Open Access

Original Article

Characteristics and Outcome of Postpartum Acute Kidney Injury Requiring Hemodialysis

Farhan Zaid, Malik Nadeem Azam Khan*, Aakash Aslam, Ahsan Tanveer, Fahad Javed Awan, Amna Butt**

Department of Medicine, Pak Emirates Military Hospital /National University of Medical Sciences (NUMS) Rawalpindi Pakistan, *Department of Nephrology, Combined Military Hospital Kharian/National University of Medical Sciences (NUMS) Pakistan, **Department of Nephrology, Pak Emirates Military Hospital /National University of Medical Sciences (NUMS) Rawalpindi Pakistan.

ABSTRACT

Objective: To study the characteristics and outcome of patients having postpartum Acute Kidney Injury requiring hemodialysis and factors associated with poor outcome.

Study Design: Cross-sectional study.

Place and Duration of Study: Department of Gynecology, Medicine and Nephrology, Pak Emirates Military Hospital, Rawalpindi and Combined Military Hospital Kharian Pakistan, Jun 2021 to Feb 2022.

Methodology: Fifty patients diagnosed as having Acute Kidney Injury during post-partum period and requiring hemodialysis were included the study. They were managed and followed up by Nephrology team for three months and outcome was recorded as good or bad on the basis of response to treatment and clinical condition. Relevant socio-demographic factors associated with outcome in study participants were also recorded on a data collection proforma.

Results: Out of 50 patients with dialysis dependent Acute Kidney Injury, 25(50%) had normal vaginal delivery while 25(50%) had either cesarean or instrumental delivery. Mean age of the study participants was 33.45±6.732 years. 30(60%) patients had good outcome while 20(40%) patients had poor outcome. Statistical test revealed that post-partum hemorrhage and presence of gestational diabetes mellitus or hypertension had statistically significant relationship with poor outcome in patients suffering from dialysis dependent post-partum acute kidney injury (p-value<0.05).

Conclusion: Significant number of patients with hemodialysis dependent post-partum acute kidney injury had good outcome at the end of three months. Patients with post-partum hemorrhage and presence of gestational diabetes mellitus or hypertension were more at risk of having poor outcome of acute kidney injury.

Keywords: Acute Kidney Injury (AKI), Nephrology, Obstetrics, Postpartum

How to Cite This Article: *Zaid F, Khan MNA, Aslam A, Tanveer A, Awan FJ, Butt A. Characteristics and Outcome of Postpartum Acute Kidney Injury Requiring Hemodialysis. Pak Armed Forces Med J 2024; 74(4): 1173-1176. DOI: https://doi.org/10.51253/pafmj.v74i4.8630*

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (https://creativecommons.org/licenses/by-nc/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

The renal system is one of the most important organ systems of body and its dysfunction leads to severe consequences in terms of maintenance of homeostasis inside human body.[1] Acute kidney injury contributes to all-cause mortality and morbidity in all health systems across the globe.[2] This mortality is more concerning in lower- and middle-income countries.[3] Pregnancy and post-partum period put many women's health at risk especially if they have a comorbid illness or complicated pregnancy or labor.[4] Acute kidney injury during early or late post-partum period is not an uncommon condition especially in developing countries like Pakistan.[5] Considerable number of patients require hemodialysis and may develop chronic kidney disease thus, the management of such patients is requires early diagnosis and treatment.[6] Women in post-partum period can have mild renal impairment to dialysis dependent renal failure. Tanwar *et al*. studied patients who developed AKI in postpartum period and concluded that mortality rate was high and most of these patients required hemodialysis, with more than half of the survivors having an eGFR <60mL/min/1.73m^2 on follow-up.[7] Mir *et al*. published a similar study and revealed that sepsis and post-partum hemorrhage (PPH) remained common causes of acute kidney injury in these patients. Diffuse cortical necrosis was seen in considerable number of patients and they remained dialysis dependent.[8] Eswarappa *et al*. reviewed 99 cases of post-partum AKI and found that maternal and fetal mortality was high in these patients and need for quality maternal care during pregnancy was essential.[9] Bokhari *et al*. also concluded that most of the patients with AKI in late pregnancy or early post-partum required hemodialysis.[10]

Limited local data has been available regarding factors related to poor outcome in patients suffering from post-partum acute kidney injury in our part of the world. We therefore planned this study with the rationale to study the characteristics and outcome of

Correspondence: Dr Farhan Zaid, Department of Medicine, Pak Emirates Military Hospital, Rawalpindi Pakistan

Received: 25 Apr 2022; revision received: 25 Jun 2022; accepted: 12 Aug 2022

patients having postpartum acute kidney injury requiring hemodialysis in multiple centers of two cities of Pakistan.

METHODOLOGY

The cross-sectional study was conducted at the Department of Gynecology, Medicine and Nephrology, Pak Emirates Military Hospital (PEMH), Rawalpindi and Combined Military Hospital (CMH) Kharian Pakistan, from June 2021 to February 2022. WHO sample size calculator was used to calculate the sample size for this study with population prevalence proportion of acute kidney injury in postpartum period as 1.5%.[11] Nonprobability consecutive sampling was done to recruit the patients.

Inclusion Criteria: All women aged 18 and 45 years, diagnosed with dialysis dependent AKI during post-partum period by consultant nephrologist or medical specialist, were included.

Exclusion Criteria: Women with known renal impairment due to any reason prior to pregnancy or post-partum period or those who had renal impairment during post-partum period but did not require hemodialysis, patients using nephrotoxic medications or illicit and women who left the hospital after diagnosis and could not be followed up, were excluded.

Ethics approval (IREB letter number: A/28) was granted by the Ethics Committee before the start of study and patients or their primary caregivers (in case of patients having delirium) gave written informed consent. Diagnosis of AKI was made by using Kidney Disease Improving Global Outcomes (KDIGO) by consultant medical specialist or nephrologist.[12] All patients underwent baseline investigations including detailed renal profile from laboratory of respective hospitals. Good outcome was defined as complete recovery after initial few sessions (3-5 sessions) of hemodialysis while poor outcome included incomplete recovery, partial recovery, dialysis dependence or death.[13] Post partum hemorrhage was confirmed from patient notes and treating obstetrician on basis of amount of bleeding during the delivery by any mode.[14]

Statistical Package for the Social Sciences (SPSS) version 23.0 was used to perform the analysis. Descriptive statistics were used to describe the variables of the study. Mean and standard deviation was calculated for age of the patients included in the study. Pearson chi-square analysis and Fischer exact test was used to establish the association between age, mode of delivery, presence of post-partum hemorrhage and presence of gestational diabetes or hypertension and poor outcome. The *p*-value lower than or up to 0.05 was considered as significant.

RESULTS

Out of 50 patients with dialysis dependent AKI, 25(50%) had normal vaginal delivery while 25(50%) had either cesarean or instrumental delivery. Table-I summarizes the general characteristics of study participants. Mean age of the study participants was 33.45±6.732 years. 30(60%) patients had good outcome while 20(40%) patients had poor outcome. 25(50%) had spontaneous vaginal delivery, 07(14%) had instrumental delivery and while 18(36%) had delivery via caesarian section. 30(60%) were non-booked cases while 20(40%) were booked cases. Table-II shows the results of statistical analysis. Post-partum hemorrhage (*p*-value=0.001) and presence of gestational diabetes mellitus or hypertension (*p*-value<0.001) had statistically significant relationship with poor outcome in patients suffering from dialysis dependent post-partum acute kidney injury while age (*p*-value=0.109) and mode of delivery (*p*-value=0.563) had no such relationship in our analysis.

Table-I: Characteristics of Post-Partum Women (n=50)

Study Parameters	n(%)
Age (years)	
Mean+SD	33.45±6.732
Range (min-max)	19 years - 45 years
Parity	
Primiparous	19(38%)
Multiparous	31(62%)
Mode of delivery	
Spontaneous vaginal	25(50%)
Instrumental	07(14%)
Cesarean section	18(36%)
Booked cases	
No	30(60%)
Yes	20(40%)
Post-partum Hemorrhage	
No	37(74%)
Yes	13(26%)

DISCUSSION

Maternal and childcare is an important aspect of health care especially in low- and middle-income countries. Renal injury during pregnancy and in early post-partum period is fairly common condition in obstetric settings requiring multidisciplinary approach and if high risk cases can be diagnosed earlier, it could be extremely beneficial for mother and baby. We

conducted this study in two different hospitals of two large cities of Pakistan in order to study the characteristics and outcome of patients having postpartum acute kidney injury requiring hemodialysis and factors associated with poor outcome.

Table-II: Association of Various Factors with Outcome in Post-Partum Patients of Acute Kidney Injury Requiring Hemodialysis (n=50)

Factors	Good outcome	Poor outcome	*p*-value
Age			
<35 years	23(76.7%)	11(55%)	0.109
35-45 years	07(23.3%)	09(45%)	
Mode of delivery			
Normal vaginal	16(53.3%)	09(45%)	0.563
Cesarean or instrumental	14(46.7%)	11(55%)	
Post-partum hemorrhage			
No	27(90%)	10(50%)	0.001
Yes	03(10%)	10(50%)	
Gestational diabetes or hypertension			
No	29(96.7%)	09(45%)	<0.001
Yes	01(3.3%)	11(55%)	

Shu *et al*.[15] published a study on patients from China and shared that renal injury in post-partum period is not uncommon and renal replacement therapy and conservative management does not differ the outcome in these patients. Overall prognosis was not poor in most of the patients in their study. Our study findings were not different as most of our patients had good outcome. Those with poor three months outcome were not followed and some or most of them may have had good long-term outcome. A single center retrospective study highlighted that about 17% women with pre-eclampsia or eclampsia and 60% women with Hemolysis, Elevated Liver enzymes and Low Platelets (HELLP) syndrome were complicated with AKI. Patients who were dialysis dependent met with poor outcome.[16] Our results concluded that significant number of patients with hemodialysis dependent post-partum AKI had good outcome at the end of three months. Patients with post-partum hemorrhage and presence of gestational diabetes mellitus or hypertension were more at risk of having poor outcome of acute kidney injury. Outcome of pregnancy related AKI was observed in a tertiary care hospital in Bangladesh by Ahammed *et al*. They concluded that 56.6% patients recovered completely, 15.0% patients recovered partially, 6.7% did not recover at the time of hospital discharge, while 21.7% died. Our data revealed that 60% had good outcome (complete early recovery) and 40% had poor outcome (partial or no recovery or death).[17] Jonard *et al*. studied French patients admitted in critical care unit with acute renal injury in post-partum period. They concluded that HELP syndrome and post-partum hemorrhage complicated the clinical situation in these patients. Our results were not very different as presence of gestational metabolic disorders or postpartum hemorrhage were associated with poor outcome in our study participants.[18]

LIMITATION OF STUDY

Long term follow up was not done so outcome remains short term and cannot be generalized. Multiple confounding factors may be responsible for determining outcome, as all of them were not controlled. Future studies addressing these limitations may generate better results.

CONCLUSION

Significant number of patients with hemodialysis dependent post-partum acute kidney injury had good outcome at the end of three months. Patients with post-partum hemorrhage and presence of gestational diabetes mellitus or hypertension were more at risk of having poor outcomes.

Conflict of Interest: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

FZ & MNAK: Data acquisition, data analysis, critical review, approval of the final version to be published.

AA & AT: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

FJA & AB: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

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.

REFERENCES

1. Coward S, Kareemi H, Clement F. Incidence of appendicitis over time: A comparative analysis of an administrative healthcare database and a pathology-proven appendicitis registry. PLoS One 2016; 11(11): e0165161. https://doi.org/10.1371/journal.pone.0165161
2. Ceresoli M, Zucchi A, Allievi N. Acute appendicitis: Epidemiology, treatment and outcomes- analysis of 16544 consecutive cases. World J Gastrointest Surg 2016; 8(10): 693–699. https://doi.org/10.4240/wjgs.v8.i10.693
3. Gorter RR, Eker HH, Gorter-Stam MA. Diagnosis and management of acute appendicitis. EAES consensus development conference 2015. Surg Endosc 2016; 30(11): 4668–4690. https://doi.org/10.1007/s00464-016-5245-7
4. Orfanu AE, Popescu C, Leuştean A, Negru AR, Tilişcan C, Aramă V, et al. The importance of haemogram parameters in the

diagnosis and prognosis of septic patients. J Crit Care Med 2017; 3(3): 105-110. https://doi.org/10.1515/jccm-2017-0019
5. Kong W, He Y, Bao H, Zhang W, Wang X. Diagnostic value of neutrophil-lymphocyte ratio for predicting the severity of acute pancreatitis: A meta-analysis. Dis Markers 2020; 2020: 9731854. https://doi.org/10.1155/2020/9731854
6. Ciccullo A, Borghetti A, Zileri Dal Verme L, Tosoni A, Lombardi F, Garcovich M, et al. Neutrophil-to-lymphocyte ratio and clinical outcome in COVID-19: A report from the Italian front line. Int J Antimicrob Agents 2020; 56(2): 106017. https://doi.org/10.1016/j.ijantimicag.2020.106017
7. Tanwar RS, Agarwal D, Gupta RK, Rathore V, Beniwal P, Joshi P, et al. Characteristics and outcome of postpartum acute kidney injury requiring dialysis: A single-center experience from North India. Saudi J Kidney Dis Transpl 2018; 29(4): 837-845. https://doi.org/10.4103/1319-2442.239663
8. Mir MM, Najar MS, Chaudary AM, Azad H, Reshi AR, Banday KA, et al. Postpartum acute kidney injury: Experience of a tertiary care center. Indian J Nephrol 2017; 27(3): 181-184. https://doi.org/10.4103/0971-4065.194391
9. Eswarappa M, Madhyastha PR, Puri S, Varma V, Bhandari A, Chennabassappa G. Postpartum acute kidney injury: A review of 99 cases. Ren Fail 2016; 38(6): 889-893. https://doi.org/10.3109/0886022X.2016.1164015
10. Bokhari SRA, Inayat F, Jabeen M, Sardar Z, Saeed S, Malik AM, et al. Characteristics and outcome of obstetric acute kidney injury in Pakistan: A single-center prospective observational study. Cureus 2018; 10(9): e3362. https://doi.org/10.7759/cureus.3362
11. Coles H, Steer P, Hughes P, Cauldwell M. Factors associated with acute kidney injury during delivery or the postpartum period: A case control study. Eur J Obstet Gynecol Reprod Biol 2021; 261: 200-204. https://doi.org/10.1016/j.ejogrb.2021.04.036
12. Xu X, Nie S, Liu Z, Chen C, Xu G, Zha Y, et al. Epidemiology and clinical correlates of AKI in Chinese hospitalized adults. Clin J Am Soc Nephrol 2015; 10(9): 1510-1518. https://doi.org/10.2215/CJN.02140215
13. Gameiro J, Fonseca JA, Outerelo C, Lopes JA. Acute kidney injury: From diagnosis to prevention and treatment strategies. J Clin Med 2020; 9(6): 1704. https://doi.org/10.3390/jcm9061704
14. Ghosh R, Spindler H, Morgan MC, Cohen SR, Begum N, Gore A, et al. Diagnosis and management of postpartum hemorrhage and intrapartum asphyxia in a quality improvement initiative using nurse-mentoring and simulation in Bihar, India. PLoS One 2019; 14(7): e0216654. https://doi.org/10.1371/journal.pone.0216654
15. Shu H, Nie F. Clinical characteristics and prognosis of postpartum acute kidney injury. J Int Med Res 2021; 49(2): 300060520988388. https://doi.org/10.1177/0300060520988388
16. Huang C, Chen S. Acute kidney injury during pregnancy and puerperium: A retrospective study in a single center. BMC Nephrol 2017; 18(1): 146. https://doi.org/10.1186/s12882-017-0551-4
17. Ahammed SU, Chowdhury AA, Roy AS, Muqueet MA, Rahman MA, Kabir MS, et al. Outcome of pregnancy related acute kidney injury observed in a tertiary care hospital. Mymensingh Med J 2017; 26(3): 463-470.
18. Jonard M, Ducloy-Bouthors AS, Boyle E, Aucourt M, Gasan G, Jourdain M, et al. Postpartum acute renal failure: A multicenter study of risk factors in patients admitted to ICU. Ann Intensive Care 2014; 4: 36. https://doi.org/10.1186/s13613-014-0036-6