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Prevalence of Acute Kidney Injury (AKI) in Females with Pre-Eclampsia in Tertiary Care Hospital

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ABSTRACT

Objective: To determine the prevalence of acute kidney injury (AKI) in females with pre-eclampsia in a tertiary care hospital setting. **Study Design:** Cross-sectional study. **Place and Duration of Study:** Department of Obstetrics and Gynecology, Jinnah Postgraduate Medical Centre (JPMC), Karachi, over a period of Three months from 20th March, 2025 to 20th June, 2025. **Methodology:** A total of 78 females aged 18–45 years with singleton pregnancies and a clinical diagnosis of pre-eclampsia after 20 weeks of gestation were enrolled using non-probability consecutive sampling. Patients with a prior history of renal disease, multiple gestations, fetal anomalies, or nephrotoxic drug use were excluded. Serum creatinine was measured, and the diagnosis and staging of AKI were done according to the RIFLE criteria. Data were analyzed using SPSS version 20. Chi-square test was applied to evaluate associations, with a p-value ≤ 0.05 considered statistically significant. **Results:** The mean age of participants was 29.8 ± 5.6 years, and the mean gestational age was 33.2 ± 3.4 weeks. Among 78 women, 19 (24.4%) were diagnosed with AKI. Of these, 9 (47.4%) had Stage 1, 6 (31.6%) had Stage 2, and 4 (21.0%) had Stage 3 AKI. AKI was significantly more prevalent among patients with severe pre-eclampsia (p = 0.02). Additionally, a higher frequency of AKI was observed in women with a history of diabetes and chronic hypertension. **Conclusion:** A substantial proportion of females with pre-eclampsia developed AKI, particularly those with severe disease and comorbidities such as diabetes and hypertension. Routine renal function assessment should be incorporated into antenatal care protocols for early detection and prevention of complications related to AKI.

INTRODUCTION

Preeclampsia is a pregnancy-specific hypertension condition that is defined as the development of elevated blood pressure (≥140/90 mmHg) along with proteinuria after 20 weeks of gestation with the possibility of multiorgan damage in both the mother and fetus [1,2]. It is one of the leading preventable causes of maternal and perinatal morbidity and mortality globally[3]. The pathogenesis is characterized by abnormal placentation, defective angiogenesis and endothelial dysfunction leading to systemic vasoconstriction and ischemic end-organ damage including the kidneys[4,5]. Owing to its multifactorial pathogenesis and heterogeneous clinical expressions, preeclampsia continues to pose a diagnostic and therapeutic quandary for obstetricians[6].

Acute Kidney Injury (AKI) is one of the major and potentially fatal complication of preeclampsia[7]. It is due to under perfusion of the kidney, endothelial injury and microangiopathic haemolytic anaemia causing abrupt renal failure[8]. The incidence of AKI in women with preeclampsia varies significantly worldwide 15%-64% based on studied population, utilized diagnostic criteria and level of availability of healthcare resources[9–11]. Pregnancy-related AKI not only increases the risk of maternal complications, which includes dialysis dependency and chronic kidney disease, but also interferes with fetal outcome such as the risk of prematurity and intrauterine growth restriction[12,13].

Whereas there is a high burden of AKI in severe preeclampsia in developing countries as reported in a study in Pakistan calling for early surveillance and management[14]. Another local study highlighted that AKI was not diagnosed because routine renal monitoring was not practiced in hypertensive pregnancies[15]. This highlights the need for renal function evaluation in the routine antenatal care package for preeclamptic women. Despite various trials, the actual burden and pattern of severity of AKI in preeclamptic patients is also not well studied in most of the tertiary care hospitals of Pakistan.

With the variation of incidence and negative consequences of AKI in preeclamptic pregnancies, there is an urgent need to have local data. The objective of the present study is to estimate the prevalence of acute kidney injury (AKI) in preeclamptic females at a tertiary care

hospital in Pakistan. This will allow early identification, stratify risk and hopefully will lead to improve maternal and fetal outcomes through early Nephrology interventions and referrals.

METHODOLOGY

This cross-sectional study was carried out in the department of Obstetrics and Gynaecology, Jinnah Postgraduate Medical Centre (JPMC), Karachi, with-in duration of three months after permission from institutional ethical review committee, from 20th March, 2025 to 20th June, 2025. Recruitment A non-probability consecutive sampling method was used. The sample size was determined using the WHO sample size calculator, for a 95% confidence level, 8% absolute precision, and with the expected prevalence of AKI among pre-eclamptic women being 15.3%, which gave a final sample size of 78 patients.

Participants Women 18 to 45 years with singleton pregnancies diagnosed with pre-eclampsia after 20 weeks of gestation by a consultant obstetrician were recruited. Study subjects with pre-existing renal disease, fetal anomalies detected on a 20-week anomaly scan, multiple pregnancy or history of use of nephrotoxic drugs on antenatal booking history were excluded from the study based on previous medical records.

Data was collected on a predesigned proforma after informed written consent. Information such as age, gestational age, gravida, para, history of diabetes, hypertension and severity of pre-eclampsia was documented. Venous blood sample of 3ml was drawn from each patient and sent to the hospital laboratory for determination of serum creatinine. AKI diagnosis and staging were performed according to the RIFLE (risk, injury, failure, loss, end-stage kidney disease) criteria. Patients with a AKI diagnosis were staged, and nephrology services were consulted as per protocol for management and follow-up.

Data were analysed with SPSS 20. Age, gestational age, gravida and serum creatinine level were presented as mean ± standard deviation or median (interquartile range) for normally distributed or non-normally distributed data. Categorical variables (history of diabetes and hypertension, severity of pre-eclampsia, and presence and stages of AKI) were summarized using frequencies and percentages. Analysis was stratified by age, gestational age, gravida and parity, history of diabetes, history of hypertension and severity of pre-eclampsia upon a priori defined potential effect modifiers. After post-stratification, the chi-square or Fisher's exact test was performed and a p-value of ≤ 0.05 was regarded as statistically significant.

RESULTS

A cohort of 78 women with pre-eclampsia was recruited. The average age of the patients was 29.8 ± 5.6 in years and 33.2 ± 3.4 in weeks at presentation. The median gravida was 3 (IQR 2–4) and the median parity was 2 (IQR 1–3). Diabetes and chronic hypertension were the only comorbidities present in 17 (21.8) and 24 (30.8%) of the participants, respectively.

According to the severity, pre-eclampsia mild was diagnosed in 43 (55.1%) women and pre-eclampsia severe in 35 (44.9%). Among the 78, 19 patients (24.4) were found to have diagnosis of AKI according to the RIFLE criteria. Of these, 9 (47.4%) had Stage 1 AKI, 6 (31.6%) had Stage 2, and 4 (21.0%) had Stage 3. A breakdown of these findings is provided in Table 1.

AKI was more prevalent in patients with severe pre-eclampsia (13, 68.4%) compared with mild pre-eclampsia (6, 31.6%) which was statistically significant (p = 0.02). The distribution of AKI stages is shown in Figure 1.

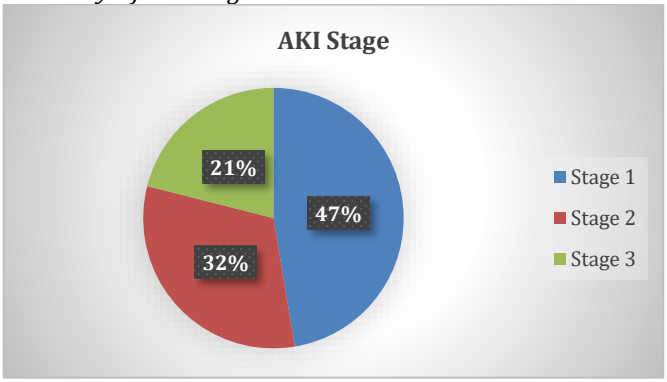
Table 1

Baseline Characteristics and AKI Distribution in Preeclamptic Patients

Variables	Values
Total Patients	78
Mean Age (years)	29.8 ± 5.6
Mean Gestational Age (weeks)	33.2 ± 3.4
Median Gravida	3 (IQR: 2–4)
Median Parity	2 (IQR: 1–3)
History of Diabetes	17 (21.8%)
History of Hypertension	24 (30.8%)
Mild Preeclampsia	43 (55.1%)
Severe Preeclampsia	35 (44.9%)
Patients with AKI	19 (24.4%)
Stage 1 AKI	9 (47.4%)
Stage 2 AKI	6 (31.6%)
Stage 3 AKI	4 (21.0%)

Figure 1

Summary Of AKI Stage



DISCUSSION

The aim of this study was to find the incidence of AKI in females with pre-eclampsia admitted in tertiary care hospital. We found that 24.4% of women with pre-eclampsia developed AKI, the majority being stage 1 (47.4%), followed by stage 2 (31.6%), and stage 3 (21.0%). These findings are clinically important because they demonstrate the high frequency of renal impairment in pre-eclamptic women, with possible unfavourable consequences on the mother as well as on the fetus.

The prevalence entered our study is also comparable with the one patient in another study by Rasool et al had developed This study reported a 26.11% prevalence of AKI in women with preeclampsia in Pakistan[10]. Nevertheless, compared to the subgroup of a multinational cohort study by Conti-Ramsden et al. which identified 15.3% with RIFLE classification we found higher values in our study group (RIFLE classification system) [11]. In contrast, our prevalence is less than 42.86% and 63.6% observed by Hassan et al. and Taj et al.[7,8]. Prevalence rates in individual studies varied depending on the criteria used for making the diagnosis of AKI, healthcare provision, severity of pre-eclampsia in the study population and time of assessing renal function.

Strong relationship was detected between severe pre-eclampsia and occurrence of AKI (p = 0.02), which was one of the interesting results of our study. This is in line with the findings of Goplani et al, who showed, poor renal function was more common in women who had severe forms of hypertensive disorders of the pregnancy[14]. Severe pre-eclampsia is accompanied by a more severe degree of endothelial dysfunction, increased proteinuria, and reduced renal perfusion, all of these involved in the pathogenesis of AKI.

Additionally, comorbidities, such as diabetes and chronic hypertension, were more commonly occurring in the AKI-developing patients. This supports the finding of Mehrabadi et al., where chronic hypertension and preexisting diabetes were found to be strong risk factors for AKI during pregnancy[15]. These conditions would make women more likely to have vascular and renal endothelial damage and to increase the impact of PE on renal function.

Early detection and grading of AKI are important for the clinical management. Stage 1 accounted for 47.4% of all AKI AD cases in our study, which meant that a considerable proportion of the patients were diagnosed early. This is encouraging for the current antenatal care strategies in this region and shows if we are vigilant,

advanced stages of renal damage might be averted.

Our study supplements the scarce available data in Pakistani patients on renal manifestations of pre-eclampsia. The results of the study suggest that estimation of renal function should be considered for all pre-eclamptic, particularly those with severe disease or concurrent risk factors. Routine creatinine testing and close follow-up with a nephrology team during antenatal care may in fact help to reduce both maternal and neonatal complications arising due to AKI.

The weaknesses of this study were single centre based analysis, relatively small sample size and no follow up to ensure long term renal outcomes after delivery. Notwithstanding these limitations, the study offers important insight to the burden of AKI in women with pre-eclampsia and reinforces the need of preventive nephrology care.

CONCLUSION

This investigation reveals a high prevalence (24.4%) of AKI in females of pre-eclampsia with a strong correlation with more severe forms of the disease. Most of the AKI was of early AKI revealing the need for close monitoring in antenatal period. Comorbidities, such as diabetes and hypertension, were also associated with higher AKI risk. These findings underscore the importance of regular evaluation of renal function in all preeclamptic patients to facilitate early identification, renal consulting and intervention, which may ultimately lead to improved maternal and fetal outcomes in an under-resourced, tertiary care setting.

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