AMJ Australasian Medical Journal [AMJ 2020;13(2):41-45]

Anaemia characteristic in end stage renal disease patients receiving haemodialysis at King Salman armed forced hospital in Tabuk, Saudi Arabia

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RESEARCH

Please cite this paper as: Ibrahim A, Sarah A, Ebtesam A, Tahani A, Mastorah A, Bayan A, Ahmed A, Marghani HO. Anemia characteristic in end stage renal disease patients receiving haemodialysis at King Salman armed forced hospital in Tabuk, Saudi Arabia. AMJ 2020;13(2):41–45.
https://doi.org/10.35841/1836-1935.13.2.41-45

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ABSTRACT

Background
Chronic kidney disease (CKD) is a disease associated with high rate of morbidity and mortality mainly due to cardiovascular disease. Anaemia is the most common haematological abnormality in end stage renal disease.

Aims
The current Study aimed to determine the laboratory characteristic and management of anaemia among haemodialysis patients.

Methods
A cross sectional study conducted among 112 adult patients with the diagnosis of end stage renal disease (ESRD) on haemodialysis at King Salman Armed Forced Hospital in Tabuk, Saudi Arabia, data were collected by a pre-tested data collection sheet.

Results
There were 112 patients with a mean age of 43 years. The mean haemoglobin value was 10.5g/dL, which was lower than the target haemoglobin range recommended by Kidney Disease Outcomes Quality Initiative (KDOQI). Twenty- eight patients (25 per cent) had haemoglobin values between 11.0 and 12.0g/dL. Only seven patients (6.3 per cent) exceeded the recommended range (>12g/dL) and seventy- seven (68.7 per cent) had less than recommended range. The majority of patients had been receiving haemodialysis for two or more years. The most common primary cause of end stage renal failure was diabetic nephropathy. Hypertension was the most common co-morbidity, followed by diabetes, and ischemic heart disease.

Conclusion
Patients with end stage renal disease at a high risk for anaemia which should be investigated for correctable causes such as Iron-deficiency before initiating erythropoietin replacement therapy.

Key Words
Anaemia, kidney, erythropoietin, dialysis

What this study adds:

1. What is known about this subject?
Anaemia is reported to be associated with high cardiovascular mortality in CKD patients. Normocytic and normochromic anaemia is considered to be the most common type of anaemia in CKD patients.

2. What new information is offered in this study?
This study showed that iron deficiency anaemia is frequently present in CKD patients and thus physicians should be aware of this condition.

3. What are the implications for research, policy, or practice?

Replacement of iron should be considered before starting EPO therapy. This should be considered in an individual patient manner.

Background

Chronic kidney disease (CKD) is a disease associated with high rate of morbidity and mortality primarily due to cardiovascular disease in the form of myocardial infarction and stroke.[1] The term "end-stage renal disease" (ESRD) generally refers to CKD treated with renal replacement therapy.[2,3]

ESRD is on the rise worldwide and has become an increasing public health burden.[4,5]

The prevalence of anaemia in chronic kidney disease (CKD) population is reaching 50 per cent, furthermore the incidence of anaemia is well collated with CKD severity.[6] Anaemia of CKD is usually normocytic normochromic and erythropoietin deficiency is to blame, However, uremic-induced inhibitors of erythropoiesis, shortened red blood cell (RBCs) lifespan and nutritional deficiencies, such as iron, folate and vitamin B12 may be contributors.[7-10] Anaemia could lead to deterioration in cardiac function increasing cardiovascular mortality and decreased cognition and mental acuity. Furthermore it can also be accompanied by debilitating symptoms, such as fatigue, weakness, lethargy, anorexia, and sleep disturbances. Also, a low haematocrit (Hct) is an independent risk factor for death in this population.[11]

Thus we conducted the current research to determine characteristic and methods of management of anaemia in haemodialysis population in Tabuk City, Saudi Arabia.

Method

A hospital-based cross-sectional study was carried out in the Department of Nephrology, King Salman military Armed Forced Hospital, Tabuk, Saudi Arabia. Data were collected from electronic medical record of 112 adult patients (52 males and 60 females) with ESRD undergoing haemodialysis. Approval from the Institutional Ethics Committee was obtained before starting the study.

For the purpose of the current study, the following definitions were applied:

- Chronic kidney disease defined as the functional abnormality of the kidney manifested by elevated serum creatinine of >1.5mg/dl for more than 3 months.
- End-stage renal disease (ESRD) is defined as irreversible decline in a person's own kidney function (GFR <15mL/min/1.73m^2 or dialysis).
- Adequate iron status defined is as a serum ferritin concentration of more than 200ng/mL plus a TSAT value of equal or more than 20 per cent according to KDOQI guidelines.
- The target haemoglobin range is haemoglobin values between 11.0 and 12.0g/dL following the Kidney Disease Outcomes Quality Initiative (KDOQI) guidelines.

Patient with end stage renal disease (ESRD) undergoing haemodialysis, aged 18 years and more were included. Patients undergoing peritoneal dialysis, younger than 18 years, known to have cancer or reserving chemotherapy were excluded from this study.

The data was collected via pre-tested data collection sheet designed to meeting study objectives to collect data about socio-demographic characteristic, co-morbidities haemoglobin level, erythropoietin dosage and iron supplement.

The Statistical Package for Social Sciences (SPSS) was used for data analysis. Descriptive statistics for the prevalence and Quantitative variables was used. Data was expressed in percentages and mean.

Results

Out of 112 patients with ESRD (the mean age was 43 years). The majority had idiopathic renal disease (71.4 per cent), diabetic nephropathy was evident in (11.6 per cent), hypertensive nephropathy in (9.8 per cent), while glomerulonephritis (7.1 per cent) represent the leading causes of ESRD. Hypertension was the most common co-morbidity (70.5 per cent), followed by diabetes (47.3 per cent), and ischemic heart disease (10.7 per cent) Table 1.

The mean haemoglobin value was 10.5g/dL, which was lower than the target haemoglobin range recommended by Kidney Disease Outcomes Quality Initiative (KDOQI). Twenty- eight patients (25 per cent) had haemoglobin values between 11.0 and 12.0g/dL. Seven patients (6.3 per cent) exceed the recommended range (>12g/dL) and seventy- seven (68.7 per cent) had less than recommended range.

All study participants (112 patients) were receiving maintenance subcutaneous erythropoietin after haemodialysis session with dose ranging from 20 up to 100 unit/ week, and nearly all patients (94.6 per cent) were on iron replacement therapy.

The current data showed that less than half of the study participants (41.3 per cent) had ferritin concentration >200ng/mL and (60.6 per cent) had transferrin saturation (TSAT) values ≥20 per cent Table 2.

Discussion

Anaemia could be due to erythropoietin deficiency, shortened red blood cell (RBC) lifespan, and chronic inflammation. Erythropoiesis stimulating agents (ESAs) in combination with iron supplementation is the primary treatment strategy. However, anaemia is resistant to ESAs in approximately 10–20 per cent of the cases. Iron deficiency, resulting from decreased iron absorption and chronic inflammation, leads to poor ESA response.[12-14]

There are several guidelines referring to the target haemoglobin in chronic kidney disease patients. The Kidney Disease Improving outcome (KDIGO) guidelines, advice to address all correctable causes of anaemia prior to initiation of erythropoietin (between 9.0–10.0g/dl) The target is a value between 10–11.5g/dl in haemodialysis patient. Haemoglobin concentration fall below 9.0g/dl is to be avoided.[15]

The current study found that twenty- eight patients (25 per cent) had haemoglobin values between 11.0 and 12.0g/dL. Seven patients (6.3 per cent) exceed the recommended range (>12g/dL) and seventy- seven (68.7 per cent) had less than recommended range. However, the mean haemoglobin in the current study (10.5g/dL) was lower than the Gulf Survey on Anaemia Management study (GSAM) which show mean haemoglobin of 11.45g/dL which may be attributed to inadequate response to erythropoietin therapy secondary to iron deficiency, 38 per cent of patients had elevated haemoglobin (>12g/dL) above the recommended target and 16 per cent had haemoglobin lower than 10mg/dL.

In the current study diabetic nephropathy was the most common primary cause of end stage renal disease and hypertension was the commonest co-morbidity, this finding in agreement with GSAM study.[16]

Targeting haemoglobin concentration more than 12g/dL is not recommended in renal patient, a meta-analysis of nine randomized controlled trials (RCT) that enrolled 5,143 chronic kidney disease patients found a significantly higher risk of all-cause mortality (risk ratio 1.17, 95 per cent CI 1.01–1.35; p=0.031) arteriovenous access thrombosis (risk ratio 1.34, 95 per cent CI 1.16–1.54; p=0.0001), and poorly controlled blood pressure (risk ratio 1.27, 95 per cent CI 1.08–1.50; p=0.004) in the higher haemoglobin target group (12–16g/dL) than in the lower haemoglobin target group (9–12g/dL).[17]

Both ferritin and TSAT levels used to assess iron status. However, both tests may be altered by several factors for example chronic inflammatory state may increase serum ferritin levels that falsely suggest an adequate iron repletion or iron overload and place the patient at risk of iron deficiency if iron therapy inappropriate withdrawal.[18]

KDOQI guideline defined adequate iron status as a serum ferritin concentration of more than 200ng/mL plus a TSAT value of equal or more than 20 per cent. In this study Iron status monitoring test was performed monthly with both tests. The percentage of patients who meet the recommended target ferritin and TSAT value, 41.3 per cent and 60.6 per cent respectively.

Conclusion

Patients with end stage renal disease at high risk for anaemia which should be investigated for correctable causes such as Iron-deficiency before initiating erythropoietin replacement therapy and the targeted haemoglobin level should be mentioned between 10–11.5g/dl.

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PEER REVIEW

Not commissioned. Externally peer reviewed.

CONFLICTS OF INTEREST

The authors declare that they have no competing interests.

FUNDING

None

ETHICS COMMITTEE APPROVAL

The current survey was approved by the ethical committee of the armed forced hospital, North-western region, Saudi Arabia (Ref. Number-HO-07-TU-002, Date 02\11\2018).

Table 1: Demographic characteristic of patients on Haemodialysis
(Total participants =112)

Age(Years)	
18-28	5(4.5%)
29-39	4(3.6%)
40-50	26(23.6%)
51-61	41(37.3%)
62-72	34(30.9%)
Gender	
Male	52(46.4%)
Female	60(53.6%)
Primary Renal Disease	
Diabetes nephropathy	13(11.6%)
HTN	11(9.8%)
Glomerulonephritis	8(7.1%)
Not recorded	80(71.4%)
Duration of Haemodialysis	
=<1 year	19(16.9%)
2-5 years	48(42.8%)
6-10 years	36(32.1%)
=>11 year	9(8.2%)
Diabetes Mellitus	
Yes	53(47.3%)
No	59(52.7%)
Hypertension	
Yes	79(70.5%)
No	33(29.5%)
Ischemic heart disease	
Yes	12(10.7%)
No	100(89.3%)

Table 2: Haematological Parameters of patients on Haemodialysis
(Total participants =112)

Haemoglobin level	
<9	5(4.5%)
9-9.9	42(37.5%)
10-10.9	30(26.8%)
11-12	28(25%)
>=12.1	7(6.3%)
Haematocrit level	
<38.8	61(54.5%)
38.8-50	39(34.8%)
>50	12(10.7%)
Patient receives erythropoietin	
Yes	112(%)
No	0(0%)
Weekly erythropoietin dose (u/week)	
20	22(19.6%)
30	3(2.7%)
40	21(18.8%)
50	5(4.5%)
60	36(32.1%)
80	14(12.5%)
100	11(9.8%)
Patent On Iron Replacement	
Yes	106(94.6%)
No	4(3.5%)
Not recorded	2(1.7%)
Ferritin level (ng/ml)	
<200	64(58.7%)
>=200	45(41.3%)
TSAT level	
<20%	40(36.7%)
>20%	66(60.6%)
Not Recorded	3(2.8%)