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EDITORIAL

Neonatal Acute Kidney Injury - Do We Need to Pay More Attention?

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Introduction

Bangladesh has declared the SDG target of reducing neonatal mortality rate to 12 deaths per 1000 live births by 2030.[1]Recently it is observed that neonatal death from acute kidney injury (AKI) are being increasing. Perinatal asphyxia (PNA), sepsis and prematurity are the common etiology of neonatal AKI in Bangladesh.[2]One study from Bangladesh showed prevalence of Neonatal AKI 8 % and common cause being severe perinatal asphyxia.[3]Highest mortality rate is found in infantand neonate from AKI.[3] To attain SDG goal along with national new born health program services, we alsoneed to provide special emphasis on prompt diagnosis of neonatal AKI, immediate referral and proper management.

Worldwide neonatal AKI prevalence and mortality rates

In a recent study incidence of AKI was 605/2022 (29·9%). The rates varied by gestational age groups (i.e., ≥22 to <29 weeks =47·9%; ≥29 to <36 weeks =18·3%; and ≥36 weeks =36·7%). Infants with AKI had higher mortality compared to those without AKI.[4]

Previous research on the definition of AKI has largely excluded neonates. It was unclear whether pediatric AKI definition are applicable to neonates. Moreover high serum creatinine (SCr) during the first postnatal week that reflects maternal creatinine level also creates difficulty in labelling AKI at this period.Kidney Disease Improving Global Outcome has published AKI staging for new born.[5]

Optimizing the definition of neonatal AKI during first postnatal life

The Neonatal Kidney Collaborative (NKC) is an international, multidisciplinary groupcomposed of neonatologists and pediatric nephrologists, dedicated to investigate neonatal AKI.The AWAKEN (Assessment of Worldwide Acute Kidney injury Epidemiology in Neonates) study wasdesigned by NKC to describe the epidemiology of neonatal AKI, validate the definition of neonatal AKI, identify primary risk factors for neonatal AKI, and investigate the contribution of fluid management to AKI events and short-term outcomes.[6]Neonates with serum creatinine (sCr) rise ≥0.3 mg/dl and/or ≥50% sCr rise are more likely to die,

Neonatal acute kidney injury KDIGO classification[5]

Stage	Serum Creatinine	Urine Output
0	No change in sCr or rise <0.3 mg/dl	>1 ml/kg/h
1	sCr rise ≥0.3 mg/dl within 48 hr or sCr rise ≥1.5-1.9 x reference *sCr*[a] within 7 days	>0.5 ml/kg/h and ≤ 1 ml/kg/h
2	sCr rise ≥2-2.9 x reference *sCr*[a]	>0.3 ml/kg/h and ≤0.5 ml/kg/h
3	sCr rise ≥3 x reference *sCr*[a] or sCr rise ≥2.5 mg/dl[b] or receipt of dialysis	≤0.3 ml/kg/h

Difference between proposed neonatal AKI definition and KDIGO include:
[a] Reference *sCr* will be defined as the lowest previous sCr value.
[b] *sCr* value of 2.5 mg/dl represents less than 10 ml/min/1. 73m^2.

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even when controlling for confounders.In a recent published study these thresholds have been tested in newborns and hypothesized that different gestational age (GA) groups require different sCr thresholds. AWAKEN with ≥1sCr on postnatal days 1-2 and ≥1 sCr on postnatal days 3-8 were assessed. The ≥0.3 mg/dL rise outperformed ≥50% sCr rise. Addition of percent rise did not improve mortality predictability. The optimal sCr thresholds to predict AUC and specificity were ≥0.3 and ≥0.6 mg/dL for ≤29 weeks GA, and ≥0.1 and ≥0.3 mg/dL for >29 week GA. The maximum sCr value provides great specificity.Unique sCr rise cutoffs for different GA improves outcome prediction.[7]

Risk factors of neonatal AKI

As detailed in several reviews, risk factors and etiology of neonatal AKI are often multifactorial including condition leading to intravascular volume depletion eg.hypovolemia, sepsis, capillary leak, ischemia, (low cardiac output, vasopressor), nephrotoxic medication and multiple organ dysfunction.Neonates have additional unique conditions predisposing to and causing AKI including prenatal/perinatal events(eg. Maternal medications during pregnancy, prematurity, placental blood loss at birth, and perinatal asphyxia(PNA) with renal ischemia, post natal events (eg. Susceptibility to infections, excessive fluidlossesthrough skin and umbilical catheter associatedrenal vessel thrombosis, urologic anomalies). Premature birth, intrauterine growth retardation and low birth weight, are associated with poor nephron development and are often the consequence of pre-renal cause of AKI.

A study in Bangladesh reported 68% of the neonatal AKI was due to PNA[2]. Renal insufficiency can occur within 24 hours of a hypoxic insult and may lead to irreversible injury in prolonged asphyxia.In critically ill newborn 8-24% are affected with AKI and has a mortality rate of 10-61%.It has been observed that one-third of critically ill children develop AKI which is four fold higher than non-critically ill children.[8]

Prediction of AKI from clinical feature and APGAR score

It is difficult to predict AKI from clinical features, oliguria or APGAR score.[9]Butvery crucial thing is to screen all the babies with PNA for AKI. A single normal value of serum creatininecannot exclude AKI, a serial monitoring is important. Shock should be detected early and treated aggressively, as shock is associated with advanced stages of AKI. Extremely premature infant and those who survive an episode of AKI should be screened for chronic kidney disease (CKD) until early adulthood. Strategies to improve outcomes include thorough careful evaluation of nephrotoxic drugs- may reduce the incidence of AKI and its consequences among this population.

Conclusion

Improving nutritional status early in pregnancy, have the potential to optimize fetal growth and reduce the risk of preterm birth and low birth weight baby, thereby improving kidney health.There are definite criteria and guideline for assessing and diagnosing neonatal AKI. So, we need to improve our diagnostic efficacy and offering dialysis service everywhere for neonate. It is mandatory to keep the survived new born from AKI under regular follow up to prevent long term renal damage.

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