Presidential Address*

Working towards zero mortality from acute kidney injury in Sri Lanka

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Dear friends,
I stand here in all humility to accept this great honour that has been bestowed on me as the 21st President of the Sri Lanka College of Paediatricians. I am very deeply grateful to the membership of the College for electing me to this very important and prestigious position. For my part, I give you my pledge to uphold the rich traditions of the College and to work towards the lofty goal of this august institution. It is customary for the newly elected President to address you on a topic that is closest to his heart. With my special interest in Paediatric Nephrology, I have chosen to pitch this privilege on the theme of "Working towards zero mortality from acute kidney injury in Sri Lanka".

Acute kidney injury (AKI), previously called acute renal failure, is characterized by a reversible increase in the blood concentration of creatinine and nitrogenous waste products as a result of the inability of the kidneys to regulate fluid and electrolyte homeostasis appropriately[1]. A standardized definition of AKI was proposed by the Kidney Disease: Improving Global Outcomes (KDIGO)[2], and it identifies and stages AKI based on changes in serum creatinine from baseline or urine output as shown in Table 1.

Table 1: ***Stages of AKI based on changes in serum creatinine from baseline or urine output***

Stage	***Serum creatinine***	***Urine output***
1	Increase by 1.5–1.9 times baseline within 7 days OR Increase by ≥0.3 mg/dl (26.5µmol/l) within 48 hours	Less than 0.5 mL/kg/h for 6–12 hours
2	Increase by 2–2.9 times baseline	Less than 0.5 mL/kg/h for ≥12 hours
3	Increase by ≥3 times baseline OR Increase to ≥4 mg/dl (353.6µmol/l) OR Renal replacement therapy initiation OR In patients younger than 18 years, decrease in estimated GFR to <35 mL/min/1.73 m^2	Less than 0.3 mL/kg/h for ≥24 hours OR Anuria for ≥12 hours

Main causes of AKI are infectious diseases such as gastroenteritis associated diarrhoea, malaria and leptospirosis, followed by snake envenomation and the use of natural herbal medicines or non-steroidal anti-inflammatory drugs[2].

Despite technological advances and substantial preventive efforts, the incidence of AKI in developing countries remains high with an estimated incidence of 13.3 million cases per year globally, 85% of which being in developing countries, with an estimated number of deaths of around 1.7 million attributable to AKI annually[3]. Although AKI in developed countries with sophisticated medical infrastructure is predominantly a disease found in hospitalized, elderly and very sick patients, in low- and middle-income countries, it is largely a community-acquired condition, with dehydration and hypotension being the most common cause[4]. Hence, death as a consequence of AKI could often be prevented by simple timely interventions such as rehydration (oral or parenteral) or immediate temporary dialysis.

AKI, if not recognized and treated early, could lead to complications such as hyperkalaemia, acidosis, uraemia and volume overload. Moreover, AKI can affect the function of inflammatory cytokines, immune function and apoptosis pathways, thereby giving rise to other complications including sepsis, lung injury and cardiac failure[5,6]. In resource-poor

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developing countries the threat to patients from complications such as sepsis is higher and contributes to mortality. In such situations, early intervention in AKI is essential.

The 0By25 Initiative

The International Society of Nephrology's AKI initiative aims to prevent all avoidable deaths from AKI by 2025[7]. This is planned to be achieved by:

- Compiling existing and prospective data in order to better understand AKI's prevalence and to improve diagnostic and treatment methods.
- Promoting increased awareness of AKI across the global healthcare community, predominantly through education and training.
- Implementing globally applicable strategies that permit timely diagnosis and treatment of AKI for patients, with potentially reversible diseases, through pilot projects.

Peritoneal dialysis for AKI

Dialysis modalities used in AKI are haemodialysis (HD) in haemodynamically stable patients and continuous renal replacement therapy (CRRT) and slow low-efficiency dialysis (SLED) for haemodynamically unstable patients[8]. As most patients with infections with AKI are haemodynamically unstable, CRRT has been the preferred mode of dialysis. However these facilities are available only in a few major centres in our country and cost has always been a concern. Although SLED has been reported as a cost-effective alternative it has not been employed on a regular basis in Sri Lanka. Acute peritoneal dialysis (PD), either performed manually or with automated machines, can be instituted for both stable and unstable patients. Acute PD is used for AKI treatment mostly due to its cost-effectiveness and minimal infrastructure requirements. Additionally, PD has been found to be an adequate form of treatment for AKI occurring as a result of snake bites especially Russell's viper envenomation, as well as malaria, leptospirosis, gastroenteritis, febrile illnesses, sepsis, acute pancreatitis, rhabdomyolysis, hepato-renal syndrome, following cardiac surgery and poisoning such as barbiturates and lithium[9,10,11].

In acute PD, the type of catheter used, peritoneal dialysis fluid employed and skill of inserting the catheter are of immense importance. There are two types of PD catheters;

i. *Rigid catheter*: It is cheap and easier to insert. However, there is a slightly increased risk of peritonitis, catheter dysfunction and poor dialysate flow when compared to a flexible catheter.

ii. *Flexible catheter*: It accommodates a higher dialysate flow rate but it has a higher cost. Swan neck configuration of such catheters prevent catheter migration from the pelvis. Flexible peritoneal catheters should be preferred over rigid catheters when available. There are 2 types of flexible catheters namely, Cook catheter and Tenckhoff catheter. Of the two, Tenckhoff catheter insertions require general anaesthesia and surgical expertise for insertion while the Cook catheter can be inserted with local anaesthesia at the bedside using a trocar or a peel-away sheath technique. Therefore, for acute dialysis the Cook catheter is the preferred choice.

PD in limited resource settings

Haemodialysis and CRRT are the preferred modes of dialysis in the developed world and HD catheters are more readily available in most parts of the world than PD catheters. Hence the availability of the PD catheters poses a challenge when considering the need to perform acute PD in Sri Lanka. The naso-gastric feeding tubes and other improvised catheters are used in developing countries to save lives of children with AKI. However, these are usually associated with more challenges of infections, blocking of the improvised catheters, and leakage from catheter exit sites, when compared to standard catheters[12]. Although dialysate solutions are manufactured in a number of developing countries, their availability is limited in many regions of the world. As a result, a number of PD units produce their own solutions using a mixture of modified Ringer's lactate and glucose, both of which are readily available in most hospitals. However, there is a real potential risks of contamination and infection[13]. Therefore, a strict aseptic protocol in the preparation of this improvised fluid is mandatory.

AKI in seriously ill children increases the morbidity and mortality. It is further increased if the interventions are delayed, principally due to fluid overload and electrolyte imbalances leading to multi organ failure[8]. In a developing country like Sri Lanka facilities to treat AKI are available only in few major centres in the country. This has resulted in a preventable mortality in the more remote parts of our country where facilities and expertise to manage AKI is at a premium while other services like neonatal intensive care and

paediatric intensive care have improved at a rapid pace. It is therefore important to equip all the medical personnel in paediatric practice to perform an acute peritoneal dialysis in a low resource setting. The skill to insert an acute PD catheter is the major challenge. However, the procedure is very simple and can be performed even as a ward procedure. All the equipment that one need are an artery forceps, scalpel blade and suture material. The College of Paediatricians, with the help of the Paediatric Nephrology Group will undertake the task of training the trainers in all regions of the country during the regional sessions of the College of Paediatricians to achieve this objective. Moreover, the College will liaise with the Board of Study in Paediatrics of the Postgraduate Institute of Medicine to have hands-on training programmes for all the Paediatric Postgraduate Trainees to be competent in performing acute PD.

Conclusion

Looking at the economic burden posed by kidney-related health concerns in developing countries like Sri Lanka, dialysis modalities should be simple and cost-effective to save lives. In that context, PD is a valuable treatment of choice. Through local manufacturing of catheter and dialysis fluid as well as improving expertise in this area through regional sessions we aim to reach towards zero mortality for children with AKI in Sri Lanka by the year 2020.

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