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Original research article

Post-partum acute kidney injury: A retrospective study

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Abstract

To determine the risk factors, course of hospital stay and mortality rate among women with post-partum acute kidney injury (AKI), we studied (of 752 patients with AKI admitted to a tertiary care center during the study period between November 2020 and January 2023) 27 (3.59%) women with post-partum AKI. The data regarding age, parity, cause of renal failure, course of hospital stay and requirement of dialysis were recorded. Sepsis was the major cause (70.3%) of post-partum AKI. Other causes included disseminated intravascular coagulation (55.5%), pre-eclampsia/eclampsia (40.7%), ante- and post-partum hemorrhage (40.7% and 22.2%) and hemolytic anemia and elevated liver enzymes and low platelet count syndrome (29.6%); most patients had more than one cause of AKI. We found a very high prevalence (18.5%) of cortical necrosis in our study patients. A significant correlation was also found between the creatinine level on admission and the period of onset of disease after delivery. In conclusion, several factors are involved in causing post-partum AKI in our population, and sepsis was the most common of them.

Keywords: Dialysis, injury, kidney, post-partum

Introduction

Post-partum acute kidney injury (AKI) is a challenging health problem in pregnant women, especially in the developing countries. The incidence of AKI requiring dialysis complicating pregnancy is approximately one in 20,000 births in industrialized countries. In contrast, pregnancy is still responsible for 15–20% of total AKI cases in the various developing countries [1-3]. Pre-eclampsia, eclampsia, post-partum hemorrhage, hemolytic anemia and elevated liver enzymes and low platelet count (HELLP) syndrome and puerperal sepsis and disseminated intravascular coagulation (DIC) are considered to be the major causes of post-partum AKI [4]. Although the incidence of AKI has decreased sharply in the past 40 years in developed countries, it is still a common problem in the developing countries. The aim of our study was to identify the causes of post-partum AKI and the outcome of these cases in terms of morbidity and mortality.

Materials and Methods

We retrospectively studied all the post-partum patients with AKI admitted in Basaveshwara medical college and hospital, Chitradurga between November 2020 and January 2023. 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. Post-partum phase was defined as the period that begins immediately after delivery and extends up to 3 months. Obstetric records including parity data, pregnancy-related disorders such as pre-eclampsia, eclampsia, HELLP syndrome, puerperal sepsis, other infections, and delivery information (route of delivery and associated complications) 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. DIC was defined as coagulation of blood in small blood vessels with bleeding that resulted from the consumption of coagulation proteins and platelets. The post-partum course was also reviewed, with specific attention to post-partum complications and timing of recovery of kidney function.

Results

Of 752 patients with AKI admitted to a tertiary care center during the study period, 27 (3.59%) women had post-partum AKI. The mean age of the patients was 26.7 ± 4.2 years. The mean parity of the women was 1.78 ± 1.1 (range: 1–6). Of the women with post-partum AKI, 66.7% required cesarean delivery,

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whereas 14.8% had obstructed labor.

Puerperal sepsis occurred in 19 (70.3%) patients, and among these 14 had cesarean deliveries; two had obstructed labor and three had delivered their child at home by unskilled persons called "Dai." Sepsis was the most common cause of post-partum AKI. In the remaining eight (29.7%) patients, the causes of AKI included pre-eclampsia/eclampsia (40.7%), DIC (55.5%), antepartum hemorrhage (40.7%), post-partum hemorrhage (22.2%), hemolytic uremic syndrome (33.3%), HELLP syndrome (29.6%) and urinary tract infection (18.5%); some patients had more than one cause of AKI. In eight (29.6%) post-partum AKI patients, there was retained placenta in the uterus as revealed by ultrasonography findings, whereas abdominal hematoma was observed in five (18.5%) patients. The symptoms of post-partum AKI were observed within an average of 1.2 ± 1.8 days of delivery. Creatinine levels were increased to a maximum of 8.71 ± 2.5 mg/dL. We found a significant correlation of the number of days after delivery with creatinine levels on admission ($r = 0.681$, $P = 0.000$) and their maximum levels ($r = 0.413$, $P = 0.032$). D Dimer values, indicators of DIC, were in- creased in 23 patients. The mean hospital stay of the patients was 18.4 ± 14.4 days.

During the hospital stay, 25 (92%) patients required hemodialysis; of these, 17 (68%) patients required more than five sessions of haemo dialysis. Five patients (20%) had irreversible kidney injury and three (60%) of them were transplanted. One patient did not require hemodialysis as of early recovery, while one patient died early before the start of hemodialysis because of development of multiple organ failure. Anemia was a common feature in all the patients, and 24 (88%) patients required blood transfusion with a mean of 4.2 ± 2.9 units, of whom 21 (87%) patients required more than three units of blood transfusion. Two patients died early and one patient did not require blood transfusion. Of the 22 (81.5%) patients who survived, 11 (40. 7%) had complete recovery of renal function, six (22.2%) had partial recovery and two (7.4%) required chronic dialysis, whereas three (11.1%) had required renal transplant. Renal biopsies were performed in patients who did not recover or required chronic dialysis. Biopsy reports indicate the presence of cortical necrosis in five (18.5%) cases. Mortality occurred in five (18.5%) patients, of which sepsis accounted for four (80%) cases whereas post-partum hemorrhage occurred in one woman who died after two days of admission.

Discussion

The incidence of pregnancy-related AKI in developed countries is 1–2.8%. In developing countries, the incidence still remains at 9-25%, mostly due to late referral for pregnancy- related complications [5]. In our study, the incidence of post-partum AKI was 3.59%. Puerperal sepsis was the most common etiology of AKI in the Indian subcontinent in several studies [6-8]. The high incidence of puerperal sepsis is mainly due to caesarian section and obstructed labor deliveries by unskilled professionals at primary health care centers in rural areas and late referral to tertiary care centers. Sepsis was more common in pregnancy with retained placenta in the uterus. Sepsis accounted for post-partum AKI in 70.3% of our study patients. Similar to our observation, Goplani *et al.* [6] noted puerperal sepsis as the most common (61%) etiology of post-partum AKI in their study. Kumar *et al.* [9] reported puerperal sepsis in 29% of patients with post-partum AKI. However, Ansari *et al.* [7] reported puerperal sepsis in 31% of AKI patients during pregnancy. 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 [10]. Patients with sepsis present generalized vasodilation, which causes renal hypo- perfusion and, consequently, renal failure [11]. It is generally accepted that pre-eclampsia does not lead to AKI in the absence of other disease processes (hematoma, hemodynamic instability, infection) despite increasing evidence suggesting the association between pre-eclampsia and renal injury [12].

In our study, ten of the 11 women with pre-eclampsia had subs tantial comorbid conditions or obstetric complications that could have contributed to AKI. Post-partum hemorrhage and antepartum hemorrhage were responsible for AKI in 60.9% of non-septic patients in our study. Similar to our observation, hemorrhage was the dominant cause of post-partum AKI in the studies by Naqvi *et al.* (58%), Ansari *et al.* (38%) and Alexopoulos *et al.* (38%). In contrast, Kumar *et al.* [9] and Prakash *et al.* [13] observed that hemorrhage of pregnancy constitutes 17% and 18.8% of post-partum AKI, respectively. Mortality of patients with post-partum AKI seems to be high in the developing countries. Overall, maternal mortality in our study was 18.5%, which is comparable with other recent studies from the Indian subcontinent [3, 7, 9, 13-14]. Previously, mortality was very high (55.3%) due to late referral, frequent sepsis and high incidence of bilateral diffuse cortical necrosis [1]. The reason for the lower incidence of post- partum AKI in the developed countries is the prevention of pregnancy-related complications through excellent ante-natal care and early and more effective treatment of pre-eclampsia. In our present study, the mortality rate was 18.5%.

The combination between AKI and sepsis was associated with a mortality of around 70% [15]. Silva *et al.* studied 128 critically ill patients with AKI and reported that high mortality was observed among patients with sepsis (82% vs. 48%) [15]. In our study, four of five (80%) patients died due to sepsis. AKI in pregnancy is associated with a high risk of bilateral renal cortical necrosis and, consequently, of chronic renal failure. Renal cortical necrosis is an uncommon entity and accounts for only 2% of all the cases of

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AKI [13]. Obstetric complications such as abruptio placentae, septic abortion, pre-eclampsia, post- partum hemorrhage and puerperal sepsis are responsible for renal cortical necrosis in 50–70% of the cases. In our study, the incidence of cortical necrosis was 18.5%, while it was 23.8% and 14.3% in two different studies previously conducted in India [6, 8].

Conclusion

Post-partum AKI is a common problem in our population. Puerperal sepsis is the most common etiological factor responsible for the post-partum AKI. Increased involvement of specialties in the care of pregnant women and improved intra- and post- operative management of cases are advised to reduce the post-partum acute injury, thereby reducing the maternal mortality.

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