Section: Dermatology

Original Research Article

# EVALUATION OF DERMATOLOGICAL LESIONS IN PATIENTS SUFFERING FROM ACUTE KIDNEY INJURY (AKI) AT A TERTIARY CARE HOSPITAL

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ABSTRACT

**Background:** Acute kidney injury (AKI) represents a clinical syndrome that significantly complicates the clinical trajectory and adversely affects outcomes for a considerable proportion of hospitalized patients. Cutaneous signs can often give diagnostic clues to underlying systemic diseases causing AKI. Hence; the present study was conducted to assess the occurrence of skin lesions in AKI patients.

**Materials and Methods:** A total of 100 patients with AKI were enrolled. Complete demographic and clinical details of all the patients were obtained. All the patients were classified according to Kidney Disease Improving Global Outcomes (KDIGO) classification as Stage I, stage II and stage III. Complete dermatological examination of all the patients was done. Blood samples were obtained and biochemical profile of all the patients was evaluated. The occurrence of dermatological lesions was correlated with severity staging of AKI. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software. Chi-square test was used for evaluation of level of significance.

**Results**: Skin lesions were seen in 16 percent of the AKI patients. Skin lesions were seen in 6.25 percent, 9.09 percent and 34.48 percent of the patients with Stage I, stage II and stage III AKI. Significant higher proportion of patients with stage III AKI manifested with skin lesions. Palpable purpura on lower limbs was seen in 6 percent of the patients while Maculopapular rash on trunk was seen in 4 percent of the patients. Nodular lesions were seen in 3 percent of the patients. Livedo reticularis, Butterfly rash and Necrotic ulcerations were seen in 1 percent of the patients each.

**Conclusion**: Understanding the clinical characteristics of dermatological manifestations in patients with acute kidney injury (AKI) is crucial, as it can facilitate more prompt diagnosis, assessment, and treatment, thereby reducing the risk of both long-term renal and extrarenal complications.

**Keywords:** Acute Kidney Injury, Skin.

## INTRODUCTION

Acute kidney injury (AKI) represents a clinical syndrome that significantly complicates the clinical trajectory and adversely affects outcomes for a considerable proportion of hospitalized patients. It is characterized by a rapid decline in renal function, occurring within hours, and encompasses both structural damage and functional impairment of the kidneys. The pathophysiology of AKI is rarely singular or distinct; rather, it often arises from a combination of factors.[1,2] Many patients exhibit a multifactorial etiology, where conditions such as sepsis, ischemia, and nephrotoxicity frequently coexist, complicating both diagnosis and management. Notably, AKI is prevalent even among patients who are not critically ill, underscoring the necessity for healthcare professionals, especially those lacking expertise in renal medicine, to recognize it promptly.[3]

The pathogenesis of AKI is driven by its underlying causes. In cases of acute tubular necrosis, the common final pathway involves cellular injury resulting from ischemia or exposure to nephrotoxins, leading to the effacement of the brush border, cellular death, and diminished function of tubular cells.[4] One specific intrarenal cause is intratubular obstruction, which may occur due to substances such as myoglobin, uric acid crystals in tumor lysis syndrome, or immunoglobulin light chains associated with monoclonal gammopathy, all of which can produce similar outcomes. Additional intrarenal injury mechanisms include glomerulonephritis and acute interstitial nephritis, often stemming from immune-mediated damage to the vasculature, inflammatory responses, and deposition of immune complexes, resulting in damage to both glomeruli and tubules.[5,6] The pathophysiology of postrenal AKI is typically associated with urinary obstruction, which can lead to reduced renal perfusion, tubular atrophy, and interstitial inflammation.[7] Prompt diagnosis and management is key in the prevention of complications. Cutaneous signs can often give diagnostic clues of underlying systemic diseases causing AKI. Knowledge of various cutaneous signs could lead to earlier diagnosis of underlying kidney disease and facilitate management strategies in a timely manner.[8] Dermatologic manifestations of renal disease are not uncommon findings in patients with AKI and end-stage renal disease (ESRD).[5] Hence; the present study was conducted for to assess the occurrence of skin lesions in AKI patients.

## MATERIALS AND METHODS

The present study employed an observational design, conducted in a hospital setting among 100 patients of acute kidney injury (AKI). AKI patients were enrolled regardless of age, sex, or underlying cause.

Inclusion criteria included AKI patients with (KDIGO) classification as Stage I, stage II and stage III. Exclusion criteria comprised hospital admitted patients age <18 years of age, CKD patients, patients on dialysis and those who do not gave consent for the study.

The current research was commenced for evaluating the occurrence of skin lesions in AKI patients. All the patients were classified according to Kidney Disease Improving Global Outcomes (KDIGO) classification as Stage I, stage II and stage III. Stage 1 (creatinine increase ≥0.3 mg/dL within past 48 hours or an increase of 1.5–1.9 times the baseline or a urine output <0.5 mL/kg/hour for 6–12 hours), Stage 2 (creatinine increase of 2.0–2.9 × baseline value or a urine output <0.5 mL/kg/hour for ≥12 hours), and Stage 3 (creatinine increase of 3 × baseline value or serum creatinine ≥4 mg/dL or RRT initiation or a urine output <0.3 mL/kg/hour for ≥24 hours or anuria for ≥12 hours).

Detailed general and systemic examinations were performed. Demographic and clinical data were collected from medical records and patient interviews. This included age, sex, medical history, and relevant demographic information. Laboratory investigations included complete blood count (CBC), serum creatinine, blood urea, Urinary Total Protein (UTP) in 24 hours and serum fasting lipid profile [Serum total cholesterol, serum triglyceride, serum low density lipoprotein cholesterol (S. LDL-C), serum high density lipoprotein cholesterol (S. HDL-C)]. A comprehensive dermatological examination was performed to identify and document skin lesions. Scraping for fungus and potassium hydroxide mount were done wherever clinically indicated. Occurrence of dermatological lesions was correlated with severity staging of AKI. Skin manifestations of the study subjects were evaluated by a qualified skin specialist in the Department of Dermatology,

The study adhered to ethical considerations, obtaining approval from the institutional review board (IRB) or ethics committee and ensuring patient informed consent. Confidentiality and anonymity were maintained throughout the study.

Statistical analysis was performed using SPSS software. Microsoft Excel was used for data entry and management. The chi-square test was employed to evaluate the significance of associations between variables, particularly the correlation between skin lesions and AKI severity.

## RESULTS

36 percent and 22 percent of the patients belonged to the age group of 31 to 40 years and 18 to 30 years respectively. 39 percent of the patients belonged to the age group of 41 to 50 years. Mean age of the patients was 49.2 years. 74 percent of the patients were males while the remaining were females. According to KDIGO classification, 55 percent of the patients were of stage II while 29 percent and 16 percent of the patients were of stage III and stage I respectively. Mean Hb levels were 14.3 g/dL while mean blood urea and serum creatinine levels were 50.7 mg/dL and 1.89 mg/dL respectively. Skin lesions were seen in 16 percent of the AKI patients. Skin lesions were seen in 6.25 percent, 9.09 percent and 34.48 percent of the patients with Stage I, stage II and stage III AKI. Significant higher proportion of patients with stage III AKI manifested with skin lesions. Palpable purpura on lower limbs was seen in 6 percent of the patients while Maculopapular rash on trunk was seen in 4 percent of the patients. Nodular lesions were seen in 3 percent of the patients. Livedo reticularis, Butterfly rash and Necrotic ulcerations were seen in 1 percent of the patients each.

**Table 1: Distribution of AKI patients according to KDIGO classification**

| KDIGO classification | Number | Percentage |
|---|---|---|
| **Stage I** | 16 | 16 |
| **Stage II** | 55 | 55 |
| **Stage III** | 29 | 29 |
| **Total** | 100 | 100 |

**Table 2: Biochemical profile**

| Variable | Mean | SD |
|---|---|---|
| **Hb (g/dL)** | 14.3 | 1.8 |
| **Blood urea (md/dL)** | 50.7 | 45.6 |
| **Serum creatinine (mg/dL)** | 1.89 | 1.89 |

**Table 3: Incidence of skin lesions in AKI patients**

| Skin lesions | Number | Percentage |
|---|---|---|
| **Present** | 16 | 16 |
| **Absent** | 84 | 84 |
| **Total** | 100 | 100 |

**Table 4: Correlation of occurrence of skin lesions among AKI patients and severity of AKI**

| Severity grading of AKI | Skin lesions present | | Skin lesions absent | |
|---|---|---|---|---|
| | Number | Percentage | Number | Percentage |
| **Stage I** | 1 | 6.25 | 15 | 93.75 |
| **Stage II** | 5 | 9.09 | 50 | 90.91 |
| **Stage III** | 10 | 34.48 | 19 | 65.52 |
| **p-value** | 0.0012 (Significant) | | | |

**Table 5: Spectrum of skin lesions**

| Skin lesions | Number | Percentage |
|---|---|---|
| **Palpable purpura on lower limbs** | 6 | 6 |
| **Maculopapular rash on trunk** | 4 | 4 |
| **Livedo reticularis** | 1 | 1 |
| **Butterfly rash** | 1 | 1 |
| **Nodules** | 3 | 3 |
| **Necrotic ulcerations** | 1 | 1 |

## DISCUSSION

AKI continues to represent a significant challenge in contemporary clinical medicine, affecting approximately 1-5% of hospitalized patients. The incidence of AKI escalates notably with the increasing severity of the underlying conditions, with up to 50% of patients in intensive care units experiencing this complication, often due to systemic infections or sepsis. Despite advancements in intensive care practices and dialysis over the past two to three decades, the prognosis for AKI has not markedly improved. In the mid-1970s, the mortality rate for AKI was around 70%, which saw a moderate decline to 30-50% by the early 1990s, yet this rate has remained relatively stable over the last twenty years. The unfavorable prognosis is attributed not only to the primary diseases that lead to AKI but also to the complications that arise from the condition itself. Therefore, the development of more effective therapeutic strategies remains a critical objective within nephrological research.[9,10] Hence; the present study was conducted for assessing the occurrence of skin lesions in AKI patients.

36 percent and 22 percent of the patients belonged to the age group of 31 to 40 years and 18 to 30 years respectively. 39 percent of the patients belonged to the age group of 41 to 50 years. Mean age of the patients was 49.2 years. 74 percent of the patients were males while the remaining were females. Skin lesions were seen in 16 percent of the AKI patients. Skin lesions were seen in 6.25 percent, 9.09 percent and 34.48 percent of the patients with Stage I, stage II and stage III AKI. Maskey A et al determined the prevalence and pattern of various cutaneous manifestations in patients undergoing maintenance hemodialysis. 52 (65%) patients were male. The mean age of study population was 51.95±14.96 years. The mean duration of dialysis was 40.28±11.09 months. The most common cause of end stage kidney disease was diabetic nephropathy. The most common cutaneous manifestations were pigmentation (82.5%), nail changes (75%), xerosis (70%) and pruritis (50%). Patients on hemodialysis were associated with multiple cutaneous symptoms, the most prevalent of which were pigmentation and nail disorders.[11]

In the present study, significant higher proportion of patients with stage III AKI manifested with skin lesions. Palpable purpura on lower limbs was seen in 6 percent of the patients while Maculopapular rash on trunk was seen in 4 percent of the patients. Nodular lesions were seen in 3 percent of the patients. Livedo reticularis, Butterfly rash and Necrotic ulcerations were seen in 1 percent of the patients each. Castello M et al evaluated the cutaneous and mucosal diseases after kidney

transplantation. Skin and mucosal diseases were reported in 173 (95.7%) of patients; 88 (50.81%) showed viral lesions; 92 (53.01%) immunosuppression-related lesions; 28 (16.39%) benign tumours; 26 (15.3%) precancers /neoplastic lesions; 24 (14.21%) mycosis; 16 (9.29%) cutaneous xerosis, 15 (8.74%) dermatitis, while absence of cutaneous disease was evident only in 8 (4.37%) cases. An association between drug side effects and anti-rejection treatment (P≤0.01) and/or calcineurin-inhibitors (CNI) exposure (P≤0.01) was found. Longer exposure to immunosuppressive drugs (>60 months) was associated with pre-malignancy and malignancy lesions. Cutaneous diseases are frequent in kidney transplanted patients. Continuous skin monitoring is necessary to make an early diagnosis and to start appropriate treatment.[12]

## CONCLUSION

Understanding the clinical characteristics of dermatological manifestations in patients with acute kidney injury (AKI) is crucial, as it can facilitate more prompt diagnosis, assessment, and treatment, thereby reducing the risk of both long-term renal and extrarenal complications.

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