



## ORIGINAL RESEARCH ARTICLE

# BIOCHEMICAL PROFILE OF CHRONIC KIDNEY DISEASE (CKD) PATIENTS IN VARIOUS AGE AND GENDER GROUP SUBJECTS VISITING KIST MEDICAL COLLEGE & TEACHING HOSPITAL, KATHMANDU

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### ABSTRACT

Nowadays it is observed that the chronic kidney disease (CKD) is a growing health problem worldwide and the most common illness associated with this is hypertension (HTN) and diabetes mellitus (DM). This study tries to find out illness associated with CKD and assess the renal parameters according to age and sex group. This is a cross sectional descriptive study. Diagnosed cases of Chronic Kidney Disease patients visiting at KIST Medical College from September to November 2011 are included in this study. SPSS-17 version is used for data analysis and appropriate statistical tests are done. Among 150 patients, 57% are male and 43% are female. Mean age of the study population is 48.62±18.09 years. Level of urine protein for male is higher than female. Mean urea, creatinine, potassium, uric acid, phosphorus and protein creatinine ratio (PCR) are higher in younger age group. The result also depicts hypertension is the leading illness associated with CKD (50%). Only 8% diabetes mellitus cases are associated with CKD followed by both of hypertension and diabetes mellitus (26%) and 16% others. This study provides an overview of routine biochemical parameters with CKD. Hypertension is found as leading illness associated with CKD. Differences in renal parameters are found in gender and different age groups.

**Key Words:** Associated Illness, CKD & Renal Function Test.

### INTRODUCTION

Chronic kidney disease (CKD) is increasingly recognized as a major public health problem. Chronic Kidney disease (CKD) is defined as kidney damage or glomerular filtration rate (GFR) <60.0ml/min/ 1.73m<sup>2</sup> for three months or more irrespective of the cause. <sup>1</sup> CKD 5 is defined when GFR is <15.0ml/min/1.73m<sup>2</sup>. <sup>2</sup> In fact CKD patients are increasing in number day by day. Nephrology service in Nepal was started by an eminent nephrologist of Nepal late Dr PR Satyal in early 1970s, but hemodialysis (HD) service in Nepal was started only in 1987 in Bir Hospital (National Academy for Medical Sciences). <sup>3</sup>

CKD can be detected via simple biochemical tests including a creatinine-based estimate of the glomerular filtration rate (GFR). <sup>4</sup> There are different renal function parameters to indicate reduced kidney function. CKD typically increases with age and therefore there is increased risk in older adults. It is found that females are less prone to the risk of CKD. It is also seen that diabetes and hypertension are the main two causes of CKD. <sup>5</sup>

Therefore the objective of the study was to determine biochemical profile of chronic kidney disease (CKD) patients and to find out the variation of renal function test among different age and

gender group and also tried to list out the illness associated with CKD visiting at KIST Medical College & Teaching Hospital, Kathmandu, Nepal.

### MATERIAL AND METHODS

This is a cross sectional study done at KIST Medical College and Teaching Hospital. The sample population is the diagnosed cases of Chronic Kidney Disease patients who visited at KIST Medical College from September to November 2011. The biochemical parameters of renal function test in serum and urine are assessed. For Data analysis SPSS-17 version is used. Descriptive statistics, Kruskal Wallis test and independent test are used in data analysis. Approval from the Institutional Review Board was taken prior to the study.

### RESULTS

The mean age of patients is 48.62±18.09 years (range: 12-95). There are 43% female and 57% male patients. Mean level of urea, creatinine, sodium and potassium are 135.25±76.06 (mg/dl), 6.21±4.31 (mg/dl), 136.25± 5.65 (mmol/L) and 4.83±1.06 (mmol/L) respectively. Similarly, average level of uric acid, calcium, phosphorus, total protein, albumin and A/G ratio

are  $5.96 \pm 2.22$  (mg/dl),  $8.22 \pm 1.18$  (mg/dl),  $6.24 \pm 2.47$  (mg/dl),  $4.84 \pm 0.91$  (g/dl) and  $2.25 \pm 0.53$  (g/dl) and  $1.23 \pm 0.61$  respectively. Likewise, average urinary protein and urinary creatinine are  $233.61 \pm 152.97$  (mg/dl) and  $64.71 \pm 30.72$  (mg/dl). Average protein Creatinine ratio (PCR) is  $4.28 \pm 3.86$ . Hypertension (50%) is found as main co-morbidity associated with CKD (Figure 1).



**Figure 1: Co-morbidity associated with CKD**

**Table 1: Sex differentials in renal parameters of CKD patients**

Renal parameter	Male		Female		p value
	Mean	SD	Mean	SD	
Level of Urea (mg/dl)	135.47	72.74	134.97	80.91	0.97
Level of Creatinine (mg/dl)	6.27	4.22	6.13	4.46	0.84
Level of Sodium (mmol/L)	136.90	5.20	135.38	6.14	0.10
Level of Potassium (mmol/L)	4.73	1.04	4.97	1.08	0.18
Level of Uric Acid (mg/dl)	6.03	2.15	5.88	2.32	0.68
Level of Calcium (mg/dl)	8.26	1.18	8.16	1.19	0.61
Level of Phosphorus (mg/dl)	6.30	2.41	6.16	2.56	0.74
Level of Total Protein (g/dl)	4.79	0.90	4.92	0.92	0.38
Level of Albumin (g/dl)	2.47	0.53	2.58	0.53	0.18
Albumin/Globulin Ratio	1.19	0.57	1.30	0.67	0.26
Level of Urine Protein (mg/dl)	243.72	157.77	220.02	146.41	0.35
Level of Urine Creatinine (mg/dl)	66.71	31.92	62.03	29.07	0.36
PCR	4.19	3.19	4.41	4.64	0.73

None of the renal parameters showed significant sex differentials. Level of urine protein for male is higher than female but the difference is not significant.

**Table 2: Age differentials in renal parameters of CKD patients**

Age group	<20(n=7)			20-40(n=44)			40-60(n=51)			>60(n=48)			P
	Mean	SD	Md	Mean	SD	Md	Mean	SD	Md	Mean	SD	Md	
Urea	191.1	68.8	182.0	134.7	77.6	108.0	134.7	77.6	123.0	69.3	6.7	118.5	0.20
Creatinine	8.4	5.9	7.9	6.8	4.3	6.6	6.2	4.1	5.5	5.2	4.1	3.8	0.11
Sodium	134.6	5.3	135.0	134.3	5.7	134.0	137.4	5.6	138.0	137.1	5.2	138.0	0.04
Potassium	5.4	1.0	5.8	4.9	1.0	4.7	4.8	1.0	4.7	4.8	1.2	4.6	0.29
Uric acid	7.0	3.1	6.8	6.1	2.6	5.2	6.1	2.6	5.4	6.0	2.1	5.7	0.69
Calcium	8.1	1.2	7.7	8.1	1.3	7.9	8.4	1.2	8.4	8.2	1.1	8.2	0.59
Phosphorus	8.3	2.7	8.0	6.3	2.5	6.5	6.5	2.7	5.9	5.6	2.0	5.3	0.07
Total Protein	4.9	1.0	4.8	4.9	0.9	4.9	5.0	1.0	5.0	4.7	0.8	4.6	0.36
Albumin	2.5	0.6	2.4	2.5	0.5	2.5	2.6	0.6	2.5	2.5	0.4	2.4	0.97
A/G ratio	1.1	0.5	0.9	1.2	0.6	1.1	1.2	0.6	1.1	1.3	0.6	1.2	0.28
PCR	6.1	4.7	5.4	4.1	3.2	3.3	4.6	4.6	4.2	3.8	3.4	3.3	0.43

The mean average level of renal parameters is statistically less significant i.e. no difference according to age and sex i.e. p-value was  $> 0.05$  but there is significant difference in the mean average level of sodium according to age group i.e.  $p = 0.042$ . Mean urea, creatinine, potassium, uric acid, phosphorus and PCR are higher in younger age group but differences are not significant. The mean value of albumin is also found almost same in all age groups. Calcium, total protein, and A/G ratio differences in various age groups are very minimal.

## DISCUSSION

Several studies concur that chronic kidney disease typically increases with age.<sup>6,8</sup> Older adults are, therefore, at increased risk for chronic kidney disease.<sup>9</sup> It is found that the female gender is associated with slower progression of chronic kidney disease. It also supports the present study in which 43% of the total patients are female. In this study we found that HTN is the leading illness associated with CKD (50%), followed by DM (8%), both of HTN and DM (26%), others (16%) and which is almost similar to the study carried out by Chhetri et al.,<sup>10</sup> where studies from the neighbouring countries like India showed DM and HTN as leading causes.<sup>10,12</sup> The two main causes of CKD, diabetes and hypertension, account for as much as 70% of all new cases.<sup>13</sup>

Mean average level of the urea, creatinine, sodium, potassium is found to be  $135.25 \pm 76.067$  mg/dl,  $6.2 \pm 4.3$  mg/dl,  $136.25 \pm 5.65$  mmol/L,  $4.8 \pm 1.06$  mmol/L respectively, similar parameter done by Chhetri et al.,<sup>14</sup> found level of urea, creatinine, sodium, potassium 209.76 mg/dl, 10.95 mg/dl, 129.27 mmol/L, 4.8 mmol/L respectively. Similarly study carried out by Bhan et al.<sup>15</sup> found level of creatinine, potassium was  $1.3 \pm 0.4$  (mg/dl),  $4.2 \pm 0.3$  (mmol/L) respectively and Shah et al.,<sup>16</sup> found level of

creatinine  $1.6 \pm 0.7$  mg/dl. This study showed the mean level of urea, creatinine lower than study carried out by Chhetri et al.<sup>14</sup> and level of creatinine higher than study carried out by Bhan et al.<sup>15</sup> and Shah et al.<sup>16</sup> In contrast to the study by Chhetri et al.,<sup>14</sup> the result from this study depict higher sodium level. Similarly the level of potassium is found to be higher than study carried out by Bhan et al.<sup>15</sup>

In this study the mean average level of uric acid, calcium, phosphorus, albumin is  $5.96 \pm 2.21$  mg/dl,  $8.21 \pm 1.18$  mg/dl,  $6.24 \pm 2.27$  mg/dl,  $2.52 \pm 0.53$  g/dl respectively, similar parameter carried out by Shah et al.,<sup>16</sup> showed that level of uric acid, calcium, phosphorus, albumin was  $7.0 \pm 2.3$ ,  $9.4 \pm 0.5$ ,  $3.6 \pm 0.6$  mg/dl,  $4.1 \pm 0.5$  g/dl respectively and study carried out by Juan et al.<sup>17</sup> showed that mean level of calcium, phosphorus, and albumin was  $9.4 \pm 0.6$ ,  $4.04 \pm 1.1$  mg/dl,  $4.04 \pm 0.31$  g/dl respectively and study carried out by Bhan et al.<sup>15</sup> showed that level of calcium, phosphorus was  $9.3 \pm 0.4$ ,  $3.2 \pm 0.5$  mg/dl respectively. This study shows that mean level of uric acid, calcium is found lower, level of phosphorus is higher and level of albumin is lower than study carried out by Shah et al.,<sup>16</sup> Juan et al.,<sup>17</sup> Bhan et al.,<sup>15</sup> respectively. In both the National Health

and Nutrition Examination Survey (NHANES) and Kidney Early Evaluation Program (KEEP) studies, the prevalence of CKD, defined as a serum creatinine level  $>1.3$  mg/dL in women and  $>1.5$  mg/dL in men, rise rapidly in those aged 60 years and over (Robinson, 2006).<sup>18</sup> A study carried out by Bhan et al.,<sup>15</sup> on the diagnosis and management of mineral metabolism in CKD concluded that disorder of the mineral metabolism in CKD is common, under diagnosed and under treated.

In this study mean level of total protein is found to be  $4.84 \pm 0.91$  g/dl, mean level of albumin is found to be  $2.25 \pm 0.53$  g/dl, Mean level of A/G ratio is found to be  $1.23 \pm 0.61$ , mean level of urinary protein is found to be  $233.61 \pm 152.97$  mg/dl and median is 195, mean level of urinary creatinine is found to be  $64.71 \pm 30.72$  mg/dl, mean level of PCR is found to be  $4.28 \pm 3.86$ .

Study done by Juan et. al.,<sup>17</sup> showed mean level of calcium, phosphorus is 8.20 mg/dl and 5.75 mg/dl which are similar to our study. Study done by Alberto et. al.,<sup>19</sup> showed that serum creatinine, serum phosphorus and serum albumin is 2.4 mg/dl, 3.7 mg/dl and 3.9 g/dl respectively. Mean level of calcium is 9.3 mg/dl, which is similar to our study.

## CONCLUSION

Hypertension is the main co morbidity associated with CKD, the second one being HTN and DM together. Difference in the mean average level of sodium according to age group is found to be statistically significant. Albumin is found higher in male and other renal parameters like urea, creatinine, potassium, uric acid, phosphorus and PCR found to be higher in younger groups.

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