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Assessment of metabolic complications of chronic kidney disease

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Abstract
Background: Chronic kidney disease (CKD) is a precursor to end-stage kidney disease and is associated with an increased risk of death. The present study assessed metabolic complications of chronic kidney disease.
Materials & Methods: 60 patients of chronic kidney disease of both genders were assessed for estimation of calcium, phosphate, bicarbonate, potassium, urea etc.
Results: Out of 60 patients, there were 38 male and 22 females. Out of 60 patients, fatigue was seen in 45 patients, muscle pain in 53, numbness in 50, bone pain in 41 and vomiting in 44. The difference was non- significant (*P*> 0.05). Hyperkalemia was seen in 12, hypocalcemia in 18, hyperurecemia in 17, metabolic acidosis in 13, hyperphosphatemia in 9 patients. The difference was non- significant (*P*> 0.05).
Conclusion: Metabolic complications are common in patients with CKD. Most common was hyperuricemia, hypocalcemia and hyperkalemia.

Keywords: Chronic kidney disease, Hypocalcemia, metabolic complication

Introduction
Chronic kidney disease (CKD) is a precursor to end-stage kidney disease and is associated with an increased risk of death [1]. During the last decade the prevalence of chronic kidney disease (CKD) has increased considerably and is estimated to range from about 10-15% of the elderly population. Only a portion of patients with early stage 3 CKD progress to stage 4 where the risk of cardiovascular disease, end stage renal disease (ESRD), or death becomes substantially higher [2]. Identifying the subset of patients who enter stage 3 and are most likely to progress to stage 4 CKD could both improve outcomes, by allowing more appropriate referrals for specialist care, as well as spare those unlikely to progress the adverse effects and costliness of an unnecessarily aggressive approach [3].
Prevalence of CKD worldwide is estimated to be 8-16% and in India prevalence is 17.2%. CKD is diagnosed on the basis of presence of markers of kidney damage and kidney function. During the last decade the prevalence of chronic kidney disease (CKD) has increased considerably and is estimated to range from about 10-15% of the elderly population [4]. Only portion of patients with early stage 3 CKD progresses to stage 4 where the risk of cardiovascular disease, end stage renal disease (ESRD), or death becomes substantially higher. Metabolic complications associated with CKD are anemia, hyperkalemia, hypocalcemia, metabolic acidosis, hyperphosphatemia and hypereuricemia etc [5]. The present study assessed metabolic complications of chronic kidney disease.

Materials & Methods
The present study was conducted among 60 patients of chronic kidney disease of both genders. All were informed regarding the study and written consent was obtained.
Data such as name, age, gender etc. was recorded. General physical examination was done in all patients. Venous blood was centrifuged at 3000 rpm for 10 minutes for the separation of serum and plasma respectively for the estimation of calcium, phosphate, bicarbonate,

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potassium, urea etc. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

Results

Table I: Distribution of patients

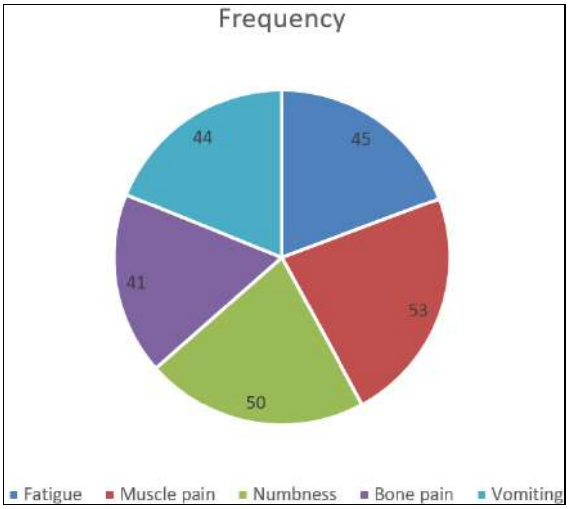
Total- 60		
Gender	**Male**	**Female**
Number	38	22

Table I shows that out of 60 patients, there were 38 male and 22 females.

Table II: Clinical profile of CKD patients

Clinical features	Frequency	P value
Fatigue	45	0.91
Muscle pain	53	
Numbness	50	
Bone pain	41	
Vomiting	44	

Table II, graph I shows that out of 60 patients, fatigue was seen in 45 patients, muscle pain in 53, numbness in 50, bone pain in 41 and vomiting in 44. The difference was non-significant (*P*> 0.05).



Graph I: Clinical profile of CKD patients

Table III: Metabolic complications in CKD patients

Stage	Hyper kalemia	Hypo calcemia	Hyper uricemia	Metabolic Acidosis	Hyper phosphatemia	P value
CKD 1	1	1	1	0	0	0.12
CKD 2	1	1	1	1	0	0.14
CKD 3A	1	1	1	1	1	0.42
CKD 3B	2	3	4	2	2	0.21
CKD 4	3	5	4	5	1	0.04
CKD 5	4	7	6	4	5	0.05

Table III shows that hyperkalemia was seen in 12, hypocalcemia in 18, hyperurecemia in 17, metabolic acidosis in 13, hyperphosphatemia in 9 patients. The difference was non- significant (*P*> 0.05).

Discussion

Of the almost 75 million Americans at risk for developing CKD, approximately 30 million people will develop CKD with only about 3.6 million aware that they have this condition. CKD is asymptomatic at its onset, and its progression can be slowed or halted in its early stages. Guidelines recommend regular CKD testing for people at risk for CKD, which includes those living with diabetes and/or hypertension [6]. Currently, 94% of patients with hypertension and 61% with diabetes are not receiving both tests necessary to detect and assess CKD. As CKD progresses, the risk for cardiovascular events, mortality and kidney failure dramatically increases [7]. The tests used to diagnose CKD have been shown to be strong predictors of both cardiovascular mortality and kidney failure risk. The National Kidney Foundation published its definition and classification of chronic kidney disease (CKD), evidence has accumulated showing that it is a common disease [8]. Early detection of CKD and its metabolic complications is now a priority for delaying disease progression and for primary prevention of many CKD-associated chronic diseases, including cardiovascular, mineral, and bone diseases. However, data on the natural history of these complications according to reference methods are sparse, and there is little evidence about the most appropriate timing for their detection [9]. The present study assessed metabolic complications of chronic kidney disease.

In present study, out of 60 patients, there were 38 male and 22 females. We found that out of 60 patients, fatigue was seen in 45 patients, muscle pain in 53, numbness in 50, bone pain in 41 and vomiting in 44. Chase *et al*. [10] found that at the entry to stage 3 CKD, hemoglobin, bicarbonate, calcium, and albumin values were significantly lower and phosphate values significantly higher in progressors compared to non-progressors even though initial eGFR values were similar. The differences were sufficiently large that a prediction model of progression could be developed based on these values. Post-test probability of progression in patients classified as progressors or non-progressors were 81% (73% − 86%) and 17% (13% − 23%), respectively.

We found that hyperkalemia was seen in 12, hypocalcemia in 18, hyperurecemia in 17, metabolic acidosis in 13, hyperphosphatemia in 9 patients. Gjørup *et al*. [11] found that of the total 229 study participants, 50.2% were females and the mean age was 47±15.7 years. Among study participants, the prevalence of chronic kidney disease (CKD) was found to be 21.8%. Of all study participants, 9 (3.9%) had renal impairment (eGFR < 60 ml/min/ 1.73 m^2) and 46 (20.1%) had albuminuria. Older age, systolic blood pressure ≥140mmHg, type 2 diabetes mellitus and longer duration of diabetes were independent risk factors of CKD.

Bhat *et al*. [12] found that out of 102 patients, males were 62 and females were 40. Common comorbid conditions was diabetes in 67, hypertension in 54, CAD in 45, cerebrovascular disease in 12 and chronic obstructive

pulmonary disease in 19. The difference was significant (P< 0.05). Serum urea level in patients was 145.6 mg/dl, serum creatinine was 5.4 mg/dl, serum sodium was 131 meq/dl and serum potassium was 4.5 meq/dl. Out of 102 patients, 86 survived and 16 died. Conclusion: Authors found AKI has poor prognosis. Common comorbid conditions were diabetes, hypertension, CAD, cerebrovascular disease and chronic obstructive pulmonary disease.

Conclusion

Authors found that metabolic complications are common in patients with CKD. Most common was hyperuricemia, hypocalcemia and hyperkalemia.

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