

Need for Peritoneal Dialysis in Neonatal Acute Kidney Injury: Results from the Prospective TINKER [The Indian Iconic Neonatal Kidney Educational Registry] Study



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Introduction

- Despite improvement in the care of critically ill neonates, acute kidney injury (AKI) is a commonly faced condition in infants admitted to neonatal intensive care units (NICUs), with incidence ~18-70% across studies [1]
- The AWAKEN study found increased risk of 48% in pre-term infants born between 22-29 weeks of gestation [2]. Additional contributors to neonatal AKI include hyperbilirubinemia, inborn errors of metabolism (IEM), and need for surgery.
 - 1st line treatment for AKI is conservative measures, followed by kidney replacement therapy (KRT) when these fail.
- AWAKEN study showed 4.1% of neonates with AKI underwent KRT compared to a study from a developing country showing 42.3% of neonates with AKI received peritoneal dialysis (PD)
- KRT is limited by difficult vascular access, small size, and fluctuating physiology, which PD provides improvement over

Objectives

- Identify variables influencing requirements of PD among neonates with AKI
- Compare outcomes of neonates with AKI who do or do not receive PD

Methodology

- Design:** Prospective study derived from TINKER database assessing all admitted neonates <28 days who received intravenous fluids for at least 48 hours. AKI was defined by KDIGO criteria
- Study Population:** Neonates (≤28 days) who were admitted in NICU; and those who received intravenous (IV) fluids for at least 48 hours for hydration and/or nutrition
 - Excluded:** Neonates with any lethal chromosome anomaly, such as Trisomy 13, 18, anencephaly etc or congenital heart surgery within the first 7 days of life
- Study Variables:** *Maternal variables:* age, gravida, parity, chronic and pregnancy-associated conditions, medications, history of peripartum infections, and history of drug intake during the pregnancy. *Neonate variables:* gestational age, birth weight, mode and site of delivery, reasons for admission, initial temperature and resuscitation data.
- Data Collection:** Daily collection of weight, blood pressure, fluid intake/output, nephrotoxic drugs, serum creatinine through enzymatic assay, urea, Na, markers of sepsis through blood and urine cultures regarding pediatric patients with suspected AKI defined by KDIGO criteria.

References

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Results

- From 1,600 neonates, a total of 491 (30.7%) had AKI defined by KDIGO criteria
- Median duration stay in NICU was 10 days, and 81 neonates (5.1%) neonates died.
- Of 491 subjects, 44 (9%) received PD
- AKI neonates with PD had significantly lower median (IQR) APGAR scores at 5 minutes vs neonates without PD [7.5 (6 - 8) vs. 8 (7 - 8); p=0.005], in addition to lower urine output, Hb, and serum pH
- AKI neonates with PD had significantly higher median (IQR) weight on admission, serum urea during first 12 hours in NICU, serum creatinine during first 12 hours in NICU, and serum potassium during first 12 hours in NICU

Discussion

- AKI is a significant burden to neonates that is understudied, especially in lower income countries [3]
- Significant differences were noted between neonates with AKI who received PD compared to those who did not receive PD:
 - Lower: APGAR scores, urine output, and serum pH
 - Higher: serum urea, serum creatinine, serum potassium
- Some underlying characteristics indicative of future PD use are maternal severe peripartum event, resuscitation requirement in the delivery room, male gender, respiratory support in NICU, sepsis, significant cardiac disease, intraventricular hemorrhage, NEC, fluid overload or the use of nephrotoxic/inotropic drugs.

- Previous studies noted these risk factors as associations, but the information that reiterates the need for support in this population prior to the development of AKI is scarce
- This study is the largest, prospective, multicenter dataset ever studying admitted neonate outcomes with AKI
- This study had a smaller proportion of patients with AKI requiring PD (9%) compared to AWAKEN study.
- This study had a lower mortality rate of patients with AKI requiring PD (5.1%) compared to AWAKEN study (26%)
- Studies with similarly high mortality in neonates requiring PD attribute the rate to the underlying cause of the patient's need for PD [4,5]
- While this study did not record PD-related complications, examining new techniques, methods and adoption of universal dialysis support / machines is required to enhance long-term recovery outlook of neonates with AKI

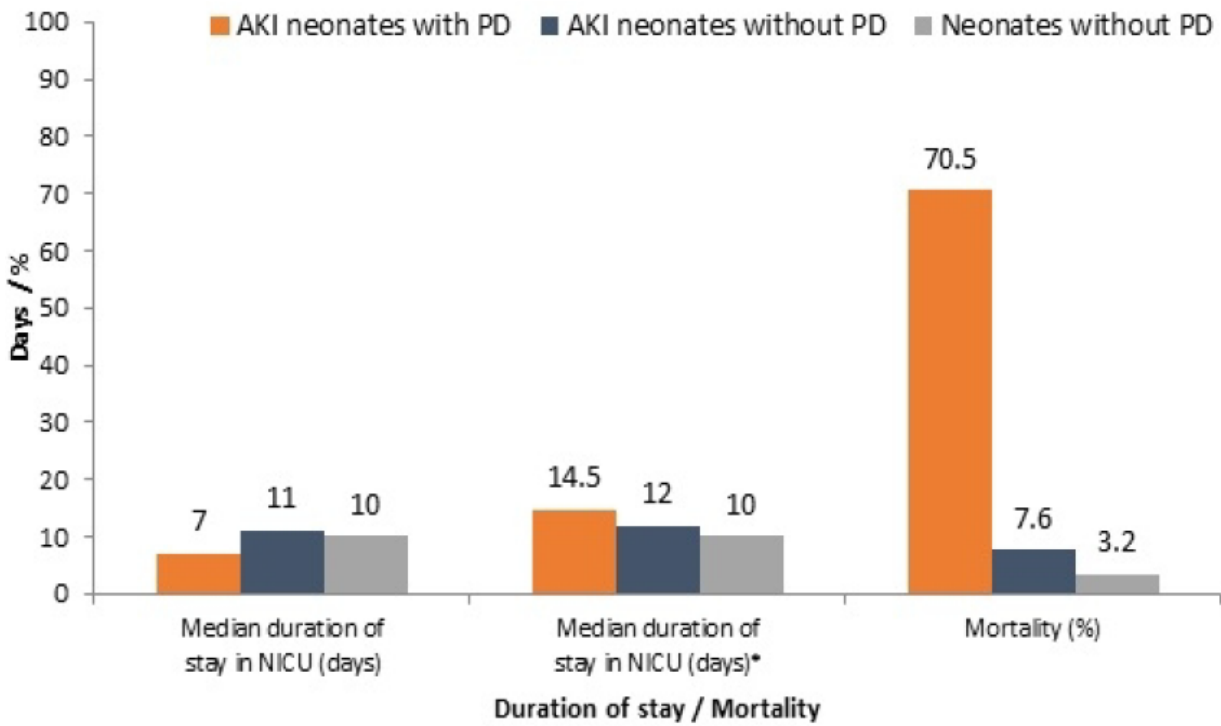


Figure 1. NICU Duration and Mortality

Figure 1 compares duration of stay in NICU and mortality among AKI neonates with PD vs without PD

- AKI neonates with PD had significantly shorter median (IQR) duration of stay in NICU [7 (4 - 14) vs. 11 (6 - 21) days; p=0.004], but significantly higher mortality [31 (70.5%) vs. 34 (7.6%); p<0.001]
- *When excluding neonates who died, median duration of stay did not differ between groups

Figure 2 displays significant association variables that may predict future need for PD in neonates with AKI:

- Severe maternal peri-partum event, resuscitation of neonate in delivery room, respiratory support in NICU, sepsis during NICU stay, significant cardiac disease, and necrotizing enterocolitis were all more frequent in the history of neonates with AKI receiving PD

Variables	AKI neonates with PD [n (%)]	AKI neonates without PD [n (%)]	p ¹
Baseline Maternal/Antenatal Characteristics [Yes]	17 (38.6%)	166 (37.1%)	0.844
Use of steroids during pregnancy [Yes]	3 (6.8%)	41 (9.2%)	0.785
Site of delivery [Outborn]	19 (43.2%)	231 (51.7%)	0.282
Mode of delivery [Caesarean]	30 (68.2%)	243 (54.4%)	0.078
Any severe peri-partum event [Yes]	4 (9.1%)	10 (2.2%)	0.029
Resuscitation required in the delivery room [Yes]	26 (59.1%)	155 (34.7%)	0.001
Gestational Age at birth (<28 weeks)	4 (9.1%)	30 (6.7%)	0.532
Birth weight (<1,000 g)	4 (9.1%)	40 (8.9%)	1.000
Gender [Male]	37 (84.1%)	321 (71.8%)	0.08
Respiratory support required in NICU [Yes]	42 (95.5%)	373 (83.4%)	0.046
Sepsis (worst episode during the NICU stay) [Yes]	36 (81.8%)	325 (72.7%)	0.191
Significant cardiac disease [Yes]	34 (77.3%)	182 (40.7%)	<0.001
Necrotizing Enterocolitis (NEC) [Yes]	4 (9.1%)	11 (2.5%)	0.037

Figure 2. Univariate association of categorical variables with PD incidence