

Original Article

Acute Kidney Injury and Abruptio Placentae: An Avoidable Association

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Abstract

Objective: To determine the frequency of acute kidney injury (AKI) and its associated risk factors among patients with abruptio placentae at Liaquat University Hospital, Hyderabad.

Methodology: This cross-sectional study was conducted in the Department of Obstetrics and Gynaecology at Liaquat University Hospital, Hyderabad from November 2024 to October 2025. Pregnant women diagnosed with abruptio placentae, irrespective of age or parity, were included. The enrolled women were managed according to institutional standard obstetric protocols for placental abruption. Serum creatinine levels and urine output were monitored serially throughout the hospital stay to assess the development of AKI. All data were entered and analyzed using SPSS version 20.

Results: The mean age of the participants was 27.73 ± 4.59 years, mean gestational age was 32.86 ± 4.41 weeks, and the mean body mass index (BMI) was 21.97 ± 3.21 kg/m². Most patients (81.2%) were from rural areas. Overall, AKI was observed in 13.0% of patients with abruptio placentae. It was more frequent among women of advanced age, those from lower socioeconomic backgrounds, those residing in rural areas, and unbooked patients; however, these associations were not statistically significant ($p > 0.05$). In contrast, higher BMI and the presence of hypertensive disorders were significantly associated with AKI ($p < 0.05$).

Conclusion: AKI was a relatively frequent and clinically significant complication of abruptio placentae. Its occurrence was associated with higher BMI and hypertensive disorders, while rural residence, unbooked status, and lower socioeconomic status were also observed more frequently among women who developed AKI.

Keywords: Acute kidney injury, frequency, risk factors, abruptio placentae.

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Introduction

Abruptio placentae is a life-threatening obstetric complication and remains a major contributor to maternal and fetal morbidity and mortality worldwide. It is generally characterized as the partial or complete separation of a normally implanted placenta from the uterine wall after 20 weeks of gestation and before delivery, while the fetus remains within the uterus.¹ Although abruptio placentae occurs in approximately 0.4–1% of pregnancies, this relatively uncommon complication accounts for approximately 10% of perinatal mortality in developed countries.^{1,2} It is

associated with severe maternal bleeding and remains an important cause of maternal and perinatal morbidity and mortality. Predisposing risk factors include maternal hypertension and preeclampsia, a previous history of placental abruption, maternal trauma, substance use, and advanced maternal age.³ Additionally, abruptio placentae can result in several maternal complications, including hemorrhagic shock, disseminated intravascular coagulation (DIC), ischemic necrosis of organs such as the liver, adrenal glands, or pituitary gland, postpartum hemorrhage (PPH),

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postpartum anemia, and acute kidney injury (AKI).

AKI is an important maternal complication of placental abruption, characterized by a sudden decline in renal function that may progress to renal failure and, in severe cases, result in maternal mortality.⁴ However, the exact mechanisms underlying renal impairment following placental abruption have not been fully elucidated. Several mechanisms have been proposed, including massive hemorrhage and hypovolemia leading to renal hypoperfusion, while DIC and the release of inflammatory cytokines and vasoactive mediators may further contribute to the development of AKI.⁵ The severity of renal injury may range from potentially reversible acute tubular injury to severe and irreversible renal damage. In cases of severe or prolonged renal hypoperfusion, bilateral renal cortical necrosis may occur, potentially resulting in permanent renal impairment. The magnitude of this risk was highlighted by a recent large population-based retrospective cohort study using the US Nationwide Readmission Database, which included approximately 18 million hospital deliveries. The study reported that placental abruption was associated with more than a five-fold increased risk of all-cause mortality and a four-fold increased risk of AKI-related mortality. It was also associated with a 1.7-fold and 2.1-fold increased risk of hospitalization for AKI and chronic kidney disease (CKD), respectively, regardless of mortality status. These risks were substantially higher among patients with concomitant hypertensive disorders of pregnancy, particularly severe preeclampsia.⁵

The burden of obstetric AKI appears to be particularly substantial in resource-limited settings. A local study reported that obstetric-related AKI was most frequently caused by puerperal sepsis, followed by obstetric hemorrhage, with the majority of affected patients requiring dialysis and many progressing to dialysis-dependent CKD within three months of follow-up.⁶ However, the incidence of AKI specifically associated with placental abruption has been inconsistently reported in the literature. Reported estimates vary considerably. A recent national study reported acute tubular necrosis in approximately 8.8% of women with placental abruption,⁷ whereas another retrospective study conducted at MGM Medical College investigating the incidence of abruptio placentae and its effects on maternal and fetal outcomes reported acute renal failure as the most common maternal complication, occurring in 24% of cases.⁸

Despite compelling evidence from developed settings,⁵ it remains uncertain whether the incidence and severity of AKI following placental abruption in resource-limited regions are comparable or substantially higher. Factors such as inadequate antenatal care, delayed presentation, limited access to emergency obstetric services, and restricted availability of renal replacement therapy may contribute to poorer outcomes in these settings. This possibility is supported by the high rates of dialysis dependence and progression to CKD reported among patients with obstetric AKI in local studies.^{6,9}

Given the considerable variation in the reported incidence of AKI among patients with placental abruption and the relatively limited number of studies specifically investigating abruptio placentae as a risk factor for AKI in local and resource-limited obstetric settings, the present study was conducted to determine the frequency of AKI among patients with abruptio placentae. The study also aimed to identify associated risk factors and contribute to the existing evidence regarding this important obstetric complication. The findings may help inform strategies for early recognition, prevention, and timely management of AKI, thereby contributing to the reduction of maternal morbidity and mortality associated with placental abruption.

Methodology

This descriptive cross-sectional study was conducted in the Department of Obstetrics and Gynaecology at Liaquat University Hospital, Hyderabad, from November 2024 to October 2025. Ethical approval was obtained from the Ethical Review Committee of Liaquat University of Medical and Health Sciences (LUMHS) ref no LUMHS/REC/227 before commencement of data collection.

A sample size of 138 patients was calculated using Rao-Soft sample size calculation software, based on a reported proportion of placental abruption associated with AKI of 7.6%,¹⁰ with a level of significance of 90% and a power of 5%. A non-probability consecutive sampling technique was used.

All pregnant women aged 18–40 years, with a gestational age of >24 weeks and a confirmed diagnosis of abruptio placentae, were eligible for inclusion. Women with pre-existing chronic kidney disease (CKD) or known renal impairment before the index pregnancy; a history of diabetes mellitus or

nephrolithiasis before the current pregnancy; pregnancy-related complications that could independently contribute to renal injury, including gestational diabetes; incomplete medical records; and those who declined to participate were excluded.

Placental abruption was defined as the premature separation of a normally situated placenta from the uterine wall. The diagnosis was based on clinical assessment and, where present, ultrasonographic findings, including a preplacental collection beneath the chorionic plate, a “jello-like” movement of the chorionic plate with fetal activity, a retroplacental collection, a marginal hematoma, a subchorionic hematoma, or increased placental thickness (>5 cm).

Written informed consent was obtained from all participants and their attendants after explaining the study procedures and potential risks related to pregnancy outcomes. A detailed medical history was obtained, and baseline investigations were performed. Baseline serum creatinine levels were recorded from available antenatal records. All enrolled women were managed according to the institutional standard obstetric protocols for placental abruption. Serum creatinine levels and urine output were monitored serially throughout the hospital stay to assess the development of AKI.

AKI was defined according to the Kidney Disease: Improving Global Outcomes (KDIGO) criteria as an increase in serum creatinine of ≥ 0.3 mg/dL within 48 hours, an increase to ≥ 1.5 times the baseline value within seven days, or urine output < 0.5 mL/kg/hour for six hours. All relevant information was collected using a structured study proforma. The data were subsequently entered into and analysed using SPSS version 20.0. Numerical variables were presented as mean $\pm$ standard deviation (SD), while categorical variables were expressed as frequencies and percentages. Stratification was performed for potential effect modifiers in relation to the outcome. The chi-square test was applied to assess associations between categorical variables, and a p-value of < 0.05 was considered statistically significant.

Results

A total of 138 women presenting with abruptio placentae were included in the study. The mean age of the participants was 27.73 ± 4.59 years, the mean gestational age was 32.86 ± 4.41 weeks, and the mean

body mass index (BMI) was 21.97 ± 3.21 kg/m² (Table I).

Most participants (81.2%) were from rural areas, while 66.7% were un-booked. More than half of the participants (58.7%) belonged to a lower socioeconomic background. Among the reported causes of trauma, heavy physical work was the most common (75.4%), followed by domestic violence (18.1%).

Table I: Descriptive statistics of maternal age, gestational age and BMI. (n=138)

Statistics	Maternal age	Gestational age	BMI
Mean	27.73	32.86	21.97
Std. Error of Mean	0.39	0.37	0.274
Median	28.00	34.00	22.00
Std. Deviation	4.59	4.41	3.21
Minimum	18.00	24.00	17.00
Maximum	40.00	39.00	30.00

A considerable proportion of women had hypertensive disorders of pregnancy, including preeclampsia (24.6%), chronic hypertension (22.5%), and eclampsia (20.3%), while pregnancy-induced hypertension (PIH) was the least common (5.8%). Overall, 26.8% of the women were normotensive. Clinically, vaginal bleeding accompanied by abdominal pain was the most common presentation (94.2%), while uterine contractions were reported in 46.4% of participants. Table: II

Table II: Frequency of residential status. (n=138)

Variables	N	%
Residential status		
Rural	112	81.2
Urban	26	18.8
Booking status		
Booked	46	33.3
Un-booked	92	66.7
Socioeconomic status		
Poor	81	58.7
Middle	53	38.4
Upper	04	02.9
Trauma		
No	9	6.5
Domestic violence	25	18.1
Heavy work	104	75.4
Hypertensive disorders		
Eclampsia	28	20.3
Pre-eclampsia	34	24.6
Chronic hypertension	31	22.5
PIH	08	05.8
Normotensive	37	26.8
Clinical presentation		
Vaginal bleeding	130	94.2
Abdominal pain	130	94.2
Uterine contractions	64	46.4

Among the 138 study participants, AKI developed in 18 women (13.0%), indicating that it was a relatively frequent obstetric complication among women with abruptio placentae. (Figure 1).

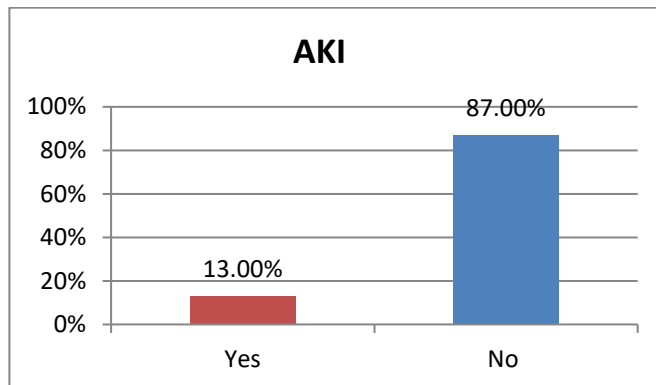


Figure 1. Frequency of acute kidney injury (AKI).

Post-stratification analysis showed that AKI was more frequent among women of advanced age, those from lower socioeconomic backgrounds, those residing in rural areas, and un-booked patients; however, these associations were not statistically significant ($p>0.05$). In contrast, higher BMI and the presence of hypertensive disorders were significantly associated with the development of AKI ($p<0.05$) (Table III).

Discussion

The placental abruption is an important obstetrical complication, occurring in about 1% of pregnancies, with basic underlying factor of hemorrhage at the decidua-placental interface. If severe, it can significantly affect fetal and maternal morbidity and mortality. The AKI is a rare and sometimes deadly complication of pregnancy, the incidence of which has been declining worldwide, though it remains higher in developing countries.¹¹ This study was conducted to observe the incidence of AKI among patients presented with abruption placenta, on 138 patients with an overall mean age of 27.73 ± 4.59 years, average gestational age of 32.86 ± 4.41 weeks and mean body mass index BMI around 21.97 ± 3.21 kg/m², along with majority of regular residents and un-booked cases. The present findings are consistent with those reported by Dambal et al.¹², who observed a mean patient age of 23.4 ± 3.6 years, with a predominance of women from rural areas (73.33%). In their study, the majority of participants (66.67%) had received only one antenatal visit at a primary healthcare facility or peripheral hospital.

Similarly, Maramba et al.¹³ reported comparable demographic characteristics, with a mean age and mean gestational age at presentation of 32.8 ± 5.5

Table III: Acute kidney injury according to age, BMI, residential status, booking status, and SES. (n=138)

Variable		Acute kidney injury		Total	p-value
		Yes	No		
Age groups	18-30 years	2	24	26	0.368
		1.4%	17.4%	18.8%	
	31-40 years	16	96	112	
		11.6%	69.6%	81.2%	
BMI	Normal weight	5	99	104	0.001
		3.6%	71.7%	75.4%	
	Overweigh	13	21	34	
		9.4%	15.2%	24.6%	
Hypertensive disorders	Yes	14	88	102	<0.05
		10.1%	63.8%	73.9%	
	No	4	32	36	
		2.9%	23.2%	26.1%	
Residential status	Rural	12	100	112	0.092
		8.7%	72.5%	81.2%	
	Urban	6	20	26	
		4.3%	14.5%	18.8%	
Booking status	Booked	7	39	46	0.592
		5.1%	28.3%	33.3%	
	un-booked	11	81	92	
		8.0%	58.7%	66.7%	
Socioeconomic status	Poor	9	72	81	0.451
		6.5%	52.2%	58.7%	
	Middle	9	44	53	
		6.5%	31.9%	38.4%	
	Upper	0	4	4	
		0.0%	2.9%	2.9%	

years and 35.3 ± 2 weeks, respectively. They also found that abruptio placentae was significantly more common among unbooked patients ($p=0.010$). In this study the acute kidney injury was observed in around 22.5% of the patients which is considerably higher than most figures reported in the recent literature on abruptio placentae, indicating a higher burden in this population. According to a relevant study done at Mardan Medical Complex reported the AKI rate around 5.1% among women with abruptio placentae, perceiving that this figure itself differ considerably across the literature, with other studies demonstrating renal impairment rates ranging from 1% to 15.6%.¹⁴

Consistent with the present findings, a study conducted at Lady Reading Hospital, Peshawar, reported acute tubular necrosis in approximately 8.8% of patients with placental abruption.⁷ Similarly, an Indian study evaluating placental abruption in the context of preeclampsia reported an incidence of approximately 5.6%.¹⁵ In addition, another retrospective study from Navi Mumbai, India, reported acute renal impairment as the leading maternal complication, occurring in approximately 24% of cases, a figure considerably higher but broadly comparable to the findings of the present study.⁸

Furthermore, a large population-based retrospective cohort study from the United States, which evaluated hospital deliveries and readmissions between 2010 and 2020, investigated whether the risk of hospitalization for renal disease following placental abruption was modified by hypertensive disorders of pregnancy. The study reported a hazard ratio of 4.1 for AKI-associated mortality among women with placental abruption. Notably, the risk of renal disease was elevated even among women without hypertensive disorders of pregnancy, but was significantly higher among those with concomitant hypertensive disorders.⁵

On the other hand, study by Shahid H et al.¹⁰ focusing on AKI frequency in obstetric complications noted around 7.6% among patients with antepartum hemorrhage and 8.4% among those with preeclampsia/eclampsia, the findings considerably lower than the AKI frequency observed in this study, indicating that an abruptio placentae specifically may carry a disproportionately higher renal impairment risk compared to other obstetric hemorrhagic and hypertensive situations. In the comparison of this study, a Jinnah Postgraduate Medical Centre study, conducted to determining the maternal morbidity

among 50 patients with abruptio placentae, found hemorrhagic shock to be the most common complication (44%), and renal failure around (6%). Dars S et al.¹⁶, in their study investigating the risk factors and maternal outcomes among patients with abruptio placentae at a tertiary care hospital, reported postpartum anemia as the most common maternal complication (44.35%), while renal failure occurred in 4.35% of cases. Similarly, Bandi S et al.¹⁷, who assessed maternal and fetal outcomes among pregnant women with abruptio placentae, reported renal impairment in only 2% of cases. Waheed N et al.¹⁸ reported renal impairment in 7.40% of patients with abruptio placentae, which was also lower than the frequency observed in the present study. Several other studies have likewise reported a lower incidence of AKI among women with placental abruption.^{19, 20}

The findings of the present study are further supported by Gandotra N et al.²¹, who investigated maternal and perinatal outcomes in women with abruptio placentae. They reported postpartum hemorrhage as the most common maternal complication (20.2%), followed by disseminated intravascular coagulation (15%) and acute renal failure (12%). The frequency of acute renal failure reported in their study was relatively close to that observed in the present study.

The relatively higher incidence of AKI detected in this study, compared to the most pre-existing literature, may due to several factors, like most previous studies were not specifically determined AKI with routine follow-up throughout the hospital stay, while they primarily examined overall maternal and fetal outcomes, with AKI noted only as one of several secondary complications rather than as a dedicated, carefully monitored outcome. Additionally, present study noted that the most of affected women were unbooked and resided in rural areas, several of whom were already anemic and experienced delayed presentation to definitive treatment, as they often sought primary treatment at local health facilities, often attended by unauthorized or informally trained health individuals, prior eventually reaching a tertiary care hospital, mostly due to. Financial barriers, specifically the cost of travel, may have further contributed to this delay presentation, which may represent a further contributing factor to their underlying anemia and, consequently, their heightened vulnerability to renal complications following placental abruption. Subsequently, since this study mainly focused on assessing the prevalence, rather than mainly designed

to comprehensively evaluate risk factors, which were instead identified only through the analysis of post-stratification. Therefore, further large-scale studies particularly designed to validate these findings are needed, along with special concern on identify other contributing demographic factors rather than focusing only on hypertensive disorders.

Conclusion

Overall, AKI was observed to be a highly frequent and clinically significant complication of abruptio placentae, emphasizing the substantial renal burden it imposes, with rural residential status, un-booked status, poor socioeconomic status, raised BMI, and hypertensive disorders emerging as the most commonly related significant contributing factors. Timely access to quality obstetric care may play a more decisive role in renal outcomes. The early recognition of abruptio placentae, early resuscitative management, and close renal monitoring, specifically in rural and underserved populations, to reduce the burden of AKI and improve maternal outcomes in this high-risk obstetric emergency.

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