Original Research Article

Study of hematological changes in chronic renal failure

Bhurke D P[1], Subodh V P[2], Mohammed Ubaidulla Mohammed Ataulla[3*]

[1]Professor, [2]P.G. Student, [3]Associate Professor, Department of Medicine, Dr. Shankarrao Chavan Government Medical College, Nanded, Maharashtra, INDIA.
Email: dbhuvai@gmail.com

Abstract

Background: Chronic renal failure is defined as kidney damage, glomerular filtration rate GFR) < 60 ml/min/1.73 sq.m for a period of ≥ 3 months. Kidney diseases rank third amongst life threatening disease. Anemia is a common sequelae of chronic kidney disease associated with significant morbidity and mortality. Most of the patient of chronic renal failure present with severe anaemia, bleeding tendancies which exacerbates with underlying illness. **Aims and objectives: 1** To study hematological manifestations, demographic feature and clinico-hematological correlation of chronic kidney disease. **Materials and Method:** This study was a cross sectional prospective observational study. **Inclusion Criteria:** Patient with chronic kidney disease with age more than 12years **Exclusion criteria:**1.Patient with other systemic illness with chronic kidney disease 2.Pregnancy 3.Aplastic anaemia 4.Known hematological malignancy and myelodysplasia with chronic kidney disease 4.Patient with chronic kidney disease with uremic encephalopathy with vitally unstable. **Results: Total 110 patients were studied among** patients 30 (27.27 %) were in age groups >60 yrs, there were 68 male and 42 females, mean Hb of precent was 7.047± 1.84 gm, 71.81 %(79) of patients were normocytic normochromic anaemia, mean of total platelets were 2.04± 0.94 lakhs and mean TLC were 5764±2.11.**Conclusions:** In present study majority patients were in age groups >60 yr, male predomint, all patients had anemia, as stage advances severity of anaemia increases. mejority patients had normocytic and normochromic anaemia. Mean MCV, MCH, MCHC were in normal ranges in cronic kidney disease. As stage progresses TLC count remains on higher side and platelet count were decreases.

Key Words: Hematological, Anemia, Kidney, Platelet, Uremia.

***Address for Correspondence:**
Dr. Mohammed Ataulla, Associate Professor, Department of Medicine, Dr. Shankarrao Chavan Govt. Medical College, Nanded, Maharashtra, INDIA.
Email: dbhuvai@gmail.com
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INTRODUCTION

Chronic renal failure is defined as kidney damage, Glomerular Filtration Rate (GFR) < 60 ml/min/1.73 sq.m for a period of ≥ 3 months..National kidney foundation states that, kidney diseases rank third amongst life threatening disease after cancer and heart disease. Prevalence of chronic kidney disease in India is 17.2%.

Anaemia is defined in terms of haemoglobin (Hb) less than 13gm/dl in male and 12 gm/dl in females.[1] It is a common sequelae of chronic kidney disease (CKD), associated with significant morbidity. Anaemia of renal failure begins relatively early in the development of kidney disease. The Hb generally begins to fall when the plasma creatinine concentration is above 2 mg/dl and gets lower as glomerular filtration rate (GFR) declines.[1-3] Anaemia of chronic kidney disease is a complex disorder determined by a variety of factors. Beside haemoglobin and red blood cells, white blood cells and platelets have been found to be affected. Anaemia in chronic kidney disease leads to left ventricular hypertrophy also causes increased cardiovascular morbidity and mortality. Most of the patient of chronic renal failure present with severe anaemia, some patient present with bleeding tendancies which exacerbates with underlying illness. Hence this study is considered to find out haematological

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abnormalities in patient of chronic kidney disease earliest. It helps to treat patients early and reduces morbidity of patients, thus it prolongs life of patients and reduces mortality of patients. The haematological profile has a major influence on the quality of life of patients with chronic renal failure. Hence there is a need to study the various hematological abnormalities in chronic kidney disease.

MATERIALS AND METHODS

This Study included patients who were with history of chronic kidney disease and age above 12 years visited out patient department of medicine and inpatient departments of medicine. This study was a cross sectional prospective observational study over a period of 18 months from July 2014 to August 2016 in tertiary care hospital.

Inclusion Criteria: Patient with chronic kidney disease with age more than 12years.

Exclusion Criteria

1. Patient with other systemic illness with chronic kidney disease
2. Pregnancy
3. Aplastic anaemia
4. Known hematological malignancy and myelodysplasia with chronic kidney disease
5. Patient with chronic kidney disease with uremic encephalopathy with vitally unstable Ethical clearance was obtained by institution's ethical review board. Patient's informed consent was taken. Detailed history noted, general and systemic examination was done.

All these findings were properly entered in proforma. Blood sample were collected by venepunture procedure under strict aseptic precaution and processed for estimation of complete blood counts measured with the help of HORIBA cell counter. TLC-(P-40-70% L 20-50% M 4-8 % E 0-6% B 0-2 %), Platelet-(165-415x10^9 /L) Normal reference range for haemoglobin has been considered as 12-16 gm for females and 13-18 gm for males. MCV-90+/-8fl, MCHC-30+/-3pg MCH- 33+/-2 % Reticulocyte count: (0.8-2.3%) peripheral smear for opinion: Sr.Bilirubin- (0.3-1.3 mg), SGOT-(12-38U/L), SGPT- (7-41U/L), Sr. creatinine–F 0.5-0.9mg/dl 0.6-1.2mg/dl, Blood urea- 15-40 mg/dl, Sr. Na-(135-145 meq/dl), Sr. K- (3.5-5 meq/dl), Random blood sugar -(70-120 mg/dl), Sr. Protein, ESR. Investigations like ultrsonography abdomen and pelvis for estimation of kidney size, urine examination and stool examination were done of every patients and whenever necessary X ray chest, arterial blood gas analysis, bone marrow examination, pregnancy test were done. ANA, HIV ELISA, HBSAg, thyroid function test were done whenever necessary to rule out systemic illnesses. Diagnosis of chronic kidney disease done patients with abnormal kidney function test, ultrasonography suggestive of chronic kidney disease (i.e small size kidneys for that age or loss of corticomedullary differentiation), glomerular filtration rate (GFR) < 60 ml/min/1.73 sq.m, and clinical history for a period of ≥ 3 months. (As per the National Kidney Foundation, Kidney Disease Outcomes Quality Initiative).Patients were classified in stages of chroni kidney disease using following formula,(Equation from the modification of diet in Renal disease study)Estimated GFR(ml/min/1.73m^2) =1.86 x$(S_{cr})^{-1.154}$ x$(age)^{-0.203}$Multiple by0.742 for women, S_{cr}- serum creatinine. Chronic renal failure were classified as stageI-GFR >90ml/min/1.83m,stageII-GFR 90-60ml/min/1.8m,stageIII-GFR 60-30ml/min/1.8m,stageIV-GFR 15-30ml/min/1.8m, and stageV-GFR <15ml/min/1.8m.

OBSERVATION AND RESULTS

Present study was conducted at tertiary care centre. There were 110 patients of chronic kidney disease included in the study from July 2014 to Augast 2016.Following observations were noted. Results prepared using appropriate methods.

Table 1: Showing agewise distribution of chronic kidney disease patients

Age in years	Total patients	%
13-20	5	4.5
21-30	10	9.09
31-40	20	18.18
41-50	24	21.81
51-60	21	19.09
ABOVE60	30	27.27
Total	**110**	**100**

Table 2: Showing sex wise distribution of chronic kidney disease patients

Sex	Male	Female
Total CKD patients	68	42

Table 3: Showing haemoglobin level in chronic kidney disease patients

Hb (gm)	CKD pts	Percentage	%
<7 (mild anaemia)	51	46.36	
7.1-10.0 (moderate anaemia)	52	47.28	
10.1-12 (severe anaemia)	7	6.36	

Table 4: Showing comparison of stages and mean Hb

Stage of chronic kidney disease	HB Mean in gms
II	8.9888
III	8.227
IV	6.127
V	5.006
Mean	7.047 +1.84

Table 5: Type of anaemia in chronic kidney disease patients in present study

Type of anaemia	NO OF Pt.	%
Microcytic hypochromic	23	20.90
Microcytic	8	7.29
Normocytic normochromic	79	71.81

Table 6: Correlation between stages of chronic kidney disease and mean values MCV, mean MCH, mean MCHC.

STAGE ofCKD	Mean MCV	Mean MCH	Mean MCHC
I	-	-	-
II	85.1	28.82	33.82
III	81.50	27.29	33.77
IV	75.24	29.45	32.50
V	79.75	28.82	31.75
MEAN	80.39+5.48	28.60+1.67	32.96+ 1.59

Table 7: Showing correlation between stages and Mean TLC

Stage of chronic kidney disease	TLC Mean
II	4722.22
III	5354.05
IV	5944.80
V	6537.71
Mean	5764.28 +2.11

Table 8: Showing stages and mean platelet count

Stage of CKD	Platelets Mean(lakhs)
II	3.34
III	1.751
IV	1.675
V	1.475
Mean	2.04+ 0.94

Table 9: Showing stages of chronic kidney disease and mean haemoglobin, TLC and platelet count.

Stage of CKD	Mean Haemoglobin(gms)	Mean TLC	Mean Platelet Count (lakhs)
II	8.9888	4722.22	3.34
III	8.227	5354.05	1.751
IV	6.127	5944.80	1.675
V	5.006	6537.71	1.475

In present study majority patients 30 (27.27 %) were in age groups >60 yrs, least No. Of patients 5 (4.5%) in age group 13-20 yrs and 10 (9.09%) patients in age group 21-30 yrs. Out of total 110 patients of chronic kidney disease there were 68 male and 42 females. In present study, there were 52(47.28%) patients having Hb in the range 7.0-10.0 gm, 51(46.36%) patients having Hb < 7.0 gm. Majority 52(47.28%) had moderate anaemia. Mean Hb of stage II patients is 8.9888 gm,stage V is 5.006,mean Hb of present study is 7.047± 1.84 gm. As stage advances severity of anaemia increases. In present shows 71.81 %(79) of patients were normocytic and normochromic anaemia In present study mean values of MCV in stage II was 85.1fl,stage II is 81.50fl,stage IV is 75.24fl,stage V was 79.75fl. Mean MCV of whole study was 80.39±5.48 fl. Mean MCH of stage IV was 29.45 pg, stage II was 28.82 pg, stage V was 28.82 pg and stage III was 27.29 pg. Mean MCH of whole study was 28.60±1.67. Mean MCHC in stage II was 33.82%,stage III was 33.77%,stage IV was 32.50%,stage V was 31.75% and Mean MCHC whole study was 32.96± 1.59%.In present study shows mean TLC of stage II was 4722.22, stage V was 6537.71 and mean TLC of study was 5764±2.11 and as stage progresses count remains on higher side. Present study stage II patients had mean platelet count 3.34 lakhs, stage III had 1.751lakh, stage IV had 1.675 lakh and stage V had mean platelet count of 1.475 lakhs. Mean platelets of total study was 2.04± 0.94 lakhs In present study stage II had mean Hb of 8.988 gm, mean TLC was 4722.22 and mean platelet count of 3.34 lakh. Stage III had 8.227 gm, mean TLC was 5354.05 and mean platelet of 1.751 lakh Stage IV had mean Hb of 6.127 gm, mean TLC was 5944.80 and mean platelet of 1.675 lakh. Stage V had mean Hb of 5.006 gm,mean TLC was 6537.71 and mean platelet of 1.475 lakh. As stage advances mean Hb level decreases, mean TLC increases and platelet count decreases but remains in the normal range.

DISCUSSION

In study done by AO SHITTU *et al*[4] mean age of chronic kidney disease patients was 45.5± 2.0 yrs, in ISLAM MN *et al*[5] mean age was 41.22±1.64 yrs, in BHATTA S *et al*[6] it was 46±17.98 yrs, similarly in present study mean age was 50±16.27 yrs which are comparable to above mentioned studies but it was observed in higher age. In studies, ARUN S *et al*[7], ISLAM MN *et al*[5], BHATTA S *et al*[6] found male predominance in CKD patients. In present study we found 61.82 % male patients and 38.32 % female patients which are similar to above mentioned studies. This may be due to increase risk factors in male patients[4] In studies done by SUNITA R *et al*[11], AO SHITTU *et al*[4], BHATTA S *et al*[6] prevalence of anaemia was 100%.In present study prevalence of anaemic patients is 100 % which are comparable to above mentioned studies. In Study done by AO SHITTU *et al*[4],mean Hb was 7.6 ±2.6gm, in RAIN *et al*[9] mean Hb was 8.3±2.1 gm and in SURESH M *et al*[10] mean Hb was 8.83±1.78 gm similar mean Hb about 7.03±1.84 gm was found in present study which are comparable. In present study, mean Hb in stage II was 8.988 gms, in stage III was 8.227 gms,in stage IV was 6.127 gms and in stage V was 5.006 gms. In study done by AO SHITTU *et al*[4] mean Hb in mild CKD was 9.24 gms, in moderate CKD was 8.32 gms and sever CKD was 5.49gm which are comparable and study done by Sunta *et al*[11] also observed mild, moderate and sever anemia cases were 9,20,11

repectively though they had not given mean Hb%. Mean haemoglobin level decreases as stage of CKD advances[4] Studies done by AO SHITTU *et al*[4] and Sunita *et al*[11] mean haemoglobin level decreases as stage of CKD advances. Similarly in present study haemoglobin decreases as stage of CKD progresses, In studies by, AO SHTTU *et al*[4], ARUN S *et al*[7], SUNITA *et al*[11] moderate anaemia was found in 60%,60.2 % and 50 % respectively. In present study moderate anaemia was found in 47.28 % of hospital admitted patients which are comparable to above mentioned studies ARUN S *et al*[7] found normocytic normochromic anaemia in 60.20% of admitted patient of CKD, SNEHA VGeorge et[12] found in 62 %. In present study normocytic normochromic anaemia was present in 71.81% of patients which are comparable. It shows that normocytic normochromic anaemia was predominant in all hospital admitted patient of chronic kidney disease. In studies done by AFSHAN *et al*[13], AO SHITTU *et al*[4], NAGHMI *et al*[14] mean MCV were 87.12 ± 12.15 ; 79.3 ± 6.6; 91.34 ±0.12 respectively. In present study mean MCV was 80.39 ±5.48 which are comparable to these studies. In studies done by AFSHAN *et al*, AO SHITTU *et al*[4], NAGHMI *et al*[14] mean MCH were 28.10 ± 4.21 ; 27.6 ± 2.3; 31.43± 0.048 respectively. In present study mean MCH were 28.60±1.67 which are comparable to these studies. In studies done by AFSHAN *et al*[13], AO SHITTU *et al*[4], NAGHMI *et al*[14] mean MCHC were 32.16 + 1.34 ; 33.3 ±1.4 ;35.74 ±0.14 respectively. In present study mean MCHC was 32.96±1.59 which is comparable to these studies. Mean MCV, MCH and MCHC found in normal ranges in all stages of chronic renal failure, similar normal range values are found in present study. In studies done by RAIAN *et al*[9], NAGHMI *et al*[14] mean TLC were 6.0 ± 2.1, 5.32 ± 0.085 thousand respectively. In present study mean TLC was 5.76 ± 2.11 thousand which is comparable to above studies. In present study stage II had mean TLC of 4722.22, stage III had mean TLC 5354.05 and stage IV had 5944.80 and stage V had 6537.71.In study done by AO SHITTU *et al*[4] mild CKD had mean TLC of 5866, moderate CKD had 5722 and severe CKD had 13400. In study done by Sneha V George *et al*[12] had studied totale no.50 patients of chronic kidney disease they observed maximum no. patients 19(38%) had more than > 12000/cumm though they had not stages chronic renal failure. In present study, mean TLC count was found on higher side in late stages of CKD, also in late stages AO SHITTU *et al*[4] had shows TLC was on higher side and Sneha V George *et al*[12] had observed maximum no. patients had higher side i.e. lucocytosis which are comparable. The reason may be that in late stages CKD patients are susceptible to infection due to immunocompromised status.[4] In studies done by SURESH M *et al*[10] and RAIAN *et al*[9] found mean platelet count 1.59 ± 0.57 lakh and 2.11 ± 72.7 lakh respectively. In present study platelet count was 2.03 ±0.94 which are comparable to above studies.

CONCLUSION

Present study was conducted in tertiary care hospital, total 110 patients of chronic kidney disease were studied from July 2014 to August 2016. In present study majority patients 30 (27.27 %) were in age groups >60 yrs followed by 24 (21.81%) patients in age group 41-50 yrs. , there were 61.82 % male and 38.18% females. Male chronic kidney disease patients were predominant in present study. All patients had anemia. 47.28% patients had moderate anaemia followed by 46.36% patients had severe anaemia. Mean haemoglobin was 7.04 gms. As stage advances severity of anaemia increases.

In present study 71.81 % of patients had normocytic and normochromic anaemia. Majority patients had normocytic and normochromic anaemia. Mean MCV, MCH, MCHC were in normal ranges in cronic kidney disease patients. mean TLC of study was 5764±2.11 As stage progresses count remains on higher side. Mean of total study was 2.04± 0.94 lakhs. As stage progresses platelet count decreases.

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