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Original Research Article

TO STUDY THE METABOLIC DISTURBANCES IN CKD PATIENTS USING LIPID PROFILE, ABG ANALYSIS AND ITS CORRELATION WITH GFR

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Abstract

Background & Methods: The aim of the study is to study the metabolic disturbances in CKD patients using lipid profile, ABG analysis and its correlation with GFR. The study will be a hospital based observational study which will include I.P.D. patients diagnosed as chronic kidney disease based on a combination of history, clinical findings, impaired renal function tests, and abdominal ultrasound.

Results: Metabolic acidosis was found in 51% of CKD patients. Metabolic alkalosis and respiratory alkalosis were found 10% and 24% respectively. Mixed metabolic respiratory acidosis and alkalosis was found 8% and 7% respectively.

Conclusion: Our study on metabolic disturbances in CKD patients derived the conclusion that declining GFR can have various impact on metabolic levels in CKD patients. Lipid profile was found to be associated with GFR. Triglyceride levels was found to increase with decreasing GFR. Metabolic acidosis was predominantly seen with decreasing GFR, however statistically significant association could not be found.

Keywords: metabolic, CKD, lipid profile & ABG.
Study Design: Observational Study.

1. Introduction

Chronic kidney disease is a substantial public health burden associated with high morbidity and mortality. The estimated global prevalence of CKD is 13.4% (11.7-15.1%) [1], and that of India is 17.2%[2].

Chronic Kidney Disease (CKD) is a progressive disease which is characterised by an inability of the kidneys to maintain normal levels of the products of protein metabolism (such as urea), normal blood pressure, haematocrit, sodium, water, potassium and acid-base balance. Renal function is clinically monitored by measurement of serum creatinine and blood urea nitrogen (BUN) and by urinalysis[3].

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KDOQI and KDIGO defines CKD by the presence of kidney damage or decreased kidney function for three or more months, irrespective of the cause. Kidney damage refers to pathologic abnormalities, established either by kidney biopsy or by imaging studies or inferred from markers such as urinary sediment abnormalities or increased rate of urinary albumin excretion[4]. Decreased kidney function refers to a decreased glomerular filtration rate, which is usually estimated using serum creatinine and one of several available equations.

Gradual deterioration of the kidney function caused by a varied range of etiology that causes reduction of effective functional unit of kidney leads to chronic kidney disease. 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, vascular calcification, and even mortality[7]

2. Material and Methods

The present study included O.P.D. and I.P.D. patients in JAH & KRH Group of Hospitals confirmed to have chronic kidney disease will be enrolled in study. The study will be a hospital based observational study. In our study 100 patients with chronic kidney diseases were studied and they underwent a detailed history, clinical examination, biochemical, haematological and radiological investigation. Lipid profile and ABG analysis were studied in relation to patients with chronic kidney diseases and it was correlated with severity of kidney disease using GFR category.

Inclusion criteria:

- Age > 18 years
- USG confirmed cases of CKD

Exclusion criteria:

- Age <18 years.
- Pregnant females
- Critically ill patients

3. Result

Table 1: Age wise distribution of study participants

Age Group	Frequency	Percent
<20 year	5	5.0
20-29 year	21	21.0
30-39 year	21	21.0
40-49 year	15	15.0
50-59 year	16	16.0
60-60 year	12	12.0
≥70 year	10	10.0
Age (Mean± SD)	43.09±17.05	
Total	100	100%

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Table 1 shows that 20-29 and 30-39 year age group had equal (21%) participants and similarly 40-49 and 50-59 year age group had almost equal participants in the study. Mean age of study participants was 43 years.

Table 2: Sign and symptoms

Symptoms		Frequency	Percent
facial puffiness	Yes	52	52.0
	No	48	48.0
Swelling of legs	Yes	31	31.0
	No	69	69.0
Oliguria	Yes	30	30.0
	No	70	70.0
Breath-lessness	Yes	55	55.0
	No	45	45.0
Loss of Appetite	Yes	35	35.0
	No	65	65.0
Oedema	Yes	31	31.0
	No	69	69.0
Pallor	Yes	24	24.0
	No	76	76.0

In table 3 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 were pale.

Table 3: Duration of CKD

Duration in Years	Frequency	Percent
0.5 year	25	25.0
1	15	15.0
2	30	30.0
3	9	9.0
4	2	2.0
5	17	17.0
6	1	1.0
7	1	1.0
Duration (Mean±SD)	2.21±1.68	

One fourth of study participants were suffering from CKD for 6 months or less, 40% for ≤1 year, 70% for ≤2 year and 98% for ≤5 year of duration cumulatively. Mean duration of CKD in study participants was 2.2 year.

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Table 4: ABG interpretation

ABG interpretation	Frequency	Percent
Metabolic Acidosis	51	51.0
Metabolic Alkalosis	10	10.0
Respiratory Alkalosis	24	24.0
Mixed Metabolic Respiratory Acidosis	8	8.0
Mixed Metabolic Respiratory Alkalosis	7	7.0
Total	100	100.0%

Metabolic acidosis was found in 51% of CKD patients. Metabolic alkalosis and respiratory alkalosis were found 10% and 24% respectively. Mixed metabolic respiratory acidosis and alkalosis was found 8% and 7% respectively.

Table 5: Lipid Profile

Parameter		Frequency	Percent
Total Cholesterol	<200 mg/dl	86	86
	≥200 mg/dl	14	14
	Mean±SD	157.10±39.32	
Triglyceride	<150 mg/dl	34	34
	≥150 mg/dl	66	66
	Mean±SD	164.71±54.70	
HDL	>40 mg/dl	6	6
	≤40 mg/dl	94	94
	Mean±SD	30.74±7.31	
LDL	<30 mg/dl	0	0
	≥30 mg/dl	100	100
	Mean±SD	1106.72±40.55	
VLDL	<130 mg/dl	0	0
	≥130 mg/dl	100	100
	Mean±SD	30.10±12.66	

Total Cholesterol was found raised in only 15% of study participants however other lipid profile variable were found deteriorated in majority of participants like triglycerides (66%), HDL (94%), LDL (100%) and VLDL (100%).

Table 6: Association between Lipid Profile and GFR Category

Investigation		GFR Category				P Value
		G3a	G3b	G4	G5	
		N (%)	N (%)	N (%)	N (%)	
Total Cholesterol	<200 mg/dl	1 (100%)	3 (100%)	4 (100%)	78 (84.8%)	0.702
	≥200 mg/dl	0 (0%)	0 (0%)	0 (0%)	14 (15.2%)	
Triglyceride	<150 mg/dl	1 (100%)	3 (100%)	3 (75%)	27 (29.3%)	0.009
	≥150 mg/dl	0 (0%)	0 (0%)	1 (25%)	65 (70.7%)	

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HDL	>40 mg/dl	0 (0%)	0 (0%)	1 (25%)	5 (5.4%)	0.412
	≤40 mg/dl	1 (100%)	3 (100%)	3 (75%)	87 (94.6%)	
LDL	<30 mg/dl	0 (0%)	0 (0%)	0 (0%)	0 (0%)	NA
	≥30 mg/dl	1 (100%)	3 (100%)	4 (100%)	92 (100%)	
VLDL	<130 mg/dl	0 (0%)	0 (0%)	0 (0%)	0 (0%)	NA
	≥130 mg/dl	1 (100%)	3 (100%)	4 (100%)	92 (100%)	

Similar to laboratory findings lipid profile was not found associated with GFR categories except triglycerides where low triglycerides level was found significantly higher in G4 category.

Table 7: Association between ABG interpretation and GFR Category

ABG interpretation	GFR Category				P Value
	G3a	G3b	G4	G5	
	N (%)	N (%)	N (%)	N (%)	
M. Acidosis	1 (100%)	1 (33.3%)	3 (75%)	46 (50%)	0.844
M. Alkalosis	0 (0%)	0 (0%)	1 (25%)	9 (9.8%)	
R. Alkalosis	0 (0%)	2 (66.7%)	0 (0%)	22 (23.9%)	
Mixed MR Acidosis	0 (0%)	0 (0%)	0 (0%)	8 (8.7%)	
Mixed MR Alkalosis	0 (0%)	0 (0%)	0 (0%)	7 (7.6%)	

ABG interpretation and GFR categories were not associated or showing any trend with ABG interpretation.

4. Discussion

Patient characteristics: 100 patients with chronic kidney diseases were enrolled in this study with age ranging between 18-80 years. (Mean 43.09±).

30 (30%) patients were females while 70 (70%) were males. In our study majority of patients (42%) belonged to age group 20-39yrs, 42% patients were more than 40yrs of age, 10% patients were above 70 yrs of age and 5% of patients were below 20yrs of age. These results suggest prevalence of CKD more in males as compared to females with 20-40yrs being the predominant age group. Mean duration of CKD in study participants was 2.2 years[6].

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.

Association of lipid profile with GFR was studied which showed a significant association between triglycerides and decrease in GFR. All other parameters of lipid profile failed to show any association with GFR[7&8].

In addition acid base imbalance in CKD patients was analysed, metabolic acidosis was found in 51% of patients. Although patients also presented with other type of acid base imbalances majority of the patients had metabolic acidosis.

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A study by Wei Chen *et al*[7] among 1038 CKD patients found that around 15% of CKD patient overall have some degree of metabolic acidosis and prevalence increases with lower eGFR.

A study by Bulbul M C *et al*[9] stated that CKD can cause alterations in lipid profile. In CKD, HDL cholesterol levels decrease and triglyceride levels can increase which form the basis of cardiovascular complications.

5. Conclusion

Our study on metabolic disturbances in CKD patients derived the conclusion that, Declining GFR can have various impact on metabolic levels in CKD patients. Lipid profile was also found to be associated with GFR. Triglyceride levels was found to increase with decreasing GFR. Metabolic acidosis was predominantly seen with decreasing GFR, however statistically significant association could not be found.

6. References

1. Lv JC, Zhang LX. Prevalence and Disease Burden of Chronic Kidney Disease. Adv Exp Med Biol. 2019;1165:3-15. doi: 10.1007/978-981-13-8871-2_1. PMID: 31399958.
2. Singh AK, Farag YM, Mittal BV, Subramanian KK, Reddy SR, Acharya VN, Almeida AF, Channakeshavamurthy A, Ballal HS, P G, Issacs R, Jasuja S, Kirpalani AL, Kher V, Modi GK, Nainan G, Prakash J, Rana DS, Sreedhara R, Sinha DK, V SB, Sunder S, Sharma RK, Seetharam S, Raju TR, Rajapurkar MM. Epidemiology and risk factors of chronic kidney disease in India - results from the SEEK (Screening and Early Evaluation of Kidney Disease) study. BMC Nephrol. 2013 May 28;14:114. doi: 10.1186/1471-2369-14-114. PMID: 23714169; PMCID: PMC3848478.
3. Loyola University, Chronic renal failure-Loyola University Chicago,https://www.meddean.luc.edu/lumen/meded/mech/cases/case24/chonicr.htm
4. Levey AS, Eckardt KU, Tsukamoto Y,et al. Definition and classification of chronic kidney disease:a position statement from Kidney Disease Improving Global Outcomes (KDIGO). Kidney Int 2005; 67:2089.
5. National Kidney Foundation. K/DOQI clinical practice guidelines for chronic kidney disease: evaluation, classification, and stratification. Am J Kidney Dis 2002; 39:S1.
6. Eckardt KU, Berns JS, Rocco MV, Kasiske BL. Definition and classification of CKD: the debate should be about patient prognosis--a position statement from KDOQI and KDIGO. Am J Kidney Dis 2009; 53:915.
7. Chen W, Abramowitz MK. Metabolic acidosis and the progression of chronic kidney disease. BMC Nephrol. 2014 Apr 3;15:55. doi: 10.1186/1471-2369-15-55. PMID: 24708763; PMCID: PMC4233646.
8. Arzhan, S., Lew, S. Q., Ing, T. S., Tzamaloukas, A. H., & Unruh, M. L. (2021). Dysnatremias in Chronic Kidney Disease: Pathophysiology, Manifestations, and Treatment. *Frontiers in medicine, 8* (). http://dx.doi.org/10.3389/fmed.2021.769287

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9. Bulbul MC, Dagel T, Afsar B, Ulusu NN, Kuwabara M, Covic A, Kanbay M. Disorders of Lipid Metabolism in Chronic Kidney Disease. Blood Purif. 2018;46(2):144-152. doi: 10.1159/000488816. Epub 2018 Apr 27. PMID: 29705798.