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RESEARCH ARTICLE

SERUM IRON PROFILE AND HEMOGLOBIN LEVEL IN CHRONIC KIDNEY DISEASE

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ABSTRACT

Background: In India, CKD one of the major public health problems with many complications. Its progression, can lead to haematological abnormalities including low hemoglobin levels .Increasing renal anemia can further lead to morbidity and mortality in the patients. Aims and objectives: To study serum iron profile and hemoglobin level in patients with CKD. **Materials and Methods:** 70 patients out of total 96 patients with CKD were studied in the Department of Medicine, BRD Medical College from September 2015 to August 2016. Hemoglobin, serum iron, serum ferritin levels, transferrin saturation, total iron binding capacity and creatinine level were assessed for all patients. Data was analyzed using IBM SPSS software. **Results:** Maximum cases were between 25-50 years (n=32, 45.7%) with male preponderance (n=22, 65.71%). Anemia was more common in male population (58.92). Out of 70 patients, 80%, 65.7%, 40%, 34.3% and 37.14% had low haemoglobin level, decreased MCV, decreased ferritin level, decreased iron level and increased TIBC respectively. Haemoglobin level was decreased in 56 patients, of that 35.71% and 5.35% had decreased and increased serum iron level. Out of 26 patients with decreased TIBC, 69.23% had decreased hemoglobin level. Of the 58 (82.85%) patients who were on iron supplementations, 41.37% had decreased ferritin levels. Out of 55 patients who had creatinine level between 5-15 mg/dl, 42 (76.36%) had anemia. **Conclusion:** Decreased hemoglobin level is one of the commonest manifestations in CKD patients with male preponderance.

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INTRODUCTION

CKD is a public health problem with an increasing prevalence in both developing and developed countries. (Andrew SL 2003)CKD is the condition where irreversible destruction of normal kidney tissue along with significant reduction in glomerular filtration rate occurs (Dewardener, 1986) Prevalence of CKD is estimated to be around 8-16% over the world (Jha V 2013), Evidences suggest that hypertension and diabetes both are the major risk factors for the development of CKD (Barsoum, 2006). In India, burden of CKD is also high. Healthy kidneys in our body have an important function of producing erythropoietin which helps in erythropoiesis causing red cell production. Low hemoglobin levels in CKD is multifactorial. Iron deficiency is very common is patients with CKD. Iron deficiency leads to reduction in formation of haemoglobin causing hypochromic microcytic anaemia. Iron deficiency is reflected by reduction in serum iron and transferrin saturation and correspondingly elevations in red cell distribution width, free erythrocyte protoporphyrin concentration, total serum iron-binding capacity (TIBC), and soluble transferrin receptor (sTfR) (Brugnara, 2003).

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Hence, the present study was done to evaluate the serum iron profile and hemoglobin status in the CKD patients as iron deficiency is common in this region and this kind of study has not been done previously in this region of India.

MATERIALS AND METHODS

A total 96subjects were considered for study but after the consideration of exclusion criteria 70 patients with CKD were analysed in the Department of Medicine, BRD Medical College from September 2015 to August 2016. The study was approved by Institutional Ethical Committee. Informed written consent was taken from each patient after explaining the purpose of study. All CKD patients previously diagnosed or newly diagnosed kidney disease patients were included. CKD was diagnosed by using blood tests, urine tests, ultrasonography and renal biopsy (Harrison, ed). Patients of hemolytic anemia, aplastic anemia, leukemia and patients who have not given consent were excluded from the study. Staging of CKD mainly comprised the glomerular filteration rate and urine albumin to creatnine ratio. Investigation including haemoglobin levels, serum iron profile including complete blood count, generalized blood picture with reticulocyte count, kidney function tests, serum ferritin levels, transferrin saturation, red cell distribution width and ultra sonography of

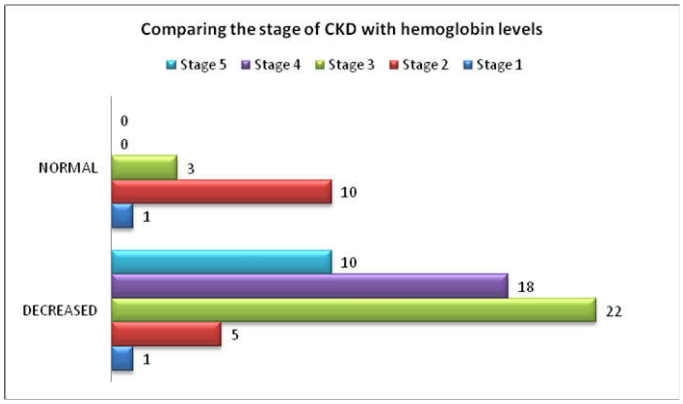
abdomen were performed for all patients. The data was collected using pre designed proforma. Anemia was defined as when haemoglobin level below 13g/dl in males (older than 15 years) and below 12g/dl in females (older than 15 years).All the data was analyzed using IBM SPSS ver. 20 software. Data is expressed as number and percentage. Frequency distribution and cross tabulation was used to analyze the data.

RESULTS

We screened 96 patients, out of which 26 were excluded and analysis was done on 70 patients. Male preponderance (n=46, 65.71%) was observed in present study. Mean haemoglobin, TLC and platelet count were 7.92, 4995 and 254500 respectively. Out of 70 patients taken in study, 56(80%) patient had decreased hemoglobin levels. Out of 70 patients, 46 (65.7%) patients had decreased MCV, 28 (40%) had decreased ferritin level, 24 (34.3%) had decreased iron level and 26 (37.14%) had increased TIBC. Out of 56 patients who had decreased haemoglobin level, 33 (58.92%) had normal, 20 (35.71%) had decreased and 3 (5.35%) had increased serum iron level. Out of 26 patients who had increased TIBC, 8 (30.77%) had normal and 18 (69.23%) had decreased haemoglobin level. In the present study 39(55.7%) of patients were hypertensive and24 (34.3%) were diabetic. Out of 70 patients, 55 (78.57%) had creatinine level between 5 to 15 mg/dl.

Table 1. Different parameters in study cohort

Parameters		Frequency	Percentage
Age	<25	5	7.1
	25-50	32	45.7
	51-75	32	45.7
	>75	1	1.4
Hypertension	Yes	39	55.7
	No	31	44.3
Diabetes	Yes	24	34.3
	No	46	65.7
Hemoglobin	Normal	14	20
	Low	56	80



DISCUSSION

The main function of kidney is excreting the waste products and therefore regulating the fluids and electrolytes in our body. Kidney also helps in erythropoesis by producing erythropoietin and hence regulates red cell production. Disruption of normal kidney function also hampers in red cell production and so a potential cause for anaemia Anemia can be defined as serum hemoglobin levels <12 g/dl in women and < 13 g/dl in men. In patients with CKD iron deficiency anemia is often common. It may be absolute i.e. may be due to poor diet or sometimes may be due to imbalance between iron requirement's of erythroid marrow and the supply. Deficiency of iron leads to decrease in red blood cell formation resulting in causing hypochromic microcytic anaemia (KDOQI, 2006).

In aretrospectives study by Buneno et al on 45 CKD patients reported that more than half of the patients had hypertension and diabetes (Bueno CS 2014). In present study also 55.7% were hypertensive whereas 34.3% were diabetics. Most of the patients with CKD in present study were male (65.71%); in agreement to this Buneno *et al.* also reported male preponderance in CKD patients. (Bueno 2014) **(**Sesso *et al.,* 2008) and **(**Ammirati *et al.,* 2010) has also reported 57.0% and 56.6% male respectively. Higher number of men with disease is possibly due to the fact that generally, women are more concerned about their health care, following more strictly the treatment of hypertension and DM; which prevents or prolongs the time for complications like CKD to develop. In present study,80% patients had decreased hemoglobin levels. Similar to present study Bueno et al reported that the anemia was present in 97.8% of the patients and treated with erythropoietin and/or iron (Bueno CS 2014). A study from Iran found that among patients having CKD who underwent hemodialysis, 85% had anemia **(**Afshar, 2010), similar findings were reported by another study done by Draczevski *et al.* 2011. In a similar study by Deori *et al.* from Dibrugarh, Assam reported that all 50 CKD patients included in the study were anemic with haemoglobin concentration below 11g/dl (Deori, 2016). Mean haemoglobin, in present study was 7.92 g/dL. As per the findings of Bregman and Pecoits-Filho, the ideal hemoglobin range in patients with CKD should be between 11-12 g/dL and it should not be less than 11 g/dL. Authors also reported that higher hemoglobin values are not related to better survival and even increase the tendency for mortality **(**Bregman, 2007). In a similar study by Thakur *et al.* on 63 CKD patients in Delhi reported significantly low serum iron and transferrin saturation levelsin patients with CKD compared to non-CKD patients (p=0.001) (Thakur V 2015). Serum ferritin is another good marker for the evaluation of the stored iron.

Thakur *et al,* contrary to the present study finding, reported high serum ferritin level in patients with CKD and iron deficient anemia. The inflammatory reactions are very common in CKD patients (Thakur, 2015). Reddy et al studied 290 CKD patients who were on hemodialysis and reported that serum ferritin and tissue iron levels were significantly higher compared to normal patients (Reddy, 2013). In our study s.ferritin was normal in 38(54%) and decreased in 28(40%) patients. Erythropoiesis stimulating agents are important for correction of anaemia in CKD patients. In addition to true iron deficiency, many CKD patients have functional iron deficiency, characterized by impaired iron release from body stores that is unable to meet the demand for erythropoiesis (also called reticuloendothelial cell iron blockade). These patients have low serum transferrin saturation (a measure of circulating iron) and normal or high serum ferritin (a marker of body iron stores).

Limitation of study

Present study had few limitation of being less in sample size; a large randomized clinical trial is required to strengthen the present study results.

Conclusion

The present study was conducted on CKD patients .New cases of CKD were diagnosed with help of history blood and urine test, radiological investigation (ultrasonography), renal biopsy was used in conformation of diagnosis. A significant correlation existed between the sex of patient and decreased hemoglobin levels. A significant population of patients in study was diabetic and hypertensive and was having anaemia.CKD patients have microcytic hypochromic anaemia likely to be iron deficiency either absolute or functional. As the stage of CKD advances the presence of anaemia in the patient's increases. Patients on regular iron supplementation had normal serum iron levels but other blood parameters when investigated showed that inappropriate values like low transferrin saturation persisted which meant that although iron supplementation was done, erythropoesis was not adequate. Mutifactorial causes are responsible for decreased hemoglobin levels. No significant correlation existed between the creatinine levels of the patient and presence of anaemia.

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