Original Article

Sociodemographic features, serum urea, creatinine and blood urea nitrogen/creatinine ratio in chronic kidney disease patients – A record based retrospective study

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ABSTRACT

Objectives: Chronic kidney disease (CKD) is a progressive reduction in renal function. It is a condition where the kidneys lose their normal function, especially excretory and regulatory functions. Urea and creatinine are good indicators of a normal functioning kidney and an increase in the serum indicates kidney dysfunction. Blood urea nitrogen (BUN) and serum creatinine are widely accepted and the most common parameters to assess renal functions. The present study was done to assess the serum urea, creatinine levels, and BUN-creatinine ratio (BCR) in CKD subjects.

Material and Methods: It was a record-based retrospective study. Data were obtained from the Medical Records Department. The patients diagnosed with CKD in August 2023 were extracted from the records. Details such as hospital ID, age, gender, and blood parameters such as serum urea, creatinine levels, and BCR were obtained. Categorical data were summarized as frequency (percentage).

Results: It was found that the number of male patients was 24 (75.4%) and the number of female patients was 14 (24.6%). The majority of patients belonging to the age group category of 50–75 were 42 in number (73.6%). Abnormal creatinine values were found in 54 patients (94.7%).

Conclusion: The present study found that male gender and age group 50–75 years were most commonly affected with CKD. The serum creatinine level was found to be predominately abnormal compared to the serum urea level and BCR.

Keywords: Blood urea nitrogen, Blood urea nitrogen-creatinine ratio, Chronic kidney disease, Creatinine, Urea

INTRODUCTION

Chronic kidney disease (CKD) is a progressive reduction in renal function. It is a condition where the kidneys lose their normal function, especially excretory and regulatory functions which can be due to infections, autoimmune diseases, diabetes, hypertension, cancer, and toxic chemicals. CKD is heading toward becoming a major health problem and is rapidly assuming epidemic proportions globally.[1-4]

Biochemical markers play an important role in accurate diagnosis and assessing risk and adopting therapy to improve clinical outcomes. Instead of urine analysis which is relatively discomforting for patients, serum analysis of renal function markers such as urea, creatinine, uric acid, and electrolytes is used routinely. Blood tests for blood urea nitrogen (BUN) which is a major nitrogenous end

product of protein and amino acid catabolism and creatinine which is a breakdown product of creatine phosphate in muscle are excreted by kidneys. BUN is an indirect and rough measurement of renal function that measures the amount of urea nitrogen in blood and is directly related to the excretory function of the kidney. Creatinine tests diagnose impaired renal function and measure the amount of creatinine phosphate in blood. Urea and creatinine are good indicators of a normal functioning kidney and an increase in the serum is indications of kidney dysfunction. BUN and serum creatinine are widely accepted and the most common parameters to assess renal functions. Collection of blood for serum analysis is an invasive technique and thus causes anxiety and discomfort to patients due to blood loss from frequent blood sampling and thereby potentially increasing the risk for patients as well as health-care professionals to blood–borne diseases. Hence, a simple diagnostic test that provides a reliable evaluation of disease status and stages and is of value to both clinicians and patients is required. Serum urea and creatinine are the most widely accepted parameters to assess CKD status as well as to assess renal status. According to standard norms of the urea value is 13–43 mg/dL, the creatinine value is 0.9–1.3 mg/dL for men and 0.6–1.1 mg/dL for women, urea nitrogen in the blood is 5–20 mg/dL, and BUN-creatinine ratio (BCR) is 10–20.[5-7]

Categories of CKD: CKD may result from disease processes in any of the three categories: Pre-renal (decreased renal perfusion pressure), intrinsic renal (pathology of the vessels, glomeruli, or tubules-interstitium), or post-renal (obstructive).[8] Hence, the present study was done to assess the serum urea, creatinine levels, and BCR in CKD subjects.

MATERIAL AND METHODS

Study design

This is record-based retrospective study.

Study setting and population

Data were obtained from the medical records departments (MRDs). The patients diagnosed with CKD in August 2023 were extracted from the records.

Sample size

Based on the records from MRD totally, there were 57 CKD patients in August 2023.

Data collection procedure

After obtaining permission from the MRDs, the following details were obtained regarding each patient such as hospital ID, age, gender, and blood parameters such as serum urea, creatinine levels, and BCR.

Statistical analysis

Microsoft Excel spreadsheet was used to record the information collected through the questionnaires. IBM Statistical Package for the Social Sciences Statistics (version 24.0; IBM Co., Armonk, NY, USA) was used for data analysis. Categorical data were summarized as frequency (percentage).

RESULTS

Table 1 describes the sociodemographic features of 57 CKD patients, and it was found that the number of male patients was 24 (75.4%) and the number of female patients was 14 (24.6%). The number of patients belonging to the age group category of 25–50 years were 5 (8.7%) and from 50 to 75 were 42 in number (73.6%) and above 75 years were 10 in number (17.5%).

Table 1: Sociodemographic features of the CKD patients (*n*=57).

Variable	Number	Percentage
Gender		
Male	43	75.4
Female	14	24.6
Age		
25–50	5	8.7
51–75	42	73.6
More than 75	10	17.5
Urea		
Normal	17	29.8
Abnormal	40	70.2
Creatinine		
Normal	3	5.3
Abnormal	54	94.7
BUN		
Normal	17	29.8
Abnormal	40	70.2
BUN/Creatine ratio		
Prerenal	26	45.6
Normal	30	52.6
Renal	1	1.8

CKD: Chronic kidney disease, BUN: Blood urea nitrogen

Tables 2 and 3 show the renal parameters in CKD patients. Out of 57 patients, 17 (29.8%) had normal serum urea levels in that 14 (24.6%) were males and 3 (5.3%) were females. Moreover, 40 had abnormal serum urea levels in that 29 (50.9%) were males and 11 (19.3%) were female. 54 patients (94.7%) had abnormal values, based on creatinine levels, in that, 40 (70.2%) were males and 14 (24.6%) females were affected. BCR was categorized into prerenal cause, normal, and post-renal cause of kidney disease [Figure 1]. In prerenal, out of 26 patients, 20 (35.1%) were males and 6 (10.5%) were females. The remaining patients come under the normal category since all CKD patients underwent treatment such as dialysis.

**Table 2:** Renal parameters in CKD patients (*n*=57).

Variable	Number	Percentage
Urea		
Normal	17	29.8
Abnormal	40	70.2
Creatinine		
Normal	3	5.3
Abnormal	54	94.7
Blood urea nitrogen		
Normal	17	29.8
Abnormal	40	70.2

CKD: Chronic kidney disease

Table 3: Categorization of renal parameters with gender (*n*=57).

Variables	Male		Female	
	Number	Percentage	Number	Percentage
Urea				
Normal	14	24.6	3	5.3
Abnormal	29	50.9	11	19.3
Creatinine				
Normal	3	5.3	0	0
Abnormal	40	70.2	14	24.6
BUN				
Normal	14	24.6	3	5.3
Abnormal	29	50.9	11	19.3
BUN/Creatine ratio				
Prerenal	20	35.1	6	10.5
Normal	23	40.4	7	12.3
Renal	0	0	1	1.8

BUN: Blood urea nitrogen
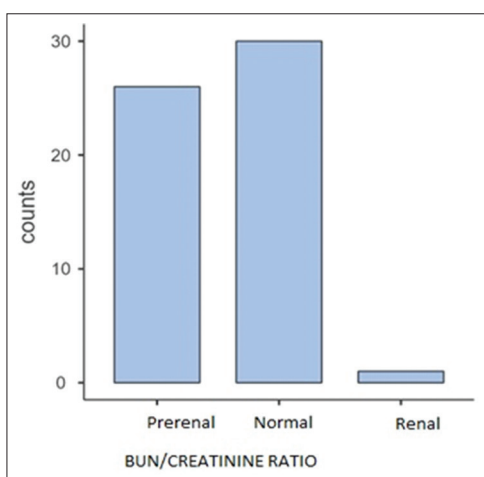
Figure 1: Categorization of blood urea nitrogen (BUN)-creatinine ratio.

DISCUSSION

In our study, we found that out of 57 patients, 3/4th were males and 1/4th were females. In the age group category, the 50–75 age group was more commonly affected than the other categories of age. In CKD patients, the serum creatinine level was found to be predominately abnormal compared to serum urea level and BCR.

In a study done by Goldberg and Krause regarding the influence of gender on CKD, the prevalence of CKD tends to be higher in women than in males, but in our study, the prevalence of CKD tends to be higher in males.[9]

In 2006, a study was conducted on the progression of CKD based on age and gender and found that the 70–79 age group was more commonly affected when compared to the age <69 and age more than 79.[10] In our study, it was found that the age group of 50–75 was more commonly affected than the age group <25 and more than 75 years.

In 2016, a study was conducted on the assessment and correlation of urea and creatinine levels in saliva and serum of patients with CKD, diabetes, and hypertension. It was concluded that serum and salivary urea and creatine are elevated and there is a strong positive relationship with $P = 0.000$ (<0.001).[11] In our study, we found that there was also a significant increase in serum urea and creatinine levels.

The study done on BCR in acute kidney injury patients shows similar results to our study. Multivariate logistic regression analysis for hospital mortality showed that the odds ratio (5.73) of high BCR (BCR >20) was higher than that of low BCR (3.32).[1]

Limitation

The parameters such as estimated glomerular filtration rate value, urine protein value, and serum potassium level can also be included in further studies.

CONCLUSION

The present study found that male gender and age group 50–75 years were most commonly affected with CKD. The serum creatinine level was found to be predominately abnormal compared to the serum urea level and BCR.

Ethical approval

The research/study approved by the SMVMCH Institutional Review Board, number 81/2023, dated 23th November 2023.

Declaration of patient consent

Patient's consent not required as there are no patients in this study.

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Nil.

Conflicts of interest

Dr. Reenaa Mohan is on the Editorial Board of the Journal.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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