# Hemoglobin and Iron Status in Diabetic CKD Stage 5 Pre-dialysis Patients

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# Background

- NKF-K/DOQI defines anemia in adult men and post-menopausal women as hemoglobin <12 g/dl or <11 g/dl in a pre-menopausal woman

- Anemia develops in CKD when the glomerular filtration rate drops below 20-30 ml/min

- Over 40% of patients with CKD are anemic and anemia in this population is under-recognized and under treated

- Contributes to many adverse clinical outcomes

- Anemia in patients with chronic renal failure is multifactorial with an absolute or functional iron deficiency present in 60-80% of patients

- Some other factors also contribute to renal anemia are: (1) a moderately reduced red cell life span, (2) blood loss results from dialysis, diagnostic sampling and occult gastrointestinal bleeding, and (3) an inadequate increase in erythropoiesis relative to the fall in hemoglobin

- NKF-K/DOQI Practice Guidelines recommend maintaining ferritin > or =100 ng/ml and transferrin saturation (TSAT) > or =20% to ensure adequate iron supply for erythropoiesis among patients with chronic kidney disease, whether or not they are dialysis-dependent

- Much has been written on the important contribution of iron deficiency toward anemia and erythropoietin resistance among end-stage renal disease (ESRD) patients, but there are few studies of iron status among chronic renal insufficiency (CRI) subjects not yet requiring dialysis

- Iron deficiency afflicts anemic patients at all stages of chronic kidney disease (CKD) and, one of the important contributory factors of renal anemia that can be measured and treated easily.

# Objectives

- To describe the frequency of anaemia in diabetic CKD stage 5 predialysis patients

- To describe the frequency of IDA among patients with CKD stage 5 before the first dialysis

- To describe the levels of haemoglobin, ferritin and TSAT among predialytic CKD stage 5 patients

- To compare the duration of CKD with the frequencies of levels of haemoglobin, ferritin and TSAT

# Materials and methods

- **Type of Study:** descriptive cross-sectional study

- **Duration of the study:** April 2011 to September 2011

- **Place of study:** department of Nephrology, BIRDEM General Hospital, Dhaka

- **Study sample:** Hospitalized CKD stage 5 pre-dialysis patients

# Inclusion Criteria

- Hospitalized diabetic CKD stage 5 preidialysis patients

# Exclusion Criteria

- Patient who had received any dialysis before

- Acute on CKD

- Recent blood loss

- Patients having hematological disorders, hematological malignancies, haemoglobinopathies etc. as evidenced by clinical and relevant laboratory documents

- Non-diabetic CKD patients

# Results

- Total number of patients 50, male 26, female 24
- Mean age was 55.2 $\pm$10.30 (33-75)  years
- Duration of CKD 03.50 $\pm$02.27 (1-8) years
- Mean eGFR was 09.44 $\pm$02 ml/min.
- Mean blood urea was 36.28$\pm$09.89 mg/dl and creatinine was 8.60$\pm$6.04 mg/dl
- Treatment- iron 60%, erythropoietin 24%, blood transfusion 38%

# Co-morbid condition of the study subjects (n=50) multiple response

| Co-morbid conditions*multiple | Number | Percentage |
|---|---|---|
| Hypertension | 37 | 74 |
| IHD | 22 | 44 |
| Dyslipidaemia | 31 | 62 |
| Stroke | 09 | 18 |

# Diabetic complications of the study subjects (n=50), multiple response

| Diabetic Complications | Number | Percentage |
|---|---|---|
| Peripheral Vascular disease | 10 | 20 |
| Diabetic Neuropathy | 13 | 26 |
| Diabetic Retinopathy | 22 | 44 |

# Haemoglobin level of the study subjects

| Haemoglobin level (mg/dl) | Number | Percentage | P- value | β- value |
|---|---|---|---|---|
| ≤ 9 | 35 | 70 | | |
| >9 | 15 | 30 | $0.036^S$ | 0.289 |
| Mean± SD | 07.61±02.54 | | | |
| Range | 04.80-10.60 | | | |
| | Pvalue reached fromt– test | | | β=Regressioncoefficient |

# Serum iron level of the study subjects

| Serum iron level (μ mole/ lit) | Number | Percentage |
|---|---|---|
| ≤ 7.3 | 23 | 46 |
| >7.3-23.6 | 26 | 52 |
| ≥23.6 | 01 | 02 |
| Mean± SD | 15.59±07.39 | |

# Ferritin level of the study subjects

| Ferritin level (ng/ml) | Number | Percentage | P- value | β- value |
|---|---|---|---|---|
| ≤ 100 | 29 | 58 | 0.041$^S$ | 0.517 |
| >100 | 21 | 42 | | |
| Mean± SD | 155.22±92.32 | | | |
| Range | 50.00-255.36 | | | |

P value reached from t

– test

β=Regression

coefficient

# TSAT level of the study subjects

| TSAT level (%) | Number | Percentage | P- value | β- value |
|---|---|---|---|---|
| ≤ 20 | 23 | 46 | | |
| >20 | 27 | 54 | 0.001$^S$ | 0.743 |

β= Regression coefficient

Pvalue reached from t–test

# Correlation of duration of CKD with Hb, ferritin and TSAT level in the study subjects (n=50)

| Correlation traits | r- value | P- value |
|---|---|---|
| Haemoglobin level (mg/dl) | -0.652 | $0.046^S$ |
| Serum ferritin (ng/ml) | -.0251 | $0.059^{NS}$ |
| TSAT (%) | -.0781 | $0.036^S$ |
| | r=Correlation coefficient | P value reached from t – test |

# Correlation of Hb level with iron, TIBC, ferritin and TSAT level in the study subjects (n=50)

| Correlation traits | r- value | P- value |
|---|---|---|
| Serum iron level (mg/dl) | 0.458 | $0.001^S$ |
| Serum TIBC | -.0204 | $0.015^S$ |
| Serum ferritin (ng/ml) | 0.120 | $0.057^{NS}$ |
| TSAT (%) | 0.769 | $0.001^S$ |
| | r=Correlation coefficient | P value reached from t – test |

# Correlation of the eGFR with several variables

| Variable | Level (mean± SD) | r- value | P- value |
|---|---|---|---|
| Serum creatinine (mg/dl) | 08.60±06.04 | -0.256 | 0.026[S] |
| Serum urea (mg/dl) | 36.28±09.89 | -0.485 | 0.042[S] |
| Haemoglobin level (mg/dl) | 07.61±02.54 | 0.684 | 0.012[S] |
| Serum ferritin (ng/ml) | 153.22±92.32 | 0.491 | 0.041[S] |
| r=Correlation coefficient | S= significant | NS=not significant | P value reached from t – test |

# Limitation

- Limited number of patients were evaluated over a short period

- All were diabetic, not certain what happens in non-diabetic CKD patients

- Bone marrow iron stain was not done

# Conclusion

• Most of the CKD stage 5 patients who are not yet receiving haemodialysis are anaemic irrespective of their previous blood transfusion, iron or EPO supplementation

• Many of them are iron deficient

• TSAT may appear to be a more useful indicator for measuring the frequency of iron deficiency than other indices like serum iron, serum TIBC and serum ferritin levels

• It is can also be recommended that iron deficiency anaemia should be corrected with iron supplementation along with other measures

# References

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Thank you all