8644 (Print & Open Access)**
Frequency: Bi-Monthly
DOI: 10.36348/merjmb.2024.v04i01.001

KUWAIT SCHOLARS PUBLISHER
Website: http://www.kspublisher.com/
Email: office.kspublisher@gmail.com

Evaluation of Complete Blood Count Changes in Patients Undergo Hemodialysis in Shendi Town, Sudan

Emad Eldein A. Mohammed[1], Sabna Tarig M. Elnager[1], Mohammed Osman Ali[1], Tibyan Abd Almajed Altaher[2], Ghanem Mohammed Mahjaf[3], Mosab Nouraldein Mohammed Hamad[4*]

[1]Department of Haematology, Faculty of Medical Laboratory Sciences, Shendi University, Sudan
[2]Department of Clinical Chemistry, Faculty of Medical Laboratory Sciences, Shendi University, Sudan
[3]Department of Medical Microbiology, Faculty of Medical Laboratory Sciences, Shendi University, Sudan
[4]Assistant Professor, Microbiology Department, Faculty of Medicine, Elsheikh Abdallah Elbadri University, Sudan

Abstract: ***Background***: Chronic Renal failure is a major health problem and affects the economic and social status of patients. In Sudan, according to the ministry of health records, the prevalence of renal failure is increasing by approximately 70 to 140 new patients undergoing dialysis each year. This high frequency is thought to be due to epidemic malarial infection, which is well known to cause glomerulonephritis. ***Methods***: This is a cross-sectional descriptive study conducted in Shendi town during the period from September 2021 to January 2022, and aimed to determine hematological parameters in hemodialysis patients. A total of venous blood samples were collected in EDTA anticoagulant containers then mix well and transfer to the laboratory, following standard procedures to prevent contamination, then count complete blood count automatically. ***Results***: Statistical analysis by SPSS showed that the Mean of HB in pre and post-hemodialysis was(7.4g/dl and7.9 g/dl), the mean PCV in pre and post-hemodialysis was(22.7% and 25.8%), the mean of RBCs count in pre and post hemodialysis was(2.6x1012cell/l and 2.8x1012cell/l), the mean of WBCs count in pre and post hemodialysis was(5.4x109/L and 5.1x109/L), the mean of platelet count in pre and post hemodialysis was(152000cell/mm3 and 146000cell/mm3), the mean of the MCV in pre and post-hemodialysis was(86.7fl and 89.0fl), the mean of MCH in pre and post-hemodialysis was(28.3pg and 28.2pg) and the mean of MCHC pre and in post hemodialysis (32.8g/dl and 31.9g/dl). ***Conclusion***: The study concluded that the hematological parameters in Shendi town in Hemodialysis patients cause an increase in RBCs, Hb, PCV, and lymphocyte count, no significant effect on PLTs, red cell indices not affected by hemodialysis and remain within normal range and women more affected than men as well as elder people.

Keywords: Hemodialysis, CBC, *Evaluation*, Shendi, Sudan.

Research Paper

***Corresponding Author:**
Mosab Nouraldein Mohammed Hamad
Assistant Professor, Microbiology Department, Faculty of Medicine, Elsheikh Abdallah Elbadri University, Sudan

How to cite this paper:
Emad Eldein A. Mohammed *et al;* "Evaluation of Complete Blood Count Changes in Patients Undergo Hemodialysis in Shendi Town, Sudan" Middle East Res J. Microbiol Biotechnol., 2024 Jan-Feb 4(1): 1-5.

Article History:
| Submit: 30.11.2023 |
| Accepted: 01.01.2024 |
| Published: 04.01.2024 |

INTRODUCTION

Kidneys are paired bean-shaped organs located in the back of the abdomen. The most prominent function is the removal of unwanted substances from plasma, filtering the blood, controlling the body's fluid balance, regulate the balance of electrolytes and secretion of hormones like Erythropoietin (which controls erythrocyte production) and Thrombopoietin (which controls Thrombocyte production) so, in the clinical laboratory, kidney function tests are used in the assessment of renal diseases [1]. Chronic kidney disease (CKD) is a clinical syndrome that occurs when there is a gradual decline in renal function over time. According to the 2007 U.S. Renal Data System (USRDS) Annual Data Report, one in nine U.S. adults has CKD and 20 million more are at risk of early detection and treatment are needed to prevent the progression to ESRD, and complications such as coronary vascular disease [2].

The statistics of the first quarter of the year 2021, for the National Center for Kidney Diseases and Surgery, showed that in the country there are about 12,500 patients with terminal kidney failure, which is equivalent to about 250 patients per million people, which number similar to the global average, and about 8,000 of these patients are subject to treatment in hospitalization. About 80 patients are treated with the

continuous ambulatory net, and about 4,300 patients live with transplanted kidneys [3].

Blood is a specialized bodily fluid that delivers necessary substances such as nutrients and oxygen to the cells and transports metabolic waste products away from those same cells. In vertebrates, it is composed of blood cells suspended in a pale yellow liquid called blood plasma [4].

Complete blood count (CBC), also known as full blood count (FBC) or full blood exam (FBE) or blood panel, or Hemogram, is a test panel requested by a doctor or other medical professional that gives information about the kinds and number of cells in a patient's blood. The cells that circulate in the bloodstream are generally divided into three types: white blood cells (leukocytes), red blood cells (erythrocytes), and platelets (thrombocytes). Abnormally high or low counts may indicate the presence of many forms of the disease [5].

Dialysis is a process for removing waste and excess water from the blood, Dialysis involves the removal of urea and other toxic substances from the plasma as well as the correction of electrolyte imbalance. Dialysis is regarded as a "holding measure" until a renal transplant can be performed, or sometimes as the only supportive measure in those for whom a transplant would be inappropriate. Two methods of dialysis, hemodialysis (HD) is the most commonly used method in which, blood is passed through an extracorporeal circuit and pumped across an artificial semi-permeable membrane to bring the blood into contact with the dialysate [1].

The second method is intermittent and continuous ambulatory peritoneal dialysis (PD). This method utilizes the peritoneal membrane, as the semi-permeable membrane, with capillaries on one side and high osmotic fluid infused into the peritoneal cavity on the other side. The peritoneal cavity is drained and the cycle is repeated after a suitable time to allow the equilibration of diffusible substances. Both types of dialysis are known to have side effects on the variable blood component. Dialysis is an imperfect treatment to replace kidney function because it does not correct the endocrine functions of the kidney [6].

MATERIALS AND METHODS

Study design:

This is a cross-sectional descriptive study that aimed to evaluate Haematological parameters in patients undergoing hemodialysis.

Study area:

This study is conducted at Elmek-near hospital which is located in Shendi town in Sudan, in duration between 2021 to 2022.

Study population: Patients undergo hemodialysis.

Inclusion Criteria: A patient with renal failure undergoes hemodialysis.

Exclusion criteria for the adult: Exclusion of normal persons and patients with renal failure but not undergoing hemodialysis.

Study sample: Blood sample.

Sample size: 82 sample.

Data collection tools: The primary data is collected by using a questionnaire.

Sample processing:

2.5 ml of venous blood was taken from the patient and transferred into an EDTA container. The sample was then sent as early as possible (maximum 3 to 6 hours) for analysis. Hematological parameters were done by the automated method.

Method:

CBC was done by using Mindray Haematology Analyzer (Mindray bc-3000): blood cells can be broadly divided into three categories. Red blood cells, White blood cells, and platelets. The analyzer measures the number of cells and distinguishes between their types according to size using sheath flow DC detection. Electrical current is passed through a solution; this method measures the changes in electrical resistance that occurs when blood cells pass through the detection aperture. This instrument performs hematology analyses according to the RF/DC detection method, Hydro Dynamic Focusing (DC Detection), and sodium lauryl sulphate (SLS) hemoglobin method. The radio frequencies and direct current (RF/DC detection method) detect the volume of blood cells by changes in direct-current resistance. RBC count, Hct, Hb concentration, haematimetric indices (MCV, MCH, and MCHC), RDW, WBCs, and platelets counts were measured by using an automatic blood cell counter (Mindray -3000 analyzers). The assay was performed according to the instructions provided by the manufacturer. The analyzer was controlled by normal control, abnormally high, and abnormally low. the EDTA blood samples were aspirated into the analyzer through a sample probe, and the counting was started automatically, the results were displayed on the screen within (20) seconds Blood films were made from samples collected from all participants.

Data analysis and presentation

Data collected in this study will be analyzed using SBSS21. Chi squire test will be used to assess the enter group's significance.

Ethical considerations

The procedure of venous blood sampling was explained to patients undergoing hemodialysis. All

participants were informed about the research objectives and procedures during the interview period. Written valid consent was obtained from all participants. All results will be with high privacy and confidentiality.

RESULTS

General Characteristics of patients under hemodialysis revealed that the patients with age (11-30) years comprise (11%), while those aged (31-50) years were (44%), and those aged (51-70) years represent (39%), and finally the group with an age of (71-90) years were (6%). Also regarding general characteristics of patients under hemodialysis, about (56%) of them were male, while (44%) were female. In addition to and based on the duration of hemodialysis, the majority of the patients (69.5%) were on hemodialysis for more than one year and those less than one year were (30.5%). The results of the current study showed that the mean of Hb level, PCV, RBCs count, MCV, MCH, MCHC, RDW-SD, and RDW-CV in patients pre-HD were (7.4g/dl, 22.7%, 2.6×106/µI, 86.7fl, 28.3pg 32.8%, 55.9fl And 16.3%) respectively, while in post HD were (7.9g/dl, 25.0%, 2.8 ×106/µI, 89.0 fl, 28.2pg, 31.9%,55.2fl, and 16.1%) respectively (Table 1). Also the results of this study revealed that the mean of TWBCs count, Neutrophils count, Lymphocytes count and Mixed cells count and in pre HD were (5.4 ×103/µl, 42.3%, 43.4%, and 12.8%) respectively, while in post HD were (5.1 ×103/µI, 41.6%, 47.3%, and 11.3%), respectively (Table 2). In addition to the mean of PLTs count, MPV, PDW, and PCT in pre-HD were (152.1×103/µI, 8.9fl, 15.7and 0.131%) respectively while in post HD were (146.7×103/µl, 8.9fl, 15.8 and 0.135%) respectively (Table 3).

Table-1: The mean of RBCs parameters Pre and post haemodialysis

Parameter		***Mean***	***P. value***
HB	*Pre*	7.471	0.059
	Post	7.956	
PCV	*Pre*	22.772	0.006
	Post	25.088	
RBCs	*Pre*	2.6513	0.070
	Post	2.8137	
MCV	*Pre*	86.727	0.008
	Post	89.051	
MCH	*Pre*	28.311	0.749
	Post	28.229	
MCHC	*Pre*	32.810	0.002
	Post	31.924	
RDW-SD	*Pre*	55.978	0.293
	Post	55.272	
RDW-CV	*Pre*	16.326	0.621
	Post	16.158	

Table-2: The mean of WBCs parameters pre and post haemodialysis

Parameter		***Mean***	***P. value***
WBCs	*Pre*	5.459	0.231
	Post	5.160	
NEU	*Pre*	42.360	0.565
	Post	41.589	
LYM	*Pre*	43.433	0.075
	Post	47.274	
MID	*Pre*	12.863	0.075
	Post	11.318	

Table-3: The mean of PLTs parameters pre and post haemodialysis

Parameter		***Mean***	***P. value***
PLT	*Pre*	152.11	0.492
	Post	146.77	
MPV	*Pre*	8.894	0.938
	Post	8.884	
PDW	*Pre*	15.704	0.222
	Post	15.789	
PCT	*Pre*	0.13159	0.714
	Post	0.13513	

Table-4: The comparison of Hb level Pre and Post HD according to gender, duration of HD, and age (N = 82)

HB	*Mean. Pre*	*Mean. Post*	*Std. Pre*	*Std. Post*
Male	7.659	8.235	1.8029	2.8471
Female	7.231	7.600	1.8495	1.8592
More than 1 year	7.502	8.119	1.8201	2.7182
Less than 1 year	7.400	7.584	1.8708	1.7696
Age	7.471	7.956	1.8247	2.4693

Table-5: The comparison of RBCs count Pre and Post HD according to gender, duration of HD, and age (N = 82)

RBCs	*Mean. Pre*	*Mean. Post*	*Std. Pre*	*Std. Post*
Male	2.7320	2.9174	0.63908	0.95601
Female	2.5483	2.6811	0.69927	0.69001
More than 1 year	2.6284	2.6868	0.69659	0.66627
Less than 1 year	2.6614	2.8693	0.66157	0.92280
Age	2.6513	2.8137	0.66828	0.85288

Table-6: The comparison of TWBCs count Pre and Post HD according to gender, duration of HD, and age (N = 82)

WBCs	*Mean. Pre*	*Mean. Post*	*Std. pre*	*Std. Post*
Male	5.217	5.093	1.6424	1.8481
Female	5.767	5.244	3.4296	2.7196
More than 1 year	5.228	5.128	1.7196	1.6610
Less than 1 year	5.560	5.174	2.8835	2.4884
Age	5.495	5.160	2.5784	2.2581

Table-7: The comparison of platelets count Pre and Post HD according to gender, duration of HD, and age (N = 82)

PLT	*Mean. Pre*	*Mean. Post*	*Std. Pre*	*Std. Post*
Male	153.50	151.50	50.083	81.474
Female	150.33	140.72	61.560	47.665
More than 1 year	157.68	150.44	52.796	53.787
Less than 1 year	149.67	145.16	56.331	74.481
Age	152.11	146.77	55.077	68.545

DISCUSSION

Chronic Renal failure is a major health problem and affects the economic and social status of patients. In Sudan, according to the ministry of health records, the prevalence of renal failure is increasing by approximately 70 to 140 new patients undergoing dialysis each year. This high frequency is thought to be due to epidemic malarial infection, which is well known to cause glomerulonephritis [7]. The results of this study denoted that patients with renal diseases on regular HD display various degrees of changes in hematological parameters. Statistical analysis of the results of this study revealed that there was insignificant variation in the mean of RBC count and HB level after HD with *P. value* of (0.070,0.059). These results disagreed with the results of the study adopted by Mohamed Siddig Mohamed Ali *et al.*, who reported significantly increased HB and RBCs and also disagreed with the results of a study done by Pradhiksha Dasaprakash *et al.*, who reported HB was decreased [8, 9]. Also, statistical analysis of the results of this study revealed that there was a significant difference in the mean of PCV after HD with a P value of (0.006). These results agreed with the results of a study done by Mohamed Siddig Mohamed Ali *et al.*, [8]. Also, statistical analysis of the results of this study revealed that there was a significant variation in the mean of MCHC after HD with a P value of (0.002). These results agreed with the results of a study done by Mohamed Siddig Mohamed Ali *et al.*, and also similar to the results of studies done by Dr. Pradhiksha Dasaprakash *et al.*, [8, 9]. Also, statistical analysis of the results of this study revealed that there was an insignificant difference in the mean of MCH after HD with a *P. value* of (0.741) so it is not similar to the results of studies done by Dr. Pradhiksha Dasaprakash *et al.*, [9]. In addition to statistical analysis of the results of this study revealed that there was significant variation in the mean of MCV after HD with a P.value of (0.008), similar to the results of a study done by Dr. Pradhiksha Dasaprakash *et al.*, [9]. The statistical analysis of the results of this study revealed that there was an insignificant difference in the mean of WBCs count and platelet count after HD with a P.value of (0.231, 0.492) respectively, this result disagreed with the results of the study done by esu Pandian *et al*, and also disagreed with to the results of a study done by Mohamed Siddig Mohamed Ali *et al., who* reported that WBCS & Plts count shows a mild increase [8, 10]. Also, statistical analysis of the results of this study that there was an insignificant difference in the mean of Neutrophil, MID absolute count after HD with *P. value* of (0.565, 0,075) respectively, which disagreed with the results of a study done by esu Pandian *et al.*, who reported a decrease in

the neutrophil absolute count [10]. In addition to statistical analysis of the results of this study revealed that there was an insignificant variation in the mean of lymphocyte absolute count after HD with a *P. value* of (0.075), which disagreed with the results of a study done by esu Pandian *et al.*, who reported an increase in lymphocyte absolute count [10].

CONCLUSION

Hemodialysis causes an increase in the mean RBC count, Hb level, PCV, and lymphocyte absolute count. No significant effectiveness on PLTs count and indices. Red cell indices are not affected by HD and remain within the normal range. Women's more affected than men as well as elder people.

Sources of Funding:

There was no specific grant for this research from any funding organization in the public, private, or nonprofit sectors.

Conflict of Interest: The author has affirmed that there are no conflicting interests.

REFERENCES

1. Bishop, M. L., Fody, E. P., & Schoeff, L. E. (2008). Clinical chemistry: techniques, principles, correlations/[edited by] Michael L. Bishop, Edward P. Fody, Larry E. Schoeff.
2. Port, F. K., & Held, P. J. (2019). The US Renal Data System at 30 years: a historical perspective. *American Journal of Kidney Diseases*, *73*(4), 459-461.
3. *Federal Ministry of Health.* [Online] Available at: http://fmoh.gov.sd/index.php/posts/post/2076 [Accessed: 22 Aug. 2021].
4. *Blood*, [online] Available at: http://www.fi.edu/learn / heart/ blood/blood.html [Accessed: 28 Aug. 2021].
5. *Complete Blood count with Differential*, [online] Available at: http://www.nlm.nih.gov/medlineplus/ency/article/003644 [Accessed:30 Aug. 2021].
6. Ciesla, B. (2007). Library of Congress Cataloging-in-Publication Data.
7. Hussein, A., Kareem, E. A. Z. A., Dawood, A. H., & Dawood, N. J. (2019). Changes in Value of Some Blood Parameters before and After Hemodialysis.
8. Mohammed, S. G. S., & Elhag, N. B. (2019). Perceptions of hemodialysis patients about fluid intake at Bahri Hemodialysis Center (Bahri Hospital), Khartoum North.
9. Dasaprakash, D. P., Ganapathy, D. S., & Raja, D. V. (2019). Effects of haemodialysis on Hemoglobin and red cell indices in chronic kidney disease patients at a tertiary health care institute. *International Journal of Clinical and Diagnostic Pathology*, *2*(1), 96-100.
10. Pandian, J., Amitkumar, K., & Swaminathan, A. (2017). Assessment of impact of hemodialysis on hematological parameters among patients with chronic kidney disease. *Comparative Clinical Pathology*, *26*, 213-218.