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Association Between Uric Acid Level and Chronic Kidney Disease in Bangladeshi Adults: A Cross-Sectional Comparative Study

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ABSTRACT: ***Background:*** Chronic kidney disease (CKD) is a growing public health concern, particularly in developing countries. Elevated serum uric acid levels have been implicated as a potential risk factor for CKD. This study aims to investigate the association between serum uric acid levels and CKD among Bangladeshi adults. ***Methods*****:** A cross-sectional comparative study was conducted from January 2024 to December 2024 in Sylhet MAG Osmani Medical College Hospital involving 300 participants, including 150 individuals diagnosed with CKD and 150 age- and sex-matched controls without CKD. Demographic and clinical data were collected through structured interviews and medical record reviews. Serum uric acid levels were measured, and logistic regression analyses were performed to identify factors associated with CKD. ***Results:*** The mean serum uric acid level was significantly higher in the CKD group (6.5 ± 1.2 mg/dL) compared to the non-CKD group (5.2 ± 1.0 mg/dL, $p < 0.001$). Univariate logistic regression revealed that elevated serum uric acid levels were associated with an odds ratio (OR) of 2.35 (95% CI: 1.56–3.52, $p < 0.001$) for CKD. Multivariate analysis confirmed that high serum uric acid levels remained independently associated with CKD (adjusted OR: 2.55, 95% CI: 1.70–3.83, $p < 0.001$), along with hypertension and diabetes mellitus. ***Conclusion:*** This study shows that among people from Bangladesh; increased serum uric acid levels are significantly associated with chronic renal disease. Monitoring serum uric acid levels may serve as an effective strategy for early identification of individuals at risk for CKD, particularly in the context of hypertension and diabetes.

Keywords: Chronic Kidney Disease, Serum Uric Acid, Hyperuricemia, Bangladesh, Hypertension, Diabetes Mellitus.

Article at a glance:

Study Purpose*: This study examines the link between serum uric acid levels and chronic kidney disease (CKD) in Bangladeshi adults, focusing on sociodemographic, clinical, and metabolic risk factors for CKD development.*

Key findings: *The study found that elevated serum uric acid levels were significantly associated with CKD, with the CKD group having a higher mean uric acid level (6.5 ± 1.2 mg/dL) than the non-CKD group (5.2 ± 1.0 mg/dL, $p < 0.001$). High uric acid levels increased the risk of CKD (adjusted OR: 2.55, 95% CI: 1.70–3.83, $p < 0.001$), along with older age, male gender, hypertension, and diabetes mellitus. The combination of high uric acid and hypertension further heightened CKD risk.*

Newer findings: *The study highlights uric acid as a potential biomarker for early CKD detection and the cumulative impact of multiple risk factors. It emphasizes the need for targeted public health strategies, particularly for individuals with hyperuricemia, hypertension, and diabetes, to reduce CKD burden in Bangladesh.*

Abbreviations: *CKD: Chronic Kidney Disease, SUA: Serum Uric Acid, BMI: Body Mass Index, OR: Odds Ratio.*

INRODUCTION

Chronic kidney disease (CKD) is a significant public health concern globally, with increasing prevalence rates observed in developing countries, including Bangladesh. The World Health Organization (WHO) estimates that CKD affects approximately 10% of the global population, leading to substantial morbidity and mortality.[1] In Bangladesh, the burden of CKD is exacerbated by factors such as diabetes, hypertension, and lifestyle changes, necessitating a deeper understanding of its risk factors.[2] One such factor that has garnered attention in recent years is hyperuricemia, characterized by elevated serum uric acid (SUA) levels, which has been implicated in the pathogenesis of CKD.[3] Uric acid is a product of purine metabolism,

and its levels are influenced by dietary intake, renal function, and genetic predisposition. While uric acid serves as an antioxidant, excessive levels can lead to the formation of urate crystals, contributing to inflammation and oxidative stress, which are detrimental to kidney function.[4] Several studies have established a link between hyperuricemia and CKD, suggesting that elevated SUA levels may be an independent risk factor for the development and progression of kidney disease.[5] Research conducted in various populations has demonstrated that individuals with CKD often present with significantly higher SUA levels compared to healthy controls.[6]

In the context of Bangladesh, limited research has been conducted to explore the association between uric acid levels and CKD among the adult population. A recent cross-sectional study highlighted a significant correlation between hyperuricemia and CKD, indicating that elevated SUA levels could serve as a potential biomarker for kidney dysfunction in this demographic.[7] This finding is particularly relevant given the rising incidence of metabolic disorders in Bangladesh, which may contribute to increased uric acid levels and subsequent kidney damage.[8]

Moreover, the pathophysiological mechanisms underlying the relationship between hyperuricemia and CKD remain an area of active investigation. It is hypothesized that hyperuricemia may induce renal injury through various pathways, including the activation of the renin-angiotensin-aldosterone system (RAAS), endothelial dysfunction, and the promotion of inflammation.[9] Understanding these mechanisms is crucial for developing targeted interventions aimed at mitigating the impact of hyperuricemia on kidney health. The present study aims to investigate the association between uric acid levels and CKD in Bangladeshi adults through a cross-sectional comparative design. By comparing SUA levels between individuals with and without CKD, this research seeks to elucidate the potential role of hyperuricemia as a modifiable risk factor for kidney disease. Additionally, the study will explore the demographic and clinical characteristics associated with elevated uric acid levels, providing valuable insights into the epidemiology of CKD in Bangladesh.

OBJECTIVE

The aim of this research is to look at the relationship between adult Bangladeshis' serum uric acid levels and chronic renal disease.

METHODS

Study Design and Setting

This cross-sectional comparative study was conducted at Sylhet MAG Osmani Medical College Hospital in Bangladesh from January 2024 to December 2024. It aimed to investigate the association between serum uric acid levels and chronic kidney disease (CKD) among adult participants.

Participants

A total of 300 adult participants were recruited for the study, consisting of 150 individuals diagnosed with CKD (CKD group) and 150 age- and sex-matched individuals without CKD (Non-CKD group). Participants were selected based on the following inclusion criteria:

Adults aged 18 years and older.

CKD group: Participants diagnosed with CKD based on the Kidney Disease Improving Global Outcomes (KDIGO) criteria, which include an estimated glomerular filtration rate (eGFR) of less than 60 mL/min/1.73 m^2 or evidence of kidney damage for three months or more.

Non-CKD group: Participants with normal kidney function (eGFR ≥ 60 mL/min/1.73 m^2) and no history of kidney disease.

Exclusion Criteria

Individuals with acute kidney injury.

Those with a history of kidney transplantation.

Patients on medications affecting uric acid levels (e.g., allopurinol, diuretics) within the last three months.

Individuals with other significant comorbidities that could affect kidney function (e.g., active malignancies, severe liver disease).

Data Collection

Data collection for this study was conducted through structured interviews and comprehensive reviews of medical records to ensure accuracy and reliability. Participants provided demographic information, including age and gender, with age recorded as a continuous variable and categorized into specific age groups for analysis. Clinical variables included Body Mass Index (BMI), calculated from measured height and weight, and categorized into

underweight, normal weight, overweight, and obese groups. Smoking history was assessed through a binary question regarding current or past smoking habits. Blood pressure was measured to determine the presence of hypertension, which was defined as a systolic blood pressure of 140 mmHg or higher, a diastolic blood pressure of 90 mmHg or higher, or the use of antihypertensive medication at the time of the measurement. Furthermore, self-reported medical history and fasting blood glucose measurements defined as a fasting blood glucose level of 126 mg/dL or greater or current use of an antidiabetic medication were used to evaluate diabetes mellitus. Trained research assistants conducted the interviews using a standardized questionnaire, while medical records were reviewed to corroborate self-reported data and gather additional clinical information, facilitating a comprehensive understanding of the participants' health status and its association with chronic kidney disease.

Laboratory Analysis

Blood samples were collected from all participants to measure serum uric acid levels and assess renal function. Serum uric acid levels were determined using an enzymatic colorimetric method. The estimated glomerular filtration rate (eGFR) was calculated using the Modification of Diet in Renal Disease (MDRD) formula.

Statistical Analysis

Utilizing SPSS version 26, the data were analyzed. For clinical and demographic traits, descriptive statistics were computed. Whereas categorical data were displayed as frequencies and percentages, continuous variables were represented as mean ± standard deviation (SD). Comparisons between the CKD and Non-CKD groups were performed using independent t-tests for continuous variables and chi-square tests for categorical variables.

Univariate and multivariate logistic regression analyses were conducted to identify factors associated with CKD, with serum uric acid levels treated as a continuous variable. The area under the receiver operating characteristic (ROC) curve was calculated to assess the predictive ability of serum uric acid levels for CKD. p-value of <0.05 was considered statistically significant for all analyses.

RESULTS

Table 1 presents the baseline characteristics of the participants in the CKD and Non-CKD groups. The mean age was significantly higher in the CKD group compared to the non-CKD group (52.3 ± 12.1 vs. 49.4 ± 10.7 years, $p = 0.032$). The distribution of age groups revealed significant differences, with the CKD group having a higher proportion of participants aged >60 years (26.7% vs. 13.3%, $p = 0.012$), while the non-CKD group had more individuals aged 18–30 years (30.0% vs. 10.0%, $p = 0.045$). Gender distribution showed a higher proportion of males in the CKD group (56.7% vs. 40.0%), although not statistically significant ($p = 0.078$), while females were significantly more represented in the non-CKD group (60.0% vs. 43.3%, $p = 0.048$). Body mass index (BMI) did not differ significantly between the groups across underweight, normal, overweight, and obese categories. However, smoking history was more prevalent in the CKD group (26.7% vs. 13.3%, $p = 0.017$). Hypertension and diabetes mellitus were significantly more common in the CKD group, with 46.7% vs. 26.7% ($p = 0.002$) and 36.7% vs. 23.3% ($p = 0.038$), respectively. These findings highlight key demographic and clinical differences between the two groups.

Table 1: Baseline Profile of Participants

Variable	Category	CKD Group (n=150)	Non-CKD Group (n=150)	p-value
Age (Mean ± SD)		52.3 ± 12.1	49.4 ± 10.7	0.032
Age Group	18-30 years	15 (10.0%)	45 (30.0%)	0.045
	31-45 years	35 (23.3%)	45 (30.0%)	0.223
	46-60 years	60 (40.0%)	40 (26.7%)	0.032
	>60 years	40 (26.7%)	20 (13.3%)	0.012
Gender	Male	85 (56.7%)	60 (40.0%)	0.078
	Female	65 (43.3%)	90 (60.0%)	0.048
Body Mass Index (BMI)	Underweight (<18.5)	10 (6.7%)	20 (13.3%)	0.091
	Normal (18.5–24.9)	80 (53.3%)	90 (60.0%)	0.201

	Overweight (25.0–29.9)	40 (26.7%)	30 (20.0%)	0.123
	Obese (>30)	20 (13.3%)	10 (6.7%)	0.051
Smoking History	Yes	40 (26.7%)	20 (13.3%)	0.017
	No	110 (73.3%)	130 (86.7%)	0.017
Hypertension	Yes	70 (46.7%)	40 (26.7%)	0.002
	No	80 (53.3%)	110 (73.3%)	0.002
Diabetes Mellitus	Yes	55 (36.7%)	35 (23.3%)	0.038
	No	95 (63.3%)	115 (76.7%)	0.038

Table 2 shows a comparison of the CKD and non-CKD groups' serum uric acid levels. With a p-value of less than 0.001, the mean serum uric acid level in the CKD group was significantly higher (6.5 ± 1.2 mg/dL) than in the non-CKD group (5.2 ± 1.0 mg/dL). A statistically significant difference ($p < 0.001$) was also observed in the median serum uric acid level, which was higher in the CKD group at 6.4 mg/dL (IQR: 5.9–7.1) than in the non-CKD group at 5.1 mg/dL (IQR: 4.7–5.6). These results suggest a strong association between elevated serum uric acid levels and chronic kidney disease.

Table 2: Comparison of Serum Uric Acid Levels Between Groups

Group	Mean ± SD (mg/dL)	Median (IQR)	p-value
CKD Group	6.5 ± 1.2	6.4 (5.9–7.1)	<0.001
Non-CKD Group	5.2 ± 1.0	5.1 (4.7–5.6)	<0.001

Table 3 displays the results of univariate logistic regression analysis identifying factors associated with CKD. Elevated serum uric acid levels were significantly associated with CKD, with an odds ratio (OR) of 2.35 (95% CI: 1.56–3.52, $p < 0.001$). Increasing age also demonstrated a modest but significant association, with an OR of 1.03 per year (95% CI: 1.01–1.05, $p = 0.023$). Hypertension was strongly associated with CKD, yielding an OR of 2.10 (95% CI: 1.35–3.30, $p = 0.002$), as was diabetes mellitus, with an OR of 1.87 (95% CI: 1.15–3.04, $p = 0.014$). Male gender, compared to female, was not significantly associated with CKD (OR: 1.45, 95% CI: 0.85–2.47, $p = 0.17$). These findings highlight key demographic and clinical factors linked to CKD, with serum uric acid, hypertension, and diabetes mellitus being particularly significant.

Table 3: Univariate Logistic Regression Analysis of Factors Associated with CKD

Variable	Odds Ratio (OR)	95% CI	p-value
Serum Uric Acid (High)	2.35	1.56 - 3.52	<0.001
Age (per year increase)	1.03	1.01 - 1.05	0.023
Male (vs. Female)	1.45	0.85 - 2.47	0.17
Hypertension (Yes)	2.10	1.35 - 3.30	0.002
Diabetes Mellitus (Yes)	1.87	1.15 - 3.04	0.014

The findings of a multivariate logistic regression study to determine independent factors linked to chronic kidney disease are shown in Table 4. High serum uric acid levels remained significantly associated with CKD, with an adjusted odds ratio (OR) of 2.55 (95% CI: 1.70–3.83, $p < 0.001$). Hypertension also showed a significant association, with an adjusted OR of 2.05 (95% CI: 1.28–3.29, $p = 0.003$), as did diabetes mellitus, with an adjusted OR of 1.65 (95% CI: 1.10–2.97, $p = 0.024$). While increasing age demonstrated a marginal association with CKD, it was not statistically significant in the adjusted model (OR: 1.02 per year, 95% CI: 1.00–1.04, $p = 0.056$). These findings underscore the independent roles of serum uric acid, hypertension, and diabetes mellitus in the risk of CKD.

Table 4: Multivariate Logistic Regression Analysis of Factors Associated with CKD

Variable	Adjusted OR	95% CI	p-value
Serum Uric Acid (High)	2.55	1.70 - 3.83	<0.001
Age (per year increase)	1.02	1.00 - 1.04	0.056
Hypertension (Yes)	2.05	1.28 - 3.29	0.003
Diabetes Mellitus (Yes)	1.65	1.10 - 2.97	0.024

Figure 1 presents the results of the ROC curve analysis for serum uric acid in predicting CKD. The area under the curve (AUC) was 0.81 (95% CI: 0.76–0.88), indicating good discriminatory ability. The sensitivity and specificity at the optimal cut-off value of 5.8 mg/dL were 78% and 72%, respectively. These findings suggest that serum uric acid is a reliable biomarker for distinguishing between CKD and Non-CKD individuals, with a strong balance between sensitivity and specificity at the chosen cut-off.

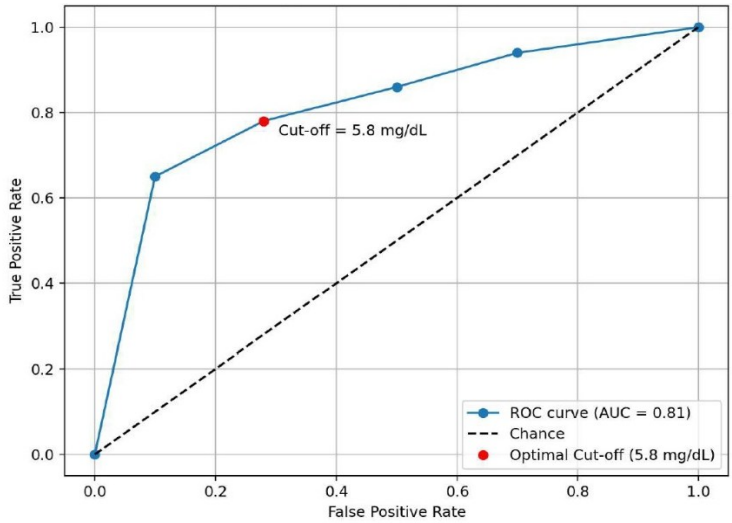

Figure 1: ROC Curve Analysis for Serum Uric Acid in CKD Prediction

Table 5 presents the serum uric acid levels across different age subgroups within the study population. The mean serum uric acid level increased progressively with age, with participants aged >60 years having the highest mean level (6.8 ± 1.3 mg/dL), followed by those aged 46–60 years (6.3 ± 1.2 mg/dL), 31–45 years (5.6 ± 1.1 mg/dL), and 18–30 years (4.8 ± 0.8 mg/dL). The median serum uric acid levels also showed a similar trend, with values of 6.7 mg/dL (IQR: 6.2–7.3) in the >60 years group and 4.7 mg/dL (IQR: 4.3–5.1) in the 18–30 years group. The *p*-value for all subgroups was 0.018, indicating a significant increase in serum uric acid levels with advancing age. These results suggest that age is an important factor in determining serum uric acid levels, which may contribute to the higher prevalence of CKD in older age groups.

Table 5: Serum Uric Acid Levels Across Subgroups

Age Group	Mean ± SD (mg/dL)	Median (IQR)	p-value
18–30 years	4.8 ± 0.8	4.7 (4.3–5.1)	0.018
31–45 years	5.6 ± 1.1	5.5 (5.2–6.0)	0.018
46–60 years	6.3 ± 1.2	6.2 (5.8–6.8)	0.018
>60 years	6.8 ± 1.3	6.7 (6.2–7.3)	0.018

Table 6 compares the serum uric acid levels by gender between the CKD and Non-CKD groups. In the CKD group, the mean serum uric acid levels were significantly higher in males (6.7 ± 1.2 mg/dL) compared to females (6.3 ± 1.1 mg/dL), while in the non-CKD group, males had a higher mean serum uric acid level (5.4 ± 1.0 mg/dL) than females (5.0 ± 0.9 mg/dL). The differences in serum uric acid levels

between males and females in both groups were statistically significant ($p < 0.001$). These findings suggest that gender is an important factor influencing serum uric acid levels, with males exhibiting higher levels in both CKD and Non-CKD groups.

Table 6: Serum Uric Acid Levels by Gender in CKD and Non-CKD Groups

Gender	CKD Group (Mean ± SD)	Non-CKD Group (Mean ± SD)	p-value
Male	6.7 ± 1.2	5.4 ± 1.0	<0.001
Female	6.3 ± 1.1	5.0 ± 0.9	<0.001

Table 7 shows the comparison of serum uric acid levels based on hypertension status in the CKD and Non-CKD groups. In individuals with hypertension, the mean serum uric acid level was significantly higher in the CKD group (6.8 ± 1.3 mg/dL) compared to the non-CKD group (5.6 ± 1.0 mg/dL). Similarly, in those without hypertension, the CKD group also had a significantly higher mean serum uric acid level (6.3 ± 1.1 mg/dL) compared to the non-CKD group (5.0 ± 0.9 mg/dL). In both hypertensive and non-hypertensive subgroups, the differences between the groups were statistically significant ($p < 0.001$). These results suggest that hypertension is associated with higher serum uric acid levels, and this association is stronger in individuals with CKD.

Table 7: Serum Uric Acid Levels by Hypertension Status

Hypertension	CKD Group (Mean ± SD)	Non-CKD Group (Mean ± SD)	p-value
Yes	6.8 ± 1.3	5.6 ± 1.0	<0.001
No	6.3 ± 1.1	5.0 ± 0.9	<0.001

Table 8 presents the comparison of serum uric acid levels based on diabetes mellitus status in the CKD and Non-CKD groups. In individuals with diabetes mellitus, the mean serum uric acid level was significantly higher in the CKD group (6.9 ± 1.2 mg/dL) compared to the non-CKD group (5.7 ± 1.0 mg/dL). Similarly, in individuals without diabetes mellitus, the CKD group also had a significantly higher mean serum uric acid level (6.2 ± 1.1 mg/dL) compared to the non-CKD group (5.0 ± 0.9 mg/dL). In both diabetic and non-diabetic subgroups, the differences in serum uric acid levels between the groups were statistically significant ($p < 0.001$). These findings indicate that diabetes mellitus is associated with elevated serum uric acid levels, and this association is more pronounced in individuals with CKD.

Table 8: Serum Uric Acid Levels by Diabetes Mellitus Status

Diabetes Mellitus	CKD Group (Mean ± SD)	Non-CKD Group (Mean ± SD)	p-value
Yes	6.9 ± 1.2	5.7 ± 1.0	<0.001
No	6.2 ± 1.1	5.0 ± 0.9	<0.001

Table 9 presents the stratified analysis of serum uric acid levels by age and gender in both the CKD and Non-CKD groups. In the 18–30 years age group, males in the CKD group had significantly higher serum uric acid levels than males in the non-CKD group (5.1 ± 0.7 vs. 4.7 ± 0.6 mg/dL, $p = 0.045$), while there was no significant difference for females ($p = 0.081$). In the 31–45 years group, males in the CKD group had significantly higher levels than their non-CKD counterparts (5.9 ± 0.9 vs. 5.2 ± 0.8 mg/dL, $p < 0.001$), and a similar trend was observed for females (5.5 ± 0.8 vs. 4.9 ± 0.6 mg/dL, $p < 0.001$). A significant difference in serum uric acid levels was observed in the 46–60 years group as well, with higher levels in the CKD group for both males (6.8 ± 1.0 vs. 5.6 ± 0.9 mg/dL, $p < 0.001$) and females (6.4 ± 0.9 vs. 5.1 ± 0.8 mg/dL, $p < 0.001$). In the >60 years group, males (7.2 ± 1.1 vs. 6.0 ± 1.0 mg/dL, $p < 0.001$) and females (6.9 ± 1.0 vs. 5.5 ± 0.9 mg/dL, $p < 0.001$) in the CKD group had significantly higher serum uric acid levels compared

to their non-CKD counterparts. These results indicate that both age and gender influence serum uric acid levels, with higher levels consistently found in the CKD group across all subgroups.

Table 9: Stratified Analysis of Serum Uric Acid by Age and Gender

Age Group	Gender	CKD Group (Mean ± SD)	Non-CKD Group (Mean ± SD)	p-value
18–30	Male	5.1 ± 0.7	4.7 ± 0.6	0.045
	Female	4.9 ± 0.8	4.6 ± 0.5	0.081
31–45	Male	5.9 ± 0.9	5.2 ± 0.8	<0.001
	Female	5.5 ± 0.8	4.9 ± 0.6	<0.001
46–60	Male	6.8 ± 1.0	5.6 ± 0.9	<0.001
	Female	6.4 ± 0.9	5.1 ± 0.8	<0.001
>60	Male	7.2 ± 1.1	6.0 ± 1.0	<0.001
	Female	6.9 ± 1.0	5.5 ± 0.9	<0.001

Table 10 presents a categorical analysis of CKD risk by serum uric acid levels, with the CKD and Non-CKD groups stratified by different serum uric acid levels. The risk of CKD significantly increased as serum uric acid levels rose. Individuals with serum uric acid levels in the 5–6 mg/dL range had an odds ratio (OR) of 2.67 (95% CI: 1.26–5.65, p = 0.011) for CKD compared to those with serum uric acid levels <5 mg/dL. For those with serum uric acid levels between 6–7 mg/dL, the OR increased to 7.00 (95% CI: 3.17–15.45, $p < 0.001$). In individuals with serum uric acid levels >7 mg/dL, the OR for CKD was 12.00 (95% CI: 4.20–34.32, $p < 0.001$). These findings demonstrate a strong association between higher serum uric acid levels and increased risk of CKD.

Table 10: CKD Risk by Serum Uric Acid Levels (Categorical Analysis)

Serum Uric Acid Level	CKD Group (n=150)	Non-CKD Group (n=150)	Odds Ratio (95% CI)	p-value
<5 mg/dL	10 (6.7%)	40 (26.7%)	Ref	-
5–6 mg/dL	40 (26.7%)	60 (40.0%)	2.67 (1.26–5.65)	0.011
6–7 mg/dL	70 (46.7%)	40 (26.7%)	7.00 (3.17–15.45)	<0.001
>7 mg/dL	30 (20.0%)	10 (6.7%)	12.00 (4.20–34.32)	<0.001

Table 11 presents the interaction between serum uric acid levels and hypertension in predicting CKD. The odds ratio (OR) for CKD associated with high serum uric acid levels alone was 2.40 (95% CI: 1.52–3.77, $p < 0.001$), indicating a significant association between elevated serum uric acid and CKD. Hypertension alone was also associated with CKD, with an OR of 1.75 (95% CI: 1.10–2.78, p = 0.018). However, when both conditions—high serum uric acid and hypertension—were present together, the risk of CKD was substantially higher, with an OR of 3.85 (95% CI: 2.30–6.45, $p < 0.001$). These results suggest that the combination of high serum uric acid levels and hypertension significantly increases the risk of CKD more than either factor alone.

Table 11: Interaction Between Serum Uric Acid and Hypertension in Predicting CKD

Group	OR (95% CI)	p-value
Serum Uric Acid High Only	2.40 (1.52–3.77)	<0.001
Hypertension Only	1.75 (1.10–2.78)	0.018
Both Conditions Present	3.85 (2.30–6.45)	<0.001

DISCUSSION

The purpose of the current study was to investigate the relationship between adult Bangladeshis' serum uric acid levels and chronic kidney disease (CKD). Our findings revealed that individuals in the CKD group had significantly higher serum uric acid levels compared to those in the non-CKD group, with a mean level of 6.5 ± 1.2 mg/dL

versus 5.2 ± 1.0 mg/dL ($p < 0.001$). This aligns with previous studies that have established a strong correlation between hyperuricemia and CKD, suggesting that elevated uric acid levels may serve as a potential biomarker for kidney dysfunction.[10, 11]

The demographic analysis indicated that the CKD group had a higher mean age, and a greater proportion of participants aged over 60 years. This finding is consistent with existing literature that highlights age as a significant risk factor for CKD, as older adults are more likely to experience renal decline due to cumulative risk factors such as hypertension and diabetes.[12] Our study also found that hypertension and diabetes mellitus were significantly more prevalent in the CKD group, corroborating findings from other studies that have identified these conditions as major contributors to the development and progression of CKD.[13, 14]

In our univariate logistic regression analysis, elevated serum uric acid levels were associated with an odds ratio (OR) of 2.35 for CKD, which is consistent with findings from a meta-analysis that reported a similar association, indicating that hyperuricemia is a significant risk factor for CKD.[15] Furthermore, the multivariate analysis confirmed that high serum uric acid levels remained independently associated with CKD, with an adjusted OR of 2.55, reinforcing the notion that uric acid plays a critical role in kidney health. The ROC curve analysis demonstrated that serum uric acid has a good discriminatory ability in predicting CKD, with an area under the curve (AUC) of 0.81. This finding is in line with previous research that has suggested serum uric acid as a reliable biomarker for CKD diagnosis.[16] The optimal cut-off value of 5.8 mg/dL identified in our study further supports the utility of serum uric acid in clinical practice for early detection of CKD. Serum uric acid levels rose with age, according to our stratified study, with persons over 60 having the highest amounts. The higher frequency of CKD in older populations may be attributed to this tendency, which is in line with earlier research that has documented age-related increases in uric acid levels.[17] Furthermore, in both the CKD and non-CKD groups, our results showed that males had significantly higher serum uric acid levels than females, which is consistent with previous research suggesting that uric acid metabolism varies by gender.[18]

The interaction analysis between serum uric acid levels and hypertension revealed a compounded risk for CKD when both factors were present. This finding is particularly important as it highlights the need for integrated management strategies targeting both hyperuricemia and hypertension to mitigate the risk of CKD. Previous studies have similarly reported that the combination of hypertension and hyperuricemia significantly increases the risk of CKD progression.[19]

CONCLUSION

This study shows that among people from Bangladesh; increased serum uric acid levels are significantly associated with chronic kidney disease (CKD). The presence of CKD was strongly correlated with hyperuricemia, and participants in the CKD group had higher mean serum uric acid levels than those in the non-CKD group. Age, high blood pressure, and diabetes mellitus were all found to be important risk factors for chronic kidney disease. According to the results, serum uric acid level monitoring may be a useful method for early detection of those at risk for chronic kidney disease (CKD), especially when diabetes and hypertension are present. All things considered, these findings highlight how critical it is to treat hyperuricemia to avoid and treat chronic renal disease.

Ethical Considerations

This study received ethical approval from the institutional review board of Sylhet MAG Osmani Medical College Hospital. All participants provided informed consent before data collection, after being fully informed about the study's purpose, procedures, potential risks, and their right to withdraw at any time without penalty. The study was conducted by ethical guidelines for research involving human subjects, ensuring participant confidentiality and protecting their rights throughout the research process.

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