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Original Research Article

TO CORRELATE THE ELECTROLYE DISTURBANCES WITH GFR

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Abstract

Background & Methods: The aim of the study is to correlate the Electrolye disturbances with GFR. All the patients in the study will be subjected to biochemical tests like, CBC, renal function tests, lipid profile, ABG analysis and ultrasonographic examination of abdomen to confirm the presence of end stage renal disease.

Results: eGFR of all study participants was found deranged below 60 and 7.5 was the mean e GFR. Majority of study participants were classified as G5 category of GFR. As majority of study participants were in G5 category and were having deranged laboratory investigations except serum calcium, however most of laboratory indicators were not showing any association or trend except serum sodium where low serum sodium level was found significantly higher in G4 category.

Conclusion: CKD patients are more prone to develop electrolyte disturbances. Hence, every CKD patient should be screened for any such disturbances. Although studies on this regard is still lacking and we need further study for better understanding and management, as early screening can defer early morbidity and mortality. Therefore, serum electrolyte to be included as one of the first line investigations in patients with chronic kidney disease.

Keywords: electrolye, disturbances & GFR.
Study Design: Observational Study.

1. Introduction

The Chronic Kidney Disease is divided into five stages, classified according to the degree of the patient's renal function. Until the fourth stage of the disease conservative treatment is recommended[1]. In more advanced stages, called the End-Stage Renal Disease (ESRD), when the kidneys can no longer maintain homeostasis of the body, the patient will depend on one of the modalities of Renal Replacement Therapy (RRT): Dialysis or kidney transplant[2]. As kidneys play a critical role in regulating body fluid, electrolytes, and acid-base balance, CKD can lead to metabolic acidosis, hyperkalaemia, hyponatremia, hypercalcemia, and hyperphosphatemia, resulting in serious adverse outcomes such as bone mineral disorders,

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vascular calcification, and even mortality[3]. Hyperkalaemia is more common with the progression of CKD and is one of life-threatening electrolyte disorders in CKD patients, with a nearly 10-fold risk of death in stages 4 and 5. CKD patients with hyperkalaemia may develops clinical manifestations such as muscle weakness, cardiac arrhythmias, and cardiac arrest. Meanwhile, hyponatremia is most common electrolyte abnormality in CKD patients, which is due to fluid overload and positively correlates with mortality and morbidity[4]. Hence this study is to evaluate the metabolic as well as electrolyte imbalances in a CKD patients and its various associations[5].

2. Material and Methods

Present study was carried out in the Department of Medicine in J.A.H. & K.R.H. Group of Hospitals, Gwalior on inpatients for 01 Year. In all cases written informed consent was obtained from each subject. A detailed clinical history and physical examination were done and findings were recorded. All the patients in the study will be subjected to biochemical tests like, CBC, renal function tests, lipid profile, ABG analysis and ultrasonographic examination of abdomen to confirm the presence of end stage renal disease.

Inclusion criteria:

- Age > 18 years
- USG confirmed cases of CKD

Exclusion criteria:

- Age <18 years.
- Patient in stage 1-2 of CKD
- Patients who refused to give informed written consent.
- DM type 2 on DKA
- Sepsis

Statistical Analysis

Statistical Analysis shall be done using SPSS 2.0 and graphs shall be generated by Microsoft Excel and Word. A p value of less than 0.05 shall be considered significant. Quantitative variables were expressed as the mean and standard deviation. categorical data were expressed in percentage. Microsoft excel and word was expressed was used to prepare tables, charts and bar diagrams. Chi Square test was used to compare the categorical data. Student (Unpaired) t-test has been used to find the significance of study parameters on continuous scale between two groups

3. Result

Table 1: Gender wise distribution of study participants

Gender	Frequency	Percent
Female	30	30.0
Male	70	70.0
Total	100	100%

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70% participants were male which indicates the gender specification towards the case condition.

Table 2: Comorbidities

Comorbidities	Frequency	Percent
Diabetes Mellitus	7	7.0%
Diabetes Mellitus & Pulmonary TB	1	1.0%
Hypertension	58	58.0%
Diabetes Mellitus & Hypertension	28	28.0%
Diabetes Mellitus & Hypertension & TB	6	6.0%
Total	100	100.0%

92% of participants were having history of hypertension, 42% were diabetic and 7 were having tuberculosis. 65% of participants were having history of diabetes (7%) or hypertension (58%) alone while 35% were having more than one comorbidity.

Table 3: Investigations

Parameter		Frequency	Percent
Hemoglobin	<7 gm (severe)	28	28.0
	7-10 gm (moderate)	51	51.0
	10-13 gm (mild)	20	20.0
	>13 gm (normal)	1	1.0
	Mean±SD	8.21±2.25	
Blood Urea	<20 mg% (below normal)	0	0.0
	20-45 mg% (normal)	0	0.0
	>45mg% (above normal)	100	100.0
	Mean±SD	143.51±41.61	
Serum Creatinine	<0.6 mg% (below normal)	0	0.0
	0.6-1.4 mg% (normal)	0	0.0
	>1.4mg% (above normal)	100	100.0
	Mean±SD	10.03±4.44	
Serum Sodium	<136 mg% (below normal)	52	52.0
	136-142 mg% (normal)	42	42.0
	>142mg% (above normal)	6	6.0
	Mean±SD		133.97±5.72
Serum Potassium	<3.6 mg% (below normal)	7	7.0
	3.6-5.0 mg% (normal)	34	34.0
	>5.0mg% (above normal)	59	59.0
	Mean±SD	5.17±1.04	
Serum Calcium	<09mg% (below normal)	37	37.0
	9-11 mg% (normal)	60	60.0
	>11mg% (above normal)	3	3.0
	Mean±SD	9.27±1.19	

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Almost 100% of study participants were anemic out of them 28% were severely anemic, 51% moderately anemic and 20% were mildly anemic. Serum urea and creatinine level was raised in all participants. 52% of study participants were having serum sodium level below the normal range and serum potassium level was found raised in 59% of study participants. Serum calcium level was below the normal range was found in 37% of study participants and in 3 % it was raised.

Table 4: E GFR

E GFR		Frequency	Percent
>60		0	0.0
≤60	G3a	1	1.0
	G3b	3	3.0
	G4	4	4.0
	G5	92	92.0
Mean ± SD		7.5±7.08	

E GFR of all study participants was found deranged below 60 and 7.5 was the mean e GFR. Majority of study participants were classified as G5 category of GFR.

Table 5: Association between Gender and GFR Category

Gender	GFR Category				P Value
	G3a	G3b	G4	G5	
	N (%)	N (%)	N (%)	N (%)	
Female	0 (0%)	0 (0%)	1 (25%)	29 (31.5%)	0.601
Male	1 (100%)	3 (100%)	3 (75%)	63 (68.5%)	
Total	1 (100%)	3 (100%)	4 (100%)	92 (100%)	

Similar to the age, e GFR and genders was not found associated.

Table 6: Association between blood investigation and GFR Category

Investigation		GFR Category				P Value
		G3a	G3b	G4	G5	
		N (%)	N (%)	N (%)	N (%)	
Hemoglobin	<7 gm	0 (0%)	0 (0%)	2 (50%)	26 (28.3%)	0.699
	7-10 gm	0 (0%)	2 (66.7%)	1 (25%)	47 (51.1%)	
	10-13 gm	1 (100%)	1 (33.3%)	1 (25%)	21 (19.6%)	
	>13 gm	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)	
Blood Urea	<20 mg%	0 (0%)	0 (0%)	0 (0%)	0 (0%)	NA
	20-45 mg%	0 (0%)	0 (0%)	0 (0%)	0 (0%)	
	>45mg%	1 (100%)	3 (100%)	4 (100%)	92 (100%)	
Serum Creatinine	<0.6 mg%	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)	NA
	0.6-1.4 mg%	0 (0%)	0 (0%)	0 (0%)	0 (0%)	
	>1.4mg%	1 (100%)	3 (100%)	4 (100%)	92 (100%)	
Serum Sodium	<136 mg%	0 (0%)	1 (33.3%)	3 (75%)	48 (52.2%)	0.002
	136-142 mg%	0 (0%)	1 (33.3%)	1 (25%)	40 (43.5%)	

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	>142mg%	1 (100%)	1 (33.3%)	0 (0%)	4 (4.3%)	
Serum Potassium	<3.6 mg%	0 (0%)	0 (0%)	0 (0%)	7 (7.6%)	0.818
	3.6-5.0 mg%	0 (0%)	2 (66.7%)	2 (50%)	30 (32.6%)	
	>5.0mg%	1 (100%)	1 (33.3%)	2 (50%)	55 (59.8%)	
Serum Calcium	<09mg%	1 (100%)	1 (33.3%)	1 (25%)	27 (29.3%)	0.850
	9-11 mg%	0 (0%)	2 (66.7%)	3 (75%)	62 (67.4%)	
	>11mg%	0 (0%)	0 (0%)	0 (0%)	3 (3.3%)	

As majority of study participants in G5 category and majority of study participants were having deranged laboratory investigations except serum calcium, so majority of laboratory indicators were not showing any association or trend except serum sodium where low serum sodium level was found significantly higher in G4 category.

4. Discussion

Studies are lacking regarding the association of electrolyte and acid base imbalance among CKD patients. Hence through this study we tried to derive the pattern of electrolyte and acid base imbalance among CKD patients.

In our study around 50% of study participants presented with facial puffiness (51%) and breathlessness (55%). Almost one third of study participants were having swelling of legs (31%), oliguria (30%), loss of appetite (35%) and oedema (31%) while only 24% participants had pallor.

52% of participants had serum sodium level below the normal range and serum potassium level raised in 59% of participants.

In our study association between serum electrolyte and GFR were analysed which showed hyponatremia was predominantly(52%) seen with decreasing GFR. Hyponatremia was found statistically significant with decreasing GFR (p value-0.002). A study conducted by Stefano Bianchi et al[6] found hyperkalemia as the most commonly occurring electrolyte imbalance in CKD patients. However in our study 59% participants had hyperkalemia but was not found statistically significant with the decreasing GFR (p value-0.818)[7].

Another study by Soraya Arzhan et al[8] concluded that dysnatremias occur frequently in patients with CKD and are associated with adverse outcomes.

Tsering Dhondup et al[9] studied the electrolyte as well as acid base disturbances among CKD patients and they found out that hyperkalemia is linked to acute cardiac death in CKD and ESRD patients and acidosis in renal failure patients should be carefully followed and corrected[10].

However our study have some limitation, as the study participants enrolled had relatively advanced stage of kidney disease. We could not find enough references due to paucity of studies done on this association of hyponatremia and CKD and it is the need of the hour to study further on the subject for better screening and management of CKD patients[11].

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5. Conclusion

CKD patients are more prone to develop electrolyte disturbances. Hence, every CKD patient should be screened for any such disturbances. Although studies on this regard is still lacking and we need further study for better understanding and management, as early screening can defer early morbidity and mortality. Therefore, serum electrolyte disturbances to be included as one of the first line investigations in patients with chronic kidney disease.

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