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EDITORIAL

End-Stage Renal Disease Patients on Haemodialysis in Gezira State Central Sudan; Aetiology and Iron Status

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Abstract:

Background: This cross sectional study was conducted to determine the possible causes of chronic renal failure (CRF) and to monitor the iron status in order to reduce the mortality and morbidity in dialysis patients.

Resluts: Sixty eight CRF patients (36 men and 32 women) on regular haemodialysis were included in this study. Their mean age was 45.4 ± 17.8 years. Diabetes nephropathy (29%) was the commonest cause of CRF, followed by hypertension (21%)
Glomerulonephritis (15%), Severe malaria (13%) and the least common one was polycystic kidney (3%). The mean serum iron was 57.7 ± 27.9 ng/ml, mean serum ferritin was 221.0 ± 170.1 ng/ml, and transferrin saturation (TSAT) was 22.8 ± 24.3%. Using TSAT, 15 (22.1%) patients had adequate (or normal) iron status (25.9 ± 4.4; 284.6 ± 111.0), 53 (77.9%) patients had iron deficiency (13.8 ± 2.6; 88.8 ± 37.7) and none had iron overload.

Conclusion: Our study suggests that, diabetes and hypertension are the conditions requiring strategies for prevention and treatment, and iron status of most cases is poor.

Key words: CRF patients, haemodialysis, iron status, ferritin, transferrin, Gezira State

Introduction:

Chronic renal failure (CRF) represents one of the most expensive and rapidly growing demands on the health-care system of developed and developing countries. Its incidence appears to be increasing, particularly in some developing countries [(1)]. Iron deficiency is considered the most common cause of inadequate response to recombinant human erythropoietin (r-HuEPO). Therefore, body iron stores should be assessed regularly and accurately. Body stores of iron are usually assessed by transferrin saturation (TSAT) (normal 20%-30%) and serum ferritin levels (normal >150 ng/ml). TSAT and serum ferritin are extensively used in clinical practice in monitoring iron status in patients with chronic kidney failure (CKD) on r-HuEPO treatment [(2, 3)]. In view of the relatively poor status of the health-care system in the developing world, there is an obvious need for reduction of the mortality rate through the reduction of the cost of dialysis, treatment and renal transplantation.In spite of the considerable efforts dedicated to the CRF patients, and the remarkable improvement in the quality of renal replacement therapy, such as increased dose of dialysis and the use of erythropoietin and biocompatible membranes, the annual mortality among dialysis patients remains high[(4)].Reports on the aetiology as well as monitoring the iron status in CRF patients in Central Sudan is scanty and based on retrospective data. In this study, the causes of ESRD in Sudanese patients and their iron status are described

Methods:

This is a cross sectional hospital based study of 68 Sudanese patients with CRF.

They receive regular haemodialysis at Gezira Hospital for Kidney Diseases and Transplantation in Gezira State, Central Sudan during the period of January 2011 to December 2011.The patients were selected based

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on a questionnaire and clinical examination. The questionnaire was developed to include the relevant information such as: age, sex, presenting symptoms, past history, duration of dialysis…. etc. Further information including complication and treatment were obtained from patient's files. After explaining the purpose of this study, a written consent was obtained from each patient. Blood samples (5 ml) were collected from each patient transferred into vials coated with anti-coagulant (EDTA) and analyzed for serum iron, total iron binding capacity (TIBC) and ferritin using fully automated chemical analyzer. Transferrin saturation (TSAT) is calculated as the ratio of serum iron and TIBC. The values reported are the means and standard deviations. The results obtained were compared with the reference value cited for each parameter.

Results:

Of the 68 CRF patients, 36 (53%) were men and 32 (47%) were women. The mean age was 45.4 ± 17.8 years and ranged from 10 to 78 years. Disease duration was presented in **(Figure 1)**. Diabetes nephropathy was the commonest cause of CRF diagnosed in 18 (29%) patients followed by hypertension in 13 (21%), glomerulonephritis (15%), severe malaria (13%) and the least common one was polycystic kidney (3%), **(Table 1)**. As shown in **Table 2**, hypertension was the most common complication among the study subjects which was found in 34 (74%) patients, hypertension and heart failure in 6 (13%) cases. The laboratory parameters are shown in **Table 3**. The mean serum iron was 57.7 ± 27.9 ng/ml, mean serum ferritin was 221.0 ± 170.1 ng/ml, and transferrin saturation (TSAT) was 22.8 ± 24.3%.

Using TSAT and Serum ferritin, 15 (22.1%) patients had adequate (or normal) iron status (25.9 ± 4.4; 284.6 ± 111.0), 19 (27.9%) patients had iron deficiency (13.8 ± 2.6; 88.8 ± 37.7) and none had iron overload. 34 (50%) patients had low TSAT with normal or high serum ferritin.The history of medication intake included anti-hypertensive drugs in 64.7%, anti-DM in 22.1% and iron and calcium carbonate supplementation in 45.6% and 14.7% respectively.

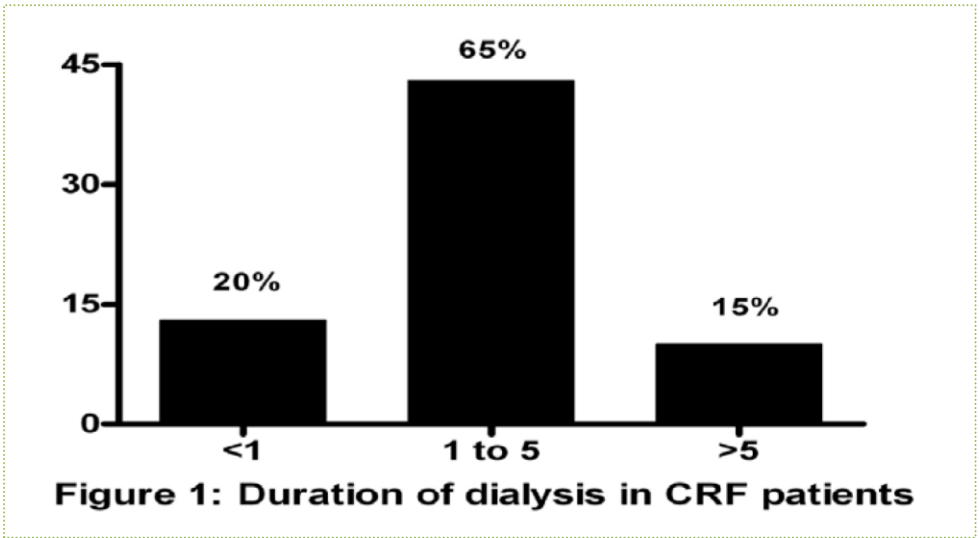

Figure 1: Duration of dialysis in CRF patients

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Table 1: The cause of CRF in the study patients under regular haemodialysis

Etiology	No. of cases	(%)
Diabetes Nephropathy	18	29.0
Hypertension	13	21.0
Glomerulonephritis	9	14.5
Severe Malaria	8	13.0
Renal stone	6	9.7
Benign prostatic hyperplasia	3	4.8
SLE	2	3.2
Polycystic kidney	2	3.2
Obstructive uropathy	1	1.6
Total	**62**	**100**

Table2: The complications among CRF patients under regular haemodialysis

Etiology	No. of cases	(%)
Hypertension	34	74.0
Hypertension + Heart failure	6	13.0
Deep vein thrombosis (DVT)	3	6.5
Hypertension + DVT	2	4.3
Peptic ulcer (stress)	1	2.2
Total	**46**	**100**

Table 3: Laboratory parameters of the study patients

Parameters	Mean values	Range values	Normal Range
Serum iron (ng/ml)	57.66 ± 27.9	14-183	50 -150
Total iron binding capacity (ng/ml)	294.3 ± 103.0	30-558	300 - 360
Serum ferritin (ng/ml)	221.0 ± 170.1	20-764	50 -200
TSAT (%)	22.8 ± 24.3	5-200	20 - 50

Discussion:

Our study showed that diabetes nephropathy was the commonest cause of ESRD occurring in 29% of the cases followed by hypertension in 13 (21%). Similarly diabetes nephropathy has been reported to be the commonest cause of ESRD in USA [5], Europe [6], Japan [4] and in Saudi Arabia [7]. Also previous studies have reported that poor glycaemic control and inadequate control of hypertension are positively correlated with the rapid progression of diabetic nephropathy to ESRD [8, 9]. Hypertension was also highly prevalent in our study, which was similar to that reported in the literature [10]. However, control of hypertension

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remains the most important strategy to halt the progression of renal failure [11]. Glomerulonephritis accounted for 15% of cases of known aetiology in this study. This observation was accounted lower than previous reports in France (31%) [12], and in India (40%) [13]. The reason for this difference could be related to the criteria used for the diagnosis as well as the sample size. The other possible explanation for these discrepancies are the difficulties in defining the exact cause of CRF in developing countries due to limitation of medical facilities, hence aetiology remains largely speculative in many cases. It is known that hypertension increases the risk of ESRD [14] and that good control of blood pressure will slow down the progression of CRF [15], prevent LVH and decrease cardiovascular mortality in CRF patients [16]. Hence, Angiotensin converting enzyme (ACE) inhibitors and Angiotensin II receptors blockers (ARB) are the preferred antihypertensive agents because of their benefits of retarding progression of renal disease and preventing cardiovascular events [17,18]. A total of 62.3% of hypertensive patients of this study have received these drugs.

The assessment of iron status is easy if both TSAT and serum ferritin are either low or normal in the study subjects. Serum ferritin has poor predictive value of iron status when there are infections and active inflammatory processes. Therefore, if these two values diverge, such as if the TSAT is low while the serum ferritin is high, iron status will still be interpreted as low and the raised serum ferritin is considered due to concomitant inflammatory process. Applying this in our study, 77.9% of the study subjects have low iron status, reflecting the necessity for thorough and meticulous care to assess these parameters in patients with CRF. Also serum ferritin should never be used alone to assess iron status. The difficulties in the interpretation of the above results demonstrate the need of applying more sensitive tests, such as percentage of circulating hypochromic red cells (HRC) and reticulocyte haemoglobin concentration (CHr) [19, 20].

In conclusion, our study indicates that diabetes, hypertension and glomerulonephritis constitute the common causes of ESRD patients in Central Sudan and the iron status is low in the majority of these patients. Early diagnosis and management of these entities can play important role in slowing the progression of renal disease. The usage of new indices like HRC and CHr rather than TSAT and serum ferritin would likely make the diagnosis of iron status more accurate and may reduce the requirements and frequency of iron and EPO administration. Assessment of ferritin alone should be avoided particularly in patients with overt inflammatory process.

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