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ORIGINAL ARTICLE

FREQUENCY, CAUSES AND OUTCOME OF ACUTE KIDNEY INJURY IN CRITICALLY ILL OBSTETRIC PATIENTS ADMITTED TO INTENSIVE CARE UNIT OF A TERTIARY CARE HOSPITAL; A CASE SERIES

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ABSTRACT

Background: Acute kidney injury represents the commonest sequela of obstetric complications. It can potentially complicate the course of hospitalization and drastically worsens the outcomes of critically ill obstetric patients. It can influence both short-term and long-term prognosis. The current research aimed to find out burden of acute kidney injury (AKI)in obstetric patients, transferred to critical care unit, and to determine its association with outcome of these women.

Materials & Methods: A review of 62 critically ill women shifted to critical care unit, was carried out in a teaching hospital of Peshawar, from January 2021 to December 2021. All obstetric cases shifted to intensive care unit (ICU), either in pregnancy or postpartum within 42 days of having birth, were considered for the review. All the relevant detail including age, parity, status(pregnant/postpartum), booking status, mode of delivery, reason for ICU admission, presence or absence of AKI, other complications, outcome, need for ventilation etc. Were noted from hospital record. Cases lacking record on the above details were not included in the review.

Results: AKI was observed in 29(46.77%) of 62 obstetric intensive care admissions. Underlying obstetrical condition more commonly associated with AKI were Eclampsia and Postpartum hemorrhage (PPH), each accounting for 11 (37.99%) cases of AKI, followed by cardiac diseases seen, in 10.34% cases, placental abruption in 6.89% women. AKI showed statistically significant association with normal birth 21(72.41%) as compared to cesarean delivery 8(27.5%). p-0.01. A total of 17 (27.4%) women expired in ICU.Out of 17 cases who expired,13 (76.4%) had AKI. (p-0.004)

Conclusion: AKI is the commonest complication and is associated with elevated risk of in- hospital mortality in critically ill obstetric patients transferred to critical care unit.

KEY WORDS: Acute kidney injury; Intensive care; Maternal death.

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INTRODUCTION

Acute renal injury, manifested by rapid decline in renal function, is a surrogate marker of critical illness and predictor of mortality in obstetric population requiring intensive care admissions. The incidence of acute renal injury in obstetric critical care admissions is varied due to lack of a uniform validated diagnostic criterion. It is reported as 5.88%[1] according to a prospective study utilizing Risk,Injury,Failure,Loss and, End stage kidney disease (RIFLE) diagnostic criterion. Another study reported an incidence of 24 % utilizing Acute Kidney Injury Network (AKIN) criterion.[2] Renal insult, in critically ill obstetric women is often multifactorial. The etiological causes can be broadly categorized into prerenal, renal and post renal causes.[3]

In obstetric population pre-renal and renal factors are the pre dominant causes resulting mainly from haemorrhages,sepsis and hypertensive

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disorders of pregnancy.[4,5] Other relatively infrequent causes of renal injury in pregnancy are acute fatty liver of pregnancy (AFLP),hemolytic uremic syndrome(HUS),thrombotic thrombocytopenic purpura (TTP), and nephrotoxic medications.[3] In critically ill patients many of these conditions overlap and exacerbate the effects of each other to culminate frequently in AKI.

Acute kidney injury can potentially complicate the course of hospitalization and drastically worsens the outcomes of critically ill obstetric patients. It can influence both short-term and long-term prognosis. Short-term sequels may include the need for dialysis, longer duration of stay in the critical care unit, and increased mortality.[5] Long-term outcomes may include chronic kidney disease, renal dysfunction in subsequent pregnancies, and increased risk of cardiovascular disease, among the survivors. The early recognition and appropriate management of AKI in critically ill obstetric patients is crucial for improving outcomes and minimizing the impact on both maternal and fetal health.

Acute renal failure in critically ill obstetric population is an under-researched subject despite its significant association with maternal mortality. Comprehensive knowledge of causes and outcomes of renal injury is vital for planning effective management strategies and to optimize outcomes. Close medical surveillance of the surviving mothers is again a significant health challenge and mechanistic research is need of the day to explore, how AKI impacts long-term events. The current research intends to investigate the frequency, causes and outcomes of acute renal injury in parturient who are transferred to intensive care unit of a tertiary care hospital. A methodical analysis of these cases will provide important insights into the prevention and management of this complication in this specific group of population. A knowledge of burden of causes, can be utilized by healthcare workers to implement targeted intervention either to reduce or prevent the underlying causes. The results of this research will add valuable knowledge to existing pool of evidence. The early recognition and prompt treatment of acute renal insult can prevent or significantly inhibit the development of renal damage in obstetric patients with acute kidney injury. This research aimed to find out burden of acute kidney injury (AKI)in obstetric patients, transferred to critical care unit, and to determine its association with outcome of these women.

MATERIALS AND METHODOLOGY

This case series, comprising of 62 ,obstetric cases transferred to critical care unit ,over a span of one year (January 2021 to December 2021) was conducted in Lady Reading hospital, Peshawar. Study protocol was approved by the institutional ethical review board.(Ref# 253/MTI/LRH,dated 20-10-2021).Sample size was estimated using formula;$n=Z^2 P(1-P)/d^2$,where z=1.60(90% confidence level),p=0.05%(estimated proportion of AKI)[1],d=0.03(margin of error).Additional 8 cases were added to estimated sample size of 54,to account for missing data, loss to follow up cases.

The study included all women admitted to ICU for complications related to, or aggravated by pregnancy. Women admitted for complications secondary to accidents, poisoning were excluded. A pre designed proforma was utilized to gather information of each case including details on, age of woman,parity,period of gestation in weeks(POG) at delivery, underlying/primary condition, delivery route(vaginal/cesarean section),place of delivery(home birth/institutional birth),outcome of neonate(Alive/Still birth),other organ complications, SOFA Score at the time of admission to ICU,outcome of patient(survived/not survived),-frequency of AKI, treatment of AKI, were studied. These factors were compared between women with and without AKI.AKI was defined according to AKIN criterion.

SPSS version 25.00 was used to analyse data. Normality of the data was determined. Qualitative variables were expressed as frequencies and percentages. Mean and standard deviations were computed for numerical variables. Fischer Exact test was used to determine associations between AKI and outcome of patients. A p value of ≤ 0.05 was taken as significant.

RESULTS

A total of 62 women, age range between 16 and 45 years, were recruited in this review. The median age of study population was estimated to be 27.50± 6.01. The median gestational age at delivery was 37.00 ± 4.54 with lowest gestation at cessation of pregnancy as 6 weeks and maximum as 40.60 weeks. Majority of the women had not received adequate and reliable antenatal care. Also, majority of women had non -facility based deliveries. Toxemia of pregnancy (Pre-eclampsia and Eclampsia) was the commonest cause for transfer to critical care, accounting for 29(46.77%) cases followed by primary postpartum hemorrhage due to atonic uterus observed in 15(24.1%) cases.

AKI was detected in 29(46.77%) cases, being the commonest organ complication followed by DIC, present in 22 (35.48%) women and sepsis in 22 (35.48%) women. Underlying obstetrical condition more commonly associated with AKI were Eclampsia and atonic uterus, each accounting for 11 (37.99%) cases of AKI, followed by cardiac diseases responsible in 10.34% cases, placental abruption in 6.89% women. (Figure I)

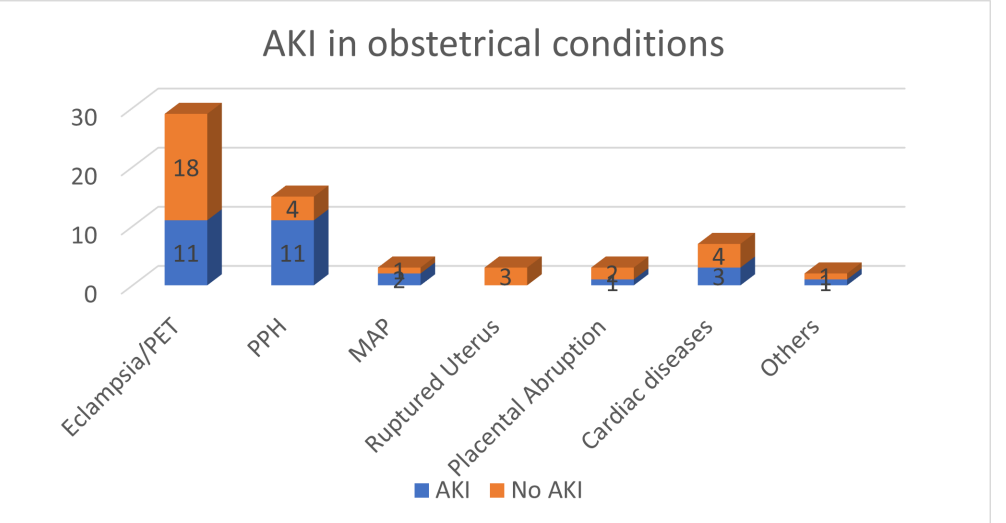

Table 1: Risk Factors comparison in relation to AKI, of obstetric patients admitted to intensive care unit

Variables	No AKI	AKI	Row Total	p-value
Age	28.30 ±5.89	27.27 ±6.21		0.50
Duration of ICU stay	6.21 ±4.5	10.00 ±5.08		0.07
Unbooked	25	27	52	0.06
Booked	08	02	10	
Vaginal Birth	13	21	34	0.01
Cesarean Section	20	08	28	
Mechanical ventilation	23	24	47	0.20
No ventilation	10	05	15	

Table 2: Comparison of outcomes of obstetric ICU admissions in relation to AKI (AKI and Outcome of critically ill women: Cross tabulation)

		Outcome of patients			
		Expired in hospital	Survived and Discharged home	Total	p-value
Acute Renal Injury	Yes	4	29	33	0.004
	No	13	16	29	
Total		17	45	62	

Out of 29 cases of acute renal failure,17(58.6%) were managed with renal replacement therapy. Vaginal birth (p=0.01), un-booked status(p=0.06) and need for mechanical ventilation (p=0.2), are frequently observed factors, associated with AKI. (Table 1)

AKI was noted to have statistically significant association with mortality(p-0.004) in intensive care admissions. As out 17 cases of mortalities,13 (76.47%) had AKI. (Table 2)

Renal failure was an independent predictor of mortality in critically ill obstetric cases. aOR:4.79 CI:1.17-19.62, P-0.02

DISCUSSION

AKI is the most common co existing complication in obstetrical critical care admissions and is strongly linked with in- hospital mortality, according to the results of the present study.

The present study, noted AKI in 29(46.77%) of obstetrical intensive care admissions, making it the commonest end organ complication in these women .In an observational research, the renal injury of acute onset in pregnancy, was observed in 172 (27.8%) of women transferred to maternal ICU.[6]Federal District, Brazil. All consecutive patients diagnosed with

pregnancy-related AKI were included. Cases of renal failure before pregnancy or kidney transplantation were excluded. Results: Of the 619 admitted patients, pregnancy-related AKI was present in 172 cases (27.8% Likewise, a study convened in India identified, renal injury in 48% of parturient with preeclampsia, transferred to ICU.[7]A remarkably high incidence of AKI (71.1%) among critically ill obstetric women, has been noticed in a study done by Pipil and et al.[8]A lower incidence of 6.21% for AKI was reported by an Indian study, among the obstetric ICU admissions ,with pre renal obstetric hemorrhage being the pre dominant reason for renal compromise in 84.4% cases .[9]important ones being haemorrhage, sepsis and preeclampsia in developing countries. Methods: A retrospective study was conducted in the department of Obstetrics and Gynaecology, and Nephrology in an Indian tertiary care hospital from 2017 to 2019. All patients admitted to Obstetric Critical Care Unit (CCU-Obs The differences in the incidence could be due to using different diagnostic criterion in different studies. These discrepancies warrant the development and use of a validated uniform criterion for diagnosis of AKI in obstetric population. A systematic review has reported an incidence of 2% for acute renal injury in obstetric population. [10]hemorrhage, and sepsis, associated with morbidity and mortality in the fetus and mother. This meta-analysis was conducted to evaluate the incidence of pregnancy-related AKI (PR-AKI

In the present study hypertensive disorders of pregnancy was the pre dominant reason for obstetric intensive care admissions accounting for 46.77% cases, followed by primary postpartum hemorrhage, seen in 24.1% cases. An Indian research also reported similar patterns i.e the primary underlying condition responsible for ICU admission was severe pre-eclampsia with pulmonary complications (22%),followed by acute respiratory distress syndrome (14.7%) and postpartum hypovolemic shock (in 13.7%).[11]

In the current study overall mortality in critically ill obstetric cases was 27% (17/62). Acute renal injury was found to be associated with mortality in 76.4% cases (13/17 vs 04/17; p=0.004).In a study from Rwanda, obstetric ICU mortality was reported to be 54.3% with average length of stay of 6.6 ±7.5.[12] A Brazilian study reported a general mortality of 7.5% and mortality due to AKI as 21%(p=0.0007).In that study ,risk factors associated with AKI were ,cesarean delivery and thrombocytopenia.[2] In the present study ,vaginal birth (p=0.01),un-booked status(p=0.06) and need for mechanical ventilation (p=0.2) were frequently observed with AKI. The difference in association with mode of birth could be due to the reason that in the present study, majority of the critically ill obstetric patients are because of complications arising from home births or deliveries in under resourced centers.

In an Egyptian study, main causes of AKI in obstetric ICU were, HELLP syndrome(43%), pregnancy induced hypertension(30%), puerperal sepsis(10%) and, placental abruption (6.6%).In that study AKI was associated with mortality in 31.3% cases.[1]In a study done by Suzanne Viera and colleagues, AKI was reported in 24.1 % of Obstetric ICU admissions and was observed to be an independent risk factor for mortality (OR:6.77).[13]

This is a novel study analyzing frequency, causes and outcomes of acute renal injury in critically ill obstetric women in a developing country.

The complex inter- related issues of lack of screening programmes, delays in identification of potentially lethal conditions, referrals and limited resources in health care facilities, all play crucial role in high mortality index from preventable conditions in pregnancy. Acute renal injury is often a surrogate marker for identification of delays and severity of underlying obstetrical condition and is a predictor of severe acute morbidity and mortality. Limited research on this subject warrant attention and development of protocols to focus on management and optimize outcomes.

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CONFLICT OF INTEREST
Authors declare no conflict of interest.
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AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

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Acquisition, Analysis or Interpretation of Data:	NL, WS
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All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.