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Original Research Article

Etiology and Clinical Spectrum of Pregnancy – Related Acute Kidney Injury

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Abstract: The aim of the present study was to analyze the etiological factors, clinical spectrum and outcome of pregnancy related acute kidney injury. A total of 64 women with pregnancy related acute kidney injury admitted in department of nephrology, Sri Aurobindo Medical College and Post Graduate Institute were recruited for the study. Data regarding age, parity, obstetrics complications encountered and clinical outcome of patients were recorded in predesigned proforma. Sepsis was the dominant cause of AKI in pregnancy and was present in 29(45.3%). Other causes includes APH/PPH (19%), preeclampsia/eclampsia (19%), HELLP (9.5%), HUS (3.1%) and malaria (3.1%). Anemia and thrombocytopenia was observed in 47(73%) and 7 (10.9%) cases respectively. Hypertension and tachycardia was observed in 19(39.7%) and 29(45.3%) cases respectively. Seven patients were succumbed to their illness. Of the 54(84.4%) surviving patients, 33(51.5%) had complete recovery of renal functions, 17(26.5%) had partial recovery and 7(10.9%) became hemodialysis dependent. Pregnancy related acute kidney injury is a life threatening condition. Prophylactic measure may be taken to avoid sepsis which is major etiological factor for PR-AKI.
Keywords: Pregnancy, Acute Kidney Injury, Sepsis, Hemodialysis.

INTRODUCTION

AKI includes a group of clinical syndromes that primarily manifest as a rapid decline in the kidney function in association with the accumulation of metabolic waste [1]. AKI occurring during pregnancy is known as pregnancy – related AKI (PR-AKI). Pregnancy is associated with many structural and functional changes in the urinary system and overall hemodynamics and these changes have clinical relevance specially in defining AKI and PIH etc.

The incidence of PR-AKI has decreased significantly worldwide in the past few decades, from 20-40 % of the total AKI in the 1960's to < 10 % in the current series through legalization of abortion, better antenatal care and better access to the antenatal care [2]. In the developed countries there is further decline in the incidence of PR-AKI, accounting to only 1-2.8 % [3, 4]. However in the developing countries its incidence is around 4.2-15 % [3]. Information regarding prevalence and etiology is insufficient in India. Although studies of PR-AKI have been carried out in India [5].

Etiology of AKI in pregnancy is varied since we have to consider both pregnancy-associated specific diseases, as well as all other possible AKI causes that may affect women in the reproductive age group. Usually, the development of AKI during pregnancy follows a bimodal distribution with 2 incidence peaks: one in the first trimester, caused by infections (usually involving septic abortion), and the other in the third trimester, due to late obstetric complications. As in the general population, the causes of AKI in pregnant women are divided into 3 groups: prerenal, intrarenal and post renal. The prerenal causes are more common in the earlier stage of pregnancy due to hyperemesis gravidarum or acute tubular necrosis in the context of septic abortion. In the later stages, AKI development is more frequent and usually associated with preeclampsia, acute fatty liver of pregnancy, hemolytic uremic syndrome (HUS) and sepsis [5,6].

Etiological variations are seen in developing and developed world. In developing countries the common contributing factors to PR-AKI are abruptio placentae, puerperal sepsis, septic abortion and postpartum hemorrhage [7-10]; whereas in developed countries, the most common causes of PR-AKI are preeclampsia, HELLP syndrome, thrombotic microangiopathy (TTP/HUS) of pregnancy, sepsis, and

hemorrhage by abruptio placentae [11]. Despite decreasing incidence, PR-AKI remains a serious complication, with 10-30% of patients progressing to end-stage renal disease [11, 12].

Aim of study was to identify the etiology and clinical spectrum of pregnancy related acute kidney injury.

MATERIAL AND METHOD:

This study was carried out on patients admitted with pregnancy related acute kidney injury in a tertiary care center of central India during July 2014 to Jun 2016. AKI was defined and classified according to the Risk, Injury, Failure, Loss and End-Stage Renal Failure (RIFLE) criteria, which are based on changes in serum creatinine or changes in urine output or both [13].

Patients with history of renal disease, hypertension or diabetes before gestation, history of renal stone disease, elevated serum creatinine and presence of small-sized kidneys prior to gestation were excluded from the study. Obstetric records including parity data, pregnancy-related disorders such as pre-eclampsia, eclampsia, HELLP syndrome, Hemolytic uremic syndrome, antepartum hemorrhage, post-partum hemorrhage, puerperal sepsis, other infections were recorded.

Pre-eclampsia was defined by a set of three signs including hypertension, edema and proteinuria after 20 weeks of gestation. HELLP syndrome was defined as existence of three main features: hemolysis elevated liver enzymes and low platelets. Hemolytic uremic syndrome (HUS) was characterized by microangiopathic hemolytic anemia, kidney injury and thrombocytopenia.

Complete recovery was defined as return of renal functions to normal. Partial recovery was defined as patients with impaired renal functions but not requiring dialysis. End-stage renal disease was defined as patients with impaired renal functions for more than three months and requiring dialysis.

RESULTS:

During the study period a total of 64 patients were admitted with chief complaint of pregnancy related acute kidney injury. The mean age of women was 24.31±4.54 years. 21(32.8%) women were nulliparous (Table 1). Out of these 64 patients, 32 patients had class III RIFLE acute kidney Injury whereas 15 and 17 patients had Class II and class III acute kidney injury respectively.

Table 1: Demographic and Obstetrics variables in PR-AKI Women

Variable	Number(Percentage)
Parity	
1	21(33)
2	16(25)
≥3	27(42)
Sepsis	29(45)
APH/PPH	12(19)
Pregnancy Induced Hypertension	12(19)
HELLP	6(9.5)
Hemolytic Uremic Syndrome	2(3)
Malaria	2(3)

The most common indication of acute kidney injury was sepsis (45%). Cause of sepsis was intra uterine death in 11 cases, urinary tract infection in 7 cases, puerperal in 5 cases, retained part of conception in 4 cases and abdominal and chest infection in 1 case each. Other causes of AKI were Antepartum/ Post-Partum hemorrhage (APH/PPH) (19%) and pregnancy induced hypertension (19%). Other causes were HELLP (9.5%), HUS (3.1%) and malaria (3.1%) (Table 1).

Sign of volume depletion and fluid overload were observed in 31(48.4%) and 18(28.1%) patients respectively. Blood pressure was found raised (SBP>140 mmHg or DBP >100mmHg) in 19(39.7%) cases whereas in 7(10.9%) cases had shock (BP < 90/60 mmHg). Tachycardia was reported in 29(45.3%) cases. Symptoms of systemic inflammatory response syndrome were observed in 23(35.9%) patients

Hemoglobin levels were below 10g/dl in 47 cases including 3 cases in which hemoglobin level was below 5g/dl and required blood transfusion. Seven patients developed severe thrombocytopenia (platelet count <50000/µl). The average of maximum creatinine from the date of admission to discharge was 3.8±2.8 mg/dl. Hypokalemia (K^+<3.5meq/l) and hyperkalemia (K^+>5.5meq/l) were observed in 13(20.3%) and 7(10.9%) cases respectively.

During the hospital stay, 28 (43.7%) patients required hemodialysis; of these, 17 patients required more than five sessions of hemodialysis. Rest of the patients were treated conservatively and discharged within 2 weeks. A total of 7(10.9%) patients expired out of which 5(7.8%) patients were succumbed even after the start of hemodialysis due to multi organ failure. 33(51.5%) patients had attained completed response and 17(26.5%) patients had partial response to the treatment. Rest of the patients had no response to the treatment and required chronic dialysis. Renal biopsies

were performed in patients who did not recover or required chronic dialysis. Biopsy reports indicate the presence of cortical necrosis in two, acute tubular necrosis in one case and thrombotic microangiopathy in 2 cases.

Table 2: Outcome of PR-AKI

Outcome	Number(Percentage)
Complete Response	33(51.5)
Partial Response	17(26.5)
No Response	7(10.9)
Mortality	7(10.9)

DISCUSSION:

Pregnancy related acute kidney injury is a rare but life threatening complication of pregnancy. The pathophysiology of renal failure in pregnancy can be categorized according to anatomical pathology, hemodynamic changes, and abnormal substrate handling or acid-base abnormalities. Over 90% of pregnant women develop a physiological hydronephrosis of pregnancy which is characterized by a dilation of the calyces, renal pelvis and ureters. This anatomical abnormality may be present until the16thpostpartum week and promotes urinary stasis in the ureters, leading to the development of urinary tract infections [14]. In present study urinary tract infections was present in 7(10.9%) of women.

Similar to our study; sepsis has been reported as most common etiology of PR-AKI in the Indian subcontinent in previous studies [3, 5, 15, 16]. Sepsis accounted for PR-AKI in 45% of our study patients. Riedemann *et al.;* reported that AKI occurs in 19% of patients with moderate sepsis, in 23% with severe sepsis and in 51% of patients with septic shock [17]. Patients with sepsis have generalized vasodilation, which causes renal hypo perfusion and, consequently, renal failure [18].

PR-AKI occurs in approximately 1% of women with severe preeclampsia [19] and 3-15% of women with HELLP syndrome [20]. In our study, preeclampsia/eclampsia was the cause of PR-AKI in 19% of cases. Similar to our study Kumar *et al.;* [2] reported the 24.4% incidence of preeclampsia/eclampsia in PR-AKI women. HELLP Syndrome was observed in 9.5% of women in present study which was similar to study done by Pahwa *et al.;* [16] Aggrawal *et al.;* [15] reported a lower incidence(4%) of HELLP syndrome in PR-AKI patients.

Post-partum hemorrhage and antepartum hemorrhage were responsible for AKI in 19% of patients in present study. Similar to present study, Kumar *et al.;* [2] and Prakash *et al.;* [21] observed that hemorrhage of pregnancy constitutes 17% and 18.8% of PR-AKI, respectively. However in contrast to our observation, hemorrhage occurred in high percentage of PR-AKI patients in the studies by Naqvi *et al.;* (58%) (21) and Goplani *et al.;* (38%) [3].

In our study, of the 54(84.4%) surviving patients, 33(51.5%) had complete recovery of renal functions, 17(26.5%) had partial recovery and 7(10.9%) required chronic dialysis. Similar to our observation Hassan *et al.;* reported that 41.4% patients had complete recovery, 27.9% had partial recovery and 13.9%required chronic dialysis [22]. In a study done by Aggarwal *et al.;* [15] 88% of patients were survived, of which 42% had complete response, 16% had partial response whereas 30% of patients develop end stage renal failure and required chronic dialysis.

CONCLUSION:

In conclusion pregnancy related AKI is a common problem in our population. Sepsis is the most common etiological factor responsible for the PR-AKI. Clinicians should apply the best evidence based diagnostic and therapeutic strategies for better management of PR-AKI.

REFERENCES

1. Srisawat N, Kellum JA. Acute kidney injury: definition, epidemiology, and outcome. Current opinion in critical care. 2011 Dec 1; 17(6):548-55.
2. Kumar KS, Krishna CR, Kuma VS. Pregnancy related acute renal failure. Job Ostetrics Gynecol India. 2006; 56: 308–310.
3. Goplani KR, Shah PR, Gera DN, Gumber M, Dabhi M, Feroz A, et al. Pregnancy related acute renal failure: A singlecentre experience. Indian J Nephrol 2008; 18:7-21.
4. Rani PU, Narayen G, Anuradha G. Changing trends in pregnancy related acute renal failure. J Obstet Gynecol India. 2002; 52(1):36-8.
5. Prakash J, Niwas SS, Parekh A, Pandey LK, Sharatchandra L, Arora P, Mahapatra AK. Acute kidney injury in late pregnancy in developing countries. Renal failure. 2010 Apr 1; 32(3):309-13.
6. Dragun K, Haase M. Acute kidney failure during pregnancy and postpartum. In: Jörres A, Ronco C, Kellum J, eds. Management of acute kidney problems. Springer; Berlin. 2010:445-458.
7. Prakash J, Kumar H, Sinha DK, Kedalaya PG, Pandey LK, Srivastava PK, Raja R, Usha. Acute renal failure in pregnancy in a developing country: twenty years of experience. Renal failure. 2006 Jan 1; 28(4):309-13.
8. Prakash J, Vohra R, Wani IA, Murthy AS, Srivastva PK, Tripathi K, Pandey LK, Raja R. Decreasing incidence of renal cortical necrosis in patients with acute renal failure in developing countries: a single-centre experience of 22 years

from Eastern India. Nephrology Dialysis Transplantation. 2007 Apr 1; 22(4):1213-7.
9. Chugh KS, Sakhuja V, Malhotra HS, Pereira BJ. Changing trends in acute renal failure in third-world countries—Chandigarh study. QjM. 1989 Dec 1; 73(3):1117-23.
10. Prakash J, Tripathi K, Usha, Pandey LK, Srivastava PK. Pregnancy-Related Acute-Renal-Failure in Eastern India. Journal of Nephrology. 1995 Jul 1; 8(4):214-8.
11. Selcuk NY, Tonbul HZ, San A, Odabas AR. Changes in frequency and etiology of acute renal failure in pregnancy (1980–1997). Renal failure. 1998 Jan 1; 20(3):513-7.
12. Stratta P, Besso L, Canavese C, Grill A, Todros T, Benedetto C, Hollo S, Segoloni GP. Is pregnancy-related acute renal failure a disappearing clinical entity? Renal failure. 1996 Jan 1; 18(4):575-84.
13. Bellomo R, Ronco C, Kellum JA, Mehta RL, Palevsky P. Acute renal failure–definition, outcome measures, animal models, fluid therapy and information technology needs: the Second International Consensus Conference of the Acute Dialysis Quality Initiative (ADQI) Group. Critical care. 2004 May 24; 8(4):1.
14. Rasmussen PE, Nielsen FR. Hydronephrosis during pregnancy: a literature survey. European Journal of Obstetrics & Gynecology and Reproductive Biology. 1988 Mar 1; 27(3):249-59.
15. Aggarwal RS, Mishra VV, Jasani AF, Gumber M. Acute renal failure in pregnancy: Our experience. Saudi Journal of Kidney Diseases and Transplantation. 2014 Mar 1; 25(2):450.
16. Pahwa N, Bharani R, Kumar R. Post-partum acute kidney injury. Saudi Journal of Kidney Diseases and Transplantation. 2014 Nov 1; 25(6):1244.
17. Niels C, Riedemann RF, FENG G. The enigma of sepsis. J Clin Invest. 2003; 112:460-7.
18. Schrier RW. Need to intervene in established acute renal failure. Journal of the American Society of Nephrology. 2004 Oct 1; 15(10):2756-8.
19. Kuklina EV, Ayala C, Callaghan WM. Hypertensive disorders and severe obstetric morbidity in the United States. Obstetrics & Gynecology. 2009 Jun 1; 113(6):1299-306.
20. Sibai BM, Ramadan MK. Acute renal failure in pregnancies complicated by hemolysis, elevated liver enzymes, and low platelets. American journal of obstetrics and gynecology. 1993 Jun 30; 168(6):1682-90.
21. Naqvi R, Akhtar F, Ahmed E, Shaikh R, Ahmed Z, Naqvi A, Rizvi A. Acute renal failure of obstetrical origin during 1994 at one center. Renal failure. 1996 Jan 1; 18(4):681-3.
22. Aggarwal RS, Mishra VV, Jasani AF, Gumber M. Acute renal failure in pregnancy: Our experience. Saudi Journal of Kidney Diseases and Transplantation. 2014 Mar 1; 25(2):450.