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Original Research Article

Clinico-biochemical profile of chronic kidney disease patients in elderly age group in a tertiary care centre

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ABSTRACT

Background: Chronic kidney disease (CKD) remains one of the major health problems in India. Renal function steadily deteriorates as age advances and advancing age has been indicted to have adverse implications in the disease progression to end stage renal disease (ESRD). With the present study, clinico-biochemical profiling of chronic kidney disease patients in geriatric age group as well as comparison with non-elderly patients was undertaken.
Methods: In this cross-sectional observational study, 100 patients of CKD admitted in the tertiary care study centre were enrolled consecutively and assessed for symptoms, signs and biochemical parameters over two years. Study subjects were divided into two groups:- Group 1: Elderly patients- aged 60 years or more, and Group 2: Non-elderly patients- less than 60 years of age. Relevant comparisons were drawn statistically and tested for significance.
Results: Pallor and pedal edema were observed to be the commonest clinical features across groups. Elderly group shows higher prevalence of severe anaemia (mean hemoglobin- 7.4 gm%). Higher prevalence of clinical and biochemical derangement was found in patients with relatively lower GFR. Elderly age group also had more prevalence of electrolyte abnormalities compared with non-elderly population, with statistically significant difference observed for hyponatremia (p value- 0.023), hypoproteinemia (p value- 0.0078) and blood urea level (p value- 0.0054).
Conclusions: Understanding beforehand the biochemical abnormalities associated with old age in CKD patients helps in appropriate modifications in patient management.

Keywords: Chronic kidney disease, Clinico-biochemical profile, End stage renal disease, Old age, Glomerular filtration rate

INTRODUCTION

Chronic diseases have become a major cause of global morbidity and mortality. Earlier considered to be a health problem only in developed countries, 4 out of 5 chronic disease deaths now occur in low- and middle-income countries.[1] Traditionally, health programs for prevention of chronic diseases have mainly focused on hypertension, diabetes mellitus and cardiovascular diseases (CVDs). However, increase in the prevalence of chronic kidney disease (CKD), progression to end-stage renal disease (ESRD) and the consequent financial burden of renal replacement therapy (RRT) has highlighted the importance of CKD and its risk factors.[2,3] On one hand the chronic diseases are on the rise, while on the other, the ageing of world population is only helping them reign over.[4] High prevalence of CKD, and subsequent ESRD, in the elderly is attributable mainly to increasing prevalence of traditional risk factors for CKD such as diabetes, hypertension and CVD as well as due to new definitions that have expanded the estimated glomerular filtration rate (eGFR) range for CKD.[5]

Accurate estimation of the burden of CKD and ESRD in India has not been possible at present due to the lack of a comprehensive CKD registry, till recently.[6] It is only imperative on the part of inquisitive researchers to dwell further into this. The present study was planned with the objective of clinico-biochemical profiling of chronic kidney disease patients in geriatric population as well as drawing relevant comparison with their non-elderly counterparts.

METHODS

The present comparative observational (prevalence) study was carried out at a tertiary care government hospital in central India over the period of two years (January 2013 to December 2014). All the patients of chronic kidney disease admitted in the study centre during study period constituted the study population and were subjected to following selection criteria for consideration of recruitment in the study.

Inclusion Criteria

- Features of uremia for 3 months or more.
- Elevated blood urea, serum creatinine and decreased creatinine clearance.
- Ultrasound evidence of chronic renal failure.
- Supportive laboratory evidence of CRF like anaemia, low specific gravity, changes in serum electrolytes etc. or supportive radiological evidence of renal osteodystrophy.

Exclusion criteria

- Patients with ischemic heart disease.
- Patients with any malignancy.
- Patients on antimetabolites drugs.
- Patients with liver disorders.
- Patients denying consent.

All the cases fulfilling above selection criteria constituted the final study sample. The study cases were divided in two group based on age of the participant:

- Group 1: Patients with age >60 years with CKD
- Group 2: Patients with age <60 years with CKD

All the study participants were assessed for clinical symptoms like generalised weakness, pedal edema, oliguria, breathlessness, vomiting, anorexia, facial edema, haematuria, altered sensorium, flank pain, convulsions etc.; as well as clinical signs like polyuria, dysuria, pallor, blood pressure measurements, ascites, flaps, pleural effusion, skin and nail changes, pulmonary edema were also studied. The biochemical parameters assessed were serum Sodium, serum Potassium, serum Calcium, serum Creatinine, blood urea, serum bilirubin, serum Albumin-Globulin, serum SGOT, serum SGPT, serum Cholesterol and serum Uric Acid. eGFR was calculated using Cockcroft–Gault formula. Multiplication factor of 0.85 was used for females, as recommended.[7]

The study was commenced after ethical approval form the Institutional Ethics Committee. Informed written consent was elicited from all the participants before enrollment. The data was analysed using SPSS (version-17) by employing chi-square test and Analysis of Variance (ANOVA). Statistical significance was defined at $p<0.05$.

RESULTS

With the present study, various clinical and biochemical parameters were assessed amongst 100 chronic kidney disease patients and relevant comparisons drawn between geriatric (Group 1: 50 participants) and non-geriatric (Group 2: 50 participants) subgroups. Mean age in group 1 was 63.92±4.69 years and mean age in group 2 was 50.78±6.72 years. Significant male preponderance was observed in both the groups (Group 1-80%, Group 2-84%). Distribution of various clinical parameters including symptoms and signs were evaluated and compared in the study. General weakness (100%) and pallor (100%) were the commonest clinical findings, followed by hypertension and pedal edema. All the parameters showed higher prevalence in group 1, but only few were found to have statistically significant difference [pedal edema (p=0.023), vomiting (p=0.016), anorexia (p=0.001)] (Table 1).

Upon calculation of GFR by Cockcroft–Gault formula, wide fluctuations were observed for GFR values. Forty two out of 50(84%) participants from group 1 and 37 out of 50(74%) participants from group 2 were observed to have GFR value less than 4.0.

Various biochemical and haematological parameters were assessed as part of the study. Obvious differences were noted in almost all the parameters between the two groups. Statistically significant difference was observed for levels of blood urea (p=0.0054), serum sodium (p=0.0231), total protein (p=0.0078), SGOT (serum glutamic-oxaloacetic transaminase) (p=0.0002), SGPT (serum glutamic pyruvic transaminase) (p=0.0089), Triglyceride (p=0.084), haemoglobin (p=0.0014) and MCV (p=0.033) (Table 2).

In view of the variable GFR levels amongst study participants, important variables were categorized according to GFR levels (GFR<4.0 and GFR>4.0). Further sub-group analysis of important biochemical and hematological parameters of the two groups by GFR categorization is detailed in (Table 3).

Serum Potassium was significantly higher in patients with GFR<4.0 in both group 1 and group 2. Statistical significance was also noted for sub-group comparison of lipid parameters like triglyceride, total cholesterol, LDL and HDL amongst elderlies. Haemoglobin was observed to be on the lower side in sub-group with GFR less than 4.0, but statistically significant could not be established for sub-group analysis, but the difference between group 1 and 2 was highly significant (p-0.0014).

Table 1: Clinical Symptoms and signs amongst study participants.

Parameter	(Group 1) (n=50)		(Group 2) (n=50)		p-value
	Number	%	Number	%	
General weakness	50	100	50	100	1
Pedal edema	42	84	32	64	0.023*
Oliguria	38	76	32	64	0.19
Breathlessness	21	42	12	24	0.056
Vomiting	33	66	21	42	0.016*
Anorexia	39	78	22	44	0.001*
Facial edema	11	22	9	18	0.617
Haematuria	5	10	4	8	0.727
Abdominal distension	8	16	9	18	0.79
Altered sensorium	9	18	10	20	0.799
Flank pain	2	4	3	6	0.646
Convulsion	5	10	1	2	0.092
Polyuria	2	4	0	0	0.222
Dysuria	2	4	1	2	0.558
Pallor	50	100	50	100	1
Hypertension	47	94	42	84	0.11
Ascites	21	42	20	40	0.839
Flaps	17	34	11	22	0.297
Pleural effusion	6	12	5	10	0.749
Skin /nails	14	28	16	32	0.668
Pulmonary edema	4	8	7	14	0.338

Table 2: Biochemical and haematological parameters amongst study participants

Parameter	Group 1 (n=50)		Group 2 (n=50)		p-value
	Mean	SD	Mean	SD	
GFR (ml/Min)	3.094	1.62	3.416	1.59	0.3188
Blood urea (mg/dL)	194.52	48.49	168.24	43.68	0.0054*
Sr creatinine (mg/dL)	16.34	5.29	15.69	4.3	0.5048
Sr sodium (mEq/L)	132.34	17.67	139.1	10.78	0.0231*
Sr potassium (mEq/L)	5.09	0.833	5.27	0.73	0.2459
Total Protein (g/dL)	5.93	0.65	5.58	0.62	0.0078*
Sr albumin (g/dL)	2.79	0.39	2.71	0.31	0.2327
Sr globulin (g/dL)	2.92	0.63	2.74	0.57	0.1336
Total bilirubin (mg/dL)	0.78	0.91	0.71	0.13	0.5926
SGOT (U/L)	32.78	10.13	41.06	11.27	0.0002*
SGPT (U/L)	27.18	9.41	33.02	12.26	0.0089*
Sr calcium (mg/dL)	7.36	0.89	7.62	0.88	0.1342
Sr uric Acid (mg/dL)	7.99	1.32	8.33	0.77	0.1276
Sr phosphorous (mg/dL)	4.93	0.95	4.91	1.03	0.9115
Triglyceride (mg/dL)	140.84	32.96	124.86	26.07	0.0084*
Total cholesterol (mg/dL)	206.26	39.37	193.46	44.44	0.1307
HDL (mg/dL)	48.24	5.69	46.52	4.48	0.0964
LDL (mg/dL)	103.88	17.86	102.16	18.98	0.6419
RBC ($x10^6$) (cells/cmm)	3.28	0.86	3.48	0.73	0.1979
Hemoglobin (gm%/dL)	7.42	0.95	8.04	0.94	0.0014*
MCV (fL/cell)	76.76	6.66	79.75	7.16	0.033*
MCH (pg/cell)	28.96	2.3	29.71	2.64	0.1359
MCHC (gm/dL)	32.06	4.52	31.79	4.2	0.7528
Platelet count (cells/cmm)	292.52	67.43	335.52	51.32	0.0005

* Statistical significant observation

Table 3: Sub-group analysis of biochemical and hematological parameters by GFR categories.

Variable	Group 1					Group 2				
	GFR<4.0 (n=42)		GFR≥4.0 (n=8)		p-value	GFR<4.0 (n=37)		GFR≥4.0 (n=13)		p-Value
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Serum potassium	5.25	0.76	4.25	0.7	0.001*	5.46	0.51	4.74	1	0.001*
Serum Calcium	7.22	0.84	8.06	0.85	0.304	7.84	0.91	7.84	0.91	0.014*
Serum Urea	7.9	1.3	8.5	1.38	0.710	8.3	0.68	8.4	1.02	0.2445
Serum Phosphorus	4.95	0.94	4.8	1.04	0.516	4.85	0.88	5.07	1.42	0.7228
Total Protein	5.85	0.65	6.36	0.47	0.170	5.51	0.61	5.79	0.63	0.041*
Triglyceride	135.8	31.84	166.87	27.34	0.157	121.75	23.17	133.69	32.4	0.013*
Total Cholesterol	211.4	39.82	179.12	23.67	0.044*	200.89	47.07	172.3	27.64	0.032*
LDL	104.9	17.39	98.5	20.56	0.028*	105.62	17.34	92.3	20.67	0.3581
HDL	48.59	5.14	46.37	8.17	0.002*	47.62	4.38	43.38	3.17	0.3168
Haemoglobin	7.35	0.92	7.775	1.09	0.537	7.99	0.88	8.18	1.11	0.2576
RBC ($x10^6$)	3.19	0.83	3.75	0.92	0.886	3.47	0.74	3.51	0.72	0.0935

DISCUSSION

Over the last couple of decades or so, CKD has been recognized as a major global public health problem. Until recently, despite repeated advocacy world-over, public health system did not recognize CKD as being a significant problem.[8] And this was despite the fact that CKD management consumes a disproportionately large fraction of the available healthcare resources.[9] With the advent of Indian CKD registry, this lacuna has been thankfully taken care of in this country to a large extent.[6] With the present study, chronic kidney disease patients coming to a government tertiary care facility were profiled, with focus on geriatric population.

The study age group of >60 years was emphasized upon, as maximum incidence of chronic kidney disease occurs in 6th decade of life. The gender ratio (4.5:1) showed overwhelming male preponderance. This is in line with the male preponderance observed by Rajapurkar et al, (2.33:1) and Modi et al, (1.43:1).[6,10]

Distribution of various clinical parameters including symptoms and signs were evaluated and compared between the two groups. The incidences of all the clinical findings were relatively higher amongst the elderly group with CKD, which is in line with the findings of a similar study by Prasad R et al,[11] The commonest clinical signs in the Prasad R study were general weakness in 100%, high blood pressure in 92% and pallor in 90% of patients, similar to this observations. GFR estimation revealed group 1 having 84% patients and group 2 having 74% patients with GFR less than 4.0ml/min/1.73m^2. This is corroborative of one elaborate hospital based study by Singh AK et al.[12]

Several important biochemical parameters were also evaluated as part of the study. Serum electrolytes assessment is an important part of work up in CKD patients. The electrolyte imbalance in CKD has been classically described as hyponatremia (less than 135.0 mEq/L), hyperkalaemia (more than 5.0 mEq/L) and hypocalcaemia (less than 8.0 mg/dL).[13] The findings amongst group 1 participants in the study were much in line with the above description, as is the case with most of the previous similar studies.[11,12,14,15] Further, hyperkalemia prevalence was observed to increase as GFR fraction went down, a finding consistent with renal physiology. Dyslipidemia is a common occurrence in CKD cases. The analysis of lipid profile showed a pattern of increased total cholesterol, LDL cholesterol and serum triglycerides with decreased HDL cholesterol levels. This correlates well with finding of other similar studies, which mostly reported hypertriglyceridemia, followed by hypercholesterolemia as the most common lipid abnormalities in the non-dialysed CKD patients.[12,16,17] Elevated serum cholesterol level due to impaired activity of lipoprotein lipase and direct inhibitory effect of various uremic toxins on the enzymes involved in lipid metabolism represents the most important pathophysiologic mechanism underlying the development of dyslipidemia in renal failure.

Haemoglobin levels have been postulated to be inversely associated with cardiovascular risk in patients with CKD.[18] Group 1 participants had a mean haemoglobin of 7.42 gm% and group 2 had a mean of 8.04 gm%, the difference being significant. Similar study done by Islam MN et al, in Bangladesh showed the mean haemoglobin to be as low as 4.96 gm%.[19] On the other hand, in a large multicentre CREATE trial, the mean haemoglobin level amongst participants was reported to be 11.6±0.6 gm%.[20] This may be indicative of the relatively higher risk of cardiovascular events in CKD patients from this part of world, a hypothesis which needs further validation. Chronic renal failure patients are prone for hyperuricemia and chronic hyperuricemia also plays role in the causation of renal failure. Very high prevalence of hyperuricemia (95%) was observed in the present study in both the groups. A similar study done by Abderraman

et al, reported the overall prevalence of hyperuricemia in chronic kidney disease to be 15.20%, while also reporting significantly positive correlation between the serum uric acid levels and stages and severity of CKD.[21]

CONCLUSION

In conclusion, it can be said that elderly chronic kidney disease patients are more likely to be develop hyponatremia, hypertriglyceridemia and anaemia, amongst mentioned abnormalities. Understanding the biochemical abnormalities beforehand helps in appropriate risk assessment as well as modifications in patient management. Larger, multi centre studies are recommended for further corroborative validation.

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