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ORIGINAL ARTICLE

Impact of Haemodialysis on Haematological Parameters in Patients with Chronic Kidney Failure

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ABSTRACT

Background: Renal failure affects about 1.1 million people worldwide, and the number is growing at a frequency of 7% each year. Anemia is a prevalent complication of chronic renal disease, which is linked to a high rate of morbidity.

Objective: To assess the impact of haemodialysis on haematological parameters in patients with chronic kidney failure

Methodology: This study design was cross-sectional, carried out at the Institute of Kidney Disease, Hayatabad Medical Complex, Peshawar for a period of six months from July 2021 to December 2021. Totally, 160 chronic kidney failure patients were included in the current research work. All the blood samples taken were analyzed by using automatic hematology analyzer (Sysmex XE-21 analyzers) for complete blood count. Data analysis was carried out by using IBM SPSS version 24.

Results: Based on the stages of anemia, amongst 160 patients, 17 (10.63%) patients were normal whereas the mild, moderate and severe anemia was observed in 64 (40%), 72 (45%) and 7 (4.68%) patients respectively. In comparison to pre-dialysis, significant increase was observed in RBC, RDW HB, MCHC and HCT after post-dialysis whereas significant decrease in TLC, MCV and non-significant decrease in Platelets was observed after post-dialysis in chronic kidney failure patients.

Conclusion: Our study concludes that haematological parameters are significantly affected by the hemodialysis. For hemodialysis patients, hemoglobin is an important risk factor. Our study recommends that all the patients should be screened for hematological parameters before hemodialysis

Keywords: Haemodialysis; Haematological parameters; chronic kidney failure

INTRODUCTION

Chronic kidney disease (CKD) is a disorder in which the kidneys stop working properly [1]. Renal failure is divided into two categories: acute and chronic [2]. Hemodialysis, peritoneal dialysis, or a kidney transplant may be used to treat patients with end-stage renal disease, which is the last stage of chronic renal failure [3].

Renal failure affects about 1.1 million people worldwide, and the number is growing at a frequency of 7% each year [4]. Chronic kidney disease is a worldwide health issue that has a substantial impact on the socioeconomic position of those who are afflicted. Hemodialysis and peritoneal dialysis are still the most common treatments for renal failure [5].

Anemia is a prevalent complication of chronic renal disease, which is linked to a high rate of morbidity. Renal failure anemia appears early in the course of kidney disease and gradually worsens as the kidneys deteriorate. Although the fundamental deficiency is diminished erythropoiesis owing to insufficient erythropoietin (EPO) production, a number of additional variables may also be involved [6]. A typical consequence of CKD is normocytic normochromic anemia. Iron deficiency or aluminum poisoning may cause a microcytic and hypochromic blood appearance. B12 and folate deficiency are the most common causes of macrocytic anemia. In CKD patients, both forms of anemia may occur. [7-9]

The total white blood cell count was found to be elevated in patients with acute renal failure but normal in those with chronic kidney disease. Both have a high rate of neutrophilic leucocytosis and lymphopenia. Although the identification of the compounds remained in the body due to renal failure is uncertain, they decrease lymphopoiesis and enhance granulopoiesis [10]. Platelet dysfunction owing to aberrant platelet activation and adhesion is to responsible for the elevated bleeding susceptibility in this syndrome [11, 12]. Dialysis removes urea and other harmful elements from the bloodstream while also correcting electrolyte imbalances [13].

Haemodialysis is the more generally used of the two types of dialysis. It involves passing blood via an extracorporeal circuit and pumping it through semi-permeable artificial membranes to get the blood into touch with the dialysate [14]. Both kinds of dialysis have the potential to harm blood components. These effects may differ depending on a variety of physiological and non-physiological variables, including the age, sex, ethnicity, muscle activity, and posture during dialysis, as well as the length and kind of dialysis of the patients [15]. This study was piloted to determine the impact of haemodialysis on

haematological parameters in patients with chronic kidney failure.

MATERIALS AND METHODS

This study design was cross-sectional carried out, at the Institute of Kidney Disease, Hayatabad Medical Complex, Peshawar. The study was conducted for a period of six months from July 2021 to December 2021. This study approval was given by the hospital ethical and research committee. The inclusion criteria for our study were all the patients of chronic kidney failure of both the sex and all ages, with previous history of ≥20 hemodialysis. While the exclusion criteria were pregnant women, patients with hematological caner, patients with transfused blood and patients having <20 session of dialysis. Totally, 160 chronic kidney failure patients were included in the current research work. Consent form was signed from all the participants in our study. For complete blood count, 2ml of venous blood, in EDTA tube, was taken from all the participants. All the samples were analyzed by using automatic haematology analyzer (Sysmex XE-21 analyzers) for complete blood count. Data analysis was carried out by using IBM SPSS version 24. For calculation of numerical variables mean and standard deviation were used whereas for the calculation of categorical variables frequency and percentages were used. For comparison of pre-dialysis and post-dialysis, pair t test was employed with p value of ≤0.05 as significant.

RESULTS

Amongst the total 160 subjects, males were 96 (60%) were males whereas females were 64 (40%). (Figure 1) The average age was 37.9 year with standard deviation of 9.5. The range of age was 13-79 years. Based on the status and stages of anemia, amongst 160 patients, 17 (10.63%) patients were normal whereas the mild, moderate and severe anemia was observed in 64 (40%), 72 (45%) and 7 (4.68%) respectively. (Figure 2) In the current study, in comparison to pre-dialysis, significant increase was observed in RBC, RDW HB, MCHC and HCT in post-dialysis whereas significant decrease in TLC, MCV and non-significant decrease in Platelets was observed in post-dialysis as shown in table 1.

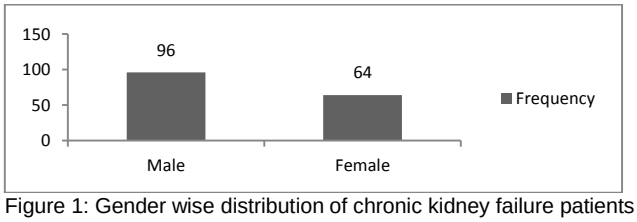

Figure 1: Gender wise distribution of chronic kidney failure patients

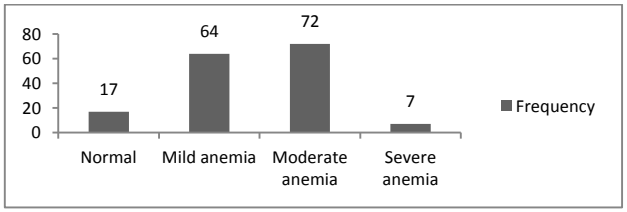

Figure 2: Distribution of patients based on stages of anemia in chronic kidney failure patients

Table 1: Comparison of complete blood profile before and after haemodialysis

Parameter	Pre-dialysis Mean (SD)	Post dialysis Mean (SD)	P value
HB	9.21 (0.56)	9.43 (0.99)	0.011
RBCs	3.31 (0.33)	3.42 (0.44)	0.001
HCT	28.95 (4.52)	29.45 (4.56)	0.031
MCV	86.99 (5.11)	86.81 (4.22)	0.011
MCH	28.24 (3.17)	28.09 (2.27)	0.001
MCHC	31.86 (0.98)	31.96 (0.99)	0.032
RDW	48.99 (5.21)	48.51 (6.43)	0.001
WBCs	8.16 (2.11)	7.61 (2.96)	0.021
Platelets	221.11 (74.21)	217.21 (72.14)	0.911

DISCUSSION

Despite its excellent efficacy as the primary modality of therapy for chronic renal failure, hemodialysis may cause acute problems with severe morbidity [16]. In the operation of dialysis devices, the amount of damage to hematological parameters is crucial. As a result, these indicators must be monitored both before and after dialysis in order to avoid problems and thereby lower the mortality rate.

In our study, based on the status and stages of anemia, amongst 160 patients, 17 (10.63%) patients were normal whereas the mild, moderate and severe anemia was observed in 64 (40%), 72 (45%) and 7 (4.68%) respectively.

In accordance with our findings, similar findings were found in a research done by Asif et al. who found that hemoglobin is one of the most commonly influenced hematological parameters in chronic renal failure patients due to a decrease in production of erythropoietin [17]. Another comparable study carried out in Sudan by Mohamed and Ali reported anemia in all patients with chronic kidney failure. They reported mild anemia in 28.2% subjects, moderate anemia in 56.1% patients while severe anemia was observed in 15.5% subjects [18]. Another study reported that the commonest problem associated with the patients of chronic kidney failure is anemia. They reported that this problem is due to erythropoesis suppression and RBCs loss during the process of dialysis [19].

In the current study, in comparison to pre-dialysis, significant increase was observed in RBC, RDW HB, MCHC and HCT in post-dialysis whereas significant decrease in TLC, MCV and non-significant decrease in Platelets was observed in post-dialysis.

Significant increase in RBC, RDW HB, MCHC and HCT in post-dialysis may be attributed to elimination of additional waste fluid following ultra-filtration procedure from the hypervolumic individuals. The loss of erythrocyte membrane protein during haemodialysis may cause a considerable drop in MCV, while supine posture and subsequent hemodilution produced by transfer of water from extra-vascular to intravascular space might cause a considerable reduction in MCH. In accordance with our study, another study reported similar results [20].

Other investigations have indicated that the number of leukocytes in chronic renal failure patients is much lower than in the control group. The explanation has not been determined, but one plausible mechanism has been proposed: exposure of blood to an artificial membrane activates the complement system, particularly C3a and C5a, causing leukocyte aggregation and a reduction in their

number [4, 21]. In concordance with our study, a previous study reported non-significant increase in platelets level [4]. The findings of this research may differ from those of other author reports owing to the length of the dialysis procedure, sample size, and kind and effectiveness of the equipment utilized, all of which might impact the results.

CONCLUSION

Our study concludes that haematological parameters are significantly affected by the hemodialysis. For hemodialysis patients, hemoglobin is an important risk factor. Our study recommends that all the patients should be screened for hematological parameters before hemodialysis. To assess anemia conduction and treatment, prospective studies with a larger sample size is needed.

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