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Evolutionary Profile of Acute Kidney Injury during Pregnancy and the Postpartum Period

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Abstract **Original Research Article**

Acute kidney injury (AKI) during pregnancy and the postpartum period remains a critical emergency in developing nations. This retrospective study (2021–2023) at the Mohammed VI University Hospital of Marrakech analyzed 52 patients meeting the 2012 KDIGO criteria. The cohort exhibited a mean age of 29.52 years, and 42.4% lacked adequate prenatal care. Preeclampsia was the primary etiology (n = 26; 20 with oligo-anuria), followed by postpartum hemorrhage (26.9%) and systemic shock (23.07%). Clinical severity was high, with 40.3% of patients requiring hemodialysis. Renal biopsy (9.6%) revealed severe lesions, including partial cortical necrosis, malignant nephroangiosclerosis, and Class IV lupus nephritis. Complete renal recovery was achieved in only 38.4% of cases, while 34.6% had partial recovery and 26.9% experienced unfavorable outcomes. Driven mainly by hypertensive disorders and severe hemorrhage, obstetric AKI carries a high risk of chronic renal sequelae, necessitating early multidisciplinary management and long-term nephrological follow-up.

Keywords: Acute Kidney Injury, Pregnancy, Postpartum, Preeclampsia, Postpartum Hemorrhage, Renal Biopsy, Hemodialysis.

INTRODUCTION

Acute kidney injury (AKI) during pregnancy and the postpartum period represents one of the most critical emergencies in perinatal medicine, simultaneously threatening both maternal and fetal survival. Although its prevalence has markedly declined in developed countries owing to improvements in obstetric care, it remains a major cause of maternal morbidity and mortality in developing countries [1].

Physiologically, pregnancy induces profound renal hemodynamic changes, particularly glomerular hyperfiltration, making the interpretation of serum creatinine levels challenging [2]. AKI usually occurs in the setting of severe obstetric complications such as preeclampsia, HELLP syndrome, and postpartum hemorrhage [4]. These conditions may lead to renal lesions ranging from reversible acute tubular necrosis to bilateral cortical necrosis, which is associated with a high risk of progression to end-stage kidney disease.

The aim of this study, conducted at Mohammed VI University Hospital in Marrakech, was to analyze the epidemiological, etiological, and outcome profiles of patients who developed AKI during pregnancy or the postpartum period, in order to identify the main prognostic factors and improve multidisciplinary management strategies.

METHODS

This retrospective, descriptive, and analytical study was conducted over a two-year period (2021–2023) at Mohammed VI University Hospital of Marrakech and involved the Departments of Nephrology-Hemodialysis and Maternal Intensive Care. AKI was defined according to the 2012 kidney disease: Improving Global Outcomes (KDIGO) classification [2].

Data collection included sociodemographic characteristics, antenatal follow-up, obstetric complications, need for renal replacement therapy, and renal biopsy findings.

RESULTS

Between January 2021 and December 2023, 52 patients developed AKI in a pregnancy-related or postpartum setting at Mohammed VI University Hospital of Marrakech.

The study population was relatively young, with a mean age of 29.52 years (range: 15–46 years). The most represented age group was 30–39 years, accounting for 44.11% of patients. Regarding antenatal care, 30 patients (57.6%) had received satisfactory prenatal follow-up. Most pregnancies were singleton pregnancies (96.1%, n = 50), whereas twin pregnancies accounted for only 3.8% (n = 2).

Gestational age was documented in 38 patients. Among them, 20 pregnancies reached term (38.4%), while 18 resulted in preterm delivery, highlighting the impact of renal disease on fetal viability.

Pregnancy outcomes were marked by a high incidence of severe complications, predominantly preeclampsia, which was identified in 26 patients, including 20 cases presenting with overt oligo-anuria. Other major complications included postpartum hemorrhage in 14 patients (26.9%) and shock in 12 patients (23.07%), reflecting the severity of the clinical presentation at admission to intensive care or nephrology units.

Therapeutic management was intensive in a substantial proportion of patients. Hemodialysis was required in 21 cases (40.3%). To clarify the etiology and assess renal prognosis, kidney biopsy was performed in five patients. Histological examination revealed a wide spectrum of lesions, including malignant nephroangiosclerosis with diffuse and nodular glomerulosclerosis, focal segmental glomerulosclerosis, partial cortical necrosis associated with acute tubular necrosis, chronic tubulointerstitial nephropathy with interstitial fibrosis, and class IV lupus nephritis figure 1,2.

Clinical and biological outcomes were heterogeneous. Complete recovery of renal function was observed in 20 patients (38.4%). Conversely, unfavorable outcomes occurred in 14 patients (26.9%). Partial recovery of renal function was noted in 18 patients (34.6%), emphasizing the risk of progression to chronic kidney disease and the need for long-term nephrological follow-up.

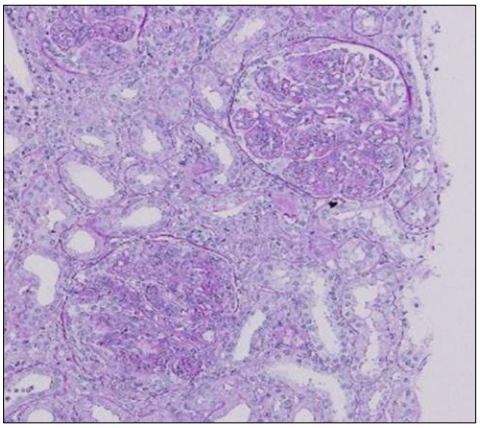

Figure 1: Renal biopsy sample (PAS staining, ×200 magnification) showing diffuse proliferative glomerulonephritis with extracapillary proliferation (Class IV lupus nephritis).

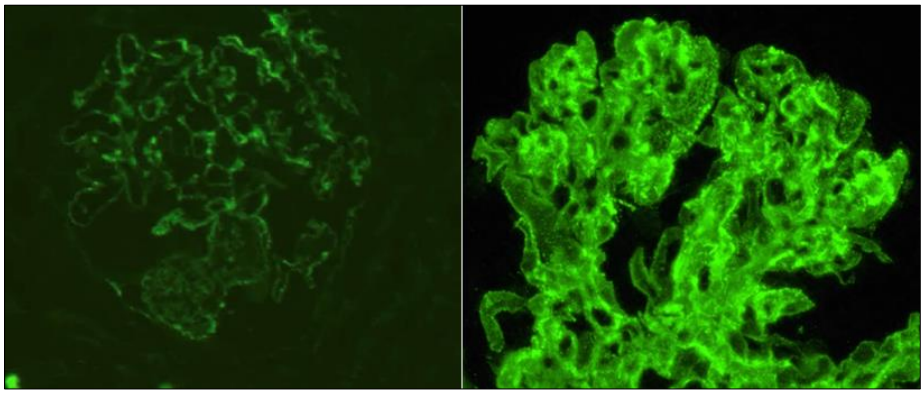

Figure 2: Immunofluorescence microscopy for IgG and C1q in Class IV lupus nephritis. The glomerulus exhibits bright, global, and diffuse mesangial staining, accompanied by less intense, segmental granular deposits tracking along the peripheral capillary walls

DISCUSSION

Pregnancy-related and postpartum AKI remains a major concern in obstetric nephrology because it simultaneously compromises maternal and fetal outcomes. In our study conducted at Mohammed VI University Hospital of Marrakech, 52 cases were identified, confirming that although this condition has become uncommon in developed countries, it remains a significant public health challenge in developing regions. As reported by De Beauregard, the persistently high incidence of obstetric AKI in these settings often reflects disparities in access to healthcare and inadequate prenatal surveillance [1].

The demographic profile of our patients, with a mean age of 29.52 years and a predominance of women aged 30–39 years, reflects the vulnerability of women during their reproductive years. Similar findings have been reported by Kabbali *et al*., in Morocco [5], and Lemrabott *et al*., in Senegal [6]. Furthermore, 42.4% of our patients did not receive adequate antenatal care, a major determinant of preventable complications. This issue has also been emphasized by Khalil *et al*., [7], who demonstrated a direct relationship between the quality of prenatal care and maternal-fetal outcomes.

From a diagnostic perspective, the use of the KDIGO 2012 criteria [2], was fundamental. Adoption of this internationally recognized classification reduces inconsistencies arising from historical definitions and facilitates comparison with contemporary intensive care standards [8, 9].

The severity of renal impairment in our cohort is reflected by the fact that 40.3% of patients required renal replacement therapy. This high dialysis rate underscores the severity of renal injury in obstetric settings and is consistent with observations reported by Miguil *et al*., [10], and Khellaf *et al*., [11].

Etiological analysis revealed that preeclampsia and its severe forms, including HELLP syndrome and eclampsia, were the leading causes of AKI in our setting (26 cases). According to Moulin, Herlig, and Rondeau [3], the underlying pathophysiology is dominated by glomerular endotheliosis resulting from placental angiogenic imbalance. Management of hypertensive disorders of pregnancy, as detailed by Berkane [12], relies on strict blood pressure control and timely delivery, which often represents the only definitive treatment. Such critical situations require multidisciplinary expertise, as recommended by the SFAR and CNGOF guidelines [13].

In addition to vascular causes, postpartum hemorrhage affected 26.9% of our patients and frequently acted as the precipitating factor for severe hypovolemia. As described by Belenfant *et al*., [4], and Marie-Noëlle P [14], prolonged hypotension leads to reduced renal perfusion and progression from functional AKI to acute tubular necrosis. If shock is not rapidly corrected, as recommended by Ricci *et al*., [15], and Trabbold *et al*., [16], the risk of bilateral cortical necrosis—a devastating and often irreversible complication—becomes substantial.

Renal biopsy contributed significantly to the diagnostic workup in our study (9.6% of cases). Findings such as partial cortical necrosis, malignant nephroangiosclerosis, and class IV lupus nephritis demonstrate that pregnancy may either reveal previously undiagnosed chronic kidney disease or induce specific structural renal lesions. The EMC review [17], also highlights the importance of close monitoring in women with pre-existing kidney disease, as pregnancy constitutes a state of increased glomerular workload that may accelerate renal function decline.

Finally, patient outcomes remain concerning, with complete renal recovery observed in only 38.4% of cases. The considerable proportions of partial recovery (34.6%) and unfavorable outcomes (26.9%) indicate that obstetric AKI is not merely a transient event. As reported by Skalli *et al*., [18], Ghezaiel *et al*., [19], and Jonard *et al*., [20], delayed management and severe initial presentation are the main predictors of long-term renal sequelae. These findings support the implementation of systematic and prolonged nephrological follow-up beyond the postpartum period to enable early detection of progression toward chronic kidney disease.

CONCLUSION

Pregnancy-related and postpartum acute kidney injury remains a severe obstetric complication associated with substantial maternal morbidity and a significant risk of persistent renal impairment. In our cohort, preeclampsia and postpartum hemorrhage were the predominant etiologies, frequently leading to severe clinical presentations requiring intensive care and renal replacement therapy. Despite advances in obstetric and nephrological management, complete renal recovery was achieved in less than half of the patients, highlighting the potential progression toward chronic kidney disease. Early identification of high-risk pregnancies, adequate antenatal surveillance, prompt management of obstetric complications, and close collaboration between obstetricians, intensivists, and nephrologists are essential to improve both maternal and renal outcomes. Long-term nephrological follow-up should be systematically implemented to detect and manage chronic renal sequelae at an early stage.

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